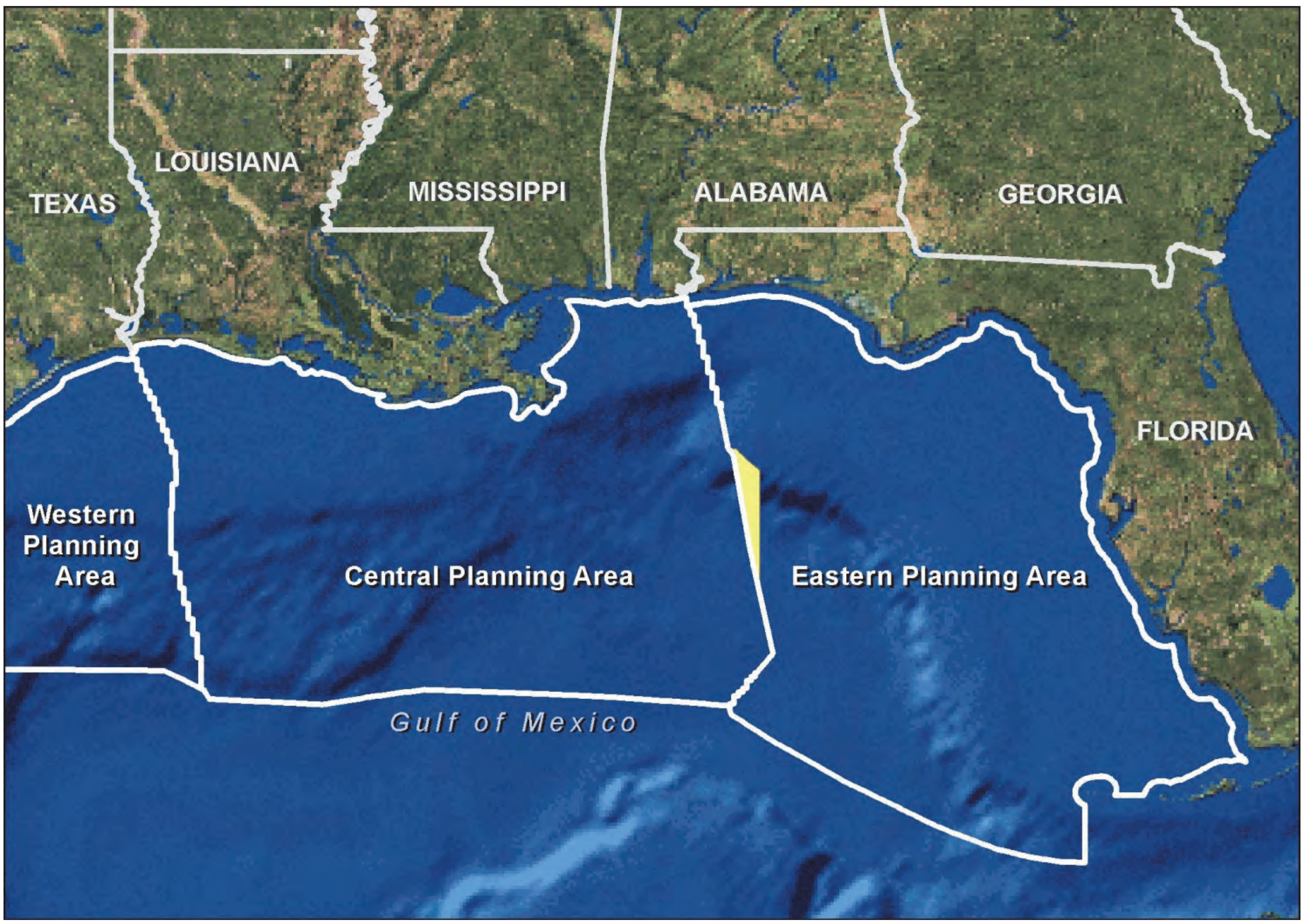
OCS EIS/EA
BOEM 2013-200

Gulf of Mexico OCS
Oil and Gas Lease Sales: 2014 and 2016

Eastern Planning Area Lease Sales 225 and 226

Final Environmental Impact Statement

Volume I: Chapters 1-8 and Keyword Index



U.S. Department of the Interior
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region

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REGIONAL DIRECTOR'S NOTE

Under the *Proposed Final Outer Continental Shelf Oil & Gas Leasing Program: 2012-2017*, two proposed lease sales are scheduled in the westernmost portion of the Eastern Planning Area (EPA). Proposed EPA Lease Sales 225 and 226 will offer all unleased blocks in the proposed lease sale area that may contain economically recoverable oil and gas, as authorized under the Gulf of Mexico Energy Security Act of 2006. Proposed EPA Lease Sales 225 and 226 are tentatively scheduled for 2014 and 2016, respectively. The Bureau of Ocean Energy Management (BOEM) has prepared *Gulf of Mexico OCS Oil and Gas Lease Sales: 2014 and 2016; Eastern Planning Area Lease Sales 225 and 226, Final Environmental Impact Statement* (EIS) for the proposed lease sales. At the completion of this EIS process, a decision will be made only for proposed EPA Lease Sale 225. An additional National Environmental Policy Act review will be conducted for proposed EPA Lease Sale 226 to address any new information relevant to that proposed action.

This EIS analyzes the potential impacts of an EPA proposed action on the marine, coastal, and human environments. It is important to note that this EIS was prepared using the best information that was publicly available at the time this document was prepared.

BOEM's Gulf of Mexico OCS Region has been conducting environmental analyses of the effects of Outer Continental Shelf (OCS) oil and gas development since the inception of the National Environmental Policy Act of 1969. We have prepared and published more than 50 draft and 50 final EIS's. Our goal has always been to provide factual, reliable, and clear analytical statements in order to inform decisionmakers and the public about the environmental effects of proposed OCS activities and their alternatives. We view the EIS process as providing a balanced forum for early identification, avoidance, and resolution of potential conflicts. It is in this spirit that we welcome comments on this document from all concerned parties.

John L. Rodi

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Regional Director
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region

COVER SHEET

Environmental Impact Statement
for
Proposed Eastern Planning Area OCS Oil and Gas Lease Sales 225 and 226

Draft ( ) Final (x)

Type of Action: Administrative (x) Legislative ( )

Area of Potential Impact: Offshore Marine Environment and Coastal Parishes/Counties of Louisiana, Mississippi, Alabama, and Florida

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ABSTRACT

This Environmental Impact Statement (EIS) addresses two proposed Gulf of Mexico Outer Continental Shelf (OCS) oil and gas lease sales: Eastern Planning Area (EPA) Lease Sales 225 and 226, as scheduled in the *Proposed Final Outer Continental Shelf Oil & Gas Leasing Program: 2012-2017* (Five-Year Program) (USDOI, BOEM, 2012a).

This EIS for proposed EPA Lease Sales 225 and 226 uses information contained in three previous environmental impact statements. This EIS tiers from the *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Programmatic Environmental Impact Statement* (Five-Year Program EIS) (USDOI, BOEM, 2012b) and, due to the close proximity of the proposed EPA lease sale area to the Central Planning Area, incorporates by reference all of the relevant material in the EIS's that were prepared for the nearby or adjacent Western and Central Planning Areas (WPA and CPA): *Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247, Final Environmental Impact Statement* (2012-2017 WPA/CPA Multisale EIS) (USDOI, BOEM, 2012c) and *Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014; Western Planning Area Lease Sale 233; Central Planning Area Lease Sale 231, Final Supplemental Environmental Impact Statement* (WPA 233/CPA 231 Supplemental EIS) (USDOI, BOEM, 2012d).

This EIS analyzes the potential impacts of an EPA proposed action on sensitive coastal environments, offshore marine resources, and socioeconomic resources both onshore and offshore. It is important to note that this EIS was prepared using the best information that was publicly available at the time the document was prepared. Where relevant information on reasonably foreseeable significant adverse impacts is incomplete or unavailable, the need for the information was evaluated to determine if it was essential to a reasoned choice among the alternatives and if so, was either acquired or in the event it was impossible or exorbitant to acquire the information, accepted scientific methodologies were applied in its place.

The proposed actions are considered to be major Federal actions requiring an EIS. This document provides the following information in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations, and it will be used in making decisions on the proposals. This document includes the purpose and background of an EPA proposed action, identification of the

alternatives, description of the affected environment, and an analysis of the potential environmental impacts of an EPA proposed action, alternatives, and associated activities, including proposed mitigating measures and their potential effects. Potential contributions to cumulative impacts resulting from activities associated with an EPA proposed action are also analyzed.

Hypothetical scenarios were developed on the levels of activities, accidental events (such as oil spills), and potential impacts that might result if an EPA proposed action is adopted. Activities and disturbances associated with an EPA proposed action on biological, physical, and socioeconomic resources are considered in the analyses.

This EIS will also assist decisionmakers in making informed, future decisions regarding the approval of operations, as well as leasing. At the completion of the NEPA process, a decision will be made only for proposed EPA Lease Sale 225. An additional NEPA review will be conducted for proposed EPA Lease Sale 226 to address any new information relevant to that proposed action.

Additional copies of this EIS, the three EIS's referenced above, and the other referenced publications may be obtained from the Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, Public Information Office (GM 335A), 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394, by telephone at 504-736-2519 or 1-800-200-GULF, or on the Internet at http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/nepaprocess.asp.

SUMMARY

This environmental impact statement (EIS) addresses two proposed Federal actions that offer for lease an area on the Gulf of Mexico Outer Continental Shelf (OCS) that may contain economically recoverable oil and gas resources. Under the *Proposed Final Outer Continental Shelf Oil & Gas Leasing Program*: *2012-2017* (Five-Year Program) (USDOI, BOEM, 2012a), two proposed lease sales are scheduled for the Eastern Planning Area (EPA). Proposed EPA Lease Sale 225 is tentatively scheduled for 2014 and proposed EPA Lease Sale 226 is tentatively scheduled for 2016. Federal regulations allow for several related or similar proposals to be analyzed in one EIS (40 CFR § 1502.4). Since each lease sale proposal and projected activities are very similar for the proposed EPA lease sale area, a single EIS is being prepared for the two proposed EPA lease sales. Pursuant to OCSLA's staged leasing process, for each lease sale proposed in the final Five-Year Program, BOEM makes individual decisions on whether and how to proceed with a lease sale. At the completion of this EIS process, a decision will be made on whether or how to proceed with proposed EPA Lease Sale 225. A separate National Environmental Policy Act (NEPA) review, in a form to be determined by the Bureau of Ocean Energy Management (BOEM), will be conducted prior to BOEM's decision on whether or how to proceed with proposed EPA Lease Sale 226.

This EIS for proposed EPA Lease Sales 225 and 226 uses information contained in three previous environmental impact statements. This EIS tiers from the *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Programmatic Environmental Impact Statement* (Five-Year Program EIS) (USDOI, BOEM, 2012b) and, due to the close proximity of the proposed EPA lease sale area to the Central Planning Area, incorporates by reference all of the relevant material published in the EIS's that were prepared for the nearby or adjacent Western and Central Planning Areas (WPA and CPA): *Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247, Final Environmental Impact Statement* (2012-2017 WPA/CPA Multisale EIS) (USDOI, BOEM, 2012c) and *Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014; Western Planning Area Lease Sale 233; Central Planning Area Lease Sale 231, Final Supplemental Environmental Impact Statement* (WPA 233/CPA 231 Supplemental EIS) (USDOI, BOEM, 2012d).

This summary is only a brief overview of the proposed EPA lease sales, alternatives, significant issues, potential environmental and socioeconomic effects, and proposed mitigating measures contained in this EIS. To obtain the full perspective and context of the potential environmental and socioeconomic impacts discussed, it is necessary to read the entire analyses. Relevant discussions can be found in the chapters of this EIS as described below.

- **Chapter 1**, The Proposed Actions, describes the purpose of and need for the proposed EPA lease sales, the prelease process, postlease activities, and other OCS-related activities. This chapter also provides summaries of the major applicable Federal laws and regulations.
- **Chapter 2**, Alternatives Including the Proposed Actions, summarizes the environmental and socioeconomic effects of an EPA proposed lease sale and alternatives. This chapter also discusses the potential mitigating measures to avoid or minimize impacts.
- **Chapter 3**, Impact-Producing Factors and Scenario, describes activities associated with an EPA proposed lease sale and the OCS Program, and other foreseeable activities that could potentially affect the biological, physical, and socioeconomic resources of the Gulf of Mexico.

    Chapter 3.1, Impact-Producing Factors and Scenario—Routine Operations, describes the offshore infrastructure and activities (impact-producing factors) associated with an EPA proposed lease sale that could potentially affect the biological, physical, and socioeconomic resources of the Gulf of Mexico.

Chapter 3.2, Impact-Producing Factors and Scenario—Accidental Events, discusses potential accidental events (i.e., oil spills, losses of well control, vessel collisions, and spills of chemicals or drilling fluids) that may occur as a result of activities associated with an EPA proposed lease sale.

Chapter 3.3, Cumulative Activities Scenario, describes past, present, and reasonably foreseeable future human activities, including non-OCS activities, as well as all OCS activities, that may affect the biological, physical, and socioeconomic resources of the Gulf of Mexico.

- **Chapter 4**, Description of the Environment and Impact Analysis, describes the affected environment and provides an analysis of the routine, accidental, and cumulative impacts of an EPA proposed action and the alternatives on environmental and socioeconomic resources of the Gulf of Mexico.

  Chapter 4.1, Proposed Eastern Planning Area Lease Sales 225 and 226, describes the impacts of an EPA proposed action and alternatives to an EPA proposed action on the biological, physical, and socioeconomic resources of the Gulf of Mexico.

  Chapter 4 also includes **Chapter 4.2**, Unavoidable Adverse Impacts of the Proposed Action; **Chapter 4.3**, Irreversible and Irretrievable Commitment of Resources; and **Chapter 4.4**, Relationship between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity.

- **Chapter 5**, Consultation and Coordination, describes the consultation and coordination activities with Federal, State, and local agencies and other interested parties that occurred during the development of this EIS.
- **Chapter 6**, References, is a list of literature cited throughout this EIS.
- **Chapter 7**, Preparers, is a list of names of persons who were primarily responsible for preparing and reviewing this EIS.
- **Chapter 8**, Glossary, is a list of definitions of selected terms used in this EIS.
- **Appendix A**, Physical and Environmental Settings, provides in-depth background information beyond the resource-specific material presented in the impact analyses.
- **Appendix B**, Catastrophic Spill Analysis, is a technical analysis of a potential catastrophic event to assist BOEM in meeting the Council on Environmental Quality's (CEQ) requirements for evaluating low-probability catastrophic events under NEPA. The CEQ regulations address impacts with catastrophic consequences in the context of evaluating reasonably foreseeable significant adverse effects in an EIS when they address the issue of incomplete or unavailable information (40 CFR § 1502.22). For NEPA purposes, "'[r]easonably foreseeable' impacts include impacts that have catastrophic consequences even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason" (40 CFR § 1502.22(b)(4)). Therefore, this analysis, which is based on credible scientific evidence, identifies the most likely and most significant impacts from a high-volume blowout and oil spill that continues for an extended period of time. The scenario and impacts discussed in this analysis should not be confused with the scenario and impacts anticipated to result from routine activities or more reasonably foreseeable accidental events of an EPA proposed action.
- **Appendix C**, BOEM-OSRA Catastrophic Run, is a detailed explanation of BOEM's Oil-Spill Risk Analysis (OSRA) and the computer model runs accomplished for this EIS.

- **Appendix D**, Essential Fish Habitat Assessment, is the text of the essential fish habitat consultations that BOEM has concluded with the National Marine Fisheries Service.
- **Appendix E**, State Coastal Management Plans, reflects the Department of Commerce-approved coastal management plans of the coastal states in the Gulf of Mexico that have the potential to be affected by an EPA proposed action.
- **Appendix F**, Recent Publications of the Environmental Studies Program, contains a listing of publications that originated in BOEM's (and the Agency's predecessors, the Bureau of Ocean Energy Management, Regulation and Enforcement and the Minerals Management Service) Environmental Studies Program of the Gulf of Mexico OCS Region, with a particular focus on the most recent studies.
- **Appendix G**, Air Quality Offshore Modeling Analysis, presents a detailed analysis of the Offshore Coastal Dispersion Model for air quality purposes.

Proposed Action and Alternatives

Alternative A (Preferred Alternative)—The Proposed Action: This alternative would offer for lease all unleased blocks within the proposed EPA lease sale area for oil and gas operations.

The proposed EPA lease sale area covers approximately 657,905 acres and includes those blocks previously included in the EPA Lease Sale 224 Area and a triangular-shaped area south of this area bordered by the CPA boundary on the west and the Military Mission Line (86º41′ W. longitude) on the east. The area is south of eastern Alabama and western Florida; the nearest point of land is 125 miles (201 kilometers) northwest in Louisiana. As of August 2013, approximately 465,200 acres of the proposed EPA lease sale area are currently unleased. The estimated amount of natural resources projected to be developed as a result of a proposed EPA lease sale is 0-0.071 billion barrels of oil (BBO) and 0-0.162 trillion cubic feet (Tcf) of gas.

Alternative A has been identified as BOEM's preferred alternative; however, this does not mean that the other alternative may not be selected in the Record of Decision.

Alternative B—No Action: This alternative is the cancellation of a proposed EPA lease sale. If this alternative is chosen, the opportunity for development of the estimated 0-0.071 BBO and 0-0.162 Tcf of gas that could have resulted from a proposed EPA lease sale would be precluded or postponed. Any potential environmental impacts resulting from a proposed EPA lease sale would not occur or would be postponed to a future lease sale decision. This is also analyzed in the EIS for the Five-Year Program on a nationwide programmatic level.

Although for its NEPA analyses in other planning areas BOEM typically analyzes alternatives that defer blocks based on the proximity or presence of biologically sensitive features or for other programmatic reasons, BOEM has determined that such alternatives are not reasonable in the EPA as there are no known blocks to exclude due to proximity to or presence of biologically sensitive features and due to the fact that the proposed EPA action area is such a small area for leasing. Scoping did not identify any other reasonable alternatives. And finally, other viable alternatives such as the deferral of blocks or the delay of a proposed EPA lease sale would essentially result in the same impacts as the No Action alternative, and therefore, do not need to be evaluated as separate and distinct alternatives.

Mitigating Measures

Proposed lease stipulations and other mitigating measures designed to reduce or eliminate environmental risks and/or potential multiple-use conflicts between OCS operations and U.S. Department of Defense activities may be applied to Alternative A. Four lease stipulations are proposed for an EPA proposed lease sale—the Protected Species Stipulation, Military Areas Stipulation, the Evacuation Stipulation, and the Coordination Stipulation.

Application of lease stipulations will be considered by the Assistant Secretary of the Interior for Land and Minerals (ASLM). The inclusion of the stipulations as part of the analysis of an EPA proposed action does not ensure that the ASLM will make a decision to apply the stipulations to leases that may result from an EPA proposed lease sale nor does it preclude minor modifications in wording during subsequent steps in the prelease process if comments indicate changes are necessary or if conditions warrant. Any stipulations or mitigation requirements to be included in an EPA lease sale will be described in the Final Notice of Sale. Mitigation measures in the form of lease stipulations are added to the lease terms and are therefore enforceable as part of the lease.

Scenarios Analyzed

Offshore activities are described in the context of scenarios for an EPA proposed action (**Chapter 3.1**) and for the OCS Program (**Chapter 3.3**). BOEM's Gulf of Mexico OCS Region developed these scenarios to provide a framework for detailed analyses of potential impacts of and EPA proposed lease sale. The scenarios are presented as ranges of the amounts of undiscovered, unleased hydrocarbon resources estimated to be leased and discovered as a result of an EPA proposed action. The analyses are based on a traditionally employed range of activities (e.g., the installation of platforms, wells, and pipelines, and the number of helicopter operations and service-vessel trips) that would be needed to develop and produce the amount of resources estimated to be leased.

The cumulative analysis (located within various subchapters of **Chapter 4.1**) considers environmental and socioeconomic impacts that may result from the incremental impact of an EPA proposed action when added to all past, present, and reasonably foreseeable future activities, including non-OCS activities such as import tankering and commercial fishing, as well as all OCS activities (OCS Program). The OCS Program scenario includes all activities that are projected to occur from past, proposed, and future lease sales during the 40-year analysis period (2012-2051). This includes projected activity from lease sales that have been held, but for which exploration or development has not yet begun or is continuing. In addition to human activities, impacts from natural occurrences, such as hurricanes, are analyzed.

Significant Issues

The major issues that frame the environmental analyses in this EIS are the result of concerns raised during years of scoping for the Gulf of Mexico OCS Program. Issues related to OCS exploration, development, production, and transportation activities include oil spills, wetlands loss, air emissions, discharges, water quality degradation, trash and debris, structure and pipeline emplacement activities, platform removal, vessel and helicopter traffic, multiple-use conflicts, support services, population fluctuations, demands on public services, land-use planning, impacts to tourism, aesthetic interference, cultural impacts, environmental justice, and conflicts with State coastal zone management programs. Environmental resources and activities identified during the scoping process to warrant an environmental analysis include air quality, water quality, coastal barrier beaches and associated dunes, wetlands, seagrass communities, live bottoms, topographic features, *Sargassum* communities, deepwater benthic communities, soft bottom benthic communities, marine mammals, sea turtles, diamondback terrapins, beach mice, coastal and marine birds, Gulf sturgeon, smalltooth sawfish, fish resources and essential fish habitat, commercial and recreational fishing, recreational resources, archaeological resources, and socioeconomic conditions.

Other relevant issues include impacts from the *Deepwater Horizon* explosion, oil spill, and response; from past and future hurricanes on environmental and socioeconomic resources; and on coastal and offshore infrastructure. During the past few years, the Gulf Coast States and Gulf of Mexico oil and gas activities have been impacted by major hurricanes. The description of the affected environment (located within various subchapters of **Chapter 4.1**) includes impacts from these storms on the physical and biological environment, socioeconomic activities, and OCS-related infrastructure. Baseline data are considered in the assessment of impacts from an EPA proposed action to the resources and the environment (located within various subchapters of **Chapter 4.1**).

Impact Conclusions

The full analyses of the potential impacts of routine activities and accidental events associated with an EPA proposed action and a proposed action's incremental contribution to the cumulative impacts are described in various subchapters of **Chapter 4.1**. A summary of the potential impacts from an EPA proposed action on each environmental and socioeconomic resource and the conclusions of the analyses can be found below.

Air Quality: Emissions of pollutants into the atmosphere from routine activities associated with an EPA proposed action are projected to have minimal impacts on onshore air quality, including emissions within the National Ambient Air Quality Standards. Increases in onshore annual average concentrations of NO_x, SO_x, and PM_{10} as a result of an EPA proposed action will be less than the maximum increases allowed in the Prevention of Significant Deterioration Class II areas. While regulations are in place to reduce the risk of impacts from hydrogen sulfide (H_2S) and while no H_2S-related deaths have occurred on the OCS, accidents involving high concentrations of H_2S could result in deaths as well as environmental damage. These emissions from routine and accidental events associated with an EPA proposed action are not expected to occur at concentrations that would change onshore air quality classifications.

Water Quality (Coastal Waters): The impacts to coastal water quality from routine activities associated with an EPA proposed action should be minimal if all existing regulatory requirements are met. Accidental events associated with an EPA proposed action that could impact coastal water quality include spills of oil and refined hydrocarbons, releases of natural gas and condensate, usage of chemical dispersants in oil-spill response, and spills of chemicals or drilling fluids. The loss of well control, pipeline failures, collisions, or other malfunctions could also result in such spills. Although response efforts may decrease the amount of oil in the environment, the response efforts may also impact the environment through, for example, increased vessel traffic, hydromodification, and application of dispersants. Natural degradation processes would also decrease the amount of spilled oil over time. For coastal spills, two additional factors that must be considered are the shallowness of the area and the proximity of the spill to shore. Over time, natural processes can physically, chemically, and biologically degrade oil. Chemicals used in the oil and gas industry are not a significant risk in the event of a spill because they are either nontoxic, are used in minor quantities, or are only used on a noncontinuous basis. Spills from collisions are not expected to be significant because collisions occur infrequently.

Water Quality (Offshore Waters): Regulations limit the levels of contaminants in discharges of drilling fluids and cuttings from exploratory activities and produced water and supply-vessel discharges during production activities. Therefore, the impacts to offshore water quality from routine activities associated with an EPA proposed action should be minimal as long as regulatory requirements are followed. Accidental events associated with an EPA proposed action that could impact offshore water quality include spills of oil and refined hydrocarbons, releases of natural gas and condensate, usage of chemical dispersants in oil-spill response, spills of chemicals or drilling fluids, loss of well control, pipeline failures, collisions, or other malfunctions that would result in such spills. Spills from collisions are not expected to be significant because collisions occur infrequently. Overall, loss of well control events and blowouts are rare events and of short duration, so potential impacts to offshore water quality are not expected to be significant except in the rare case of a catastrophic event. Although there is the potential for accidental events, an EPA proposed action would not significantly change the water quality of the Gulf of Mexico over a large spatial or temporal scale.

Coastal Barrier Beaches and Associated Dunes: Routine activities associated with an EPA proposed action are not expected to adversely alter barrier beach configurations much beyond existing, ongoing impacts in localized areas. This is because of the small amount of dredging, small probability of pipeline landfall, and the forecast for no new onshore facilities expected to result from an EPA proposed action. If any such activities should occur, multiple Federal and State regulations would ensure decreased impacts to coastal habitats.

Due to the proximity of inshore spills to barrier islands and beaches, inshore spills pose the greatest threat to coastal barrier beaches and dunes. The effects could be changes in species diversity that could result in changes in forage areas for species using microfauna as a food base. The probability of an offshore spill contacting recreational beaches is <0.5 percent. Equipment and personnel used in cleanup efforts can generate the greatest direct impacts to the area. No significant long-term impacts to the physical shape and structure of barrier beaches and associated dunes are expected to occur as a result of an EPA proposed action.

Wetlands: The impacts to wetlands from routine activities associated with an EPA proposed action are expected to be low because of the small length of onshore pipelines projected, the forecast for no new onshore facilities expected, and the minimal contribution to the need for maintenance dredging. Also, the mitigation measures required in most permits would further reduce all of these impacts.

Due to the proximity of inshore spills to wetlands and coastal habitats, inshore spills pose the greatest threat to wetlands. Fringe wetlands in the northern Gulf of Mexico are in moderate- to high-energy environments; therefore, sediment transport and tidal stirring should reduce the chances for oil persisting in the event that these areas are oiled. While a resulting slick may cause minor impacts to wetland habitat and surrounding seagrass communities, the equipment, chemical treatments, and personnel used to clean up can generate the greatest impacts to the area. Close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. Overall, impacts to wetland habitats from an oil spill associated with activities related to an EPA proposed action would be expected to be low and temporary because of the nature of the system, regulations, and specific cleanup techniques.

Seagrass Communities: Routine OCS activities related to an EPA proposed action that may impact seagrasses include maintenance dredging, vessel traffic, and pipeline landfalls. These activities are not expected to significantly increase in occurrence and range in the near future. If they do occur, these activities should have minor effects on submerged vegetation.

The greatest threat to inland, submerged vegetation communities would be from an inland spill resulting from a vessel accident or pipeline rupture, but the size of these types of spills is small and the duration short. The resulting slick may cause short-term and localized impacts to a submerged vegetation bed. Because prevention and cleanup measures can have negative effects on submerged vegetation, close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. Safety and spill-prevention technologies are expected to continue to improve and would decrease the detrimental effects to submerged vegetation from an EPA proposed action.

Live Bottoms (Pinnacle Trend): Based on the localized impacts of routine oil and gas activities, the distance of the Pinnacle Trend from the proposed EPA lease sale area, and the depth of the proposed EPA lease sale area in relation to the depth where Pinnacle features are found, no impacts from routine events are anticipated to occur to Pinnacle features in the CPA as a result of an EPA proposed action.

Due to the distance of an EPA proposed action from the Pinnacle Trend, only large spills have the potential to reach the Pinnacle Trend. Most of the oil released from a spill at depth would be expected to rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on Pinnacle features.

Live Bottoms (Low Relief): Based on the localized impacts of routine oil and gas activities, the distance of the live bottom low relief features from the sale area, and the depth of the sale area in relation to the depth where live bottom features are found, no impacts from routine events are anticipated to occur to live bottom low relief features in the EPA or CPA as a result of an EPA proposed action.

Due to the distance of an EPA proposed action from the low relief, only large spills have the potential to reach the topographic features. Most of the oil released from a spill at depth would be expected to rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on live-bottom features.

Topographic Features: Based on the localized impacts of routine oil and gas activities, the distance of the topographic features from the proposed EPA lease sale area, and the depth of the proposed EPA lease sale area in relation to the depth where topographic features are found, no impacts from routine events are anticipated to occur to topographic features in the Gulf of Mexico as a result of an EPA proposed action.

Due to the distance of an EPA proposed action from the topographic features, only large spills have the potential to reach the topographic features. Most of the oil released from a spill at depth would be expected to rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on topographic features.

Sargassum Communities: Impact-producing factors associated with routine events for an EPA proposed action that could affect *Sargassum* in the EPA may include the following: (1) drilling discharges (muds and cuttings); (2) produced water and well treatment chemicals; (3) operational discharges (deck drainage, sanitary and domestic water, and bilge and ballast water); and (4) physical disturbance from vessel traffic and the presence of exploration and production structures (i.e., rigs, platforms, and mobile offshore drilling units). The potential routine impacts to *Sargassum* that are associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community as a whole. The *Sargassum* community lives in pelagic waters with generally high water quality and would be resilient to the minor effects predicted.

The potential accidental impacts to *Sargassum* that are associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community unless a catastrophic spill occurs. In the case of a very large spill, the *Sargassum* algae community could suffer severe impacts to a sizable portion of the population in the northern Gulf of Mexico. The *Sargassum* community lives in pelagic waters with generally high water quality and is expected to show good resilience to the predicted effects of spills.

Chemosynthetic Deepwater Benthic Communities: Due to BOEM's avoidance measures for chemosynthetic communities, the impacts on chemosynthetic communities caused by routine activities associated with an EPA proposed action would be minimal to none.

Potential accidental impacts from an EPA proposed action are expected to cause little damage to the ecological function or biological productivity of chemosynthetic communities. Adverse impacts would be limited by adherence to guidelines in Notice to Lessees and Operators (NTL) 2009-G40. Accidental impacts to deepwater chemosynthetic communities in the Gulf of Mexico are considered negligible because of the application of BOEM's avoidance criteria as described in NTL 2009-G40, because of the patchy distribution of these communities, and because physical interactions between oil and water are not likely to carry oil to the habitats.

Nonchemosynthetic Deepwater Benthic Communities: Due to BOEM's avoidance measures, the impacts on deepwater live-bottom communities caused by routine activities associated with an EPA proposed action would be minimal to none.

Potential accidental impacts from an EPA proposed action are expected to cause little damage to the ecological function or biological productivity of nonchemosynthetic communities. Similar to chemosynthetic communities, accidental impacts to deepwater nonchemosynthetic communities in the Gulf of Mexico are considered negligible because of the application of BOEM's avoidance criteria as described in NTL 2009-G40, because of the patchy distribution of these communities, and because physical interactions between oil and water are not likely to carry oil to the habitats.

Soft Bottom Benthic Communities: Routine activities related to an EPA proposed action would only affect a small portion of the substrate and benthic communities of the Gulf of Mexico. Routine operations may affect soft bottom benthic communities through infrastructure emplacement, turbidity, sedimentation, drilling effluent discharges, and produced-water discharges. These localized impacts generally occur within a few hundred meters of platforms, and the greatest impacts are seen close to the platform. Benthic communities farther from a well would not be impacted by routine oil and gas activities.

Marine Mammals: Routine activities related to an EPA proposed action have the potential to have adverse, but not significant impacts to marine mammal populations in the Gulf of Mexico. Impacts from vessel traffic, structure removals, and seismic activity could negatively impact marine mammals; however, when mitigated as required by BOEM and the National Marine Fisheries Service, these activities are not expected to have long-term impacts on the size and productivity of any marine mammal species or population. Most other routine activities are expected to have negligible effects.

Accidental events related to an EPA proposed action have the potential to have adverse, but not significant impacts to marine mammal populations in the Gulf of Mexico.

Sea Turtles: Most routine OCS energy-related activities such as noise, operational discharges, vessel traffic, and marine debris are expected to have sublethal effects that are not expected to rise to the level of significance.

Accidental blowouts, oil spills, and spill-response activities resulting from a proposed action in the EPA have the potential to impact small to large numbers of sea turtles in the GOM, depending on the magnitude and frequency of accidents, the ability to respond to accidents, the location and date of accidents, and various meteorological and hydrological factors. Impacts on sea turtles from smaller accidental events are likely to affect individual sea turtles in the spill area, but they are unlikely to rise to the level of population effects (or significance) given the size and scope of such spills.

Diamondback Terrapins: The routine activities of an EPA proposed action are unlikely to have significant adverse effects on the size and recovery of any terrapin species or population in the Gulf of Mexico. Most routine, OCS energy-related activities are expected to have sublethal effects, such as behavioral effects, that are not expected to rise to the level of significance to the populations.

Impacts on diamondback terrapins from smaller accidental events are likely to affect individual diamondback terrapins in the spill area, but the impacts are unlikely to rise to the level of population effects (or significance) given the probable size and scope of such spills.

Beach Mice: An impact from the routine activities associated with an EPA proposed action on the Alabama, Choctawhatchee, St. Andrew, Perdido Key, southeastern, and Anastasia Island beach mice is possible but unlikely. An impact may result from consumption of or entanglement in beach trash and debris. Because an EPA proposed action would deposit only a small portion of the total debris that would reach the habitat, the impacts would be expected to be minimal.

A review of the available information shows that impacts on beach mice from accidental impacts associated with an EPA proposed action would be minimal.

Coastal and Marine Birds: The majority of the effects resulting from routine activities of an EPA proposed action on threatened or endangered and nonthreatened or nonendangered coastal and marine birds are expected to be sublethal, e.g., primarily disturbance-related effects. Overall, impacts to avian species from routine activities are expected to be adverse, but not significant.

Overall, impacts to coastal and marine birds associated with accidental events (oil spills regardless of size) in the EPA should be much less than compared with either the CPA or the WPA due to the following forecasts: only a single proposed platform; lower oil-spill probabilities; and a much lower number of predicted oil spills over the life of an EPA proposed action.

Fish Resources and Essential Fish Habitat: Routine activities such as pipeline trenching and OCS discharge of drilling muds and produced water could affect fish resources or essential fish habitat. It is expected that any possible coastal and marine environmental degradation from routine activities associated with an EPA proposed action is expected to cause a nondetectable decrease in fish resources or essential fish habitat.

Accidental events that could impact fish resources and essential fish habitat include blowouts and oil or chemical spills. Because subsurface blowouts, although a highly unlikely occurrence, suspend large amounts of sediment, they have the potential to adversely affect fish resources in the immediate area of the blowout. Also, any accidental event that could affect water quality or sensitive habitats has the potential to affect fish resources.

Commercial Fisheries: The commercial fish and shellfish populations have remained healthy in the Gulf of Mexico in spite of the OCS activities. In recent years, since 2005, the major contributors to the lower fisheries catches in the Gulf of Mexico have been hurricanes, fisheries closures, and freshwater diversions. The expected incremental effect of an EPA proposed action remains small when viewed in light of other historic, ongoing, and reasonably foreseeable future factors impacting commercial fishing, such as fishing pressures, habitat loss, and hurricanes.

Recreational Fishing: There could be minor and short-term, space-use conflicts with recreational fishermen during the initial phases of an EPA proposed action. An EPA proposed action could also lead to low-level environmental degradation of fish habitat, which would also negatively impact recreational fishing activity. However, these minor negative effects would likely be offset by the beneficial role that oil rigs serve as artificial reefs for fish populations. The degree to which oil platforms would become a part of a particular State's Rigs-to-Reefs program would be an important determinant of the degree to which an EPA proposed action would impact recreational fishing activity in the long term.

An oil spill would likely lead to recreational fishing closures in the vicinity of the oil spill. Small-scale spills should not affect recreational fishing to a large degree due to the likely availability of substitute fishing sites in neighboring regions. A large spill such as the one associated with the *Deepwater Horizon* explosion may have more noticeable effects due to the larger potential closure regions and due to the wider economic implications such closures may have. However, the longer-term implications of a large oil spill would primarily depend on the extent to which fish ecosystems recover after the spill has been cleaned.

Recreational Resources: Routine OCS actions in the EPA can cause disturbances to recreational resources, particularly beaches, through increased levels of noise, debris, and rig visibility. The OCS activities can also change the composition of local economies through changes in employment, land use, and recreation demand. However, the small scale of an EPA proposed action relative to the scale of the existing oil and gas industry suggests that these potential impacts on recreational resources are likely to be minimal.

Spills most likely to result from an EPA proposed action would be small, of short duration, and not likely to impact Gulf Coast recreational resources. The distance of an EPA proposed action from shore makes it quite unlikely that an oil spill would reach resources that are important for recreational activities. However, should an oil spill occur and contact a beach area or other recreational resource, it would cause some minor disruptions during the impact and cleanup phases of the spill. A catastrophic oil spill could have more noticeable effects on recreational resources.

Archaeological Resources (Historic): Offshore oil and gas activities resulting from an EPA proposed action could impact an archaeological resource because of incomplete knowledge on the location of these sites in the Gulf. The greatest potential impact to an archaeological resource as a result of an EPA proposed action would result from direct contact between an offshore activity (i.e., platform installation, drilling rig emplacement, dredging, and pipeline emplacement) and a historic site.

Accidental events producing oil spills may threaten archaeological resources along the Gulf Coast. Should a spill contact an historic archaeological site, damage might include direct impact from oil-spill cleanup equipment, contamination of materials, and/or looting. Previously unrecorded sites could be impacted by oil-spill cleanup operations on beaches and offshore. It is not very likely for an oil spill to occur and contact submerged, coastal or barrier island historic sites as a result of an EPA proposed action. The major effect from an oil-spill impact would be visual contamination of a historic coastal site, such as a historic fort or lighthouse. When oil is spilled in offshore areas, much of the oil volatilizes or is dispersed by currents, so it has a low probability of contacting coastal areas. It is expected that any spill cleanup operations would be considered a Federal action for the purposes of Section 106 of the National Historic Preservation Act and would be conducted in such a way as to cause little or no impacts to historic archaeological resources. Recent research suggests the impact of direct contact of oil on historic properties may be long term and not easily reversible without risking damage to fragile historic materials.

Archaeological Resources (Prehistoric): An EPA proposed action is not expected to result in impacts to prehistoric archaeological sites due to the distance from shore and the depth of the actions that may result from a proposed EPA lease sale.

A major effect from an oil-spill impact would be contamination of a prehistoric coastal site, such as a shell midden, disturbance as a result of cleanup activities, or looting from the location of the site becoming known after an oil spill. Other impacts that remain unknown at this time include the effect that the oiling of archaeological resources would have on the ability to conduct future chemical and observational analysis on the artifact assemblage. Currently, it is unknown to what extent the release of hydrocarbons or of dispersant would impede the analysis that may help interpret and understand archaeological resources.

Land Use and Coastal Infrastructure: The impacts of routine events associated with an EPA proposed action remain somewhat uncertain due to the post-*Deepwater Horizon* explosion, oil spill, and response environment, the effects of the drilling suspension, the changes in Federal requirements for drilling safety, and the current pace of permit approvals. BOEM projects 0-1 new gas processing facilities and 0-1 new pipeline landfalls for an EPA proposed action. Because of the current near zero estimates for a pipeline landfall and gas processing facility construction, the routine activities associated with an EPA proposed action would have little effect on land use.

Accidental events associated with an EPA proposed action would occur at different levels of severity, based in part on the location and size of event. The impact of small-scale oil spills, vessel collisions, and chemical/drilling fluid spills are not likely to last long enough to adversely affect overall land use or coastal infrastructure in the analysis area.

Demographics: An EPA proposed action is projected to minimally affect the demography of the analysis area. Population impacts from an EPA proposed action are projected to be minimal for any economic impact area in the Gulf of Mexico region. The baseline population patterns and distributions are expected to remain virtually unchanged as a result of an EPA proposed action.

Accidental events associated with an EPA proposed action, such as oil or chemical spills, blowouts, and vessel collisions, would likely have minimal effects on the demographic characteristics of the Gulf coastal communities. This is because accidental events typically cause only short-term population movements as individuals seek employment related to the event or have their existing employment displaced during the event. This is particularly true given the low likelihood of spills arising from an EPA proposed action.

Economic Factors: There would be only minor economic changes in the Louisiana, Mississippi, Alabama, and Florida economic impact areas as the result of an EPA proposed action. An EPA proposed action is expected to generate less than a 1 percent increase in employment in any of the economic impact areas. The short-term social and economic consequences for the Gulf coastal region should a spill ≥1,000 bbl occur includes opportunity cost of employment and expenditures that could have gone to production or consumption rather than spill cleanup efforts. Non-market effects such as traffic congestion, strains on public services, shortages of commodities or services, and disruptions to the normal patterns of activities or expectations are also expected to occur in the short term. These negative, short-term social and economic consequences of an oil spill are expected to be modest in terms of projected cleanup expenditures and the number of people employed in cleanup and remediation activities.

Negative, long-term economic and social impacts may be more substantial if fishing, shrimping, oystering, and/or tourism were to suffer or were to be perceived as having suffered because of the spill.

Environmental Justice: The effects of an EPA proposed action are expected to be widely distributed and little felt. Impacts related to an EPA proposed action are expected to be economic and to have a limited but positive effect on low-income and minority populations. Given the existing distribution of the current OCS-related infrastructure in relationship to the concentrations of minority and low-income peoples, an EPA proposed action is not expected to have a disproportionate effect on these populations. Routine activities or accidental events associated with an EPA proposed action are not expected to have disproportionate high/adverse environmental or health effects on minority or low-income people.

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ABBREVIATIONS AND ACRONYMS

°C	degree Celsius
°F	degree Fahrenheit
µg	microgram
µm	micrometer
2012-2017 WPA/CPA Multisale EIS	*Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247, Final Environmental Impact Statement*
WPA 233/CPA 231 Supplemental EIS	*Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014; Western Planning Area Lease Sale 233; Central Planning Area Lease Sale 231, Draft Supplemental Environmental Impact Statement*
2D	two-dimensional
3D	three-dimensional
4D	four-dimensional
ac	acre
ACP	Area Contingency Plan
AHTS	anchor-handling towing supply/mooring vessels
AL	Alabama
ANPR	Advance Notice of Proposed Rulemaking
APD	Application for Permit to Drill
API	American Petroleum Institute
Area ID	Area Identification
ASA	Applied Science Associates, Inc.
ASLM	Assistant Secretary of the Interior for Land and Minerals
atm	atmosphere
B.P.	before present
bbl	barrel
BBO	billion barrels of oil
Bcf	billion cubic feet
BCR	Bird Conservation Region
BOD	biochemical oxygen demand
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOP	blowout preventer
BP	British Petroleum
BSEE	Bureau of Safety and Environmental Enforcement
BTEX	benzene, ethylbenzene, toluene, and xylene
CAA	Clean Air Act of 1970
CAAA	Clean Air Act Amendments of 1990
Call	Call for Information
CD	Consistency Determination
CEI	Coastal Environments, Inc.
CEQ	Council on Environmental Quality
CER	categorical exclusion review
cf.	compare, see
CFR	*Code of Federal Regulations*
CG	Coast Guard (also: USCG)
CH_4	methane
CIAP	Coastal Impact Assistance Program
cm	centimeter
CMP	Coastal Management Program
CO	carbon monoxide
CO_2	carbon dioxide

COE	Corps of Engineers (U.S. Army)
CPA	Central Planning Area
CSA	Continental Shelf Associates
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
dB re^{-1}µPa-m	decibels, reference pressure 1 micropascal, reference range 1 meter
dB	decibel
DDE	dichloro-diphenyldichloro-ethylene
DDT	dichloro-diphenyl-trichloroethane
DOC	Department of Commerce (U.S.) (also: USDOC)
DOCD	development operations coordination document
DOD	Department of Defense (U.S.)
DOE	Department of Energy (U.S.) (also: USDOE)
DOI	Department of the Interior (U.S.) (also: USDOI)
DOSS	dioctyl sodium sulfosucinate
DOT	Department of Transportation (U.S.) (also: USDOT)
DP	dynamically positioned
DPnB	dipropylene glycol nbutyl ether
DPP	development and production plan
DWOP	deepwater operations plan
e.g.	for example
EA	environmental assessment
EFH	Essential Fish Habitat
EIA	economic impact area
EIS	environmental impact statement
EP	exploration plan
EPA	Eastern Planning Area
ERMA	Environmental Response Management Application
ESA	Endangered Species Act of 1973
ESI	Environmental Sensitivity Index
ESP	Environmental Studies Program
ESPIS	Environmental Studies Program Information System
et al.	and others
et seq.	and the following
EWTA	Eglin Water Test Area
FAZ	full azimuth
FEMA	Federal Emergency Management Agency
Five-Year Program	*Proposed Final Outer Continental Shelf Oil & Gas Leasing Program: 2012-2017*
Five-Year Program EIS	*Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Programmatic Environmental Impact Statement*
FL	Florida
FO	Field Operations
FONSNI	Finding of No New Significant Impact
FPSO	floating production, storage, and offloading system
FR	*Federal Register*
FSV	fast support vessel
ft	feet
FWS	Fish and Wildlife Service (U.S.)
FY	fiscal year
g	gram
G&G	geological and geophysical
GCCF	Gulf Coast Claims Facility
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection

GIS	geographical information system
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
GPS	global positioning system
GS	Geological Survey (U.S.) (also: USGS)
GuLF Study	Gulf Long-Term Follow-up Study
H_2S	hydrogen sulfide
ha	hectare
HAP	hazardous air pollutant
HAPC	Habitat Areas of Particular Concern
HIPPS	high-integrity pressure protection system
HMS	highly migratory species
HPHT	high-pressure, high-temperature
hr	hour
HWCG	Helix Well Containment Group
Hz	hertz
i.e.	specifically
IADC	International Association of Drilling Contractors
IBA	Important Bird Area
ICC	International Beach Cleanup
IFR	Interim Final Rule
in	inch
IPCC	Intergovernmental Panel Climate Change
ITOPF	International Tanker Owners Pollution Federation Limited
IUCN	International Union for the Conservation of Nature
IWC	International Whaling Commission
JITF	Joint Industry Task Force
kg	kilogram
km	kilometer
kn	knot
L	liter
LA	Louisiana
LA Hwy 1	Louisiana Highway 1
lb	pound
LC_{50}	lethal concentration, 50% mortality
LCA	Louisiana Coastal Area
LMA	labor market area
LNG	liquefied natural gas
LP	launch point
LSU	Louisiana State University
m	meter
m/sec	meters/second
MAFLA	Mississippi, Alabama, and Florida
MARAD	U.S. Department of Transportation, Maritime Administration
MARPOL	International Convention for the Prevention of Pollution from Ships
mg	milligram
mg/L	milligrams per liter
mi	mile
mm	millimeter
MMbbl	million barrels
MMS	Minerals Management Service
MOA	Memorandum of Agreement
MODU	mobile offshore drilling unit
MOU	Memorandum of Understanding
MPA	Marine Protected Area
mph	miles per hour

MS	Mississippi
MWA	military warning area
MWCC	Marine Well Containment Company
N.	north
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NACE	National Association of Corrosion Engineers
NEPA	National Environmental Policy Act
NERBC	New England River Basins Commission
NHPA	National Historic Preservation Act
NHPF	National Historic Preservation Fund
NMFS	National Marine Fisheries Service
nmi	nautical mile
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent to Prepare an EIS
NOS	Notice of Sale
NOSAC	National Offshore Safety Advisory Committee
NPDES	National Pollutant and Discharge Elimination System
NPS	National Park Service
NRC	National Research Council
NRDA	Natural Resource Damage Assessment
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
O_3	ozone
OBC	ocean bottom cables
OBF	oil-based fluids
OCD	Offshore and Coastal Dispersion Model
OCRM	Office of Ocean and Coastal Resource Management
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
ODMDS	ocean dredged-material disposal site
OSAT	Operational Science Advisory Team
OSC	On-Scene Coordinator
OSCP	Oil Spill Contingency Plan
OSHA	Occupational Safety and Health Administration
OSRA	Oil Spill Risk Analysis
OSRP	oil-spill response plans
OSV	offshore supply/service vessels
P.L.	Public Law
PAH	polycyclic aromatic hydrocarbon
PM_{10}	particulate matter smaller than 10 microns in size
$PM_{2.5}$	particulate matter smaller than 2.5 microns in size
ppb	part per billion
ppm	parts per million
ppt	parts per thousand
PSBF	potentially sensitive biological feature
PSD	Prevention of Significant Deterioration
PSV	platform supply vessel
RD	Regional Director
RESTORE Act	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012
ROD	Record of Decision
ROV	remotely operated vehicle

ROW	right-of-way
RP	Recommended Practice
RRT	Regional Response Team
RS	Regional Supervisor
RS-FO	Regional Supervisor for Field Operations
RTR	Rigs-to-Reef
S.	south
SAFMC	South Atlantic Fishery Management Council
SAIC	Science Application International Corporation
SAV	submerged aquatic vegetation
SBF	synthetic-based fluid
SBM	synthetic-based mud
SCAT	Shoreline Cleanup and Assessment Team
SEAMAP	Southeastern Area Monitoring and Assessment Program
Secretary	Secretary of the Interior
SEMS	Safety and Environmental Management System
SIL	Significant Impact Level
SO_2	sulphur dioxide
SO_x	sulphur oxides
sp.	species
spp.	multiple species
SSSV	subsurface safety valves
Stat.	Statutes
SUSIO	State University System of Florida Institute of Oceanography
SWSS	Sperm Whale Seismic Study
TA&R	Technical Assessment & Research Program (MMS)
Tcf	trillion cubic feet
TLP	tension-leg platform
TMDL	total maximum daily load
TOC	total organic carbon
TSS	traffic separation schemes
TSP	total suspended particulate
TVD	true vertical depth
TWC	treatment, workover, and completion
TX	Texas
U.S.	United States
U.S.C.	United States Code
UME	unusual mortality event
USCG	U.S. Coast Guard (also: CG)
USDHS	U.S. Department of Homeland Security
USDOC	U.S. Department of Commerce (also: DOC)
USDOD	U.S. Department of Defense (also: DOD)
USDOE	U.S. Department of Energy (also: DOE)
USDOI	U.S. Department of the Interior (also: DOI)
USDOT	U.S. Department of Transportation (also: DOT)
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey (also: GS)
VOC	volatile organic compound
VSP	vertical seismic profiling
W.	west
WAF	water accommodated fraction
WAZ	wide azimuth
WBF	water-based fluids
WPA	Western Planning Area
WSF	water soluble fraction
yd	yard

CONVERSION CHART

To convert from	To	Multiply by
millimeter (mm)	inch (in)	0.03937
centimeter (cm)	inch (in)	0.3937
meter (m)	foot (ft)	3.281
kilometer (km)	mile (mi)	0.6214
meter^2 (m^2)	foot^2 (ft^2)	10.76
	yard^2 (yd^2)	1.196
	acre (ac)	0.0002471
hectare (ha)	acre (ac)	2.47
kilometer^2 (km^2)	mile^2 (mi^2)	0.3861
meter^3 (m^3)	foot^3 (ft^3)	35.31
	yard^3 (yd^3)	1.308
liter (L)	gallons (gal)	0.2642
degree Celsius (°C)	degree Fahrenheit (°F)	°F = (1.8 x °C) + 32

1 barrel (bbl) = 42 gal = 158.9 L = approximately 0.1428 metric tons
tonnes = 1 long ton or 2,200 pounds
1 nautical mile (nmi) = 6,076 ft (1,852 m) or 1.15 mi (1.85 km)

CHAPTER 1

THE PROPOSED ACTIONS

1. THE PROPOSED ACTIONS

1.1. PURPOSE OF AND NEED FOR THE PROPOSED ACTIONS

The proposed Federal actions addressed in this environmental impact statement (EIS) are to offer for lease certain Outer Continental Shelf (OCS) blocks located in the Eastern Planning Area (EPA) of the Gulf of Mexico (GOM) (**Figure 1-1**). Under the *Proposed Final Outer Continental Shelf Oil & Gas Leasing Program: 2012-2017* (Five-Year Program) (USDOI, BOEM, 2012a), proposed EPA Lease Sale 225 is tentatively scheduled for 2014 and proposed EPA Lease Sale 226 is tentatively scheduled for 2016. The purpose of the proposed Federal actions is to offer for lease those areas that may contain economically recoverable oil and gas resources in accordance with the Outer Continental Shelf Lands Act (OCSLA) of 1953 (67 Stat. 462), as amended (43 U.S.C. §§ 1331 *et seq*. [1988]). The proposed EPA lease sales will provide qualified bidders the opportunity to bid upon and lease acreage in the Gulf of Mexico OCS in order to explore, develop, and produce oil and natural gas.

The need for the proposed actions is to further the orderly development of OCS resources. Oil serves as the feedstock for liquid hydrocarbon products; among them gasoline, aviation and diesel fuel, and various petrochemicals. The United States (U.S.) consumed 18.6 million barrels (MMbbl) of oil per day in 2012 (USDOE, Energy Information Administration, 2013a). The Energy Information Administration projects the total U.S. consumption of liquid fuels, including both fossil fuels and biofuels, to remain at about 19.1 MMbbl per day from 2013 to 2040 (USDOE, Energy Information Administration, 2013b). Altogether, net imports of crude oil and petroleum products (imports minus exports) accounted for 45 percent of our total petroleum consumption in 2011. The U.S. crude oil imports stood at 8.4 MMbbl per day in 2011. Petroleum product imports were 2.4 MMbbl per day in 2011. Exports totaled 2.9 MMbbl per day in 2011, mainly in the form of distillate fuel oil, petroleum coke, and residual fuel oil. The biggest supplier of crude oil and petroleum-product imports was Canada (29%), with countries in the Persian Gulf being the second largest source (22%) in 2011 (USDOE, Energy Information Administration, 2012). Oil produced from the GOM would also reduce the environmental risks associated with transoceanic oil tankering from sources overseas.

This EIS analyzes the potential impacts of the EPA proposed actions on the marine, coastal, and human environments. This EIS will also assist decisionmakers in making informed, future decisions regarding the approval of operations, as well as leasing. Pursuant to the OCSLA's staged leasing process, for each lease sale proposed in the final Five-Year Program, BOEM makes individual decisions on whether and how to proceed with a lease sale. After completion of this EIS, BOEM will make a decision on proposed EPA Lease Sale 225. An additional NEPA review (e.g., a determination of NEPA adequacy, an environmental assessment [EA] or, if determined necessary, a supplemental EIS) will be conducted prior to proposed EPA Lease Sale 226 to address any newly available significant information relevant to that proposed action (refer to **Chapter 2.1**) and a separate decision will be made at that time for proposed EPA Lease Sale 226.

This EIS for proposed EPA Lease Sales 225 and 226 uses information contained in three previous environmental impact statements. This EIS tiers from the *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Programmatic Environmental Impact Statement* (Five-Year Program EIS) (USDOI, BOEM, 2012b) and, due to the close proximity of the proposed EPA lease sale area to the Central Planning Area, incorporates by reference all of the relevant material published in the EIS's that were prepared for the nearby or adjacent Western and Central Planning Areas (WPA and CPA): *Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247, Final Environmental Impact Statement* (2012-2017 WPA/CPA Multisale EIS) (USDOI, BOEM, 2012c) and *Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014; Western Planning Area Lease Sale 233; Central Planning Area Lease Sale 231, Final Supplemental Environmental Impact Statement* (WPA 233/CPA 231 Supplemental EIS) (USDOI, BOEM, 2012d).

The OCSLA, as amended, established Federal jurisdiction over submerged lands on the OCS seaward of the States' boundaries. Under the OCSLA, the U.S. Department of the Interior (DOI) is required to manage the leasing, exploration, development, and production of oil and gas resources on the Federal OCS. The Secretary of the Interior (Secretary) oversees the OCS oil and gas program and is required to balance orderly resource development with protection of the human, marine, and coastal environments while simultaneously ensuring that the public receives an equitable return for these resources and that free-market competition is maintained. The Act empowers the Secretary to grant leases to the highest qualified responsible bidder(s) on the basis of sealed competitive bids and to formulate such regulations as necessary to carry out the provisions of the Act.

The Secretary has designated the Bureau of Ocean Energy Management (BOEM) as the administrative agency responsible for mineral leasing on submerged OCS lands. Effective October 1, 2011, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) was reorganized and separated into two separate bureaus, BOEM and the Bureau of Safety and Environmental Enforcement (BSEE). The reorganization is more fully described below in **Chapter 1.3.1**.

The Gulf of Mexico constitutes one of the world's major oil and gas producing areas, and has proved a steady and reliable source of crude oil and natural gas for more than 50 years. Oil from the Gulf of Mexico can help reduce the Nation's need for oil imports and reduce the environmental risks associated with oil tankering. Natural gas is generally considered to be an environmentally preferable alternative to oil, both in terms of the production and consumption.

1.2. Description of the Proposed Actions

The proposed actions are two oil and gas lease sales in the EPA as scheduled under the Five-Year Program. Federal regulations allow for several related or similar proposals to be analyzed in one EIS (40 CFR § 1502.4). Since the proposed lease sales are in the same area and their projected activities are very similar, BOEM has decided to prepare a single EIS for the proposed EPA lease sales. An additional NEPA review will be conducted for proposed EPA Lease Sale 226 to address any newly available significant information relevant to that proposed action (refer to **Chapter 2.1**).

Proposed EPA Lease Sales 225 and 226 are scheduled to be held in 2014 and 2016, respectively. The proposed EPA lease sale area is approximately 657,905 acres (ac) and includes those blocks previously included in the EPA Lease Sale 224 Area and a triangular-shaped area south of this area bordered by the CPA boundary on the west and the Military Mission Line (86°41′ W. longitude) on the east. The area is south of eastern Alabama and western Florida; the nearest point of land is 125 miles (mi) (201 kilometers [km]) northwest in Louisiana (**Figure 1-1**). As of August 2013, approximately 465,200 ac of the proposed EPA lease sale area are currently unleased.

The estimated amount of resources projected to be developed as a result of a proposed EPA lease sale is 0-0.071 billion barrels of oil (BBO) and 0-0.162 trillion cubic feet (Tcf) of gas. A proposed EPA lease sale includes proposed lease stipulations designed to reduce environmental risks; the stipulations are discussed in **Chapter 2.3.1.3**.

1.3. Regulatory Framework

Federal laws mandate the OCS leasing program (i.e., Outer Continental Shelf Lands Act) and the environmental review process (e.g., NEPA). Several Federal regulations establish specific consultation and coordination processes with Federal, State, and local agencies (e.g., Coastal Zone Management Act, Endangered Species Act (ESA), Magnuson Fishery Conservation and Management Act, and Marine Mammal Protection Act). In addition, the OCS leasing process and all activities and operations on the OCS must comply with other applicable Federal, State, and local laws and regulations. On December 20, 2006, President Bush signed into law the Gulf of Mexico Energy Security Act of 2006, which made available two new areas in the Gulf of Mexico for leasing, placed a moratorium on other areas in the Gulf of Mexico, and increased the distribution of offshore oil and gas revenues to coastal States. The major, applicable Federal laws, regulations, and Executive Orders are listed below.

Regulation, Law, and Executive Order	Citation
Outer Continental Shelf Lands Act	43 U.S.C. §§ 1331 *et seq*.
National Environmental Policy Act of 1969	42 U.S.C. §§ 4321-4347 40 CFR parts 1500-1508
Coastal Zone Management Act of 1972	16 U.S.C. §§ 1451 *et seq*. 15 CFR § 930.76
Endangered Species Act of 1973	16 U.S.C. §§ 1631 *et seq*.

Magnuson-Stevens Fishery Conservation and Management Act	16 U.S.C. §§ 1251 *et seq.*
Essential Fish Habitat Consultation (in 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act)	P.L. 94-265 16 U.S.C. §§ 1801-1891 50 CFR part 600 subpart K
Marine Mammal Protection Act	16 U.S.C. §§ 1361 *et seq.*
Clean Air Act	42 U.S.C. §§ 7401 *et seq.* 40 CFR part 55
Clean Water Act	33 U.S.C. §§ 1251 *et seq.*
Harmful Algal Bloom and Hypoxia Research and Control Act	P.L. 105-383
Oil Pollution Act of 1990	33 U.S.C. §§ 2701 *et seq.* Executive Order 12777
Comprehensive Environmental Response, Compensation, and Liability Act of 1980	42 U.S.C. §§ 9601 *et seq.*
Resource Conservation and Recovery Act	42 U.S.C. §§ 6901 *et seq.*
Marine Plastic Pollution Research and Control Act	33 U.S.C. §§ 1901 *et seq.*
National Fishing Enhancement Act of 1984	33 U.S.C. §§ 2601 *et seq.*
Fishermen's Contingency Fund	43 U.S.C. §§ 1841-1846
Ports and Waterways Safety Act of 1972	33 U.S.C. §§ 1223 *et seq.*
Marine and Estuarine Protection Acts	33 U.S.C. §§ 1401 *et seq.*
Marine Protection, Research, and Sanctuaries Act of 1972	P.L. 92-532
National Estuarine Research Reserves	16 U.S.C. § 1461, Section 315
National Estuary Program	P.L. 100-4
Coastal Barrier Resources Act	16 U.S.C. §§ 3501 *et seq.*
National Historic Preservation Act	16 U.S.C. §§ 470 *et seq.*
Rivers and Harbors Act of 1899	33 U.S.C. §§ 401 *et seq.*
Occupational Safety and Health Act of 1970	29 U.S.C. §§ 651 *et seq.*
Energy Policy Act of 2005	P.L. 109-58
Gulf of Mexico Energy Security Act of 2006	P.L. 109-432
Marine Debris Research, Prevention, and Reduction Act	P.L. 109-449
American Indian Religious Freedom Act of 1978	P.L. 95-341 42 U.S.C. §§ 1996 and 1996a
Migratory Bird Treaty Act of 1918	16 U.S.C. §§ 703 *et seq.*
Submerged Lands Act of 1953	43 U.S.C. §§ 1301 *et seq.*
49 U.S.C. 44718: Structures Interfering with Air Commerce	49 U.S.C. §§ 44718
Marking of Obstructions	14 U.S.C. § 86
Wilderness Act of 1964	P.L. 88-577 16 U.S.C. §§ 1131-1136 78 Stat. 890
Toxic Substances Control Act	P.L. 94-469 15 U.S.C. §§ 2601-2671 Stat. 2003
Bald Eagle Protection Act of 1940	P.L. 86-70 16 U.S.C. §§ 668-668d
Executive Order 11988: Floodplain Management	42 FR 26951 (1977); amended by Executive Order 12148 (7/20/79)
Executive Order 11990: Protection of Wetlands	42 FR 26961 (1977); amended by Executive Order 12608 (9/9/87)

Executive Order 12114: Environmental Effects Abroad	44 FR 1957 (1979)
Executive Order 12898: Environmental Justice	59 FR 5517 (1994)
Executive Order 13007: Indian Sacred Sites	61 FR 26771-26772 (1996)
Executive Order 13089: Coral Reef Protection	63 FR 32701-32703 (1998)
Executive Order 13175: Consultation and Coordination with Indian Tribal Governments	65 FR 67249-67252 (2000)
Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds	66 FR 3853 (2001)

1.3.1. Rule Changes for the Reorganization of Title 30 for the Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement

All regulatory citations identified in this EIS are concordant with the regulation changes made following the creation of the Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement, which was effective on October 1, 2011 (*Federal Register*, 2011a).

On May 19, 2010, U.S. Dept. of the Interior Secretary Salazar announced in Secretarial Order 3299 (USDOI, 2010a) that the Bureau of Ocean Energy Management, Regulation and Enforcement would be reorganized into two new bureaus within DOI and that each bureau would be reporting to the Assistant Secretary Land and Minerals Management. These bureaus are now known as BOEM and BSEE. BOEM is responsible for managing development of the Nation's offshore resources in an environmentally and economically responsible way. The functions of BOEM include leasing, exploration and development, plan administration, environmental studies, NEPA analysis, resource evaluation, economic analysis, and the renewable energy program. The BSEE is responsible for enforcing safety and environmental regulations. The functions of BSEE include all field operations, including permitting and research, inspections, offshore regulatory programs, oil-spill response, and training and environmental compliance functions.

The OCS oil and gas operations regulations that are administered by BSEE remain in 30 CFR part 250 and the OCS oil and gas operations regulations that are to be administered by BOEM are in 30 CFR part 550.

1.3.2. Recent BOEM/BSEE Rule Changes

In light of the *Deepwater Horizon* explosion, oil spill, and response, the Federal Government, along with industry, modified and added rules and safety measures related to oil-spill prevention, containment, and response. Additionally, the Federal Government and industry have advanced their research in response to the *Deepwater Horizon* explosion, oil spill, and response through government-funded research, industry-funded research, and joint partnerships. These joint partnerships are often between government agencies, industry, and nongovernmental organizations. For more information about the recent BOEM/BSEE rule changes, refer to Chapter 1.3.1 of the 2012-2017 WPA/CPA Multisale EIS.

1.3.2.1. Recent Rule Changes

Recent major rule changes by BSEE and BOEM include, but are not limited to, those described in this section. It is incumbent upon lessees and their operators to comply with BOEM's and BSEE's regulations and directives, which may change over time and during the life of a lease and operations.

In 2010, this Agency adopted the Interim Final Rule to Enhance Safety Measures for Energy Development on the Outer Continental Shelf ("Drilling Safety Rule") (*Federal Register*, 2010a), which identifies those regulatory changes made as a result of the *Increased Safety Measures for Energy Development on the Outer Continental Shelf* report (the "30-Day Report" or "Safety Measures Report") (USDOI, 2010b). All of the provisions of the Drilling Safety Rule are implemented by BSEE. All regulatory citations in this EIS are concordant with the regulation changes made following the effective date of October 1, 2011, for the creation of BOEM and BSEE (*Federal Register*, 2011a). These regulations and guidance documents (e.g., the Notices to Lessees and Operators [NTL's] indicated below and those described in **Chapter 1.5**, and in 30 CFR §§ 250.103 and 550.103), in addition to the new procedures, were not in effect at the time of the *Deepwater Horizon* explosion, oil spill, and response but they will apply to all future applicable drilling activities. The regulations, NTL's, and procedures include the following:

- NTL 2010-N06, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS," effective June 18, 2010 ("Plans NTL").
- NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources," effective November 8, 2010 ("Certification NTL").
- NTL 2011-G01, "Hurricane and Tropical Storm Effects Reports" supersedes NTL 2010-G04 as of June 1, 2011.
- NTL 2012-JOINT-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting" supersedes NTL 2007-G04 as of January 1, 2012.
- NTL 2012-JOINT-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program" supersedes and replaces NTL 2007-G02 as of January 1, 2012.
- NTL 2012-BSEE-N06, "Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans" supersedes NTL 2006-G21 as of August 10, 2012.
- The Drilling Safety Rule, Final Rule to Enhance Safety Measures for Energy Development on the Outer Continental Shelf ("Drilling Safety Rule") (Federal Register, 2012a). This rule strengthens requirements for safety equipment, well control systems, and blowout prevention practices on offshore oil and gas operations.
- The Workplace Safety Rule on Safety and Environmental Management Systems ("SEMS Rule") (Federal Register, 2010b). This rule requires operators to develop and implement a comprehensive SEMS for identifying, addressing, and managing operational safety hazards and impacts; promoting both human safety and environmental protection; and improving workplace safety by reducing the risk of human error.
- Enhanced Inspection Procedures. The BSEE is developing plans and schedules for conducting safety inspections of all deepwater drilling facilities. These plans and schedules have been implemented.

This Agency determined that issuance of an interim rule on drilling safety was needed after the *Deepwater Horizon* explosion, oil spill, and response. This rule implemented the recommendations from the 30-Day Report considered by the Secretary to be the most important for safe resumption of offshore drilling operations. On October 14, 2010, the interim final rule (IFR) was published in the *Federal Register* (2010b), together with a discussion of the comments that had been received by the Secretary in the period leading up to promulgation of the rule. The interim rulemaking revises selected sections of 30 CFR part 250 subparts D, E, F, O, and Q. Only a portion of the proposed changes in Subpart D add material capital or operating costs (some of which may be significant). For example, identical costly new requirements for subsea function testing of remotely operated vehicle (ROV) intervention during drill operations (Subpart D) apply to well completion (Subpart E) and workover (Subpart F) operations.

On August 22, 2012, the final rule was published in the *Federal Register* (2012a). The final rule became effective on October 22, 2012, implementing certain safety measures recommended in the Safety Measures Report (USDOI, 2010b). The BSEE has implemented the appropriate recommendations in the Safety Measures Report and the *Deepwater Horizon* Joint Industry Task (JIT) report by amending drilling, well-completion, well-workover, and decommissioning regulations related to well-control, including subsea and surface blowout preventers (BOP's), well casing and cementing, secondary intervention, unplanned disconnects, recordkeeping, and well plugging. This rulemaking

- establishes new casing installation requirements;
- establishes new cementing requirement;
- requires independent third-party verification of blind-shear ram capability;
- requires new casing and cementing integrity tests;
- establishes new requirements for subsea secondary BOP intervention;
- requires function testing for subsea secondary BOP intervention;
- requires documentation for BOP inspections and maintenance;
- requires a registered professional engineer to certify casing and cementing requirements; and
- establishes new requirements for specific well control training to include deepwater operations.

After reviewing the comments, BSEE retained many of the provisions adopted in the IFR without change. However, the final rule did change the IFR in the following ways:

- Updated the incorporation by reference to the second edition of the American Petroleum Institute (API) Standard 65-Part 2, which was issued in December 2010. This standard outlines the process for isolating potential flow zones during well construction. The new Standard 65-Part 2 enhances the description and classification of well-control barriers, and it defines testing requirements for cement to be considered a barrier.
- Revised requirements from the IFR on the installation of dual mechanical barriers in addition to cement for the final casing string (or liner if it is the final string) to prevent flow in the event of a failure in the cement. The final rule provides that, for the final casing string (or liner if it is the final string), an operator must install one mechanical barrier in addition to cement to prevent flow in the event of a failure in the cement. The final rule also clarifies that float valves are not mechanical barriers.
- Revised 30 CFR § 250.423(c) to require the operator to perform a negative pressure test only on wells that use a subsea BOP stack or wells with a mudline suspension system instead of on all wells, as was provided in the IFR.
- Added new 30 § CFR 250.451(j), stating that an operator must have two barriers in place before removing the BOP and that the BSEE District Manager may require additional barriers.
- Extended the requirements for BOP's and well-control fluids to well-completion, well-workover, and decommissioning operations under 30 CFR part 250 subpart E—"Oil and Gas Well-Completion Operation," 30 CFR part 250 subpart F—"Oil and Gas Well-Workover Operations," and 30 CFR part 250 subpart Q—"Decommissioning Activities" to promote consistency in the regulations.

Subsea ROV and Deadman Function Testing—Drilling

In a stump test, the subsea BOP system is placed on a simulated wellhead (the stump) on the rig floor. The BOP system is tested on the stump to ensure that the BOP is functioning properly. Previous regulations at 30 CFR § 250.449(b) required a stump test of the subsea BOP system. In conjunction with the changes from the IFR regarding stump test requirements, the final rule revises 30 CFR § 250.449(b) to clarify that the time lapse between the stump test of a subsea BOP system and the initial test of a subsea BOP system on the seafloor must not exceed 30 days. The IFR added 30 CFR § 250.449(j), which requires that all ROV intervention functions on the subsea BOP stack must be tested during the stump test and that one set of rams must be tested by an ROV on the seafloor. The final rule has added that test of the one set of rams on the seafloor must be done through an ROV hot stab to ensure the functioning of the hot stab. The final rule also clarified that, when an operator submits the test procedures to BSEE for approval, the operator must include how it will test each ROV intervention function. The final rule also added a new paragraph, at 30 CFR § 250.449(j)(2), which requires a 72-hour notification prior to the initiation of a stump test and initial test on the seafloor. Operators must notify BSEE at least 72 hours prior to all BOP stump tests and initial BOP tests on the seafloor to facilitate having a BSEE representative present to witness at least one of these tests. In addition to 30 CFR § 250.449(j), 30 CFR § 250.449(k) in the final rule requires the operator to test the deadman system and to verify closure of a set of blind-shear rams during the initial test on the seafloor. The final rule also adds new clarification to ensure that the well is secure and that hydrocarbon flow would be isolated during the initial deadman test on the seafloor.

These new requirements will confirm that a well will be secured in an emergency situation and prevent a possible loss of well control. The ROV test requirement will ensure that the dedicated ROV has the capacity to close the BOP functions on the seafloor. The deadman-switch test on the seafloor verifies that the wellbore closes automatically if both hydraulic pressure and electrical communication are lost with the drilling rig. The final rule also revised 30 CFR § 250.449(k)(1) to clarify that the required submittals of procedures for the autoshear and deadman function testing must include documentation of the controls and circuitry of the system utilized during each test. The documentation verifies that the same deadman controls are used in testing and emergency activation. The final rule also specifies that the submittals include procedures on how the ROV will be utilized during testing. For the same reasons, BSEE made corresponding changes in the final 30 CFR § 250.517(d)(9), 30 CFR § 250.617(h)(2), and 30 CFR § 250.17019(h)(2).

Blowout Prevention Equipment

The IFR added the requirements of 30 CFR § 250.442 in subpart D—"Oil and Gas Drilling Operations" to the requirements in 30 CFR § 250.515 for well-completion operations using a subsea BOP stack. The final rule redesignates 30 CFR § 250.515 in the IFR as 30 CFR § 250.516, but it makes no further changes to that section.

Subsea ROV Function Testing—Workover/Completions

The IFR added 30 CFR § 250.516(d)(8) to require tests for ROV intervention functions during the stump test and 30 CFR § 250.516(d)(9) to require a function test of the autoshear and deadman system. The final rule redesignates the IFR provisions at 30 CFR § 250.516 to 30 CFR § 250.517.

The final rule revises redesignated 30 CFR § 250.517(d)(2) to specify that the time lapse between the stump test of a subsea BOP system and initial BOP system test on the seafloor must not exceed 30 days.

The final rule redesignated 30 CFR § 250.517(d)(8) and extends the requirements added to deepwater drilling operations (discussed in "Subsea ROV and Deadman Function Testing—Drilling" above) to well completion and workover operations using a subsea BOP stack.

The final rule revises the redesignated 30 CFR § 250.517(d)(9) to require the operator to test the deadman system and to verify closure of a set of blind-shear rams during the initial test on the seafloor. The verification requirement is new and is consistent with revised 30 CFR § 250.449(k).

Negative Pressure Tests

The final rule revises 30 CFR § 250.423(c) to require that a negative pressure test be conducted only on wells that use a subsea BOP stack or wells with a mudline suspension system instead of on all wells, as was provided in the IFR. Requiring the performance of negative pressure tests on wells that use a surface BOP stack is not necessary; it is more important to test the barriers in subsea wells and wells with a mudline suspension.

Installation of Mechanical Barriers

The final rule at 30 CFR § 250.420(b)(3) requires that the operator install one mechanical barrier in addition to cement barriers for the final casing string (or liner if it is the final string). This barrier prevents hydrocarbon flow in the event of cement failure at the bottom of the well. This requirement applies to the final casing string or liner since that is the string of casing that will be exposed to wellbore conditions. The operator must document the installation of the mechanical barrier and submit this documentation to BSEE in the End-of-Operations Report instead of 30 days after installation, as was provided in the IFR. These barriers cannot be modified prior to or during completion or abandonment operations.

Professional Engineer Certification for Well Design

The final rule at 30 CFR § 250.420(a)(6) requires that a registered professional engineer must be involved in the well casing and cementing design process and must certify the well casing and cementing specifications. The registered professional engineer will verify that the well casing and cementing design is appropriate for the purpose for which it is intended under expected wellbore conditions. This verification adds assurance that the appropriate design is used for the well, thus decreasing the likelihood of a blowout.

Emergency Cost of Activated Shear Rams

The final rule at 30 CFR § 250.451(i) requires that, if a blind-shear ram or casing-shear ram is activated in a well control situation in which the pipe or casing is sheared, the BOP stack must be retrieved, fully inspected, and tested. This provision will ensure the integrity of the BOP and that the BOP will still function and hold pressure after the event.

Third-Party Shearing Verification

The BSEE regulation at 30 CFR § 250.416(e) requires information verifying that BOP blind-shear rams are capable of shearing any drill pipe in the hole under maximum anticipated surface pressure, as recommended in the Safety Measures Report. This regulation has been modified to require the BOP verification be conducted by an independent third party. The independent third party provides an objective assessment that the blind-shear rams can shear any drill pipe, including workstring and tubing, in the hole if the shear rams are functioning properly. This confirmation will be required for both subsea and surface BOP's. The NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources," clarifies how the regulations apply to operators conducting operations using subsea BOP's or surface BOP's on floating facilities. The NTL informs these operators that a statement, signed by an authorized company official stating that the operator will conduct all authorized activities in compliance with all applicable regulations, including the increased safety measures regulations, should be submitted with each application for a well permit.

1.3.2.2. Recent Regulatory Reform and Government-Sponsored Research

BOEM and BSEE have already instituted regulatory reforms responsive to many of the recommendations expressed in the various reports prepared following the *Deepwater Horizon* explosion, oil spill, and response. To date, regulatory reform has occurred through both prescriptive and performance-based regulation and guidance, as well as OCS safety and environmental protection requirements. The reforms strengthen the requirements for all aspects of OCS operations. The discussion below also addresses ongoing reform and research endeavors to improve workplace safety and to strengthen oil-spill prevention planning, containment, and response. For more information, refer to the 2012-2017 WPA/CPA Multisale EIS.

The Oil and Gas and Sulphur Operations in the Outer Continental Shelf—Revisions to Safety and Environmental Management Systems (SEMS II) Final Rule was completed in June 2013. The final rule includes refinements to the existing SEMS program. The SEMS II rule amends the existing regulations to require operators to develop and implement additional provisions involving stop work authority and ultimate work authority, to establish requirements for reporting unsafe working conditions, to require employee participation in the development and implementation of their SEMS programs, and to establish requirements for reporting unsafe working conditions. In addition, the final rule requires the use of independent third parties to perform the audits of the operators' programs.

1.3.2.3. Recent and Ongoing Industry Reform and Research

Shortly after the *Deepwater Horizon* explosion, oil spill, and response, various industry trade associations formed four Joint Industry Task Forces (JITF's) to learn from the *Deepwater Horizon* explosion, oil spill, and response and to advance industry practices. The JITF's are comprised of member companies and affiliates of API, the International Association of Drilling Contractors, Independent Petroleum Association of America, National Ocean Industries Association, and U.S. Oil and Gas Association. The ultimate objectives of the JITF's are to reduce risk and improve the industry's capabilities in safety, environmental performance, and spill prevention and response. Recommendations from the JITF's have led to the reform of industry standards, recommended practices, and guidelines. For more information, refer to the 2012-2017 WPA/CPA Multisale EIS.

The API completed "Recommended Practice 96: Deepwater Well Design and Construction" in March 2013. This Standard provides well design and operational considerations for the safe construction of a deepwater well, including the drilling and completion activity performed with subsea BOP's, a marine drilling riser, and a subsea wellhead.

The API also completed "Balloted Bulletin 97: Well Construction Interface Document Guidelines" in May 2013. These guidelines aim to meet DOI's objective by being a bridging document between the drilling contractor's Health, Safety, and Environmental safety case and the operator's Safety and Environmental Management System (SEMS), and it addresses safety and risk management considerations on a well-by-well basis

1.4. PRELEASE PROCESS

Scoping for this EIS was conducted in accordance with the Council on Environmental Quality's (CEQ) regulations implementing NEPA. Scoping provides those with an interest in the OCS Program an opportunity to provide comments on the proposed actions. In addition, scoping provides BOEM an opportunity to update the Gulf of Mexico OCS Region's environmental and socioeconomic information base. The scoping process officially commenced on March 20, 2012, with the publication in the *Federal Register* of the Notice of Intent to Prepare an EIS (NOI) and to announce public scoping meetings. Additional public notices were distributed via local newspapers, the U.S. Postal Service, and the Internet. A 45-day comment period, which closed on May 4, 2012, was provided. Federal, State, and local governments, along with other interested parties, were invited to send written comments to the Gulf of Mexico OCS Region on the scope of the EIS. Formal scoping meetings were held during April 2012 in Tallahassee and Panama City Beach, Florida; Mobile, Alabama; and New Orleans, Louisiana. Comments were received in response to the NOI and at the five scoping meetings from Federal, State, local government agencies; interest groups; industry; businesses; and the general public on the scope of the EIS, significant issues that should be addressed, alternatives that should be considered, and mitigation measures. All scoping comments received were considered in the preparation of the Draft EIS. The comments are summarized in **Chapter 5.3**, "Development of the Draft EIS."

BOEM conducted early coordination with appropriate Federal and State agencies and other concerned parties to discuss and coordinate the prelease process for the proposed lease sales and this EIS. Key agencies and organizations included the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (FWS), U.S. Department of Defense (USDOD), U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (USEPA), State Governors' offices, and industry groups.

Although the scoping process was formally initiated on March 20, 2012, with the publication of the NOI in the *Federal Register*, scoping efforts and other coordination meetings have proceeded and will continue to proceed throughout this NEPA process. Scoping and coordination opportunities are available during BOEM's requests for information, comments, input, and review on other Bureau of Ocean Energy Management NEPA documents.

On August 29, 2012, BOEM released its Area Identification (Area ID) decision. The Area ID is an administrative prelease step that describes the geographical area of the proposed actions (proposed lease sale area). As mandated by NEPA, this EIS analyzes the potential impacts of the EPA proposed actions on the marine, coastal, and human environments.

BOEM mailed copies of the Draft EIS for review and comment to Federal, State, and local government agencies; interest groups; industry; the general public; and local libraries. To initiate the public review and comment period on the Draft EIS, BOEM published a Notice of Availability (NOA) in the *Federal Register* on March 1, 2013. In addition, public notices were mailed with the Draft EIS and were placed on BOEM's Internet website at http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/nepaprocess.aspx. In accordance with 30 CFR § 556.26, BOEM held public meetings to solicit comments on the Draft EIS. The meetings provided the Secretary with information from interested parties to help in the evaluation of potential effects of the proposed EPA lease sales. Notices of the public meetings were included in the NOA, posted on BOEM's Internet website, and published in the *Federal Register* and local newspapers.

A consistency review will be performed in accordance with the Coastal Zone Management Act (CZMA), and a Consistency Determination (CD) will be prepared for each affected State prior to each proposed EPA lease sale. To prepare the CD's, BOEM reviews each State's Coastal Management Program (CMP) and analyzes the potential impacts as outlined in this EIS, new information, and applicable studies as they pertain to the enforceable policies of each CMP. Based on the analyses, BOEM's Director makes an assessment of consistency, which is then sent to each State with the Proposed Notice of Sale (NOS). If a State disagrees with the Bureau of Ocean Energy Management's CD, the State is required to do the following under the CZMA: (1) indicate how BOEM's presale proposal is inconsistent with its CMP; (2) suggest alternative measures to bring BOEM's proposal into consistency with their CMP; or (3) describe the need for additional information that would allow a determination of consistency. Unlike the consistency process for specific OCS plans and permits, there is not a procedure for administrative appeal to the Secretary of Commerce for a Federal CD for presale activities. In the event of a disagreement between a Federal agency and the State's CMP regarding consistency of the proposed lease sales, either BOEM or the State may request mediation. The regulations provide for an opportunity to resolve any differences with the State, but CZMA allows BOEM to proceed with the proposed lease sale despite any unresolved disagreements if the Federal agency clearly describes, in writing, to the State CMP how the activity is consistent to the maximum extent practicable with the State's CMP.

Prior to proposed EPA Lease Sale 225, which is tentatively scheduled for 2014, this Final EIS will be published for public review for 30 days. To initiate the public review, BOEM will publish an NOA in the *Federal Register*. BOEM will send copies of the Final EIS for review and comment to Federal, State, and local agencies; interest groups; industry; the general public; and local libraries. In addition, public notices will be mailed with the Final EIS and will be placed on BOEM's Internet website at http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/nepaprocess.aspx. At the completion of this EIS process, a decision will be made for proposed EPA Lease Sale 225. A NEPA review will be conducted before proposed EPA Lease Sale 226.

This EIS is not a decision document. A Record of Decision (ROD) will be prepared for the decision on whether to hold each lease sale, i.e., one for proposed EPA Lease Sale 225 and one for proposed EPA Lease Sale 226. The ROD will identify BOEM's preferred alternative for each lease sale, as well as the environmentally preferable alternative. The ROD will summarize the proposed action and the alternatives evaluated in this EIS, the conclusions of the impact analyses, and other information considered in reaching the decision.

A Proposed NOS will become available to the public 4-5 months prior to each proposed lease sale. A notice announcing the availability of the Proposed NOS appears in the *Federal Register*, initiating a 60-day comment period. Comments received will be analyzed during preparation of the decision documents that are the basis for the Final NOS, including lease sale configuration and terms and conditions.

If the decision by the Assistant Secretary of the Interior for Land and Minerals (ASLM) is to hold a proposed lease sale, a Final NOS will be published in its entirety in the *Federal Register* at least 30 days prior to the lease sale date, as required by the OCSLA.

Measures to Enhance Transparency and Effectiveness in the Leasing and Tiering Process

The following discussion is from the *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Environmental Impact Statement* (Five-Year Program EIS) (USDOI, BOEM, 2012b) and has been incorporated into this EIS for information purposes.

BOEM realizes that each region is different in terms of mineral resources and dependent economies, the relative state of infrastructure and support industries, and the sensitivity of ecosystems, environmental resources, and communities; and that a leasing strategy needs to be sensitive to those differences, but also that it must be consistent with OCSLA principles. BOEM envisions a phased OCSLA process that minimizes multiple-use and environmental conflicts to the extent possible during Five-Year Program implementation, that makes lease sale decisions in the context of the best available information, and that discloses clear reasons for those decisions, even in the face of uncertainty. This vision is consistent with the National Ocean Policy Implementation Plan and related Coastal and Marine Spatial Planning initiatives, all of which provide a complementary framework for space-use conflict considerations.

BOEM is committing to several process enhancements to ensure transparency during the phased OCSLA and tiered NEPA processes of the Five-Year Program. Although specific approaches to implementation may be tailored to the different needs of the Regions and their stakeholders, BOEM is determined to improve the effectiveness of the tiering process through the following:

- **Alternative and Mitigation Tracking Table.** BOEM has established an alternative and mitigation tracking table to provide increased visibility into the consideration of recommendations for deferrals, mitigations, and alternatives at different stages of the leasing process. Beginning with the Five-Year Program EIS, the table tracks the lineage and treatment of suggestions for spatial exclusions, temporal deferrals, and/or mitigation from the Five-Year Program, to the lease sale phase, and on to the plan phase. This table allows commenters to see how and at what stage of the process their concerns are being considered. BOEM will maintain a table that will be updated as deferral requests are considered at the lease sale and plan stages and as new requests are made. The alternative and mitigation tracking table has been placed on BOEM's website at http://www.boem.gov/5-year/2012-2017/Tracking-Table/. A link to the table will be provided in the lease sale documents and in the annual report, which is discussed below.

- **Strengthening the Prelease Sale Process.** BOEM is taking a number of steps to enhance opportunities for members of the public to comment and provide new information in the prelease sale planning process. Historically, the Call for Information (Call), which is the first step in the Prelease Sale Process, has generally asked for industry to nominate specific blocks or descriptions of areas within the Five-Year Program area for which they have the most interest, while the NOI requests comments on issues that should be addressed and alternatives that should be considered in the NEPA documents that will be prepared for the action.

- **Annual Progress Report.** BOEM will publish an annual progress report on the approved Five-Year Program that includes an opportunity for stakeholders and the public to comment on the Five-Year Program's implementation. Under Section 18(e) of the OCSLA, the Secretary must review an approved Five-Year Program each year. Historically, this has been an internal review process that reported to the Secretary any information or events that might result in a revision to the Program. If the revision is considered significant under the OCSLA, the Program can only be revised and reapproved by following the same Section 18 steps used to originally develop the Program. However, once the Section 18 process has been initiated for the next Five-Year Program, the annual review is subsumed in that process, as the same substantive and procedural requirements are being addressed.

  The findings of this progress report may lead the Secretary to revise the Five-Year Program by changing the size of, changing the timing of, or canceling scheduled lease sales. If the desired revisions are considered significant, such as including new areas for consideration or more lease sales in areas already included, the entire Section 18 process must be followed, in essence resulting in the preparation of a new Five-Year Program.

- **Systematic Planning**. BOEM is committed to engaging in systematic planning opportunities that foster improved governmental coordination, communication, and information exchange. As the only agency authorized to grant renewable energy, marine mineral, and oil and gas leases on the OCS, the Bureau of Ocean Energy

Management is acting as the Federal co-lead, along with the U.S. Coast Guard, for systematic regional planning efforts in the Mid-Atlantic. Additionally, BOEM will participate on Regional Planning Bodies in the Northeast, Mid-Atlantic, and West Coast as the DOI lead. In the Gulf of Mexico OCS Region, BOEM representatives will assist the U.S. Fish and Wildlife Service (FWS), the DOI regional lead, with various working group activities. This will facilitate data and information availability, provide research of new technologies, and identify conflict resolution and avoidance strategies. BOEM anticipates that its Marine Planning engagement will enhance regulatory efficiency through improved coordination and collaboration and, in the long term, will enhance the stewardship of ocean and coastal resources.

These strategies will allow BOEM to not only address the activities that take place under the 2012-2017 Five-Year Program but also to lay the groundwork for decisions that will be faced in subsequent Five-Year Programs. The strategies include efforts to gather information while enhancing opportunities for stakeholders and other interested parties to participate in and be engaged in the decisionmaking process. The initiation of studies and long-term planning will now facilitate future decisions by ensuring that the best information is available when making leasing decisions on the approved program and before the development of future OCS Programs.

1.5. POSTLEASE ACTIVITIES

BOEM and BSEE are responsible for managing, regulating, and monitoring oil and natural gas exploration, development, and production operations on the Federal OCS to promote orderly development of mineral resources and to prevent harm or damage to, or waste of, any natural resource, any life or property, or the marine, coastal, or human environment. BOEM regulations for oil, gas, and sulphur lease operations are specified in 30 CFR parts 550, 551 (except those aspects that pertain to drilling), and 554.

Measures to mitigate potential impacts are an integral part of the OCS Program. These measures are implemented through lease stipulations, operating regulations, NTL's, and project-specific requirements or approval conditions. Mitigating measures address concerns such as endangered and threatened species, geologic and manmade hazards, military warning and ordnance disposal areas, air quality, oil-spill response planning, chemosynthetic communities, artificial reefs, operations in hydrogen sulfide (H_2S) prone areas, and shunting of drill effluents in the vicinity of biologically sensitive features. Standard mitigation measures in the Gulf of Mexico OCS include, but are not limited to the following:

- limiting the size of explosive charges used for structure removals (NTL 2010-G05);
- requiring placement of explosive charges at least 15 feet (ft) (5 meters [m]) below the mudline;
- requiring site-clearance procedures to eliminate potential snags to commercial fishing nets upon abandonment;
- establishment of No Activity and Modified Activity Zones around high-relief live bottoms;
- requiring remote-sensing surveys to detect and avoid potential archaeological sites and biologically sensitive areas such as low-relief live bottoms, pinnacles, and chemosynthetic communities; and
- requiring coordination with the military to prevent multiuse conflicts between OCS and military activities.

BOEM issues NTL's to provide clarification, description, or interpretation of a regulation; to provide guidelines on the implementation of a special lease stipulation or regional requirement; or to convey administrative information. A detailed listing of current Gulf of Mexico OCS Region NTL's is available through BOEM's Gulf of Mexico OCS Region's Internet website at http://boem.gov/Regulations/Notices-Letters-and-Information-to-Lessees-and-Operators.aspx or through the Region's Public Information Office at (504) 736-2519 or 1-800-200-GULF.

Formal plans must be submitted to BOEM for review and approval before any project-specific activities, except for ancillary activities (such as geological and geophysical activities or studies that model potential oil and hazardous substance spills), can begin on a lease. Conditions of approval are mechanisms to control or mitigate potential safety or environmental problems associated with proposed operations. Conditions of approval are based on BOEM's technical and environmental evaluations of the proposed operations. Comments from Federal and State agencies (as applicable) are also considered in establishing conditions. Conditions may be applied to any OCS plan, permit, right-of-use of easement, or pipeline right-of-way grant.

Some BOEM-identified mitigation measures are implemented through cooperative agreements or coordination with the oil and gas industry and Federal and State agencies. These measures include NMFS's Observer Program to protect marine mammals and sea turtles when OCS structures are removed using explosives, labeling of operational supplies to track sources of accidental debris loss, development of methods of pipeline landfall to eliminate impacts to barrier beaches, and semiannual beach cleanup events.

The following postlease activity descriptions apply to the proposed EPA lease sale area.

Geological and Geophysical Activities

A geological and geophysical (G&G) permit must be obtained from BOEM prior to conducting off-lease geological or geophysical exploration or scientific research on unleased OCS lands or on lands under lease to a third party (30 CFR §§ 551.4(a) and (b)). Geological investigations include various seafloor sampling techniques to determine the geochemical, geotechnical, or engineering properties of the sediments.

Ancillary activities are defined in 30 CFR § 250.105 (BSEE) and 30 CFR § 550.105 (BOEM), with regulations outlined in 30 CFR §§ 550.207 through 550.210. Ancillary activities are activities conducted on-lease and include G&G exploration and development G&G activities; geological and high-resolution geophysical, geotechnical, archaeological, biological, physical oceanographic, meteorological, socioeconomic, or other surveys; or various types of modeling studies. This Agency issued NTL 2009-G34, "Ancillary Activities," to provide guidance and clarification on conducting ancillary activities in BOEM's Gulf of Mexico OCS Region. Operators must notify the Gulf of Mexico OCS Region, Regional Supervisor, Office of Leasing and Plans, Plans Section, in writing 30 days in advance before conducting any of the following types of ancillary activities related to a G&G exploration or development G&G activity:

- involving the use of an airgun or airgun array anywhere in the EPA regardless of water depth;
- independent of water depth, involving the use of explosives as an energy source; and
- independent of water depth, including ocean-bottom cable surveys, node surveys, and time-lapse (4D) surveys.

Additionally, NTL 2009-G34 clarifies that BOEM's Gulf of Mexico OCS Region, Regional Supervisor, Office of Leasing and Plans, Plans Section, may require notification in writing 15 days in advance before conducting the following types of other ancillary activities:

- involving the use of an airgun or airgun array anywhere in the EPA regardless of water depth;
- involving bottom disturbance, independent of water depth, including ocean-bottom cable surveys, node surveys, and time-lapse (4D) surveys; and
- a geotechnical evaluation involving piston-/gravity-coring or the recovery of sediment specimens by grab-sampling or similar technique and/or any dredging or other ancillary activity that disturbs the seafloor (including deployment and retrieval of bottom cables, anchors, or other equipment).

This NTL also provides guidance for each type of ancillary activity, the type and level of BOEM review, and follow-up, post-survey report requirements.

Seismic surveys are performed to obtain information on surface and near-surface geology and on subsurface geologic formations. Low-energy, high-resolution seismic surveys collect data on surficial geology used to identify potential shallow geologic or manmade hazards (e.g., faults or pipelines) for engineering and site planning for bottom-founded structures. The high-resolution surveys are also used to identify environmental and archaeological resources such as low-relief live bottom areas, pinnacles, chemosynthetic community habitat, and shipwrecks. High-energy, deep-penetration, common-depth-point seismic surveys obtain data about geologic formations thousands of feet below the seafloor. The two-dimensional (2D) and three-dimensional (3D) common-depth-point data are used to map structure features of stratigraphically important horizons in order to identify potential hydrocarbon traps. They can also be used to map the extent of potential habitat for chemosynthetic communities. In some situations, a set of 3D surveys can be run over a time interval to produce a four-dimensional (4D), or "time-lapse," survey that could be used to characterize production reservoirs.

This Agency completed the programmatic environmental assessment (EA) *Geological and Geophysical Exploration for Mineral Resources on the Gulf of Mexico Outer Continental Shelf* (G&G Programmatic EA) (CSA, 2004a). Upon receiving a complete G&G permit application, BOEM conducts a categorical exclusion review (CER), an EA, or an EIS in accordance with the G&G Programmatic EA's conclusions, NEPA guidelines, and other applicable BOEM policies. When required under an approved coastal management program, proposed G&G permit activities must receive State concurrence (or the State's presumed concurrence if the State does not provide a response within the time set by regulation) prior to BOEM's permit approval.

Exploration and Development Plans

To ensure conformance with the OCSLA, other laws, applicable regulations, and lease provisions, and to enable BOEM to carry out its functions and responsibilities, formal plans (30 CFR §§ 550.211 and 550.241) with supporting information must be submitted for review and approval by BOEM before an operator may begin exploration, development, or production activities on any lease. Supporting environmental information, archaeological reports, biological reports (monitoring and/or live-bottom survey), and other environmental data determined necessary must be submitted with an OCS plan. This information provides the basis for an analysis of both offshore and onshore impacts that may occur as a result of the activities. BOEM may require additional, specific supporting information to aid in the evaluation of the potential environmental impacts of the proposed activities. BOEM can require amendment of an OCS plan based on inadequate or inaccurate supporting information. The latest 30 CFR part 550 subpart B regulations were published in the *Federal Register* on October 18, 2011, and became effective on October 1, 2011 (*Federal Register*, 2011a).

The OCS plans are reviewed as appropriate by geologists, geophysicists, engineers, biologists, archaeologists, air quality specialists, oil-spill specialists, NEPA coordinators, and/or environmental scientists. The plans and accompanying information are evaluated to determine whether any seafloor or drilling hazards are present; that air and water quality issues are addressed; that plans for hydrocarbon resource conservation, development, and drainage are adequate; that environmental issues and potential impacts are properly evaluated and mitigated; and that the proposed action is in compliance with NEPA, CZMA, BOEM operating regulations, and other requirements. Federal agencies, including FWS, NMFS, USEPA, the U.S. Navy, the U.S. Air Force, and the USCG, may be consulted if the proposal has the potential to impact areas or activities under their jurisdictions. Each Gulf Coast State has a designated CZM agency that takes part in the review process. The OCS plans are also made available to the general public for comment through BOEM's Gulf of Mexico OCS Region's Public Information Office.

In response to deepwater activities in the Gulf of Mexico, this Agency developed a comprehensive strategy to address NEPA compliance and environmental issues in the deepwater areas. A key component of that strategy was the completion of a Programmatic EA to evaluate the potential effects of the deepwater technologies and operations (USDOI, MMS, 2000a). As a supplement to the Programmatic EA, this Agency prepared a series of technical papers that provide a summary description of the different types of structures that may be employed in the development and production of hydrocarbon resources in the deepwater areas of the GOM (Regg et al., 2000). Information in the Programmatic EA and technical papers were used in the preparation of this EIS.

On the basis of BOEM's reviews of the OCS plan, the findings of the proposal-specific CER, EA, or EIS, and other applicable BOEM studies and NEPA documents, the OCS plan is approved or disapproved by BOEM, or it is modified and resubmitted for further analyses and decision. Although very few OCS plans are ultimately disapproved, many must be amended prior to approval to fully comply with BOEM's operating regulations and requirements, or other Federal laws, to address reviewing agencies' concerns or to avoid potential hazards or impacts to environmental resources.

Exploration Plans

An exploration plan (EP) must be submitted to BOEM for review and decision before any exploration activities, except for preliminary activities (such as hazard surveys or geophysical surveys), can begin on a lease. The EP describes exploration activities, drilling rig or vessel, proposed drilling and well-testing operations, environmental monitoring plans, and other relevant information, and includes a proposed schedule of the exploration activities. Guidelines and environmental information requirements for lessees and operators submitting an EP are addressed in 30 CFR § 550.211 and further explained in NTL's 2008-G04, "Shallow Hazards Program," and 2009-G27, "Submitting Exploration Plans and Development Operations Coordination Documents." The NTL 2008-G04 provides guidance on information requirements and establishes the contents for OCS plans required by 30 CFR part 550 subpart B. The NTL 2010-N06, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS," effective June 18, 2010, rescinded the limitations set forth in NTL 2008-G04 regarding a blowout and worst-case discharge scenarios and provided national guidance regarding the content of information in blowout and worst-case discharge scenario descriptions. The NTL 2009-G27 clarifies guidance for submitting OCS plans and development operations coordination documents (DOCD's) to BOEM's Gulf of Mexico OCS Region.

After receiving an EP, BOEM determines if the plan is complete before continuing with technical and environmental reviews. BOEM evaluates the proposed exploration activities for potential impacts relative to geohazards and manmade hazards (including existing pipelines), archaeological resources, endangered species, sensitive biological features, water and air quality, oil-spill response, State CZMA requirements, and other uses (e.g., military operations) of the OCS. The EP is reviewed for compliance with all applicable laws and regulations.

A CER or EA is prepared as documentation of the environmental review of the EP. The CER or EA is based on available information, which may include the geophysical report (for determining the potential for the presence of deepwater benthic communities); archaeological report; air emissions data; live-bottom survey and report; biological monitoring plan; and recommendations by the affected State(s), DOD, FWS, NMFS, and/or internal BOEM offices. As part of the review process, each EP must contain a certification of consistency and necessary data and information for the State to determine that the proposed activities comply with the enforceable policies of the State's approved CMP and that such activities will be conducted in a manner that is consistent with the CMP (16 U.S.C. § 1456(c)(3)(A) and 15 CFR § 930.76).

If the EP is approved, the operator is required to submit and obtain approval for an Application for Permit to Drill (APD) (see *Wells* under *Permits and Applications* below) prior to conducting drilling operations.

Deepwater Operations Plans

In 1992, this Agency formed an internal Deepwater Task Force to address technical issues and regulatory concerns relating to deepwater (>1,000 ft; 305 m) operations and projects utilizing subsea technology. Based on the Deepwater Task Force's recommendation, an NTL (2000-N06) was developed, which required operators to submit a Deepwater Operations Plan (DWOP) for all operations in deep water (400 m [1,312 ft] or greater) and all projects using subsea technology. DeepStar, an industry-wide cooperative workgroup focused on deepwater regulatory issues and critical technology development issues, worked closely with this Agency's Deepwater Task Force to develop the initial guidelines for the DWOP. The DWOP requirement was established to address regulatory issues and concerns that were not addressed in the Agency's then-existing regulatory framework, and it is intended to initiate an early dialogue between BSEE and industry before major capital expenditures on deepwater and subsea projects are committed. Deepwater technology has been evolving faster than BSEE's ability to revise OCS regulations; the DWOP was established through the NTL process, which provides for a more timely and flexible approach to provide guidance on regulatory requirements and to keep pace with the expanding deepwater operations and subsea technology.

The DWOP is intended to address the different functional requirements of production equipment in deep water, particularly the technological requirements associated with subsea production systems, and the complexity of deepwater production facilities. The DWOP provides BSEE with information specific to deepwater equipment issues to demonstrate that a deepwater project is being developed in an acceptable manner as mandated in the OCSLA, as amended, and BSEE's operating regulations at 30 CFR part 250. The BSEE reviews deepwater development activities from a total system perspective, emphasizing operational safety, environmental protection, and conservation of natural resources. The DWOP process is a phased approach that parallels the operator's state of knowledge about how a field will be developed. A DWOP outlines the design, fabrication, and installation of the proposed development/production system and its components. A DWOP will include structural aspects of the facility (fixed, floating, subsea); station-keeping (includes mooring system); wellbore, completion, and riser systems; safety systems; product removal or offtake systems; and hazards and operability of the production system. The DWOP provides BSEE with the information to determine that the operator has designed and built sufficient safeguards into the production system to prevent the occurrence of significant safety or environmental incidents. The DWOP, in conjunction with other permit applications, provides BSEE the opportunity to assure that the production system is suitable for the conditions in which it will operate.

This Agency recently completed a review of several industry-developed, recommended practices that address the mooring and risers for floating production facilities. The recommended practices address such things as riser design, mooring system design (station-keeping), and hazard analysis. Hazard analyses allow BSEE to be assured that the operator has anticipated emergencies and is prepared to address them, either through their design or through the operation of the equipment in question. This Agency released these clarifications of its requirements in recent NTL's: NTL 2009-G03, "Synthetic Mooring Systems"; NTL 2009-G11, "Accidental Disconnect of Marine Drilling Risers"; and NTL 2009-G13, "Guidelines for Tie-downs on OCS Production Platforms for Upcoming Hurricane Seasons."

Conservation Reviews

One of BOEM's primary responsibilities is to ensure development of economically producible reservoirs according to sound resource conservation, engineering, and economic practices as cited in 30 CFR §§ 550.202(c), 550.203, 250.204, 250.205, 550.210, 550.296, 550.297, 550.298, 250.299, and 250.1101. Operators must submit the necessary information as part of their EP, initial and supplemental development and production plan, and Conservation Information Document. Conservation reviews are performed to ensure that economic reserves are fully developed and produced and that there is no harm to the ultimate recovery.

Development and Production Plans

A development and production plan (DPP) must be submitted to BOEM for review and decision before any development operations can begin on a lease in the eastern Gulf of Mexico. The eastern Gulf of Mexico means all OCS areas in the Gulf of Mexico adjacent to the State of Florida, as described in the OCSLA (43 U.S.C. § 1333(a)(2)). The DPP's describe the proposed development activities, drilling activities, platforms or other facilities, proposed production operations, environmental monitoring plans, and other relevant information, and include a proposed schedule of development and production activities. Requirements for lessees and operators submitting a DPP are addressed in 30 CFR part 550 subpart B.

After receiving a DPP, BOEM performs technical and environmental reviews. BOEM evaluates the proposed activity for potential impacts relative to geohazards and manmade hazards (including existing pipelines), archaeological resources, endangered species, sensitive biological features, water and air quality, oil-spill response, State CMP requirements, and other uses (e.g., military operations) of the OCS. The DPP is reviewed for compliance with all applicable laws and regulations.

An EA and/or EIS is prepared in support of the NEPA environmental review for every DPP. The EA and/or EIS is based on available information, which may include the geophysical report (for determining the potential for the presence of deepwater benthic communities); archaeological report; air emissions data; live-bottom survey and report; biological monitoring plan; and recommendations by the affected State(s), DOD, FWS (for selected plans under provisions of a DOI agreement), NMFS, and/or internal BOEM offices.

As part of the review process, the DPP and supporting environmental information may be sent to the affected State(s) for a consistency review under the States' federally approved CMP's. The OCSLA (43 U.S.C. §§ 1345(a) through (d) and 43 U.S.C. § 1351(a)(3)) and CZMA (16 U.S.C. § 1456(c)(3)(A) and 15 CFR § 930.76) provide for this coordination and consultation with the affected State and local governments concerning a DPP.

New or Unusual Technologies

Technologies continue to evolve to meet the technical, environmental, and economic challenges of deepwater development. New or unusual technologies may be identified by the operator in its EP, DWOP, and DPP or through BOEM's plan review processes. Some of the technologies proposed for use by the operators are actually extended applications of existing technologies and interface with the environment in essentially the same way as well-known or conventional technologies. These technologies are reviewed by BOEM for alternative compliance or departures that may trigger additional engineering, technological, or environmental review. Some examples of new technologies that do not affect the environment differently and that are being deployed in the OCS Program are synthetic mooring lines, subsurface safety devices, and multiplex subsea controls.

Some new technologies differ in how they function or interface with the environment. These include equipment or procedures that have not been installed or used in Gulf of Mexico OCS waters previously. Having no operational history, they have not been assessed by BOEM through technical and environmental reviews. New technologies may be outside the framework established by BOEM regulations and, thus, their performance (safety, environmental protection, efficiency, etc.) has not been addressed by BOEM. The degree to which these new technologies interface with the environment and the potential impacts that may result are considered in determining the level of NEPA review that would be initiated.

BOEM has developed a new or unusual technologies' matrix to help facilitate decisions on the appropriate level of engineering and environmental review needed for a proposed technology. Technologies will be added to the new or unusual technologies' matrix as they emerge, and technologies will be removed as sufficient experience is gained in their implementation. From an environmental perspective, the matrix characterizes new technologies into three categories: technologies that may affect the environment; technologies that do not interact with the environment any differently than "conventional" technologies; and technologies about which BOEM does not have sufficient information to determine its potential impacts to the environment. In this later case, BOEM will seek to gain the necessary information from operators or manufacturers regarding the technologies to make an appropriate determination on its potential effects on the environment.

Alternative Compliance and Departures: The BSEE project-specific engineering safety review ensures that equipment proposed for use is designed to withstand the operational and environmental conditions in which it would operate. When an OCS operator proposes the use of new or unusual technologies or procedures not specifically addressed in established BSEE's regulations, the operations are evaluated for alternative compliance or departure determination. Any new technologies or equipment that represents an alternative compliance or departure from existing BSEE regulations must be fully described and justified before they would be approved for use. For BSEE and BOEM to grant alternative compliance or departure approval, the operator must demonstrate an equivalent or improved degree of protection as specified in 30 CFR § 250.141 and 30 CFR § 550.141. Comparative analysis with other approved systems, equipment, and procedures is one tool that BSEE and BOEM use to assess the adequacy of protection provided by alternative technology or operations. Actual operational experience is necessary with alternative compliance measures before BOEM and BSEE would consider them as proven technology.

Emergency Plans

Criteria, models, and procedures for shutdown operations and the orderly evacuation for an impending hurricane or other emergency have been in place in the Gulf of Mexico OCS for more than 30 years. (Such emergency plans are different from the oil-spill response plans described later in this chapter.) Operating experience from extensive drilling activities and more than 4,000 platforms during the 50-plus years of the Gulf of Mexico OCS Program have demonstrated the effectiveness and safety of securing wells and evacuating a facility in advance of severe weather conditions. Preinstallation efforts, historical experience with similar systems, testing, and the actual operating experience (under normal conditions and in response to emergency situations) are used to formulate the exact time needed to secure the wells and production facility and to evacuate it as necessary. Operators develop site-specific curtailment, securing, and evacuation plans that vary in complexity and formality by operator and type of activity. In general terms, all plans are intended to make sure the facility (or well) is secured in advance of an impending storm or developing emergency. The operating procedures developed during the engineering, design, and manufacturing phases of the project, coupled with the results (recommended actions) from hazard analyses performed, are used to develop the emergency action and curtailment plans. Evacuation and production curtailment must consider a combination of factors, including the well status (drilling, producing, etc.), and the type and mechanics of wellbore operations. These factors are analyzed onsite through a decisionmaking process that involves onsite facility managers. The emphasis is on making real-time, situation-specific decisions and forecasting based on available information. Details of the shut-in criteria and various alerts are addressed on a case-by-case basis, as explained below.

Plans for shutting in production from the subsea wells are addressed as part of the emergency curtailment plan. The plan specifies the various alerts and shutdown criteria linked to both weather and facility performance data, with the intent to have operations suspended and the wells secured in the event of a hurricane or emergency situation. Ensuring adequate time to safely and efficiently suspend operations and to secure the well is a key component of the planning effort. Clearly defined responsibilities for the facility personnel are part of the successful implementation of the emergency response effort.

For a severe weather event such as a hurricane, emergency curtailment plans would address the criteria and structured procedures for suspending operations and ultimately securing the wellbore(s) prior to weather conditions that could exceed the design operating limitations of the drilling or production unit. For drilling operations, the plan might also address procedures for disconnecting and moving the drilling unit off location after the well has been secured, should the environmental conditions exceed the floating drilling unit's capability to maintain station. Curtailment of operations consists of various stages of "alerts" indicating the deterioration of meteorological, oceanographic, or wellbore conditions. Higher alert levels require increased monitoring, the curtailment of lengthy wellbore operations, and, if conditions warrant, the eventual securing of the well. If conditions improve, operations could resume based on the limitations established in the contingency plan for the known environmental conditions. The same emergency curtailment plans would be implemented in an anticipated or impending emergency situation, such as the threat of terrorist attack.

Neither BSEE nor USCG mandates that an operator must evacuate a production facility for a hurricane or other emergency; it is a decision that rests solely with the operator. The USCG does require the submittal of an emergency evacuation plan that addresses the operator's intentions for evacuation of nonessential personnel, egress routes on the production facility, lifesaving and personnel safety devices, firefighting equipment, etc. As activities move farther from shore, it may become safer to not evacuate the facility because helicopter operations become inherently more risky with greater flight times. Severe weather conditions also increase the risks associated with helicopter operations. The precedent for leaving a facility manned during severe weather is established in the North Sea and other operating basins.

Redundant, fail-safe, automatic shut-in systems located inside the wellbore and at the sea surface, and in some instances at the seafloor, are designed to prevent or minimize pollution. These systems are designed and tested to ensure proper operation should a production facility or well be catastrophically damaged. Testing occurs at regular intervals with predetermined performance limits designed to ensure functioning of the systems in case of an emergency.

After the *Deepwater Horizon* explosion, oil spill, and response, the testing requirements for well control systems came under immediate scrutiny in the DOI Secretary's "Safety Measures Report," which was delivered to the President on May 27, 2010. The Safety Measures Report included a recommendation of a program for immediate recertification of BOP's. On August 22, 2012, the final rule was published in the *Federal Register* (2012a), together with comments and responses on the IFR. The final rule became effective on October 22, 2012. As stated above, the final regulatory section at 30 CFR § 250.451(i) requires that, if a blind-shear ram or casing shear ram is activated in a well control situation where the pipe is sheared, the BOP stack must be retrieved, fully inspected, and tested (*Federal Register*, 2012a). This and other new regulations that improve safety in the event of an emergency are described in **Chapter 1.3.2**.

Permits and Applications

After EP or DPP approval, the operator submits applications for specific activities to BOEM or BSEE, as appropriate, for approval. These applications include those for drilling wells; well-test flaring; temporary well abandonment; installing a well protection structure, production platforms, satellite structures, subsea wellheads and manifolds, and pipelines; installation of production facilities; commencing production operations; platform removal and lease abandonment; and pipeline decommissioning.

Wells

The BSEE requirements for the drilling of wells can be found at 30 CFR part 250 subpart D. Lessees are required to take precautions to keep all wells under control at all times. The lessee must use the best available and safest technology to enhance the evaluation of abnormal pressure conditions and to minimize the potential for uncontrolled well flow.

Prior to conducting drilling operations, the operator is required to submit and obtain approval for an APD. The APD requires detailed information—including project layout at a scale of 24,000:1, design criteria for well control and casing, specifications for blowout preventers, a mud program, cementing program, directional drilling plans—to allow for BOEM's evaluation of operational safety and pollution-prevention measures. The APD is reviewed for conformance with the engineering requirements and other technical considerations.

The BSEE is responsible for conducting technical and safety reviews of all drilling, workover, and production operations on the OCS. These detailed analyses determine if the lessee's proposed operation is in compliance with all regulations and all current health, safety, environmental, and classical engineering standards.

The BSEE regulations at 30 CFR §§ 250.1710-1717 address the requirements for permanent abandonment of a well on the OCS. A permanent abandonment includes the isolation of zones in the open wellbore, plugging of perforated intervals, plugging the annular space between casings (if they are open), setting a surface plug, and cutting and retrieving the casing at least 15 ft (5 m) below the mudline. All plugs must be tested in accordance with the regulations. There are no routine surveys of permanently abandoned well locations. If a well were found to be leaking, BSEE would require the operator of record to perform an intervention to repair the abandonment. If a well is temporarily abandoned at the seafloor, an operator must provide BSEE with an annual report summarizing plans to permanently abandon the well or to bring the well into production.

Platforms and Structures

The BSEE does a technical review of all proposed structure designs and installation procedures. All proposed facilities are reviewed for structural integrity. These detailed engineering reviews entail an evaluation of all operator proposals for fabrication, installation, modification, and repair of all mobile and fixed structures. The lessee must design, fabricate, install, use, inspect, and maintain all platforms and structures on the OCS to assure their structural integrity for the safe conduct of operations at specific locations. Applications for platform and structure approval are filed in accordance with 30 CFR § 250.901. Design requirements are presented in detail at 30 CFR §§ 250.904 through 250.909. The lessee evaluates characteristic environmental conditions associated with operational functions to be performed. Factors such as waves, wind, currents, tides, temperature, and the potential for marine growth on the structure are considered. In addition, pursuant to 30 CFR §§ 250.902 and 250.903, a program has been established by BSEE to assure that new structures meeting the conditions listed under 30 CFR §

250.900(c) are designed, fabricated, and installed using standardized procedures to prevent structural failures. This program facilitates review of such structures and uses third-party expertise and technical input in the verification process through the use of a Certified Verification Agent. After installation, platforms and structures are required to be periodically inspected and maintained under 30 CFR § 250.912.

Pipelines

Regulatory processes and jurisdictional authority concerning pipelines on the OCS and in coastal areas are shared by several Federal agencies, including DOI, the Department of Transportation (DOT), the U.S. Army Corps of Engineers (COE), the Federal Energy Regulatory Commission, and USCG. Aside from pipeline regulations, these agencies have the responsibility of overseeing and regulating the following areas: the placement of structures on the OCS and pipelines in areas that affect navigation; the certification of proposed projects involving the transportation or sale of interstate natural gas, including OCS gas; and the right of eminent domain exercised by pipeline companies onshore. In addition, DOT is responsible for promulgating and enforcing safety regulations for the transportation in interstate commerce of natural gas, liquefied natural gas (LNG), and hazardous liquids by pipeline. This includes, for the most part, offshore pipelines on State lands beneath navigable waters and on the OCS that are operated by transmission companies. The regulations are contained in 49 CFR parts 191 through 193 and 195. In a Memorandum of Understanding (MOU) between DOT and DOI dated December 10, 1996, each party's respective regulatory responsibilities are outlined. The DOT is responsible for establishing and enforcing design, construction, operation, and maintenance regulations, and for investigating accidents for all OCS transportation pipelines beginning downstream of the point at which operating responsibility transfers from a producing operator to a transporting operator. The DOI's responsibility extends upstream from the transfer point described above.

The BSEE is responsible for regulatory oversight of the design, installation, and maintenance of OCS producer-operated oil and gas pipelines. The BSEE operating regulations for pipelines, found at 30 CFR part 250 subpart J, are intended to provide safe and pollution-free transportation of fluids in a manner that does not unduly interfere with other users of the OCS. Pipeline applications are usually submitted and reviewed separately from DPP's. Pipeline applications may be for on-lease pipelines or right-of-way for pipelines that cross other lessees' leases or unleased areas of the OCS. Pipeline permit applications to BSEE include the pipeline location drawing, profile drawing, safety schematic drawing, pipe design data, a shallow hazard survey report, and an archaeological report, if applicable.

The BSEE evaluates the design, fabrication, installation, and maintenance of all OCS pipelines. Proposed pipeline routes are evaluated for potential seafloor or subsea geologic hazards and other natural or manmade seafloor or subsurface features or conditions (including other pipelines) that could have an adverse impact on the pipeline or that could be adversely impacted by the proposed operations. Routes are also evaluated for potential impacts on archaeological resources and biological communities. A NEPA review is conducted in accordance with applicable policies and guidelines. BOEM prepares an EA on all pipeline rights-of-way that go ashore. For Federal consistency, applicants must comply with the requirements of NTL 2007-G20, "Coastal Zone Management Program Requirements for OCS Right-of-way Pipeline Applications." All Gulf Coast States require consistency review of right-of-way pipeline applications as described in the clarifying NTL.

The design of the proposed pipeline is evaluated for an appropriate cathodic protection system to protect the pipeline from leaks resulting from the effects of external corrosion of the pipe; an external pipeline coating system to prolong the service life of the pipeline; measures to protect the inside of the pipeline from the detrimental effects, if any, of the fluids being transported; the submersibility of the line (i.e., that the pipeline will remain in place on the seafloor and not have the potential to float, even if empty or filled with gas rather than liquids); proposed operating pressure of the line, and protection of other pipelines crossing the proposed route. Such an evaluation includes the following: (1) reviewing the calculations used by the applicant in order to determine whether the applicant properly considered such elements as the grade of pipe to be used, the wall thickness of the pipe, derating factors (the practice of operating a component well inside its normal operating limits to reduce the rate at which the component deteriorates) related to the submerged and riser portions of the pipeline, the pressure rating of any valves or flanges to be installed in the pipeline, the pressure rating of any other pipeline(s) into which the proposed line might be tied, and the required pressure to which the line must be tested before it is placed in service; (2) protective safety devices such as pressure sensors and remotely operated valves, the physical arrangement of those devices proposed to be installed by the applicant for the purposes of protecting the pipeline from possible overpressure conditions and for detecting and initiating a response to abnormally low-pressure conditions; and (3) the applicant's planned compliance with regulations requiring that pipelines installed in water depths less than 200 ft (61 m) be buried to a depth of at least 3 ft (1 m) (30 CFR § 250.1003). In addition, pipelines crossing fairways require a COE permit and must be buried to a depth of at least 10 ft (3 m) and to 16 ft (5 m) if crossing an anchorage area.

Operators are required to periodically inspect pipeline routes. Monthly overflights are conducted to inspect pipeline routes for leakage.

Applications for pipeline decommissioning must also be submitted for BSEE review and approval. Decommissioning applications are evaluated to ensure they will render the pipeline inert and/or to minimize the potential for the pipeline becoming a source of pollution by flushing and plugging the ends; and to minimize the likelihood that the decommissioned line will become an obstruction to other users of the OCS by filling it with water and burying the ends.

Inspection and Enforcement

The OCSLA authorizes and requires BSEE to provide for an annual scheduled inspection and a periodic unscheduled (unannounced) inspection of all oil and gas operations on the OCS. The inspections are to assure compliance with all regulatory constraints that allowed commencement of the operation.

The primary objective of an initial inspection is to assure proper installation of mobile drilling units and fixed structures, and proper functionality of their safety and pollution prevention equipment. After operations begin, additional announced and unannounced inspections are conducted. Unannounced inspections are conducted to foster a climate of safe operations, to maintain a BSEE presence, and to focus on operators with a poor performance record. These inspections are also conducted after a critical safety feature has previously been found defective. Poor performance generally means that more frequent, unannounced inspections may be conducted on a violator's operation.

The annual inspection examines all safety equipment designed to prevent blowouts, fires, spills, or other major accidents. These annual inspections involve the inspection for the installation and performance of all facilities' safety-system components.

The inspectors follow the guidelines as established by the regulations, API RP 14C, and the specific BSEE-approved plan. The BSEE inspectors perform these inspections using a national checklist called the Potential Incident of Noncompliance list. This list is a compilation of yes/no questions derived from all regulated safety and environmental requirements.

The BSEE administers an active civil penalties program (30 CFR part 250 subpart N). A civil penalty in the form of substantial monetary fines may be issued against any operator that commits a violation that may constitute a threat of serious, irreparable, or immediate harm or damage to life, property, or the environment. The BSEE may make recommendations for criminal penalties if a willful violation occurs. In addition, the regulation at 30 CFR § 250.173(a) authorizes suspension of any operation in the Gulf of Mexico OCS Region if the lessee has failed to comply with a provision of any applicable law, regulation, or order or provision of a lease or permit. Furthermore, the Secretary may invoke his authority under 43 U.S.C. § 1334(c) and 30 CFR § 550.185(c) to cancel a nonproductive lease with no compensation. Exploration and development activities may be canceled under 30 CFR §§ 550.182 and 550.183.

Pollution Prevention, Blowout Preventers, Oil-Spill Response Plans, and Financial Responsibility

Pollution Prevention

Pollution prevention is addressed through proper design and requirements for safety devices. The BSEE regulations at 30 CFR § 250.400 require that the operator take all necessary precautions to keep its wells under control at all times. The lessee is required to use the best available and safest drilling technology in order to enhance the evaluation of conditions of abnormal pressure and to minimize the potential for the well to flow or kick. Redundancy is required for critical safety devices that will shut off flow from the well if loss of control is encountered. A complete description of rule changes implemented as a result of the *Deepwater Horizon* explosion, oil spill, and response is detailed in **Chapter 1.3.2**.

In addition, BSEE's regulations at 30 CFR part 250 subparts E, F, and H require that the lessee assure the safety and protection of the human, marine, and coastal environments during completion, workover, and production operations. All production facilities, including separators, treaters, compressors, headers, and flowlines, are required to be designed, installed, tested, maintained, and used in a manner that provides for efficiency, safety of operations, and protection of the environment. Wells, particularly subsea wells, include a number of sensors that help in detecting pressures and the potential for leaks in the production system. Safety devices must be monitored and tested frequently to ensure their operation, should an incident occur. To ensure that safety devices are operating properly, BSEE incorporates API RP 14C into the operating regulations. The API RP 14C incorporates the knowledge and experience of the oil and gas industry regarding the analysis, design, installation, and testing of the safety devices used to prevent pollution. The API RP 14C presents proven practices for providing these safety devices for offshore production platforms. Proper application of these practices, along with good design, maintenance, and operation of the entire production facility, should provide an operationally safe and pollution-free production platform.

Also, BSEE's regulations at 30 CFR part 250 subpart J require that pipelines and associated valves, flanges, and fittings be designed, installed, operated, and maintained to provide the safe and pollution-free transportation of fluids in a manner that does not unduly interfere with other uses on the OCS.

The BSEE regulation at 30 CFR § 250.300(a) requires that lessees not create conditions that will pose an unreasonable risk to public health, life, property, aquatic life, wildlife, recreation, navigation, commercial fishing, or other uses of the ocean during offshore oil and gas operations. The lessee is required to take measures to prevent the unauthorized discharge of pollutants into the offshore waters. Control and removal of pollution is the responsibility and is at the expense of the lessee. Immediate corrective action in response to an unauthorized release is required. All hydrocarbon-handling equipment for testing and production, such as separators, tanks, and treaters, is required to be designed, installed, and operated to prevent pollution. Maintenance and repairs that are necessary to prevent pollution are required to be taken immediately. Drilling and production facilities are required to be inspected daily or at intervals approved or prescribed by the BSEE District Field Operations Supervisor to determine if pollution is occurring.

Operators are required to install curbs, gutters, drip pans, and drains on platform and rig deck areas in a manner necessary to collect all greases, contaminants, and debris not authorized for discharge. The rules also explicitly prohibit the disposal of equipment, cables, chains, containers, or other materials into offshore waters. Portable equipment, spools or reels, drums, pallets, and other loose items must be marked in a durable manner with the owner's name prior to use or transport over offshore waters. Smaller objects must be stored in a marked container when not in use. Operational discharges such as produced water and drilling muds and cuttings are regulated by USEPA through the National Pollutant Discharge Elimination System (NPDES) permit program for new and existing discharges and sources (40 CFR part 435 subpart A). The BSEE may restrict the rate of drilling fluid discharge or prescribe alternative discharge methods. No petroleum-based substances, including diesel fuel, may be added to the drilling mud system without prior approval of the BSEE District Field Operations Supervisor.

Blowout Preventers

A blowout preventer (BOP) is a complex of choke lines and hydraulic rams mounted atop the well head that can seal off the casing of a well by remote control at the surface. The BOP's were invented in the early 1920's and have been instrumental in ending dangerous, costly, and environmentally-damaging oil gushers. The BOP's have been required for OCS oil and gas operations from the time offshore drilling began in the late 1940's. There are two types of BOP's: ram and annular (also called spherical). Rams were deployed in the 1920's and annular preventers in the 1950's. Rams are designed to seal an open hole by closing the wellbore with a sharp horizontal motion that may cut through casing or tool strings, as a last resort. An annular BOP closes around the drill string in a smooth simultaneous upward and inward motion. Both types are usually used together to create redundancy in a BOP stack. Because BOP's are important for the safety of the drilling crew, as well as the rig and the wellbore itself, BOP's are regularly inspected, tested, and refurbished. The BOP's are actuated as a last resort upon imminent threat to the integrity of the well or the surface rig (**Chapter 3.2.2**). The final regulations for BOP's were published on August 22, 2012, as described in **Chapter 1.3.2** (*Federal Register*, 2012a).

Oil-Spill Response Plans

The BSEE responsibilities under the Oil Pollution Act of 1990 include the following: enforcing spill-prevention measures; review and approval of oil-spill response plans (OSRP's); inspection of oil-spill containment and cleanup equipment; and ensuring oil-spill financial responsibility for facilities in offshore waters located seaward of the coastline or in any portion of a bay that is connected to the sea either directly or through one or more other bays. The BSEE regulations at 30 CFR part 254 require that all owners and operators of oil-handling, storage, or transportation facilities located seaward of the coastline submit an OSRP for approval. The term "coastline" means the line of ordinary low water along that portion of the coast that is in direct contact with the open sea and the line marking the seaward limit of inland waters. The term "facility" means any structure, group of structures, equipment, or device (other than a vessel) that is used for one or more of the following purposes: exploring for, drilling for, producing, storing, handling, transferring, processing or transporting oil. An MODU is classified as a facility when engaged in drilling or downhole operations.

The regulation at 30 CFR § 254.2 requires that an OSRP must be submitted and approved before an operator can use a facility. The BSEE can grant an exception to this requirement during BSEE's review of an operator's submitted OSRP. In order to be granted this exception during this time period, an owner/operator must certify in writing to BSEE that it is capable of responding to a "worst-case" spill or the substantial threat of such a spill. To continue operations, the facility must be operated in compliance with the approved OSRP or the BSEE-accepted, "worst-case" spill certification. Owners or operators of offshore pipelines are required to submit an OSRP for any pipeline that carries oil, condensate, or gas with condensate; pipelines carrying essentially dry gas do not require an OSRP. Current OSRP's are required for abandoned facilities until they are physically removed or dismantled.

The OSRP describes how an operator intends to respond to an oil spill. The OSRP may be site-specific or regional (30 CFR § 254.3). The term "regional" means a spill response plan that covers multiple facilities or leases of an owner or operator, including affiliates, which are located in the Gulf of Mexico region. Although Regional OSRP's have not been allowed for facilities subject to the State of Florida consistency review in the past, BSEE has initiated a policy accepting subregional plans for this area. The subregional plan concept is similar to the regional concept, which allows leases or facilities to be grouped together for the purposes of (1) calculating response times, (2) determining quantities of response equipment, (3) conducting oil-spill trajectory analyses, (4) determining worst-case discharge scenarios, and (5) identifying areas of special economic and environmental importance that may be impacted and the strategies for their protection. The number and location of the leases and facilities allowed to be covered by a subregional OSRP will be decided by BSEE on a case-by-case basis considering the proximity of the leases or facilities proposed to be covered. The NTL 2012-N06 provides clarification, guidance, and information concerning the preparation and submittal of a regional OSRP.

The Emergency Response Action Plan serves as the core component of the OSRP, which is required to be submitted to BSEE. In accordance with 30 CFR § 254.23, the Emergency Response Action Plan requires identification of (1) the qualified individual and the spill-response management team, (2) the spill-response operating team, (3) the oil-spill response cleanup organizations under contract for response, and (4) the Federal, State, and local regulatory agencies that an owner/operator must notify or that they must consult with to obtain site-specific environmental information when an oil spill occurs. The OSRP is also required to include an inventory of appropriate equipment and materials, their availability, and the time needed for deployment, as well as information pertaining to dispersant use, in-situ burning, a worse-case discharge scenario, contractual agreements, training and drills, identification of potentially impacted environmental resources and areas of special economic concern and environmental importance, and strategies for the protection of these resources and areas. The response plan must provide for response to an oil spill from the operator's facility, and the operator must immediately carry out the provisions of the plan whenever an oil spill from the facility occurs. The OSRP must be in compliance with the National Response Framework, the National Incident Management System, the National Contingency Plan, and the appropriate Area Contingency Plan(s) (ACP). The operator is also required to carry out the training, equipment testing, and periodic drills described in the OSRP. All BSEE-approved OSRP's must be reviewed at least every 2 years. In addition, revisions must be submitted to BSEE within 15 days of the change, as required by 30 CFR § 254.30(b).

As a result of the *Deepwater Horizon* explosion, oil spill, and response, although BSEE did not require the submission of revised OSRP's at that time, BSEE provided guidance regarding additional information that operators should submit regarding spill response and surface containment in light of the "worst-case" discharge calculations that are required by the regulations and as clarified in NTL 2010-N06, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS," which became effective on June 18, 2010. This NTL provides clarification of the regulations requiring a lessee or operator to submit supplemental information for new or previously submitted EP's, DPP's, or DOCD's. The required supplemental information includes the following: (1) a description of the blowout scenario as required by 30 CFR §§ 550.213(g) and 550.243(h); (2) a description of their assumptions and calculations used in determining the volume of the worst-case discharge required by 30 CFR § 550.219(a)(2)(iv) (for EP's) or 30 CFR § 550.250(a)(2)(iv) (for DPP's and DOCD's); and (3) a description of the measures proposed that would enhance the ability to prevent a blowout, to reduce the likelihood of a blowout, and to conduct effective and early intervention in the event of a blowout, including the arrangements for drilling relief wells and any other measures proposed. The early intervention methods could actually include the surface and subsea containment resources that this Agency announced in NTL 2010-N10, which states that this Agency will begin reviewing OSRP's and information submitted by operators to ensure that the measures are adequate to promptly respond to a blowout or other loss of well control.

Additionally, to address new improved containment systems, NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources," became effective on November 8, 2010. This NTL applies only to operators conducting operations using subsea or surface BOP's on floating facilities. It clarifies the regulations that lessees and operators must submit a certification statement signed by an authorized company official with each application for a well permit, indicating that they will conduct all of their authorized activities in compliance with all applicable regulations, including the Increased Safety Measures Regulations at 75 FR 63346. The NTL also informs lessees that BSEE will be evaluating whether or not each operator has submitted adequate information demonstrating that it has access to and can deploy surface and subsea containment resources that would be adequate to promptly respond to a blowout or other loss of well control. Although the NTL does not provide that operators submit revised OSRP's that include this containment information at this time, operators were notified of BSEE's intention to evaluate the adequacy of each operator to comply in the operator's current OSRP; therefore, there is an incentive for voluntary compliance.

Financial Responsibility

The responsible party for covered offshore facilities must demonstrate oil-spill financial responsibility, as required by 30 CFR part 553. These regulations implement the oil-spill financial responsibility requirements of Title I of the Oil Pollution Act of 1990, as amended. Penalties for noncompliance with these requirements are covered at 30 CFR § 553.51 and in NTL 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities." A covered offshore facility, as defined in 30 CFR § 553.3, is any structure and all of its components (including wells completed at the structure and the associated pipelines), equipment, pipeline, or device (other than a vessel or other than a pipeline or deepwater port licensed under the Deepwater Port Act of 1974) used for exploring, drilling, or producing oil, or for transporting oil from such facilities. The BSEE ensures that each responsible party has sufficient funds for removal costs and damages resulting from the accidental release of liquid hydrocarbons into the environment for which the responsible party is liable.

Air Emissions

The Clean Air Act (CAA), which was last amended in 1990, is the comprehensive Federal law that regulates air emissions from stationary and mobile sources within the jurisdictional boundaries of the U.S. This law authorizes USEPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare. The CAA designates six pollutants as criteria pollutants for which NAAQS are promulgated. The USEPA has promulgated NAAQS for carbon monoxide, ozone, sulfur dioxide, nitrogen dioxide, particulate matter less than 10 microns in diameter and less than 2.5 microns in diameter, and lead to protect human health and human welfare. The potential impacts on local and regional air quality conditions near a proposed action are determined by the increases in regulated pollutant emissions relative to existing conditions and ambient air quality.

On the OCS in the GOM east of 87.5° W. longitude, the provisions of the CAA are implemented through regulations established by USEPA at 40 CFR part 55. These regulations require that sources within 25 mi (40 km) of a State's seaward boundary comply with the applicable regulations of the corresponding onshore area, generally a state. Areas beyond 25 mi (40 km) of the State's seaward boundary are subject to Federal requirements including the requirements for construction and operating permits and equipment-specific performance standards. Pursuant to the Federal OCS regulations, OCS facilities go through a case-by-case review process to ensure they are in compliance with the CAA and would not cause or contribute to a violation of a NAAQS. The proposed EPA lease sale area falls east of 87.5° W. longitude, where the CAA assigns air quality jurisdiction to USEPA. Operators with activities in this area that impact air quality must comply with USEPA's air quality regulations and submit air permit applications to USEPA for approval.

The OCSLA (43 U.S.C. § 1334(a)(8)) requires the Secretary of the Interior to promulgate and administer regulations that comply with NAAQS, pursuant to the CAA (42 U.S.C. §§ 7401 *et seq*.), to the extent that authorized activities significantly affect the air quality of any State. BOEM-regulated pollutants include carbon monoxide, suspended particulates, sulfur dioxide, nitrogen oxides, and volatile organic compounds. BOEM regulates suspended particulates, which is equivalent to USEPA's particle pollution.

On the OCS in the GOM west of 87.5° W. longitude, the provisions regarding air quality for OCS oil and gas activities are implemented through regulations established by BOEM at 30 CFR part 550 subpart C. BOEM's regulations require a review of air quality emissions to determine if the projected emissions from a facility result in onshore ambient air concentrations above BOEM's significance levels and to identify appropriate emissions controls to mitigate potential onshore air quality degradation. Emissions data for new or modified onshore facilities directly associated with proposed OCS activities are required to be included in development plans submitted to BOEM so that the affected States can determine potential air quality impacts on its air quality.

The proposed EPA lease sale area falls within the jurisdiction of USEPA. The area is under the air quality regulation of USEPA's Region 4. The emissions from an EPA proposed action's activities are evaluated on an individual project basis for compliance with applicable permitting requirements for Prevention of Significant Deterioration (PSD) and NAAQS. For postlease activities, lessees under an EPA proposed action would be required to evaluate their potential emissions in light of USEPA's air regulations for OCS activities and submit, as necessary, permit applications and supporting documentation to USEPA prior to commencing operations that exceed USEPA's significance levels.

Flaring/Venting

Flaring is the controlled burning of natural gas, and venting is releasing gas directly into the atmosphere without burning. Flaring/venting may be necessary to remove potentially damaging completion fluids from the wellbore, to provide sufficient reservoir data for the operator to evaluate reservoir development options, during unloading/testing operations, and/or in emergency situations. The BSEE regulates flaring/venting to minimize the loss of revenue producing natural gas resources. The BSEE regulations (30 CFR part 250 subpart K) allow, without prior BSEE approval, flaring or venting of natural gas on a limited basis under certain specified conditions. Regulations permit more extensive flaring/venting with prior approval from BSEE. Records must always be prepared by the operator for all flaring/venting, and justification must be provided for flaring/venting not expressly authorized by BSEE regulations. The NTL 2012-N04, "Flaring and Venting Request," provides guidance for requesting approval to flare or vent natural gas and clarification on the discretionary authority of the BSEE for approving such requests.

Hydrogen Sulfide Contingency Plans

The operator of a lease must request a BSEE area classification for the presence of hydrogen sulfide (H_2S) gas. The BSEE classifies areas for proposed operations as (1) H_2S absent, (2) H_2S present, or (3) H_2S unknown.

All OCS operators must provide information about potential contact with sour hydrocarbons (i.e., those containing H_2S) that could result in atmospheric H_2S concentrations above 20 parts per million (ppm) in their exploration or development plan. If an area is known to contain H_2S or is in an area where

H_2S potential is unknown, operators are required to file an H_2S contingency plan with BSEE. This plan must include the 30 CFR part 250 requirements that are intended to ensure workers' safety at the production facility and to provide contingencies for simultaneous drilling, well-completion, well-workovers, and production operations. The NTL 2009-G31, "Hydrogen Sulfide (H_2S) Requirements," provides clarification, guidance, and information regarding BSEE's H_2S regulations at 30 CFR part 250.

Archaeological Resources Regulation

Bottom-disturbing operations such as well placement, anchoring, and pipelaying activities can lead to damage to resources located on and below the seabed, including archaeological resources such as historic shipwrecks. The archaeological resources regulations at 30 CFR § 550.194 grant authority in certain cases to BOEM's Regional Director to require that archaeological resource reports be submitted with the EP, DOCD, or DPP where deemed necessary. The technical requirements of the archaeological resource reports are detailed in NTL 2005-G07, "Archaeological Resource Surveys and Reports." If the evidence from the operator's geophysical survey and/or archaeological report suggests that an archaeological resource may be present, the lessee must either locate the site of any operation so as not to adversely affect the area where the archaeological resource may be, demonstrate that an archaeological resource does not exist, or demonstrate that archaeological resources will not be adversely affected by operations. If the lessee discovers any archaeological resource while conducting approved operations, operations must be immediately stopped and the discovery reported to BOEM's Regional Supervisor, Office of Environment, within 48 hours of its discovery.

High-resolution surveys, where required, provide an effective tool that analysts use to identify and help protect archaeological resources; however, such survey coverage is often not available for all areas of the GOM, particularly in deeper water where oil and gas activities are increasing and where more shipwrecks are being identified. As part of the environmental reviews conducted for postlease activities, available information will be evaluated regarding the potential presence of archaeological resources within the EPA proposed action area to determine if mitigation is warranted.

Coastal Zone Management Consistency Review and Appeals for Plans

The CZMA places requirements on any applicant for an OCS plan that describes in detail Federal license or permit activities affecting any coastal use or resource, in or outside of a State's coastal zone. The applicant must provide in the OCS plan submitted to BOEM a consistency certification and necessary data and information for the State to determine that the proposed activities comply with the enforceable policies of the States' CMP, approved by NOAA and that such activities will be fully consistent with those enforceable policies (16 U.S.C. § 1456(c)(3)(A) and 15 CFR § 930.76).

Except as provided in 15 CFR § 930.60(a), State agency consistency review begins when the State receives the OCS plan, consistency certification, and necessary data and information pursuant to 15 CFR §§ 930.76(a) and (b). Only missing information can be used to delay the commencement of State agency review, and a request for information and data that are not required by 15 CFR § 930.76 will not extend the date of commencement of review (15 CFR § 930.58). The information requirements for CZM purposes are found at 30 CFR §§ 550.226 and 250.260 and are discussed in NTL 2007-G20, "Coastal Zone Management Program Requirements for OCS Right-of-Way Pipeline Applications"; NTL 2008-G04, "Information Requirements for Exploration Plans and Development Operations Coordination Documents"; NTL 2009-G27, "Submitting Exploration Plans and Development Operations Coordination Documents"; NTL 2010-N06, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS"; NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources"; and NTL 2012-BSEE-N06, "Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans."

All of the Gulf States have approved CMP's. Requirements for the CZM consistency information for Texas, Louisiana, Mississippi, Alabama, and Florida are identified in NTL's 2007-G20, 2008-G04, 2009-G27, 2010-N06, and 2012-N06. In accordance with the requirements of 15 CFR § 930.76, BOEM's Gulf of Mexico OCS Region sends copies of an OCS plan, including the consistency certification and other necessary data and information, to the designated State CMP agency by receipted mail or other approved communication. If no State-agency objection is submitted by the end of the consistency review period, BOEM shall presume consistency concurrence by the State (15 CFR § 930.78(b)). BOEM can require modification of a plan to promote consistency with a State's CMP.

If BOEM receives a written consistency objection from the State, BOEM will not approve any activity described in the OCS plan unless (1) the operator amends the OCS plan to accommodate the objection, concurrence is subsequently received or conclusively presumed; (2) upon appeal, the Secretary of Commerce, in accordance with 15 CFR part 930 subpart H, finds that the OCS plan is consistent with the objectives or purposes of the CZMA or is necessary in the interest of national security; or (3) the original objection is declared invalid by the courts.

Best Available and Safest Technologies

To assure that oil and gas exploration, development, and production activities on the OCS are conducted in a safe and environmentally sensitive manner, 43 U.S.C. § 1347(b) of the OCSLA, as amended, requires that all OCS technologies and operations use the best available and safest technology (BAST) whenever practical. The Director may require additional technological measures to protect safety, health, and the environment, if it is economically feasible and the benefits outweigh the costs. Conformance to the standards, codes, and practices referenced in or required under the authority of 30 CFR part 250 is considered the application of BAST. These standards, codes, and practices include requirements for state-of-the-art drilling technology, production safety systems, oil and gas well completions, oil-spill response plans, pollution-control equipment, and specifications for platform/structure designs. The BSEE conducts periodic offshore inspections and continuously and systematically reviews OCS technologies to ensure that the best available and safest technologies are applied to OCS operations. The BAST is not required when BSEE determines that the incremental benefits are clearly insufficient to justify increased costs; however, it is the responsibility of an operator of an existing operation to demonstrate why application of a new technology would not be feasible. The BAST requirement is applicable to equipment and procedures that, upon failure, would have a significant effect on safety, health, or the environment, unless in BSEE's determination the benefits clearly do not justify the cost (30 CFR §§ 550.107(c) and (d)).

The BAST concept is addressed in BSEE's Gulf of Mexico OCS Region by a continuous effort to locate and evaluate the latest technologies and to report on these advances at periodic Regional Operations Technology Assessment Committee meetings. A part of BSEE's staff has an ongoing function to evaluate vendors and industry representatives' innovations and improvements in techniques, tools, equipment, procedures, and technologies applicable to oil and gas operations (drilling, producing, completion, and workover operations). This information is provided to BSEE district personnel at Regional Operations Technology Assessment Committee meetings. The requirement for the use of BAST has been, for the most part, an evolutionary process whereby advances in equipment, technologies, and procedures have been integrated into OCS operations over a period of time. The OCS operators have implemented the most advanced equipment and technologies into their day-to-day operations, and BSEE's inspectors have kept up with these advances. An example of such an equipment change that evolved over a period of time is the upgrading of diverter systems on drilling rigs from the smaller diameter systems of the past to the large-diameter, high-capacity systems found on drilling rigs operating on the OCS today.

Production Facilities

The BSEE's regulations governing oil and gas production safety systems are found in 30 CFR part 250 subpart H. Production safety equipment used on the OCS must be designed, installed, used, maintained, and tested in a manner to assure the safety and protection of the human, marine, and coastal environments. All tubing installations open to hydrocarbon-bearing zones below the surface must be equipped with safety devices that will shut off the flow from the well in the event of an emergency, unless the well is incapable of flowing. Surface- and subsurface-controlled safety valves and locks must conform to the requirements of 30 CFR § 250.801. All surface production facilities, including separator and treatment tanks, compressors, headers, and flowlines must be designed, installed, and maintained in a manner that provides for efficiency, safety of operations, and protection of the environment. Production facilities also have stringent requirements concerning electrical systems, flowlines, engines, and firefighting systems. The safety-system devices are tested by the lessee at specified intervals and must be in accordance with API RP 14 C Appendix D and other measures.

Personnel Training and Education

An important factor in ensuring that offshore oil and gas operations are carried out in a manner that emphasizes operational safety and minimizes the risk of environmental damage is the proper training of personnel. Under 30 CFR part 250 subpart O, BSEE has outlined well control and production safety training program requirements for lessees operating on the OCS. The goal of the regulation (30 CFR § 250.1501) is safe and clean OCS operations. Lessees must ensure that their employees and contract personnel engaged in well control or production safety operations understand and can properly perform their duties. To accomplish this, the lessee must establish and implement a training program so that all of their employees are trained to competently perform their assigned well control and production safety duties. The lessee must also verify that their employees understand and can perform the assigned duties.

The mandatory Drilling Well-Control Training Program was instituted by this Agency in 1979. In 1983, the mandatory Safety Device Training Program was established to ensure that personnel involved in installing, inspecting, testing, and maintaining safety devices are qualified. As a preventive measure, all offshore personnel must be trained to operate oil-spill cleanup equipment, or the lessee must retain a trained contractor(s) to operate the equipment for them. In addition, BSEE offers numerous technical seminars to ensure that personnel are capable of performing their duties and are incorporating the most up-to-date safety procedures and technology in the petroleum industry. In 1994, the Office of Safety Management created this Agency's Offshore Training Institute to develop and implement an inspector training program. The Institute introduced state-of-the-art multimedia training to the inspector work force and has produced a series of interactive computer training modules.

Structure Removal and Site Clearance

During exploration, development, and production operations, temporary and permanent equipment and structures is often required to be embedded into or placed onto the seafloor around activity areas. In compliance with Section 22 of BOEM's Oil and Gas Lease Form (BOEM-2005) and OCSLA regulations (30 CFR § 250.1710—*Permanently Plugging Wells* and 30 CFR § 250.1725—*Removing Platforms and Other Facilities*), operators need to remove seafloor obstructions from their leases within 1 year of lease termination or after a structure has been deemed obsolete or unusable. These regulations also require the operator to sever bottom-founded objects and their related components at least 5 m (15 ft) below the mudline (30 CFR § 250.1716(a)—*Wellheads/Casings* and 30 CFR § 250.1728(a)—*Removing Platforms and Other Facilities*). The severance operations are generally categorized as explosive or nonexplosive.

Chapter 3.1.1.10 describes regulations, reporting guidelines, and specific mitigation measures developed through consultation, pursuant to Section 7 of the Endangered Species Act and the Marine Mammal Protection Act, concerning potential impacts on endangered and threatened species associated with explosive severance activities conducted during the structure-removal operations. All of the current terms and conditions of structure and well removal activities are outlined in NTL 2010-G05, "Decommissioning Guidance for Wells and Platforms."

Marine Protected Species NTL's

Three NTL's advise operators of measures designed to reduce impacts to Marine Protected Species: NTL 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program"; NTL 2012-BSEE-G01, "Marine Trash and Debris Awareness and Elimination"; and NTL 2012-JOINT-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting." The provisions outlined in these NTL's apply to all existing and future oil and gas operations in the Gulf of Mexico OCS.

The NTL 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program," provides guidance to protect marine mammals and sea turtles during seismic operations. This NTL clarifies how operators should implement seismic survey mitigation measures, including ramp-up procedures, the use of a minimum sound source, airgun testing, and protected species observation and reporting. The measures contained in this NTL apply to all on-lease surveys conducted under 30 CFR part 550 and to all off-lease surveys conducted under 30 CFR part 551.

The NTL 2012-BSEE-G01, "Marine Trash and Debris Awareness and Elimination," provides guidance to prevent intentional and/or accidental introduction of debris into the marine environment. Operators are prohibited from deliberately discharging containers and other similar materials (i.e., trash and debris) into the marine environment (30 CFR §§ 250.300(a) and (b)(6)) and are also required to make durable identification markings on equipment, tools, containers (especially drums), and other material (30 CFR § 250.300(c)). The intentional jettisoning of trash has been the subject of strict laws, such as the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V and the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies including USCG and USEPA. These USCG and USEPA regulations require that operators become more proactive in avoiding the accidental loss of solid-waste items by developing waste management plans, posting informational placards, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. The NTL 2012-BSEE-G01 states that marine debris placards must be posted in prominent places on all fixed and floating production facilities that have sleeping or food preparation capabilities and on mobile drilling units. Operators must also ensure that all of their offshore employees and those contractors actively engaged in their offshore operations complete annual training that includes (1) viewing a training video or slide show (specific options are outlined in the NTL) and (2) receiving an explanation from the lessee company's management that emphasizes their commitment to the NTL's provisions. An annual report that describes the marine trash and debris awareness training process and certifies that the training process has been followed for the previous calendar year is to be provided to BSEE by January 31 of each year.

The NTL 2012-JOINT-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting," explains how operators must implement measures to minimize the risk of vessel strikes to protected species and report observations of injured or dead protected species. Vessel operators and crews must maintain a vigilant watch for marine protected species and slow down or stop their vessel to avoid striking protected species. Crews must report sightings of any injured or dead protected species (marine mammals and sea turtles) immediately, regardless of whether the injury or death is caused by their vessel, to the Marine Mammal and Sea Turtle Stranding Hotline or the Marine Mammal Stranding Network. In addition, if it was their vessel that collided with a protected species, BSEE must be notified within 24 hours of the strike.

Rigs-to-Reefs

Rigs-to-Reefs (RTR) is a term for converting obsolete, nonproductive offshore oil and gas platforms to designated artificial reefs (Dauterive, 2000). Disposal of obsolete offshore oil and gas platforms is not only a financial liability for the oil and gas industry but it can also be a loss of productive marine habitat. The use of obsolete oil and gas platforms for reefs has proven to be highly successful. Their availability, design profile, durability, and stability provide a number of advantages over the use of traditional artificial reef materials. To capture this valuable fish habitat, the States of Florida, Louisiana, Alabama, Texas, and Mississippi in 1982, 1986, 1987, 1989, and 1999, respectively, passed enabling legislation and signed into law the RTR program to coincide with their respective States' Artificial Reef Plan. The States' laws set up a mechanism to transfer ownership and liability of the platform from oil and gas companies to the State when the platform ceases production and the lease is terminated. The company (donor) saves money by donating a platform to the State (recipient) for a reef rather than scrapping the platform onshore. The industry then donates 50 percent of the savings to the State, which is put toward the State's artificial reef program. Since the inception of the RTR program, more than 400 retired platforms have been donated and used for reefs in the Gulf of Mexico.

1.6. OTHER OCS-RELATED ACTIVITIES

BOEM and BSEE have programs and activities that are OCS related but not specific to the oil and gas leasing process or to the management of exploration, development, and production activities. These programs include both environmental and technical studies, and cooperative agreements with other Federal and State agencies for NEPA work, joint jurisdiction over cooperative efforts, inspection activities, and regulatory enforcement. BOEM also participates in industry research efforts and forums.

Environmental Studies Program

The Environmental Studies Program (ESP) was established in 1973 in accordance with Section 20 of the OCSLA. The goals of the ESP are to obtain environmental and socioeconomic information that can be used to assess the potential and real effects of the Gulf of Mexico OCS natural gas and oil program, renewable or alternative energy programs, and sand program. As a part of the ESP, the Gulf of Mexico OCS Region has funded more than 875 completed or ongoing environmental studies. The types of studies funded include the following:

- literature reviews and baseline studies of the physical, chemical, and biological environment of the shelf;
- literature review and studies of the physical, chemical, and biological environment of deep water >300 m (1,000 ft);
- studies of the socioeconomic impacts along the Gulf Coast; and
- studies of the effects of oil and gas activities, renewable or alternative energy activities, and sand activities on the marine environment.

A list of the Gulf of Mexico OCS Region's studies published from 2006 to the present is presented in **Appendix F**. Studies completed since 1974 are available on BOEM's Gulf of Mexico OCS Region's Internet website under "Environmental Stewardship, Environmental Studies." BOEM's Environmental Studies Program Information System (ESPIS) provides immediate access to all completed BOEM studies. The ESPIS is a searchable, web-based, full-text retrieval system allowing users to view online or to download the complete text of any completed ESP report. A complete list of all ongoing Gulf of Mexico OCS Region studies is available on BOEM's Internet website. Each listing not only describes the research being conducted but also shows the institution performing the work, the cost of the effort, timeframe, and any associated publications, presentations, or affiliated websites.

The ESP funds studies to obtain information needed for NEPA assessment and the management of environmental and socioeconomic impacts on the human, marine, and coastal environments that may be affected by OCS oil and gas activities, renewable or alternative energy activities, and sand activities. The ESP studies were used by BOEM's Gulf of Mexico OCS Region analysts to prepare this document. While not all of the Gulf of Mexico OCS Region's studies are specifically referenced in this document, they were used by analysts as input into their analysis. The information in ESP studies is also used by decisionmakers to manage and regulate exploration, development, and production activities on the OCS.

Technical Assessment & Research Program

The Technical Assessment & Research (TA&R) Program supports research associated with operational safety and pollution prevention as well as oil-spill response and cleanup capabilities. The TA&R Program is comprised of two functional research activities: (1) operational safety and engineering research (topics such as air quality, decommissioning, and mooring and anchoring); and (2) oil-spill research (topics such as behavior of oil, chemical treating agents, and in-situ burning of oil). The TA&R Program has four primary objectives.

- Technical Support—Providing engineering support in evaluating industry operational proposals and related technical issues and in ensuring that these proposals comply with applicable regulations, rules, and operational guidelines and standards.
- Technology Assessment—Investigating and assessing industry applications of technological innovations and ensuring that governing BSEE regulations, rules, and operational guidelines ensure the use of BAST (**Chapter 1.5**, ["New and Unusual Technologies"] and **Chapter 3.1.1.9.3**).
- Research Catalyst—Promoting and participating in industry research initiatives in the fields of operational safety, engineering research, and oil-spill response and cleanup research.

- International Regulations—Supporting international cooperative efforts for research and development initiatives to enhance the safety of offshore oil and natural gas activities and the development of appropriate regulatory program elements worldwide.

Interagency Agreements

Memorandum of Understanding under NEPA

Section 1500.5(b) of the CEQ implementing regulations (40 CFR § 1500.5(b)) encourages agency cooperation early in the NEPA process. A Federal agency can be a lead, joint lead, or cooperating agency. A lead agency manages the NEPA process and is responsible for the preparation of an EIS; a joint lead agency shares these responsibilities; and a cooperating agency that has jurisdiction by law and has special expertise with respect to any environmental issue shall participate in the NEPA process upon the request of the lead agency.

When an agency becomes a Cooperating Agency, the cooperating and lead agencies usually enter into a Memorandum of Understanding (MOU), previously called a Cooperating Agency Agreement. The MOU details the responsibilities of each participating agency. BOEM, as lead agency, has requested other Federal agencies to become cooperating agencies while other agencies have requested BOEM to become a cooperating agency (e.g., the Ocean Express Pipeline project). Some projects, such as major gas pipelines across Federal waters and projects under the Deepwater Port Act of 1974, can require cooperative efforts by multiple Federal and State agencies.

The NOI included an invitation to other Federal agencies and State, tribal, and local governments to consider becoming cooperating agencies in the preparation of this EIS. Consultation and coordination activities for this EIS are described in **Chapter 5**.

Memorandum of Understanding and Memoranda of Agreements between BOEM/BSEE and USCG

Since BOEM, BSEE, and USCG have closely related jurisdiction over different aspects of safety and operations on the OCS, the agencies have established a formal MOU that delineates lead responsibilities for managing OCS activities in accordance with OCSLA, as amended, and the Oil Pollution Act of 1990. The latest MOU, dated September 30, 2004, supersedes the August 1989 and December 1998 versions of the interagency agreement. The MOU is designed to minimize duplication and promote consistent regulation of facilities under the jurisdiction of both agencies. A Memorandum of Agreement (MOA), OCS No.1—Agency Responsibilities, between this Agency and USCG, dated September 30, 2004, further clarifies the technical and process section of this Agency/USCG Memorandum of Understanding. The MOA requires the participating agencies to review their internal procedures and, where appropriate, revise them to accommodate the provisions of the September 2004 MOA. To facilitate coordination with USCG, BSEE has established a full-time position within the Office of Offshore Regulatory Programs to provide liaison between the agencies.

Generally for purposes of the MOU, BSEE acts as the lead agency for matters concerning the equipment and operations directly involved in the production of oil and gas. These include, among others, design and operation of risers, permanent mooring foundations of the facility, drilling and well production and services, inspection and testing of all drilling-related equipment, and platform decommissioning. Issues regarding certain aspects of safe operation of the facility, its systems, and equipment generally fall under the jurisdiction of USCG. These include, among others, design of vessels, their sea-keeping characteristics, propulsion and dynamic positioning systems, supply and lightering procedures and equipment, utility systems, safety equipment and procedures, and pollution prevention and response procedures. In 2002, this Agency was authorized to inspect USCG-related safety items on fixed facilities on the OCS.

Generally, the MOA identifies agency responsibilities (i.e., agency representatives for the purpose of keeping each other informed of issues, relevant applications, routine policy determinations and to coordinate joint activities), civil penalties (i.e., USCG refers civil penalty cases to BSEE), oil-spill financial responsibility (i.e., BSEE determines and provides oil-spill financial responsibility-related information to USCG upon request), oil-spill preparedness and response planning (i.e., BSEE requires responsible parties to maintain approved oil-spill-response plans consistent with Area Contingency Plans and the National Contingency Plan), oil-spill response (i.e., reporting all spills to the National Response Center and direct measures to abate sources of pollution from an OCS facility), accident investigations (i.e., BSEE and USCG responsible for investigating and preparing report of fires, spillage, injury, fatality and blowouts, and collisions and allisions), and offshore facility system/subsystem responsibility matrix (identifies lead agency responsible for MODU's, fixed, and floating systems and subsystems, and coordinates with other agencies as appropriate).

On April 18, 2005, this Agency and USCG met to identify MOA's that needed to be developed and to prioritize work. The following subject areas were selected: (a) civil penalties; (b) incident investigations; (c) offshore security; (d) oil-spill planning, preparedness, and response; (e) deepwater ports; (f) digital databases; (g) MODU's; (h) fixed platforms; (i) floating platforms; (j) floating, production, storage, and offloading units (FPSO's); and (k) incident reporting. Joint agency teams have been established to develop the MOA's for the first five subject areas. In addition, an MOA is also being pursued to address renewable energy and alternate use of the OCS. The Civil Penalties MOA-OCS-02 was approved on September 12, 2006. The Floating Offshore Facilities MOA OCS-04 was signed on February 28, 2008. The Oil Discharge Planning, Preparedness, and Response MOA-OCS-03 became effective on April 3, 2012, and the Incident Investigation MOA-OCS-03 became effective on April 3, 2012.

CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTIONS

2. ALTERNATIVES INCLUDING THE PROPOSED ACTIONS

2.1. MULTISALE NEPA ANALYSIS

This EIS addresses two proposed Federal actions: two proposed oil and gas lease sales (Lease Sales 225 and 226) in the proposed EPA lease sale area of the Gulf of Mexico OCS (**Figure 1-1**), as scheduled in the Five-Year Program (USDOI, BOEM, 2012a).

For analysis purposes, a proposed action is presented as a set of ranges for resource estimates, projected exploration and development activities, and impact-producing factors. Each of the proposed lease sales is expected to be within the scenario; therefore, a proposed action is representative of either proposed EPA Lease Sale 225 or proposed EPA Lease Sale 226. A proposed action (proposed lease sale) includes compliance with applicable regulations in place at the time a ROD is signed for each proposed action and related matters (e.g., lease stipulations). Although the leasing of portions of the EPA (subareas or blocks) can be deferred during a Five-Year Program, DOI is conservative throughout the NEPA process and includes the total area within the Gulf of Mexico for analysis.

Since proposed EPA Lease Sales 225 and 226 and their projected activities are very similar, this EIS encompasses both proposed leases sales as authorized under 40 CFR § 1502.4, which allows related or similar proposals to be analyzed in one EIS. In addition, one Area ID was prepared for both proposed lease sales. The Multisale EIS approach is intended to focus the NEPA/EIS process on the differences between the proposed lease sales and new issues and information. It also lessens duplication and saves resources. The scoping process for this document is described in **Chapters 1.4 and 5.3**. As mandated by NEPA, this EIS analyzes the potential impacts of a proposed action on the marine, coastal, and human environments.

Pursuant to OCSLA's staged leasing process, for each lease sale proposed in the final Five-Year Program, BOEM makes individual decisions on whether and how to proceed with a lease sale. At the completion of the NEPA process for this EIS, a decision will be made on whether or how to hold proposed EPA Lease Sale 225. An additional NEPA review (e.g., a determination of NEPA adequacy, an EA or, if determined necessary, a supplemental EIS) will be conducted in the year prior to proposed EPA Lease Sale 226 to address any relevant significant new information. Informal and formal consultation with other Federal agencies, the affected States, and the public will be carried out to assist in the determination of whether or not the information and analyses in this EIS are still valid. Specifically, information requests will be issued soliciting input on proposed EPA Lease Sale 226.

If a subsequent EA is prepared, it may tier from this EIS and summarize and incorporate the material by reference. Because the subsequent EA will be prepared for a proposal that "is, or is closely similar to, one which normally requires the preparation of an EIS" (40 CFR § 1501.4(e)(2)), the EA will be made available for public review for a minimum of 30 days prior to making a decision on the proposed lease sale. Consideration of the EA and any comments received in response to the Information Request will result in either a Finding of No New Significant Impacts (FONNSI) or the determination that the preparation of a Supplemental EIS is warranted. If the EA results in a FONNSI, the EA and FONNSI will be sent to the Governors of the affected States. The availability of the EA and FONNSI will be announced in the *Federal Register*. The FONNSI will become part of the documentation prepared for the decision on the Notice of Sale.

In some cases, an EA may result in a finding that it is necessary to prepare a Supplemental EIS (40 CFR § 1502.9) or this Agency may deem it prudent to proceed directly with a Supplemental EIS. Some of the factors that could justify a Supplemental EIS are a significant change in resource estimates, legal challenge on the EA and FONNSI, significant new information, significant new environmental issue(s), new proposed alternative(s), a significant change in the proposed action, or the analysis in this Multisale EIS is no longer deemed adequate.

If a Supplemental EIS is necessary, it will also tier from this Multisale EIS and will summarize and incorporate the material by reference. The analysis will focus on addressing the new issue(s) or concern(s) that prompted the decision to prepare the Supplemental EIS. The Supplemental EIS will include a discussion of the purpose of the Supplemental EIS, a description of the proposed action and alternatives, a comparison of the proposed alternatives, a description of the affected environment, potentially affected resources, an analysis of new impacts, and new information not addressed in this

Multisale EIS. The Supplemental EIS will also include an updated discussion of associated BOEM coordination and consultations.

2.2. Alternatives, Mitigating Measures, and Issues

2.2.1. Alternatives for Proposed Eastern Planning Area Lease Sales 225 and 226

The discussions below outline the alternatives to the EPA proposed actions that are considered for this environmental analysis. These suggested alternatives have been derived from both the historical comments submitted to BOEM and the EIS-specific scoping performed for this analysis.

Alternative A—The Proposed Action: This is BOEM's preferred alternative. This alternative would offer for lease all unleased blocks within the proposed EPA lease sale area for oil and gas operations (**Figure 1-1**).

The proposed EPA lease sale area covers approximately 657,905 ac and includes those blocks previously included in the EPA Lease Sale 224 Area and a triangular-shaped area south of this area bordered by the CPA boundary on the west and the Military Mission Line (86º41′ W. longitude) on the east. The area is south of eastern Alabama and western Florida; the nearest point of land is 125 mi (201 km) northwest in Louisiana. As of August 2013, approximately 465,200 ac of the proposed EPA lease sale area are currently unleased. The estimated amount of natural resources projected to be developed as a result of a proposed EPA lease sale is 0-0.071 BBO and 0-0.162 Tcf of gas.

Alternative B—No Action: This alternative is the cancellation of a proposed EPA lease sale. If this alternative is chosen, the opportunity for development of the estimated 0-0.071 BBO and 0-0.162 Tcf of gas that could have resulted from a proposed EPA lease sale would be precluded or postponed. Any potential environmental impacts resulting from a proposed EPA lease sale would not occur or would be postponed to a future lease sale decision. This is also analyzed in the EIS for the Five-Year Program on a nationwide programmatic level.

Although for its NEPA analyses in other planning areas BOEM typically analyzes alternatives that defer blocks based on the proximity or presence of biologically sensitive features or for other programmatic reasons, BOEM has determined that such alternatives are not reasonable in the EPA as there are no known blocks to exclude due to proximity to or presence of biologically sensitive features and due to the fact that the EPA proposed action area is such a small area for leasing. Scoping did not identify any other reasonable alternatives. And finally, other viable alternatives such as the deferral of blocks or the delay of a proposed EPA lease sale would essentially result in the same impacts as the No Action alternative, and therefore, do not need to be evaluated as separate and distinct alternatives.

Alternatives and Deferrals Considered but Not Analyzed in Detail

Chapter 2.9 of the Five-Year Program EIS (USDOI, BOEM, 2012b) includes a description of alternatives considered but not analyzed in this EIS, including the following: expand the oil and gas leasing program to include more or all OCS planning areas beyond those identified in the NOI; hold multiple sales in some OCS planning areas; delay leasing until further data regarding oil-spill response and drilling safety is improved; delay leasing until the state of the Gulf of Mexico's environmental baseline is known; develop alternative/renewable energy sources as a complete or partial substitute for oil and gas leasing on the OCS; add spatial exclusions and temporal deferrals; reduce the lease sale sizes to smaller than areawide; and defer deepwater leasing. The justifications for not carrying these alternatives and deferrals through detailed analyses in this EIS are the same as those used in the Five-Year Program EIS, and BOEM has identified no new information that changes these conclusions.

BOEM received a public comment during the Eastern Planning Area EIS's scoping period (refer to **Chapter 5.3.1**, Center for Biological Diversity letter, comment 2) stating that the EIS should consider an alternative of removing the EPA from the Five-Year Program and canceling proposed EPA Lease Sales 225 and 226. This requested alternative would remove the EPA from the Five-Year Program due to the fact "the area is directly adjacent to an area subject to Congressional moratorium from oil and gas leasing and any spills would directly and negatively impact the area under moratorium and frustrate the aim of OCSLA to 'balance the potential for environmental damage with the potential for the discovery of oil and gas' 43 U.S.C. § 1344(a)(3)." The requested alternative is functionally equivalent to and would result in the same environmental impacts as Alternative B (No Action). Therefore, the requested alternative was not analyzed as a separate and distinct alternative in this EIS.

2.2.2. Mitigating Measures

The NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences and to take actions that protect, restore, and enhance the environment. Agencies are required to identify and include in the alternative chosen relevant and reasonable mitigation measures that could improve the action. The CEQ regulations (at 40 CFR § 1508.20) define mitigation as follows:

- Avoidance—Avoiding an impact altogether by not taking a certain action or part of an action.
- Minimization—Minimizing impacts by limiting the intensity or magnitude of the action and its implementation.
- Restoration—Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Maintenance—Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensation—Compensating for the impact by replacing or providing substitute resources or environments.

2.2.2.1. Proposed Mitigating Measures Analyzed

The potential mitigating measures included for analysis in this EIS were developed as the result of numerous scoping efforts for the continuing OCS Program in the Gulf of Mexico. Four lease stipulations (described in **Chapter 2.3.1.3**) are proposed for the EPA lease sales—the Protected Species Stipulation, Military Areas Stipulation, the Evacuation Stipulation, and the Coordination Stipulation.

These measures will be considered for adoption by the ASLM, under the authority delegated by the Secretary of the Interior. The analysis of any stipulations as part of Alternative A does not ensure that the ASLM will make a decision to apply the stipulations to leases that may result from a proposed lease sale nor does it preclude minor modifications in wording during subsequent steps in the prelease process if comments indicate changes are necessary or if conditions change.

Any stipulations or mitigation requirements to be included in a lease sale will be described in the ROD for that lease sale. Mitigating measures in the form of lease stipulations are added to the lease terms and are therefore enforceable as part of the lease. In addition, each exploration and development plan, as well as any pipeline applications that result from a lease sale, will undergo a NEPA review, and additional project-specific mitigations may be applied as conditions of plan approval. The BSEE has the authority to monitor and enforce these conditions, and under 30 CFR part 250 subpart N, may seek remedies and penalties from any operator that fails to comply with those conditions, stipulations, and other mitigating measures.

2.2.2.2. Existing Mitigating Measures

This section discusses mitigating measures that may be applied by BOEM. Mitigating measures have been proposed, identified, evaluated, or developed through previous BOEM lease sale NEPA review and analysis. Many of these mitigating measures have been adopted and incorporated into regulations and/or guidelines governing OCS exploration, development, and production activities. All plans for OCS activities (e.g., exploration and development plans, pipeline applications, and structure-removal applications) go through rigorous BOEM review and approval to ensure compliance with established laws and regulations. Existing mitigating measures must be incorporated and documented in plans submitted to BOEM. Operational compliance of these mitigating measures is enforced through BSEE's onsite inspection program.

Mitigating measures that are a standard part of BOEM's program ensure that the operations are always conducted in an environmentally sound manner (with an emphasis on minimizing any adverse impact of routine operations to the environment). For example, certain measures ensure site clearance, and survey procedures are carried out to determine potential snags to commercial fishing and avoidance of archaeological sites and biologically sensitive areas such as pinnacles, topographic features, and chemosynthetic communities.

Some BOEM-identified mitigating measures are incorporated into OCS operations through cooperative agreements or efforts with industry and State and Federal agencies. These mitigating measures include NMFS's Observer Program to protect marine mammals and sea turtles during explosive removals, labeling operational supplies to track possible sources of debris or equipment loss, development of methods of pipeline landfall to eliminate impacts to beaches or wetlands, and beach cleanup events.

Site-specific mitigating measures are also applied by BOEM during plan and permit reviews. BOEM realized that many of these site-specific mitigations were recurring and developed a list of "standard" mitigations. There are currently over 120 standard mitigations. The wording of a standard mitigation is developed by BOEM in advance and may be applied whenever conditions warrant. Standard mitigation text is revised as often as is necessary (e.g., to reflect changes in regulatory citations, agency/personnel contact numbers, and internal policy). Site-specific mitigation "categories" include the following: air quality, archaeological resources; artificial reef material; chemosynthetic communities; Flower Garden Banks; topographic features; hard bottoms/pinnacles; military warning areas and Eglin water test areas; Naval mine warfare areas; hydrogen sulfide; drilling hazards; remotely operated vehicle surveys; geophysical survey reviews; and general safety concerns. Site-specific mitigation "types" include the following: advisories; conditions of approval; hazard survey reviews; inspection requirements; notifications; post-approval submittals; and safety precautions. In addition to standard mitigations, BOEM may also apply nonrecurring mitigating measures that are developed on a case-by-case basis.

BOEM is continually revising applicable mitigations to allow the Gulf of Mexico OCS Region to more easily and routinely track mitigation compliance and effectiveness. A primary focus of this effort is requiring post-approval submittal of information within a specified timeframe or after a triggering event (e.g., end of operations reports for plans, construction reports for pipelines, and removal reports for structure removals).

2.2.3. Issues

Issues are defined by CEQ to represent those principal "effects" that an EIS should evaluate in-depth. Scoping identifies specific environmental resources and/or activities rather than "causes" as significant issues (CEQ Guidance on Scoping, April 30, 1981). The analysis in the EIS can then show the degree of expected change from present conditions for each issue due to the actions related to a proposed action.

Selection of environmental and socioeconomic issues to be analyzed was based on the following criteria:

- issue is identified in CEQ regulations as subject to evaluation;
- the relevant resource/activity was identified through agency expertise, through the scoping process, or from comments on past EIS's;
- the resource/activity may be vulnerable to one or more of the impact-producing factors associated with the OCS Program; a reasonable probability of an interaction between the resource/activity and impact-producing factor should exist; or
- information that indicates a need to evaluate the potential impacts to a resource/activity has become available.

2.2.3.1. Issues to be Analyzed

The following issues relate to potential impact-producing factors and the resources and activities that could be affected by OCS exploration, development, production, and transportation activities. These issues and potential impacts have been developed over time, through the expertise of this Agency in managing OCS oil and gas activities, and through input from industry, the public, and other Federal, State and local agencies, among others. The notable issues identified below, as well as other resource-specific issues, are described more fully in the impacts analyses in **Chapter 4.1**.

Drilling Fluids and Cuttings: Specific concerns related to drilling fluids include mercury, synthetic-based drilling fluids and large volumes of industrial chemicals necessary for deepwater drilling operations, and potential for persistence of drilling muds and cuttings. Other concerns raised over the years of scoping were the potential smothering of benthic communities by offshore disposal of drilling fluids and cuttings, the use and disposal of drilling fluids, the onshore disposal of oil-based drilling fluids, the fate and effects of synthetic-based drilling fluids, and the potential toxic effects or bioaccumulation of trace metals in drilling fluids discharged into the marine environment.

Visual and Aesthetic Interference: Lighting was raised as a specific concern. Concerns raised over the years of scoping were the potential effects of the presence of drilling rigs and platforms, service vessels, helicopters, trash and debris, and flaring on visual aesthetics.

Air Emissions: The potential effects of emissions of combustion gases from platforms, drill rigs, service vessels, and helicopters have been raised as an issue over the years of scoping. Also under consideration are the flaring of produced gases during extended well testing and the potential impacts of the transport of production with associated H_2S.

Water Quality Degradation: Issues related to water quality degradation raised over the years of scoping most often were associated with operational discharges of drilling muds and cuttings, produced waters, and domestic wastes. Water quality issues also included concerns related to impacts from sediment disturbance, petroleum spills and blowouts, and discharges from service vessels.

Other Wastes: Other concerns raised over the years of scoping include storage and disposal of trash and debris, and trash and debris on recreational beaches.

Structure and Pipeline Emplacement: Some of the issues raised over the years of scoping related to structure and pipeline emplacement are bottom area disturbances from bottom-founded structures or anchoring, sediment displacement related to pipeline burial, space-use conflicts, and the vulnerability of offshore pipelines to damage that could result in hydrocarbon spills or H_2S leaks.

Platform Removals: Concerns raised over the years of scoping about the abandonment of operations include how a platform is removed, potential impacts of explosive removals on marine organisms, remaining operational debris snagging fishing nets, and site clearance procedures.

OCS-Related Support Services, Activities, and Infrastructure: Specific issues were damage to coastal infrastructure by past hurricane activity and the vulnerability of coastal infrastructure to damage from future hurricanes. Concerns raised over the years of scoping include activities related to the shore-based support of the DPP, including vessel and helicopter traffic and emissions, construction or expansion of navigation channels or onshore infrastructure, maintenance and use of navigation channels and ports, and deepening of ports.

Sociocultural and Socioeconomic: Many concerns have focused on the potential impacts to coastal communities, including the demands on public services and tourism. Issues raised over the years of scoping include impacts on employment, population fluctuations, effects on land-use impacts to low-income or minority populations, and cultural impacts.

OCS Oil and Gas Infrastructure: Specific issues were damage to offshore infrastructure by past hurricane activity and the vulnerability of offshore infrastructure to damage from future hurricanes.

Other Issues: Many other issues have been identified. Several of these issues are subsets or variations of the issues listed above. All are taken under advisement and are considered in the analyses, if appropriate. Additional issues raised during the years of scoping are new and unusual technologies, noise from platforms, vessels, helicopters, and seismic surveys; turbidity as a result of seafloor disturbance or discharges; mechanical damage to biota and habitats; and multiple-use conflicts.

Accidental Events: Concerns were raised related to the potential impact of oil spills, including the *Deepwater Horizon* explosion, oil spill, and response, on the marine and coastal environments specifically regarding the potential effects of oil spills on tourism, emergency response capabilities, spill prevention, effect of winds and currents on the transport of oil spills, accidental discharges from both deepwater blowouts and pipeline ruptures, and oil spills resulting from past and future hurricanes. Other concerns raised over the years of scoping were the fate and behavior of oil spills, availability and adequacy of oil-spill containment and cleanup technologies, oil-spill cleanup strategies, impacts of various oil-spill cleanup methods, effects of weathering on oil spills, toxicological effects of fresh and weathered oil, air pollution associated with spilled oil, and short-term and long-term impacts of oil on wetlands.

After the *Deepwater Horizon* explosion, oil spill, and response, BOEM prepared **Appendix B**, "Catastrophic Spill Event Analysis." The purpose of this technical analysis is to assist BOEM in the preparation of robust environmental analyses of the proposed actions. The CEQ guidance addresses impacts with catastrophic consequences in the context of evaluating reasonably foreseeable significant adverse effects in an EIS when they address the issue of incomplete or unavailable information (40 CFR § 1502.22). "'Reasonably foreseeable' impacts include impacts which have catastrophic consequences even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason" (40 CFR § 1502.22(b)(4)). Therefore, this analysis, which is based on credible scientific evidence, identifies the most likely and most significant impacts from a high-volume blowout and oil spill that continues for an extended period of time. The scenario and impacts discussed in this analysis should not be confused with the scenario and impacts anticipated to result from routine activities or more reasonably foreseeable accidental events of an EPA proposed action.

Resource Topics Analyzed in this EIS: The analyses in **Chapter 4.1** address the issues and concerns identified above under the following resource topics:

- Air Quality
- Archaeological Resources (Historic and Prehistoric)
- Beach Mice
- Coastal and Marine Birds
- Coastal Barrier Beaches and Associated Dunes
- Commercial Fisheries
- Deepwater Benthic Communities (Chemosynthetic and Nonchemosynthetic)
- Diamondback Terrapins
- Fish Resources and Essential Fish Habitat
- Human Resources and Land Use (Land Use and Infrastructure, Demographics, Economic Factors, and Environmental Justice)
- Live Bottoms (Pinnacle Trend and Low Relief)
- Marine Mammals
- Recreational Fishing
- Recreational Resources
- *Sargassum* Communities
- Sea Turtles
- Seagrass Communities
- Soft Bottom Benthic Communities
- Topographic Features
- Species Considered due to U.S. Fish and Wildlife Service Concerns
- Water Quality (Coastal Waters and Offshore Waters)
- Wetlands

2.2.3.2. Issues Considered but Not Analyzed

As previously noted, CEQ regulations for implementing NEPA instruct agencies to adopt an early process (termed "scoping") for determining the scope of issues to be addressed and for identifying significant issues related to a proposed action. As part of this scoping process, agencies shall identify and eliminate from detailed study the issues that are not significant to a proposed action or have been covered by prior environmental review. No additional issues were identified during scoping that are not addressed in this EIS. Comments received during scoping are summarized in **Chapter 5.3.1**.

Program and Policy Issues

Comments and concerns that relate to program and policy are issues under the direction of the Department of the Interior and/or BOEM's guiding regulations, statutes, and laws. The comments and concerns related to program and policy issues are not considered to be specifically related to a proposed action. Programmatic issues, including expansion of the lease sale area, administrative boundaries, and royalty relief, have been considered in the preparation of the Five-Year Program EIS (USDOI, BOEM, 2012b).

BOEM has established an alternative and mitigation tracking table to provide increased visibility into the consideration of recommendations for deferrals, mitigations, and alternatives at different stages of the leasing process. Beginning with the Five-Year Program EIS, the table tracks the lineage and treatment of suggestions for spatial exclusions, temporal deferrals, and/or mitigation from the Five-Year Program, to the lease sale phase, and on to the plan phase. This table allows commenters to see how and at what stage of the process their concerns are being considered. BOEM will maintain a table that will be updated as deferral requests are considered at the lease sale and plan stages and as new requests are made. The alternative and mitigation tracking table has been placed on BOEM's website at http://www.boem.gov/5-year/2012-2017/Tracking-Table/.

Revenue Sharing

A number of comments were received on previous EIS's from State and local governments, interest groups, and the general public stating that locally affected communities should receive an increased share of revenues generated by the OCS oil and gas leasing program. This increased revenue would act as mitigation of OCS-related impacts to coastal communities, including impacts to Louisiana Highway 1 (LA Hwy 1) and Lafourche Parish, Louisiana, from OCS-related activity at Port Fourchon. Comments and concerns that relate to the use and distribution of revenues are issues under the direction of the U.S. Congress or the Department of the Interior and their guiding regulations, statutes, and laws.

On October 1, 2010, the revenue collection function of BOEMRE became the independent Office of Natural Resource Revenue. The Office of Natural Resource Revenue distributes revenues collected from Federal mineral leases to special-purpose funds administered by Federal agencies, to States, and to the General Fund of the U.S. Department of the Treasury. Legislation and regulations provide formulas for the disbursement of these revenues. With the enactment of the Gulf of Mexico Energy Security Act of 2006, the Gulf producing States (i.e., Texas, Louisiana, Mississippi, and Alabama) and their coastal political subdivisions were granted an increased share of offshore oil and gas revenue. Beginning in FY 2007, and thereafter, Gulf producing States and their coastal political subdivisions received 37.5 percent of the qualified OCS revenue from new leases issued in the 181 Area in the EPA and the 181 South Area. Beginning in FY 2016, and thereafter, Gulf producing States and their coastal political subdivisions will receive 37.5 percent and the Land and Water Conservation Fund will receive 12.5 percent of qualified OCS revenue from new leases in the existing areas available for leasing, subject to a $500 million cap. The remaining 50 percent of qualified OCS revenues and revenues exceeding the $500 million cap will be distributed to the U.S. Treasury.

The socioeconomic benefits and impacts to local communities are analyzed in **Chapter 4.1.1.22**.

2.3. PROPOSED EASTERN PLANNING AREA LEASE SALES 225 AND 226

2.3.1. Alternative A—The Proposed Actions (Preferred Alternative)

2.3.1.1. Description

Alternative A would offer for lease all unleased blocks within the proposed EPA lease sale area for oil and gas operations.

The proposed EPA lease sale area covers approximately 657,905 ac and includes those blocks previously included in the EPA Lease Sale 224 Area and a triangular-shaped area south of this area bordered by the CPA boundary on the west and the Military Mission Line (86º41′ W. longitude) on the east. The area is south of eastern Alabama and western Florida; the nearest point of land is 125 mi (201 km) northwest in Louisiana. As of August 2013, approximately 465,200 ac of the proposed EPA lease sale area are currently unleased. The estimated amount of natural resources projected to be developed as a result of proposed a proposed EPA lease sale is 0-0.071 BBO and 0-0.162 Tcf of gas.

The analyses of impacts summarized below and described in detail in **Chapter 4.1** are based on the development scenario, which is a set of assumptions and estimates on the amounts, locations, and timing for OCS exploration, development, and production operations and facilities, both offshore and onshore. A detailed discussion of the development scenario and major related impact-producing factors is included in **Chapter 3**.

Alternative A has been identified as BOEM's preferred alternative; however, this does not mean that another alternative may not be selected in the Record of Decision.

2.3.1.2. Summary of Impacts

Air Quality (Chapter 4.1.1.1)

Emissions of pollutants into the atmosphere from the routine activities associated with an EPA proposed action are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, emission heights, emission rates, and the distance of these emissions from the coastline. BOEM compared the modeled impacts of the EPA proposed action with USEPA's Significant Impact Levels since USEPA's Significant Impact Levels appear to be more appropriate target values for significant impact assessment. The ambient concentrations of pollutants due to emissions from proposed action activities in the EPA are below USEPA's Significant Impact Levels, BOEM's Significance Levels, and are well below the NAAQS. As indicated in **Appendix G**, an EPA proposed action would have only a small effect on ozone levels in ozone nonattainment areas and would not interfere with the States' schedule for compliance with the NAAQS. The OCD modeling results show that increases in onshore annual average concentrations of NO_x, SO_x, and PM_{10} are estimated to be less than the maximum increases allowed in the PSD Class II areas. The 1-hour NO_2 modeling performed by operators as part of the postlease approval process indicates concentrations less than the maximum increase allowed.

Accidental events associated with an EPA proposed action that could impact air quality include spills of oil, natural gas, condensate, and refined hydrocarbons; H_2S release; fire; and releases of NAAQS air pollutants (i.e., SO_x, NO_x, VOC's, CO, PM_{10}, and $PM_{2.5}$). Response activities that could impact air quality include in-situ burning, the use of flares to burn gas and oil, and the use of dispersants applied from aircraft. Accidents involving high concentrations of H_2S could result in deaths as well as environmental damage. Other emissions of pollutants into the atmosphere from accidental events as a result of an EPA proposed action are not projected to have significant impacts on onshore air quality because of the prevailing atmospheric conditions, emissions height, emission rates, and the distance of these emissions from the coastline. These emissions are not expected to have concentrations that would change onshore air quality classifications. The impacts of accidental events are not expected to have significant impacts on onshore air quality. The impacts of accidents from catastrophic events are still uncertain.

Overall, since loss of well-control events and blowouts are rare events and are of short duration, the potential impacts to air quality are not expected to be significant, except in the rare case of a catastrophic event. The summary of vast amounts of data collected and additional studies will provide more information in the future.

Emissions of pollutants into the atmosphere from activities associated with the OCS Program are not projected to have significant effects on onshore air quality because of the prevailing atmospheric conditions, emission rates and heights, and the resulting pollutant concentrations. Ozone precursors, NO_x and VOC's, are shown to have more ozone emitting sources present onshore. Onshore impacts on air quality from emissions from OCS activities are estimated to be within PSD Class II allowable increments. The modeling results indicate that the cumulative impacts to a PSD Class I Area are well within the PSD Class I allowable increment.

Ozone levels are on a declining trend because of air-pollution control measures that have been implemented by the States. This downward trend is expected to continue as a result of local as well as nationwide air-pollution control efforts.

The Gulf Coast has significant visibility impairment from anthropogenic emission sources. Area visibility is expected to improve somewhat as a result of regional and national programs to reduce emissions.

Based on the discussion above and modeled impacts in **Appendix G**, the incremental contribution of an EPA proposed action to the cumulative impacts is not significant. The incremental contribution of an EPA proposed action to the cumulative impacts would likewise not significantly affect coastal nonattainment areas. The cumulative contribution to visibility impairment from an EPA proposed action would also not be significant.

Water Quality (Chapter 4.1.1.2)

Coastal Waters (Chapter 4.1.1.2.1)

The primary impacting sources to water quality in coastal waters are point-source and storm-water discharges from support facilities, vessel discharges, and nonpoint-source runoff. These activities are not only highly regulated but also localized and temporary in nature. The impacts to coastal water quality from routine activities associated with an EPA proposed action should be minimal because of the distance to shore of most routine activities, USEPA regulations that restrict discharges, and few, if any, new pipeline landfalls or onshore facilities to be constructed.

Accidental events associated with an EPA proposed action that could impact coastal water quality include spills of oil and refined hydrocarbons, releases of natural gas and condensate, usage of chemical dispersants in oil-spill response, and spills of chemicals or drilling fluids. The loss of well control, pipeline failures, collisions, or other malfunctions could also result in such spills. Although response efforts may decrease the amount of oil in the environment, the response efforts may also impact the environment through, for example, increased vessel traffic, hydromodification, and application of dispersants. Natural degradation processes would also decrease the amount of spilled oil over time. For coastal spills, two additional factors that must be considered are the shallowness of the area and the proximity of the spill to shore. Over time, natural processes can physically, chemically, and biologically degrade oil. Chemicals used in the oil and gas industry are not a significant risk in the event of a spill because they are either nontoxic, used in minor quantities, or are only used on a noncontinuous basis. Spills from collisions are not expected to be significant because collisions occur infrequently.

Water quality in coastal waters would be impacted by sediment disturbance and suspension (i.e., turbidity), vessel discharges, erosion, runoff from nonpoint-source pollutants (including river inflows), seasonal influences, and accidental events. These impacts may be a result of an EPA proposed action and the OCS Program, State oil and gas activity, the activities of other Federal agencies (including the military), natural events or processes, or activities related to the direct or indirect use of land and waterways by the human population (e.g., urbanization, agricultural practices, coastal industry, and municipal wastes). The impacts resulting from an EPA proposed action are a small addition to the cumulative impacts on the coastal waters of the Gulf of Mexico because non-OCS activities, including vessel traffic, erosion, and nonpoint source runoff, are cumulatively responsible for a majority of coastal water impacts. Increased turbidity and discharge from an EPA proposed action would be temporary in nature and minimized by regulations and mitigation. Since a catastrophic OCS Program-related accident would be rare and not expected to occur in coastal waters, the impact of accidental spills is expected to be small. The incremental contribution of the routine activities and accidental events associated with an EPA proposed action to the cumulative impacts on coastal water quality is not expected to be significant.

Offshore Waters (Chapter 4.1.1.2.2)

During exploratory activities, the primary impacting sources to offshore water quality are discharges of drilling fluids and cuttings. During platform installation and removal activities, the primary impacting sources to water quality are sediment disturbance and temporarily increased turbidity. Impacting discharges during production activities are produced water and supply-vessel discharges. Regulations are in place to limit the toxicity of the discharge components, the levels of incidental contaminants in these discharges, and in some cases, the discharge rates and discharge locations. Pipeline installation can also affect water quality by sediment disturbance and increased turbidity. Service-vessel discharges might include water with oil concentration of approximately 15 ppm as established by regulatory standards. Any disturbance of the seafloor would increase turbidity in the surrounding water, but the increased turbidity should be temporary and restricted to the area near the disturbance. There are multiple Federal regulations and permit requirements that would decrease the magnitude of these activities. Impacts to offshore waters from routine activities associated with an EPA proposed action should be minimal as long as regulatory requirements are followed.

Accidental events associated with an EPA proposed action that could impact offshore water quality include spills of oil and refined hydrocarbons, releases of natural gas and condensate, usage of chemical dispersants in oil-spill response, spills of chemicals or drilling fluids, loss of well control, pipeline failures, collisions, or other malfunctions that would result in such spills. Spills from collisions are not expected to be significant because collisions occur infrequently. Overall, loss of well control events and blowouts are rare events and of short duration, so potential impacts to offshore water quality are not expected to be significant except in the rare case of a catastrophic event. Although response efforts may decrease the amount of oil in the environment, the response efforts may also impact the environment through, for example, increased vessel traffic and the application of dispersants. Natural physical, chemical, and biological processes would decrease the amount of spilled oil over time through dilution, weathering, and degradation of the oil. Chemicals used in the oil and gas industry are not a significant risk for a spill because they are either nontoxic, are used in minor quantities, or are only used on a noncontinuous basis. Although there is the potential for accidental events, an EPA proposed action would not significantly change the water quality of the Gulf of Mexico over a large spatial or temporal scale.

Water quality in offshore waters may be impacted by sediment disturbance and suspension (i.e., turbidity), vessel discharges, erosion and runoff of nonpoint-source pollutants (including river inflows), natural seeps, discharges from exploration and production activities, and accidental events. These impacts may be a result of an EPA proposed action and the OCS Program, the activities of other Federal agencies (including the military), private vessels, and natural events or processes. To a lesser degree, these impacts may also be a result of State oil and gas activity or activities or related to the direct or indirect use of land and waterways by the human population (e.g., urbanization, agricultural practices, coastal industry, and municipal wastes). Routine activities that increase turbidity and discharges are temporary in nature and are regulated; therefore, these activities would not have a lasting adverse impact on water quality. In the case of a large-scale spill event, degradation processes in both surface and subsurface waters would decrease the amount of spilled oil over time through natural processes that can physically, chemically, and biologically degrade oil. The impacts resulting from an EPA proposed action are a small addition to the cumulative impacts on the offshore waters of the Gulf when compared with inputs from natural hydrocarbon inputs (seeps), coastal factors (such as erosion and runoff), and other non-OCS industrial discharges. The incremental contribution of the routine activities and accidental discharges associated with an EPA proposed action to the cumulative impacts on offshore water quality is not expected to be significant.

Coastal Barrier Beaches and Associated Dunes (Chapter 4.1.1.3)

Routine activities associated with an EPA proposed action are not expected to adversely alter barrier beach configurations much beyond existing, ongoing impacts in localized areas. This is because of the small amount of dredging, small probability of pipeline landfall, and no expected new facilities. If any such activities should occur, multiple Federal and State regulations would ensure decreased impacts to coastal habitats.

Due to the proximity of inshore spills to barrier islands and beaches, inshore spills pose the greatest threat. The effects could be changes in species diversity that could result in changes in forage areas for species using microfauna as a food base. The probability of an offshore spill contacting recreational beaches is <0.5 percent. Equipment and personnel used in cleanup efforts can generate the greatest direct impacts to the area. No significant long-term impacts to the physical shape and structure of barrier beaches and associated dunes are expected to occur as a result of an EPA proposed action.

An EPA proposed action is not expected to adversely alter barrier beach configurations significantly beyond existing, ongoing impacts in localized areas downdrift of artificially jettied and maintained channels. Strategic placement of dredged material from channel maintenance, channel deepening, and related actions could mitigate localized adverse impacts. Also, an EPA proposed action is not expected to increase the probabilities of oil spills beyond the current estimates. Thus, the incremental contribution of an EPA proposed action to the cumulative impacts on coastal barrier beaches and associated dunes is expected to be small.

Wetlands (Chapter 4.1.1.4)

The impacts to wetlands from routine activities associated with an EPA proposed action are expected to be low because only 0-1 new pipeline landfalls is projected, only 0-1 new gas processing facilities is expected, and the contribution from an EPA proposed action to the need for maintenance dredging would be minimal. Also, the mitigation measures required in most permits would further reduce all of these impacts.

Due to the proximity of inshore spills to wetlands and coastal habitats, inshore spills pose the greatest threat. Louisiana is the only state with a probability of an offshore spill contacting State waters. Fringe wetlands in the northern Gulf of Mexico are in moderate- to high-energy environments; therefore, sediment transport and tidal stirring should reduce the chances for oil persisting in the event that these areas are oiled. While a resulting slick may cause minor impacts to wetland habitat and surrounding seagrass communities, the equipment, chemical treatments, and personnel used to clean up can generate the greatest impacts to the area. Close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. Overall, impacts to wetland habitats from an oil spill associated with activities related to an EPA proposed action would be expected to be low and temporary because of the nature of the system, regulations, and specific cleanup techniques.

The wetlands within the area of potential effects associated with an EPA proposed action have a minimal probability for oil-spill contact. The cumulative effects of human and natural activities in the coastal area have severely degraded the deltaic processes and have shifted the coastal area from a condition of net land building to one of net landloss. The incremental contribution of an EPA proposed action to the cumulative impacts on coastal wetlands is expected to be small.

Seagrass Communities (Chapter 4.1.1.5)

Routine OCS activities in the EPA that may impact seagrasses include maintenance dredging, vessel traffic, and pipeline landfalls. These activities are not expected to significantly increase in occurrence and range in the near future. If they do occur, these activities should have minor effects on submerged vegetation. This is because of Federal and State requirements and implemented programs, along with the beneficial effects of natural flushing (e.g., from winds and currents). Any potential effects on submerged vegetation from routine activities in the EPA are expected to be localized and not significantly adverse.

The greatest threat to inland, submerged vegetation communities would be from an inland spill resulting from a vessel accident or pipeline rupture, but the size of these types of spills is small and the duration short. The resulting slick may cause short-term and localized impacts to a submerged vegetation bed. Because prevention and cleanup measures can have negative effects on submerged vegetation, close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. Safety and spill-prevention technologies are expected to continue to improve and would decrease the detrimental effects to submerged vegetation from an EPA proposed action.

The current Federal and State mitigation policies, the small probability of an oil spill, and the natural flow regimes reduce the incremental contribution of stress from an EPA proposed action on submerged vegetation. The impact of an EPA proposed action remains minor compared with the cumulative effects of other factors, including dredging, hurricanes, and vessel traffic. This is a summary of the seagrass communities.

Live Bottoms (Chapter 4.1.1.6)

Live Bottoms (Pinnacle Trend) (Chapter 4.1.1.6.1)

Based on the localized impacts of routine oil and gas activities, the distance of the Pinnacle Trend from the proposed lease sale area, and the depth of the proposed lease sale area in relation to the depth where Pinnacle features are found, no impacts from routine events are anticipated to occur to Pinnacle features in the CPA as a result of an EPA proposed action. The Pinnacle Trend is approximately 64 nautical miles (nmi) (120 km; 75 mi) from the proposed lease sale area, which eliminates the potential effects of routine impacts that could affect these features, including anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal. Because the greatest impacts of routine oil and gas activity are reported close to the well and because the discharge of drilling muds, cuttings, and produced waters is strictly regulated by NPDES permits, routine discharges will not reach the Pinnacle Trend. In addition, BSEE's regulations protect Pinnacle features from structure removal by reducing shock impact.

As described above, the proposed lease sale area is approximately 130 km (80 mi) from the Pinnacle Trend, and because of the distance of an EPA proposed action from the features, only large spills have the potential to reach the Pinnacle Trend. Most of the oil released from a spill at depth would rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on Pinnacle features. The depth of the Pinnacle Trend would protect it from the physical mixing of oil into the water column. Small droplets of oil in the water column may attach to suspended particles in the water column, sink to the seafloor, and could possibly contact Pinnacle features. The Pinnacle Trend features and their benthic communities that are exposed to subsea plumes, dispersed oil, or oil adsorbed to sediment particles may demonstrate reduced recruitment success, reduced growth, and reduced coral cover as a result of impaired recruitment.

Overall, the incremental contribution of an EPA proposed action to the cumulative impact is negligible when compared with non-oil and gas impacts. Activities causing mechanical disturbance represent the greatest threat to the Pinnacle Trend features. With respect to OCS oil and gas leasing related activities, this would, however, be prevented by the distance of the proposed lease sale area from the Pinnacle Trend. Routine impacts of oil and gas activity include anchoring of vessels, structure emplacement, and operational discharges (drilling muds and cuttings, and produced waters), none of which will impact the Pinnacle features because of their distance from the proposed lease sale area and because of USEPA's discharge regulations. It is highly unlikely that blowouts and oil spills would impact Pinnacle features due to the distance of the proposed lease sale area from Pinnacle features, which would allow for the dispersion of oil. In addition, the depth of an EPA proposed action is much deeper than the depth of the Pinnacle features, which would prevent deep oil plumes from rising to the crests of the pinnacles.

Non-oil and gas activities that may occur in the vicinity of the pinnacle communities include recreational boating and fishing, import tankering, fishing and trawling, and natural events such as extreme weather conditions and extreme fluctuations of environmental conditions. These activities could cause damage to the pinnacle communities. Ships using fairways in the vicinity of pinnacles anchor in the general area of pinnacles on occasion, and numerous fishermen take advantage of the resources of regional bottoms. These activities could lead to instances of severe and permanent physical damage to individual formations. During severe storms, such as hurricanes, large waves may reach deep enough to stir bottom sediments. Because of the depth of the Pinnacle Trend area, these forces are not expected to be strong enough to cause direct physical damage to organisms living on the reefs.

Live Bottoms (Low Relief) (Chapter 4.1.1.6.2)

Based on the localized impacts of routine oil and gas activities, the distance of the live bottom, low-relief features from the proposed EPA lease sale area, and the depth of the proposed lease sale area in relation to the depth where live bottom features are found, no impacts from routine events are anticipated to occur to live bottom, low-relief features in the EPA or CPA as a result of an EPA proposed action. The closest Live Bottom Stipulation block is approximately 70 nmi (130 km; 80 mi) from the proposed lease sale area, which eliminates the potential effects of routine impacts that could affect live bottom, low-relief features, including anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal. Because the greatest impacts of routine oil and gas activity are reported close to the well and because discharge of drilling muds, cuttings, and produced waters is strictly regulated by NPDES permits, routine discharges will not reach the live bottom features. In addition, BSEE's regulations protect live bottoms from structure removal by reducing shock impact.

The proposed EPA lease sale area is >250 km (155 mi) from the closest live bottom feature, and because of the distance of an EPA proposed action from the features, only large spills have the potential to reach the live bottom features. Most of the oil released from a spill at depth would rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on live bottom features. Deeper live bottoms may be protected from the mixing depth of oil into the water column, but shallower features may be oiled if oil mixes into the water column. Small droplets of oil in the water column may attach to suspended particles in the water column, sink to the seafloor, and could possibly contact live bottom (low-relief) features. The live bottom features and their benthic communities that are exposed to subsea plumes, dispersed oil, or oil adsorbed to sediment particles may demonstrate reduced recruitment success, reduced growth, and reduced coral cover as a result of impaired recruitment.

Overall, the incremental contribution of an EPA proposed action to the cumulative impact is negligible when compared with non-oil and gas impacts. Activities causing mechanical disturbance represent the greatest threat to the live bottom, low-relief features. With respect to OCS oil and gas leasing-related activities, this would, however, be prevented by the distance of the proposed lease sale area from the features. Possible impacts from routine activities of OCS oil and gas operations include anchoring, structure emplacement and removal, pipeline emplacement, drilling discharges, and discharges of produced waters. In addition, accidental subsea oil spills or blowouts associated with OCS oil and gas activities can cause damage to low-relief, hard-bottom communities. Impacts from these factors should be minimized based on BOEM's policy and a case-by-case review of proposed OCS oil and gas activity and the fact that live bottom (low-relief) blocks are not currently offered for lease. The physical distance between any routine OCS oil and gas activity and accidental spill from the live bottom areas would minimize any possible impacts from the activity. The impact to the live bottom resource as a whole is expected to be minimal because of the distance of any OCS oil-and gas-related activity from these habitats.

Non-oil and gas activities that may occur in the vicinity of the low-relief, hard bottom communities include boating and fishing, import tankering, fishing and trawling, and natural events such as extreme weather conditions and extreme fluctuations of environmental conditions. These activities could cause damage to the low-relief, hard bottom communities. Occasionally, ships using fairways in the vicinity of communities anchor in the general area of live bottoms, and commercial and recreational fishermen take advantage of the relatively shallow and easily accessible resources of regional hard bottoms. These activities could lead to instances of severe and permanent physical damage. During severe storms, such as hurricanes, large waves may reach deep enough to stir bottom sediments, which could cause severe mechanical damage to organisms, including abrasion from suspended sand, bruising and crushing from tumbling rocks, and complete removal of organisms. Yearly hypoxic events may affect portions of live bottom benthic populations in the northeastern part of the Gulf of Mexico.

Topographic Features (Chapter 4.1.1.7)

Based on the localized impacts of routine oil and gas activities, the distance of the topographic features from the proposed lease sale area, and the depth of the proposed lease sale area in relation to the depth where topographic features are found, no impacts from routine events are anticipated to occur to topographic features in the Gulf of Mexico as a result of an EPA proposed action. The closest topographic feature is approximately 250 km (150 mi) from the proposed lease sale area, which eliminates the potential effects of routine impacts that could affect topographic features, including: anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal. Because the greatest impacts of routine oil and gas activity are reported close to the well and because discharge of drilling muds, cuttings, and produced waters is strictly regulated by NPDES permits, routine discharges will not reach the topographic features. In addition, BSEE's regulations protect topographic features from structure removal by reducing shock impact.

As described above, the proposed lease sale area is approximately 250 km (155 mi) from the closest topographic feature, and because of the distance of an EPA proposed action from the features, only large spills have the potential to reach the topographic features. Most of the oil released from a spill at depth would rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on topographic features. The depth of active coral growth would protect them from the physical mixing of oil into the water column. Small droplets of oil in the water column could possibly attach to suspended particles in the water column, sink to the seafloor, and contact topographic features. Topographic features and their benthic communities that are exposed to subsea plumes, dispersed oil, or oil adsorbed to sediment particles may demonstrate reduced recruitment success, reduced growth, and reduced coral cover as a result of impaired recruitment.

Overall, the incremental contribution of an EPA proposed action to the cumulative impact is negligible when compared with non-OCS oil and gas impacts. Activities causing mechanical disturbance represent the greatest threat to the topographic features. With respect to OCS oil and gas leasing-related activities for an EPA proposed action, this would, however, be prevented by the distance of the proposed lease sale area from the topographic features. Routine impacts of oil and gas activity include the anchoring of vessels, structure emplacement, and operational discharges (drilling muds and cuttings, and produced waters), none of which will impact the topographic features because of their distance from the proposed lease sale area and because of USEPA's discharge regulations. It is highly unlikely that blowouts and oil spills would impact topographic features due to the distance of the proposed lease sale area from topographic features, which would allow for the dispersion of oil. In addition, the depth of an EPA proposed action is much deeper than the depth of the zone of active coral growth on topographic features, which would prevent deep oil plumes from rising to the crests of topographic features.

Non-OCS oil and gas activities could mechanically disrupt the bottom (such as anchoring and treasure-hunting activities). Natural events such as hurricanes or the collapse of the tops of the topographic features (through dissolution of the underlying salt structure) could cause severe impacts. The collapsing of topographic features from geologic events is unlikely and would impact a single feature. Impacts from scuba diving, fishing, and private boat anchoring could have detrimental effects on topographic features and could have long recovery periods.

Sargassum Communities (Chapter 4.1.1.8)

Sargassum, as pelagic algae, is a widely distributed resource that is found throughout the Gulf of Mexico and northwest Atlantic. Considering its ubiquitous distribution and occurrence in the upper water column near the sea surface, at least some small portions of it will contact routine discharges from oil and gas operations. All types of discharges, including drill muds and cuttings, produced water, and operational discharges (e.g., deck runoff, bilge water, sanitary effluent, etc.), would contact small portions of *Sargassum* algae. However, the quantity and volume of these discharges within the proposed lease sale area is relatively small compared with the pelagic waters of the EPA. Therefore, although discharges would contact *Sargassum*, they would only contact a very small portion of the *Sargassum* population. Likewise, impingement effects by service vessels and working platforms and drillships would contact only a very small portion of the *Sargassum* population. The potential routine impacts to *Sargassum* that are associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community as a whole. The *Sargassum* community lives in pelagic waters with generally high water quality and would be resilient to the minor effects predicted. It has a yearly cycle that promotes quick recovery from impacts. No measurable impacts are expected to the overall population of the *Sargassum* community.

Considering its ubiquitous distribution and occurrence in the upper water column near the sea surface, potential accidental spills from oil and gas operations would be expected to contact localized portions of the *Sargassum* community. All types of spills (including surface oil and fuel spills), underwater well blowouts, and chemical spills would contact *Sargassum* algae. The quantity and volume of most of these spills would be relatively small compared with the pelagic waters of the Gulf of Mexico. Therefore, most spills would only contact a very small portion of the *Sargassum* population. The potential accidental impacts to *Sargassum* that are associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community unless a catastrophic spill occurs. In the case of a very large spill, the *Sargassum* algae community could suffer severe impacts to a sizable portion of the population in the northern Gulf of Mexico. The *Sargassum* community lives in pelagic waters with generally high water quality and is expected to show good resilience to the predicted effects of spills. It has a yearly growth cycle that promotes quick recovery from impacts and that would be expected restore typical population levels in 1-2 growing seasons. Because of the patchy and ephemeral nature of

Sargassum, accidental impacts associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community as a whole.

Because of the ephemeral nature of *Sargassum* communities, many activities associated with an EPA proposed action would have a localized and short-term effect. *Sargassum* occurs seasonally in almost every part of the northern GOM, resulting in a wide distribution over a very large area. However, its occurrence is patchy, drifting in floating mats that are occasionally impinged on ships and on oil and gas structures. This large, scattered, patchy distribution results in only a small portion of the total population contacting ships, structures, or drilling discharges. Contact with drilling discharges and discharges of effluent from ships' operations also results in only short-term, localized effects. Because discharges are highly regulated to limit toxicity and because they would continue to be diluted in the GOM waters, concentrations of any toxic components related to an EPA proposed action would be limited. There is also a low probability of a catastrophic spill to occur with an EPA proposed action. If such a spill did occur, *Sargassum* and its associated inhabitants in that area are expected to suffer mortality. However, *Sargassum* resilience is good and recovery is expected within 1-2 growing seasons. The incremental contribution of an EPA proposed action to the overall cumulative impacts on *Sargassum* communities that would result from the OCS Program, when compared with environmental factors (such as hurricanes and coastal water quality), and non-OCS-related activities (such as non-OCS vessel traffic and commercial shipping) are expected to be minimal.

Chemosynthetic Deepwater Benthic Communities (Chapter 4.1.1.9)

Chemosynthetic communities are susceptible to physical impacts from anchoring, structure emplacement, pipeline installation, structure removal, and drilling discharges. Without mitigation measures, these activities could result in smothering by the suspension of sediments or the crushing of organisms residing in these communities. Information included in required hazards survey for oil and gas activities depicts areas that could potentially harbor chemosynthetic communities. This allows BOEM to require avoidance of any areas that are conducive to chemosynthetic growth. The policies described in NTL 2009-G40 greatly reduce the risk of these physical impacts by requiring the avoidance of potential chemosynthetic communities. With the implementation of BOEM's avoidance measures, impacts on chemosynthetic communities caused by routine activities associated with an EPA proposed action would be minimal to none.

The most likely threat to chemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. The possibility of oil from a surface spill reaching a depth of 300 m (984 ft) or greater in any measurable concentration is very small. Subsea oil plumes resulting from high-pressure subsea oil releases and/or the application of chemical dispersants have the potential to negatively affect chemosynthetic communities. If oil is ejected under high pressure or dispersants are applied to an oil spill, oil would mix into the water column, be carried by underwater currents, and could eventually contact the seafloor where it may impact patches of chemosynthetic community habitat in its path.

The guidance provided in NTL 2009-G40 greatly reduces the risk of impacts. It describes the requirement to avoid potential chemosynthetic communities that are identified on the required geophysical survey records prior to approval of any structure or pipeline emplacement. The 2,000-ft (610-m) required drilling avoidance would protect sensitive communities from heavy sedimentation in the event of a blowout, with only light sediment components able to reach the communities in small quantities. BOEM's protective measures would minimize the possible impacts caused by physical disturbance of the seafloor and minor impacts from sediment resuspension or drill cutting discharges through avoidance. Potential accidental impacts from an EPA proposed action are expected to cause little damage to the ecological function or biological productivity of chemosynthetic communities. Adverse impacts would be limited by adherence to guidelines in NTL 2009-G40. Accidental impacts to deepwater chemosynthetic communities in the Gulf of Mexico are considered negligible because of the application of BOEM's avoidance criteria as described in NTL 2009-G40, because of their patchy distribution, and because physical interactions between oil and water are not likely to carry oil to the habitats.

The most serious, impact-producing factor threatening chemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. Such disturbance would most likely come from those OCS-related activities associated with pipelaying, anchoring, structure emplacement, and seafloor blowouts. Drilling discharges and resuspended sediments have a potential to cause minor, mostly sublethal impacts to patchy, high-density chemosynthetic communities, but substantial accumulations could result in more serious impacts. Sublethal impacts may include possible incremental losses of productivity, reproduction, community relationships, overall ecological functions of the community, and incremental damage to ecological relationships with the surrounding benthos. Recovery from minor impacts is expected within several years, but even minor impacts are not expected based on avoidance measures described in NTL 2009-G40. If physical disturbance (such as anchor damage) or extensive burial by muds and cuttings were to occur to high-density communities, impacts could be severe, with recovery time as long as 200 years for mature tube-worm communities. There is evidence that substantial impacts on these communities could permanently prevent reestablishment.

Recent analyses reveal over 16,000 possible hard-bottom locations across the deepwater Gulf of Mexico. Guidance provided in NTL 2009-G40 describes surveys and avoidance measures required prior to drilling or pipeline installation and greatly reduces risks. Studies have refined predictive information and have confirmed the effectiveness of these provisions throughout all depth ranges of the Gulf of Mexico. With the dramatic success of this work, confidence is increasing regarding the use of geophysical signatures for the prediction of chemosynthetic communities. These geophysical signatures enable BOEM to locate possible chemosynthetic communities and to implement avoidance measures in plan and pipeline reviews, which substantially reduces the possibility of impacting a chemosynthetic community.

Possible catastrophic oil spills due to seafloor blowouts have the potential to devastate localized deepwater benthic habitats. Major impacts to localized benthic habitat are possible in such an event, particularly when chemical dispersants are applied to oil releases at depth. However, these events are rare and would only affect a small portion of the sensitive benthic habitat in the Gulf of Mexico. The recovery time from an oiling event, if reestablishment is not permanently prevented, would be similar to that occurring from physical disturbance.

Activities unrelated to the OCS Program include fishing and trawling. Because of the water depths in these areas (>300 m; 984 ft) and the low density of commercially valuable fishery species, these activities are not expected to impact deepwater benthic communities.

The overall and incremental contribution of an EPA proposed action to cumulative impacts is expected to be slight and to result from the effects of the possible impacts caused by physical disturbance of the seafloor and by minor impacts from sediment resuspension or drill cutting discharges. Cumulative impacts to deepwater communities in the GOM are considered negligible because of the remoteness of communities from most impacts, the scattered and patchy nature of chemosynthetic communities, and the application of BOEM's avoidance criteria as described in NTL 2009-G40. The proposed activities in the EPA considered under the cumulative scenario are expected to cause no damage to the ecological function or biological productivity of chemosynthetic communities as a whole.

Nonchemosynthetic Deepwater Benthic Communities (Chapter 4.1.1.10)

Some impact to soft bottom benthic communities from drilling and production activities would occur as a result of physical impact from drilling discharges, structure placement (including templates or subsea completions), anchoring, and the installation of pipelines regardless of their locations. Even in situations where the substantial burial of typical soft bottom infaunal communities occurred, recolonization from populations from widespread neighboring soft bottom substrate would be expected over a relatively short period of time for all size ranges of organisms.

Impacts to hard-bottom communities are expected to be avoided as a consequence of the application of the existing NTL 2009-G40. Geophysical conditions associated with hard-bottom habitats are generally avoided in exploration and development planning. With the implementation of BOEM's avoidance measures, impacts on deepwater benthic communities caused by routine activities associated with an EPA proposed action would be minimal to none.

The most likely threat to nonchemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. The possibility of oil from a surface spill reaching a depth of 300 m (984 ft) or greater in any measurable concentration is very small. Subsea oil plumes resulting from high-pressure subsea oil releases and/or the application of chemical dispersants have the potential to negatively affect nonchemosynthetic communities. If oil is ejected under high pressure or if dispersants are applied to an oil spill, oil would mix into the water column, would be carried by underwater currents, and could eventually contact the seafloor where it may impact patches of nonchemosynthetic community habitat in its path.

The guidance provided in NTL 2009-G40 greatly reduces the risk of impacts to deepwater nonchemosynthetic communities. It describes the requirement to avoid potential nonchemosynthetic communities that are identified on the required geophysical survey records prior to approval of any structure or pipeline emplacement. The 2,000-ft (610-m) required drilling avoidance would protect sensitive communities from heavy sedimentation in the event of a blowout, with only light sediment components able to reach the communities in small quantities. BOEM's protective measures would minimize the possible impacts caused by physical disturbance of the seafloor and minor impacts from sediment resuspension or drill cutting discharges through avoidance. Potential accidental impacts from an EPA proposed action are expected to cause little damage to the ecological function or biological productivity of nonchemosynthetic communities. Accidental impacts to deepwater nonchemosynthetic communities in the Gulf of Mexico are considered negligible because of the application of BOEM's avoidance criteria as described in NTL 2009-G40, because of their patchy distribution, and because physical interactions between oil and water are not likely to carry oil to the habitats.

The most serious, impact-producing factor threatening nonchemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. Such disturbance would most likely come from those OCS-related activities associated with pipelaying, anchoring, structure emplacement, and seafloor blowouts. Drilling discharges and resuspended sediments have a potential to cause minor, mostly sublethal impacts to patchy, high-density nonchemosynthetic communities, but substantial accumulations could result in more serious impacts. Sublethal impacts may include possible incremental losses of productivity, reproduction, community relationships, overall ecological functions of the community, and incremental damage to ecological relationships with the surrounding benthos. Recovery from minor impacts is expected within several years, but even minor impacts are not expected based on avoidance measures described in NTL 2009-G40. If physical disturbance (such as anchor damage) or extensive burial by muds and cuttings were to occur to high-density communities, impacts could be severe, with recovery time as long as 200 years for mature tube-worm communities. There is evidence that substantial impacts on these communities could permanently prevent reestablishment.

Recent analyses reveal over 16,000 possible hard-bottom locations across the deepwater Gulf of Mexico. Guidance provided in NTL 2009-G40 describes surveys and avoidance measures required prior to drilling or pipeline installation and greatly reduces risks. Studies have refined predictive information and have confirmed the effectiveness of these provisions throughout all depth ranges of the Gulf of Mexico. With the dramatic success of this work, confidence is increasing regarding the use of geophysical signatures for the prediction of nonchemosynthetic communities. These geophysical signatures enable BOEM to locate possible nonchemosynthetic communities and to implement avoidance measures in plan and pipeline reviews, which substantially reduces the possibility of impacting a nonchemosynthetic community.

Possible catastrophic oil spills due to seafloor blowouts have the potential to devastate localized deepwater benthic habitats. Major impacts to localized benthic habitat are possible in such an event, particularly when chemical dispersants are applied to oil releases at depth. However, these events are rare and would only affect a small portion of the sensitive benthic habitat in the Gulf of Mexico. The recovery time from an oiling event, if reestablishment is not permanently prevented, would be similar to that occurring from physical disturbance.

Activities unrelated to the OCS Program include fishing and trawling. Because of the water depths in these areas (>300 m; 984 ft) and the low density of commercially valuable fishery species, these activities are not expected to impact deepwater benthic communities.

The incremental contribution of an EPA proposed action to cumulative impacts is expected to be slight and to result from the effects of the possible impacts caused by physical disturbance of the seafloor and minor impacts from sediment resuspension or drill cutting discharges. Cumulative impacts to deepwater communities in the GOM are considered negligible because of the remoteness of communities from most impacts, the scattered and patchy nature off nonchemosynthetic communities, and the application of BOEM's avoidance criteria as described in NTL 2009 G-40. The proposed activities in the EPA considered under the cumulative scenario are expected to cause no damage to the ecological function or biological productivity of nonchemosynthetic communities as a whole.

Soft Bottom Benthic Communities (Chapter 4.1.1.11)

A majority of the Gulf of Mexico seafloor is soft bottom sediments. Drilling activities would occur directly in these soft substrates and pipelines would be laid upon them; however, the routine activities would only affect a small portion of the substrate and benthic communities of the Gulf of Mexico. Routine operations may affect soft bottom benthic communities through infrastructure emplacement, anchoring activity, turbidity, sedimentation, drilling effluent discharges, and produced-water discharges. Of the small area affected, the resultant impacts from drilling and produced-water discharges have been measured to reach only about 100-1,000 m (328-3,281 ft) from the production well. The greatest impact is the alteration of benthic communities as a result of smothering, chemical toxicity, and substrate change. Communities that are smothered by cuttings would repopulate, and populations that are eliminated as a result of sediment toxicity or organic enrichment would be taken over by more tolerant species. The community alterations are not so much the introduction of a new benthic community as a shift in species dominance. These localized impacts generally occur within a few hundred meters of platforms, and the greatest impacts are seen close to the platform. Infauna may also be crushed by anchors or pipelines laid upon the seafloor. The footprint of disturbance will be relatively small compared with the soft bottom habitats in the GOM, and impacted areas are expected to repopulate within a year of disturbance. These repopulated habitats within the Gulf of Mexico are probably not very different from the early successional communities that predominate throughout areas of the Gulf of Mexico and that are frequently disturbed. Benthic communities farther from a well would not be impacted by routine oil and gas activities.

Most of the oil released from a spill would rise to the sea surface and therefore reduce the amount of oil that may directly contact soft bottom benthic communities. Small droplets of oil in the water column could attach to suspended particles in the water column, sink to the seafloor, and possibly contact benthic communities. Because of the small amount of proportional space that OCS activities occupy on the seafloor, only a very small portion of the Gulf of Mexico seafloor would be expected to experience lethal impacts in an accidental event as a result of blowouts, surface and subsurface oil spills, and their associated effects. The greatest impacts would be closest to the spill, and impacts would decrease with distance from the spill. Contact with spilled oil at a distance from the spill would likely cause sublethal to immeasurable effects to benthic organisms because the distance of activity would prevent contact with concentrated oil. Oil from a subsurface spill that reaches benthic communities would be primarily sublethal and impacts would be at the local community level. Any sedimentation and sedimented oil would also be at low concentrations by the time it reaches benthic communities far from the location of the spill, also resulting in sublethal impacts. Also, any local communities that are lost would be repopulated fairly rapidly. Although an oil spill may have some detrimental impacts, especially closest to the occurrence of the spill, the impacts may be no greater than natural biological fluctuations, and impacts would be to an extremely small portion of the overall Gulf of Mexico.

Impacts from routine activities of OCS oil and gas operations include anchoring, structure emplacement and removal, pipeline emplacement, drilling discharges, and discharges of produced waters. In addition, accidental subsea oil spills or blowouts associated with OCS oil and gas activities can cause damage to infaunal communities. Long-term OCS oil and gas activities are not expected to adversely impact the entire soft bottom environment because the local impacted areas are extremely small compared with the entire seafloor of the Gulf of Mexico and because impacted communities are repopulated relatively quickly. Also, USEPA's general NPDES permit restrictions on the discharge of produced water, which require the effluent concentration 100 m (328 ft) from the outfall to be less than the 7-day no observable effect concentration based on laboratory exposures, would help to limit the impacts on benthic communities.

Impacts from blowouts, pipeline emplacement, muds and cuttings discharges, other operational discharges, and structure removals may have local devastating impacts, but the cumulative effect on the overall seafloor and infaunal communities on the Gulf of Mexico would be very small. Soft bottom benthic communities are ubiquitous throughout and often remain in an early successional stage due to natural fluctuation, and therefore, the activities of OCS production of oil and gas would not cause additional severe cumulative impacts.

Non-OCS oil and gas activities that may occur on soft bottom benthic substrate of the EPA include recreational boating and fishing, import tankering, and natural events such as extreme weather conditions and extreme fluctuations of environmental conditions. These activities could cause temporary damage to soft bottom communities. Oil spills from non-OCS oil and gas import tankering or other activity may result in oiled benthic communities that would only repopulate once the concentration of oil in the sediment has decreased. Most non-OCS oil and gas activities (anchoring, fishing, and storm waves) should not occur in such deep water and, therefore, should not impact the proposed lease sale area.

The overall and incremental contribution of an EPA proposed action to the cumulative impact is expected to be slight, with possible impacts from physical disturbance of the bottom, discharges of drilling muds and cuttings, other OCS oil and gas discharges, and oil spills. Non-OCS oil and gas factors, such as storms, trawling, and non-OCS oil- and gas-related spills are not likely to impact the proposed lease sale area. Impacts from OCS oil and gas activities are also somewhat minimized by the fact that these communities are ubiquitous through the EPA and can recruit quickly from neighboring areas.

Marine Mammals (Chapter 4.1.1.12)

Some routine activities related to an EPA proposed action have the potential to have adverse, but not significant, impacts to marine mammal populations in the GOM. Impacts from vessel traffic, structure removals, and seismic activity could negatively impact marine mammals; however, when mitigated as required by BOEM and NMFS, these activities are not expected to have long-term impacts on the size and productivity of any marine mammal species or population. Most other routine activities (i.e., discharges, aircraft, and marine debris) are expected to have negligible effects.

Accidental events related to an EPA proposed action have the potential to have adverse, but not significant, impacts to marine mammal populations in the Gulf of Mexico. Accidental blowouts, oil spills, and spill-response activities may impact marine mammals in the Gulf of Mexico. Characteristics of impacts (i.e., acute vs. chronic impacts) depend on the magnitude, frequency, location, and date of accidents; characteristics of spilled oil; spill-response capabilities and timing; and various meteorological and hydrological factors.

Oil spills may cause chronic (long-term lethal or sublethal oil-related injuries) and acute (spill-related deaths occurring during a spill) effects on mammals. Long-term effects include (1) decreases in prey availability and abundance because of increased mortality rates, (2) change in age-class population structure because certain year-classes were impacted more by oil, (3) decreased reproductive rate, and (4) increased rate of disease or neurological problems from exposure to oil. The effects of cleanup activities are unknown, but increased human presence (e.g., vessels) could add to changes in marine mammal behavior and/or distribution, thereby additionally stressing animals, and perhaps making them more vulnerable to various physiologic and toxic effects.

Even after the spill is stopped, oiling or deaths of marine mammals would still occur due to oil and dispersants persisting in the water, past marine mammal/oil or dispersant interactions, and ingestion of contaminated prey. The animals' exposure to hydrocarbons persisting in the sea may result in sublethal impacts (e.g., decreased health, reproductive fitness, and longevity; and increased vulnerability to disease) and some soft tissue irritation, respiratory stress from inhalation of toxic fumes, food reduction or contamination, direct ingestion of oil and/or tar, and temporary displacement from preferred habitats. These long-term impacts could have population-level effects.

On July 30, 2010, BOEMRE reinitiated ESA Section 7 Consultation on the previous 2007-2012 WPA/CPA Multisale EIS with both FWS and NMFS. This request was made as a response to the *Deepwater Horizon* explosion, oil spill, and response and is meant to comply with 50 CFR § 402.16, "Re-initiation of formal consultation." BOEM is acting as lead agency in the reinitiated consultation, with BSEE involvement. Consultation is ongoing at this time. As BOEM moves forward with the 2012-2017 Five-Year Program, BOEM and BSEE have developed an interim coordination and review process with NMFS and FWS for specific activities leading up to or resulting from upcoming lease sales. The purpose of this coordination is to ensure that NMFS and FWS have the opportunity to review postlease exploration, development and production activities prior to BOEM's approval to ensure that all approved plans and permits contain any necessary measures to avoid jeopardizing the existence of any ESA-listed species or precluding the implementation of any reasonable and prudent alternative measures. This interim coordination program remains in place while formal consultation and the development of a Biological Opinion are ongoing.

Cumulative impacts on marine mammals are expected to result in a number of chronic and sporadic sublethal effects (i.e., behavioral effects and nonfatal exposure to or intake of OCS-related contaminants or discarded debris) that may stress and/or weaken individuals of a local group or population and predispose them to infection from natural or anthropogenic sources. Disturbance (noise from vessel traffic and drilling operations) and/or exposure to sublethal levels of toxins and anthropogenic contaminants may stress animals, weaken their immune systems, and make them more vulnerable to parasites and diseases that normally would not be fatal. The net result of any disturbance will depend upon the size and percentage of the population likely to be affected, the ecological importance of the disturbed area, the environmental and biological parameters that influence an animal's sensitivity to disturbance and stress, or the accommodation time in response to prolonged disturbance. As discussed in **Appendix B**, a low-probability, large-scale catastrophic event could have population-level effects on marine mammals.

The effects of an EPA proposed action, when viewed in light of the effects associated with other past, present, and reasonably foreseeable future activities may result in greater impacts to marine mammals than before the *Deepwater Horizon* explosion, oil spill, and response; however, the magnitude of those effects cannot yet be determined. Nonetheless, operators are required to follow all applicable lease stipulations and regulations, as clarified by NTL's, to minimize these potential interactions and impacts. The operator's reaffirmed compliance with NTL 2012-JOINT-G01 ("Vessel Strike Avoidance and Injured/Dead Protected Species Reporting") and NTL 2012-BSEE-G01 ("Marine Trash and Debris Awareness and Elimination"), as well as the limited scope, timing, and geographic location of an EPA proposed action, would result in negligible effects from the proposed drilling activities on marine mammals. In addition, NTL 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program," minimizes the potential of harm from seismic operations to marine mammals. These mitigations include onboard observers, airgun shut-downs for whales in the exclusion zone, ramp-up procedures, and the use of a minimum sound source. Therefore, no significant cumulative impacts to marine mammals would be expected as a result of the proposed exploration activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other ongoing activities in the area.

Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations. Therefore, in light of an EPA proposed action and its impacts, the incremental effect of an EPA proposed action on marine mammal populations is not expected to be significant when compared with non-OCS energy-related activities.

Sea Turtles (Chapter 4.1.1.13)

BOEM has reexamined the analysis for sea turtles and has considered the recent reports and other new information. Because of the mitigations (e.g., BOEM and BSEE proposed compliance with NTL 2012-JOINT-G01, NTL 2012-JOINT-G02, and NTL 2012-BSEE-G01) described in the above analysis, routine activities (e.g., operational discharges, noise, vessel traffic, and marine debris) related to an EPA proposed action are not expected to have long-term adverse effects on the size and productivity of any sea turtle species or populations in the northern Gulf of Mexico. Lethal effects could occur from chance collisions with OCS service vessels or ingestion of accidentally released plastic materials from OCS vessels and facilities. Most routine OCS energy-related activities are then expected to have sublethal effects that are not expected to rise to the level of significance.

Accidental blowouts, oil spills, and spill-response activities resulting from an EPA proposed action have the potential to impact small to large numbers of sea turtles in the GOM, depending on the magnitude and frequency of accidents, the ability to respond to accidents, the location and date of accidents, and various meteorological and hydrological factors. Impacts on sea turtles from smaller accidental events are likely to affect individual sea turtles in the spill area, but they are unlikely to rise to the level of population effects (or significance) given the size and scope of such spills. Further, the potential remains for smaller accidental spills to occur the proposed EPA lease sale area, regardless of which alternative selected under this EIS, given that there are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities.

The effects of an EPA proposed action, when viewed in light of the effects associated with other past, present, and reasonably foreseeable future OCS activities may result in greater impacts to sea turtles than before the *Deepwater Horizon* explosion, oil spill, and response; however, the magnitude of those effects cannot yet be determined. Nonetheless, operators are required to follow all applicable lease stipulations and regulations, as clarified by NTL's, to minimize these potential interactions and impacts. The operator's reaffirmed compliance with NTL 2012-JOINT-G01 ("Vessel-Strike Avoidance and

Injured/Dead Protected Species Reporting") and NTL 2012-BSEE-G01 ("Marine Trash and Debris Awareness Elimination"), as well as the limited scope, timing, and geographic location of an EPA proposed action, would result in negligible effects from the proposed drilling activities on sea turtles. In addition, NTL 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program," minimizes the potential of harm from seismic operations to sea turtles and marine mammals; these mitigations include onboard observers, airgun shut-downs for whales in the exclusion zone, ramp-up procedures, and the use of a minimum sound source. Therefore, no significant cumulative impacts to sea turtles would be expected as a result of the proposed exploration activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other ongoing activities in the area.

Adverse effects may result from the incremental contribution of an EPA proposed action combined with non-OCS energy-related activities. The biological significance of any mortality or adverse impact would depend, in part, on the size and reproductive rates of the affected populations, as well as the number, age, and size of animals affected. However, the potential for impacts is mainly focused on the individual, and population-level impacts are not anticipated based on the best available information.

Incremental injury effects from an EPA proposed action on sea turtles are expected to be negligible for drilling and vessel noise and minor for vessel collisions, but it would not rise to the level of significance because of the limited scope, duration, and geographic area of the proposed drilling and vessel activities and the relevant regulatory requirements.

The effects of an EPA proposed action, when viewed in light of the effects associated with other relevant non-OCS activities, may affect sea turtles occurring in the GOM. With the enforcement of regulatory requirements for drilling and vessel operations and the scope of an EPA proposed action, incremental effects from the proposed drilling activities on sea turtles would be negligible (drilling and vessel noise) to minor (vessel strikes). The best available scientific information indicates that sea turtles do not rely on acoustics; therefore, vessel noise and related activities would have limited effect. Consequently, no significant cumulative impacts would be expected from an EPA proposed action's activities or as the result of past, present, or reasonably foreseeable oil and gas leasing, exploration, development, and production in the GOM. Even taking into account additional effects resulting from non-OCS energy-related activities, the potential for impacts from an EPA proposed action is mainly focused on the individual. Population-level impacts are not anticipated based on the best available information.

In any event, the incremental contribution of an EPA proposed action would not be likely to result in a significant incremental impact on sea turtles within the EPA; in comparison, non-OCS-related activities, such as overexploitation, commercial fishing, and pollution, have historically proved to be a greater threat to sea turtles.

Diamondback Terrapins (Chapter 4.1.1.14)

Adverse impacts due to routine activities resulting from an EPA proposed action are possible but unlikely. Because of the greatly improved handling of waste and trash by industry and the annual awareness training required by the marine debris mitigations, the plastics in the ocean are decreasing and the devastating effects on offshore and coastal marine life are minimizing. The routine activities of an EPA proposed action are unlikely to have significant adverse effects on the size and recovery of any terrapin species or population in the Gulf of Mexico. Most routine OCS energy-related activities are expected to have sublethal effects, such as behavioral effects, that are not expected to rise to the level of significance to the populations.

Impacts on diamondback terrapins from smaller accidental events are likely to affect individual diamondback terrapins in the spill area, as described above, but are unlikely to rise to the level of population effects (or significance) given the probable size and scope of such spills. Further, the potential remains for smaller accidental spills to occur in the EPA proposed action area regardless of which alternative is selected under this EIS, given that there are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities.

The analyses in **Chapter 4.1.1.14 and Appendix B** conclude that there is a low probability for catastrophic spills, and **Appendix B** concludes that there is a potential for a low-probability catastrophic event to result in significant, population-level effects on affected diamondback terrapin species. BOEM continues to concur with the conclusions from these analyses.

For those terrapin populations that may not have been impacted by the *Deepwater Horizon* explosion, oil spill, and response, it is unlikely that a future accidental event related to an EPA proposed action would result in significant impacts due to the distance of most terrapin habitat from offshore OCS energy-related activities. A low-probability, large-scale catastrophic event of the size and type that could reach these habitats is discussed in **Appendix B**.

Diamondback terrapins have experienced impacting pressures from habitat destruction, road construction, drowning in crab traps, and past overharvesting resulting in historical reductions in their habitat range and declines in populations. Inshore oil spills from non-OCS energy-related sources are potential threats to terrapins in their brackish coastal marshes. Pipelines from offshore oil and gas and other shoreline crossings have contributed to marsh erosion. However, an EPA proposed action includes only 0-1 pipeline landfalls and 0-1 gas processing facilities, and modern regulations require avoidance or mitigation of wetland impacts. Low-probability, large-scale catastrophic offshore oil spills could affect the coastal marsh environment but such events are rare occurrences and may not reach the shore, even if they do occur. Therefore, the incremental contribution of an EPA proposed action is expected to be minimal compared with non-OCS activities. The major impact-producing factors resulting from the cumulative activities associated with an EPA proposed action that may affect the diamondback terrapin include oil spills and spill-response activities, alteration and reduction of habitat, and consumption of trash and debris. Due to the extended distance from shore, impacts associated with activities occurring in the OCS Program are not expected to impact terrapins or their habitat. No substantial information was found at this time that would alter the overall conclusion that cumulative impacts on diamondback terrapins associated with an EPA proposed action is expected to be minimal.

Beach Mice (Chapter 4.1.1.15)

An impact from the routine activities associated with an EPA proposed action on the Alabama, Choctawhatchee, St. Andrew, Perdido Key, southeastern, and Anastasia Island beach mice is possible but unlikely. Impact may result from consumption of or entanglement in beach trash and debris. Because an EPA proposed action would deposit only a small portion of the total debris that would reach the habitat, the impacts would be minimal. Unless all personnel are adequately trained, efforts undertaken for the removal of marine debris may temporarily scare away beach mice or destroy their food resources, such as sea oats. However, their burrows are about 1-3 m (3-10 ft) long and involve a plugged escape tunnel, which would function after the main burrow entrance was trampled by foot traffic of insufficiently trained debris cleanup personnel. Alternatively, mice could dig themselves out through the trampled main entrance.

The oiling of beach mice could result in local extinction. Oil-spill-response and cleanup activities could also have a substantial impact to the beach mice and their habitat if all cleanup personnel are not adequately trained. However, potential spills that could result from an EPA proposed action are not expected to contact beach mice or their habitats. The probability of contact with the shoreline next to beach mouse habitat is unlikely (<0.5% probability), and the probability of oil washing over the foredunes to beach mouse habitat is even less. Also, inshore facilities related to an EPA proposed action are unlikely to be located on beach mouse habitat.

A review of the available information shows that impacts on beach mice from accidental impacts associated with an EPA proposed action would be minimal.

Cumulative activities have the potential to harm or reduce the numbers of Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice. Those activities include oil spills, alteration and reduction of habitat, predation and competition, consumption of and entanglement in beach trash and debris, beach development, and natural catastrophes (hurricanes and tropical storms). Most spills related to an EPA proposed action and prior and future lease sales are not expected to contact beach mice or their habitats because the species lives above the intertidal zone where contact is less likely. Cumulative impacts could potentially deplete some beach mice populations to unsustainable levels. Within the last 20-30 years, the combination of habitat loss due to beachfront development, the isolation of the remaining beach mouse habitat areas and populations, and the destruction of the remaining habitat by tropical storms and hurricanes have increased the threat of extinction of several subspecies of beach mice. Impacts from OCS activities could come from trash and debris and from efforts to remove them, as well as oil spills and cleanup operations. If personnel are properly trained (on short notice if under emergency conditions) and supervised, these impacts could be reduced. The expected incremental contribution of an EPA proposed action to the cumulative impacts is negligible.

Coastal and Marine Birds (Chapter 4.1.1.16)

In general, the effects from routine activities in the EPA are not expected to exceed those in the CPA or WPA due to major reductions in the number of proposed (and current) platforms (n =1), onshore infrastructure and pipeline landfalls, and the number of service support vessel and helicopter trips. The majority of the effects resulting from routine activities of an EPA proposed action on threatened or endangered and nonthreatened and nonendangered coastal and marine birds are expected to be sublethal, e.g., primarily disturbance-related effects. However, collision-related mortality of trans-Gulf migrant landbirds does occur, i.e., approximately 50 birds/platform or roughly 200,000 birds/year across the archipelago. Conservatively, the addition of one installed platform would probably result in the collision death of an additional 50-100 birds/year or 2,000-4,000 birds over the life of the newly installed platform. Over the life of the GOM platform archipelago (a 40-year period), mortality estimates may be on the order of 7-12 million birds from platform-related mortality alone. There is likely an unknown number of avian mortalities associated with small oil spills and produced water. This represents an adverse, but not significant, impact to coastal and marine birds. The platform-related mortality estimates should be considered conservative given that (1) they only include deaths due to collisions and (2) these estimates do not account for issues related to detection bias. Although there will always be some level of incomplete information on the effects from routine activities under an EPA proposed action on birds, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be generally sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects. Also, routine activities will be ongoing in the EPA proposed action area as a result of existing leases and related activities.

The discussion of routine impacts, including much data from Russell (2005), uses rigorous scientific reasoning and determines that impacts due to nocturnal circulation events and platform collisions are not expected to be significant. A full understanding of any incomplete or unavailable information on the effects of routine activities is not essential to make a reasoned choice among the alternatives. Particularly given the level of activities related to an EPA proposed action and in comparison with other causes of bird mortality (refer to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS), the routine events in the EPA associated with an EPA proposed action are unlikely to result in population-level impacts to avian species. Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS lists anthropogenic sources of bird mortality nationwide.

Overall, impacts to coastal and marine birds associated with accidental events (oil spills regardless of size) in the EPA should be much less compared with either the CPA or WPA due to the following factors: only a single platform is proposed; lower oil-spill probabilities; and a much lower number of predicted oil spills over the life of an EPA proposed action. However, if oil from a spill were to reach the coast north, northeast, or east of the EPA proposed action area, then avian mortality could be high due to avian species diversity, abundance, and density for numerous species of beach-nesting waterbirds and coastal marshbirds. The impact of the spill to avian species generally restricted to the nearshore environment would be dependent on the timing of the spill, spill volume and oil characteristics, ocean currents, and wind direction. If oil were to reach any of the greater than 30 Important Bird Areas during peak nesting, then major losses to several species can be expected.

Oil spills (and disturbance impacts associated with cleanup) have the greatest impact on coastal and marine birds. Depending on the timing and location of the spill, even small spills can result in major avian mortality events. Small amounts of oil can affect birds, and mortality from oil spills is often related to numerous symptoms of toxicity. Data from actual spills strongly suggest that impacts to a bird species' food supply are typically delayed after initial impacts from direct oiling. Sublethal, long-term effects of oil on birds have previously been documented.

Oil-spill impacts on birds from an EPA proposed action are expected to be adverse, but not significant, given the number and relatively small size of spills expected over the 40-year life of an EPA proposed action. Impacts of oil-spill cleanup from an EPA proposed action are also expected to be adverse, but not significant, but could be negligible depending on the scope and scale of efforts. In the event of a catastrophic spill, depending on the timing, location, and size of the spill, impacts to coastal and marine birds could result in significant impacts.

Overall, impacts to coastal and marine birds associated with cumulative impacts in the EPA, particularly those effects related directly to OCS activities, should be less overall compared with either the CPA or WPA. A myriad of different anthropogenic (both OCS-related and non-OCS-related) and natural (e.g., disease, predation, and weather) mortality factors can negatively affect individuals of populations comprising the seven avian species groups found in the Gulf of Mexico. Several OCS-related activities are relevant to the discussion of their potential effects: habitat loss, alteration, or fragmentation; disturbance-related effects (e.g., support vessels and helicopters); attraction to and collision with offshore platforms; nocturnal circulation (night flights) around platforms and the potential associated energetic demands; discharge of produced waters; oil spills; and chronic oil pollution. All but the latter factor represents factors associated with routine OCS activities. Unfortunately, little information exists with respect to either direct or indirect effects to avian resources for most of these impact-producing factors, except for collision-related mortality. For the factors not studied to date, it is inappropriate to assume that these factors result in no effects. It is predicted that the EPA's anticipated level of activity, including one platform, will result in 50-100 bird deaths/year or 2,000-4,000 birds over the life of the newly installed platform. This is in addition to the estimated 200,000-321,000 bird deaths/year over the entire platform archipelago. This number represents a small fraction compared with other anthropogenic sources of avian mortality, though there is limited population-level information available to assess long-term impacts to individual species migrating across the GOM. Of the various factors to consider for avian resources in the GOM associated with climate change, the factor with the greatest potential net negative impact, at least for the coastal breeding avian assemblage, would be sea-level rise. Of the 84 avian species considered, 74 were considered to be moderately or highly vulnerable to climate change impacts. In particular, those species that select low-lying habitats such as islands, beaches, flats, dunes, bars, and similar inshore habitats are particularly vulnerable due to annual sea-level rise. As well, saltmarsh obligate species (e.g., seaside sparrow, Nelson's sharp-tailed sparrow, Rallidae-yellow rail, black rail, clapper rail, and king rail) are also extremely sensitive to the loss of saltmarsh habitat. The incremental contribution of an EPA proposed action to the cumulative impact is considered adverse, but not significant.

Fish Resources and Essential Fish Habitat (Chapter 4.1.1.17)

Routine activities such as pipeline trenching and OCS discharge of drilling muds and produced water could affect fish resources or essential fish habitat (EFH). It is expected that any possible coastal and marine environmental degradation from routine activities associated with an EPA proposed action is expected to cause a nondetectable decrease in fish resources or in EFH. This is because of regulations, mitigations, and the fact that Gulf of Mexico fish stocks have retained both diversity and biomass throughout the years of offshore development; an EPA proposed action is expected to result in a minimal decrease in fish resources and/or standing stocks or in EFH.

Accidental events that could impact fish resources and EFH include blowouts and oil or chemical spills. Because subsurface blowouts, although a highly unlikely occurrence, suspend large amounts of sediment, they have the potential to adversely affect fish resources in the immediate area of the blowout. Also any accidental event that could affect water quality or sensitive habitats has the potential to affect fish resources. If oil spills due to an EPA proposed action were to occur in open waters of the OCS proximate to mobile adult finfish, the effects would likely be nonfatal and the extent of damage would be reduced because adult fish have the ability to move away from a spill, to metabolize hydrocarbons, and to excrete both metabolites and parent hydrocarbon compounds. Benthic EFH's would have decreased effects from oil spills because of the depths many occupy and because of the distance these low-probability spills would occur from benthic habitats (due to stipulations, NTL's, etc.). The likely size of an accidental event resulting from an EPA proposed action would be small and unlikely to impact coastal and estuarine habitats where juvenile and larval stages of fish resources are predominant, and adult fish tend to avoid adverse water conditions.

Along with an EPA proposed action, there are widespread anthropogenic and natural factors that impact EFH and fish populations in the Gulf of Mexico. These different impact-producing factors include structure emplacement and removal, oil spills, degradation of water quality, overfishing, and storm events. The activities associated with an EPA proposed action potentially impacting fish resources in the Gulf of Mexico are generally federally regulated or mitigated and are small. Overfishing is reduced by limits on catch and by fishing seasons set by the Gulf of Mexico Fishery Management Council. State agencies regulate inshore fishing seasons and limits. Naturally occurring tropical cyclones can cause damage to various EFH's. However, these storms are a continual part of the Gulf of Mexico climate. While fish resources and EFH are impacted by these many factors, an EPA proposed action would add a minimal amount to the overall cumulative effects.

Commercial Fisheries (Chapter 4.1.1.18)

Drilling muds can be discharged into the ocean only if they meet the U.S. Environmental Protection Agency's NPDES permit requirements, which include testing for toxicity prior to discharge. Offshore discharges of produced water are expected to disperse and dilute to background levels within 1,000 m (3,281 ft) of the discharge point. These discharges must meet the general toxicity limits in the NPDES general permit. Discharge and monitoring records must be kept. Marine environmental degradation resulting from routine offshore activities also has the potential to indirectly affect commercial fish resources by reducing food stocks in soft bottom and reef habitats. However, activities are monitored and subject to regulations so there would be an overall minimal impact to commercial fisheries from routine activities associated with an EPA proposed action.

The potential for an oil spill from the EPA affecting commercial species as calculated by the Oil Spill Risk Analysis (OSRA) modeling is small. Most commercial fish and shellfish species spend at least part of their life cycle in inshore waters, and this area, according to OSRA calculations is unlikely to be affected by a spill in the EPA. Few offshore species would be affected, primarily because they are mobile and are able to avoid adverse conditions. Benthic fish, such as tile fish, may be affected if the oil remains on the bottom.

Commercial offshore fishermen (longliners, shrimp fisheries) would be forced to move temporarily from the area of the oil spill. The potential for such an event, however, is small, as evidenced by the OSRA model. The effect of oil spills on commercial fisheries is anticipated to be small.

In summary, there are widespread anthropogenic and natural factors that impact fish populations in the GOM.

While production facilities compete with commercial fishing interests for physical space in the open ocean, the area occupied by these structures is small compared with the area available in the GOM for fishing. Also, the emplacement of structures and artificial reefs has a positive effect on fish resources by providing habitat and/or food for reef fishes. Discharges from OCS activities such as drill mud and produced water have an incremental effect on offshore water quality. All discharges are regulated by USEPA or State agencies.

Oil spills can affect offshore waters. Adult fish are known to actively avoid oil-spill areas because they avoid any area of adverse water quality. The impacts of a catastrophic oil spill are discussed in **Appendix B**. The OCS factors potentially impacting fish resources in the GOM are federally regulated or mitigated and are small. Also to be considered is the variability in GOM fish populations due to natural factors such as spawning success and juvenile survival.

Overfishing (including bycatch) has contributed in a large way to the decline of some populations of GOM fish. The Magnuson-Stevens Fishery Conservation and Management Act and its amendments address sustainable fisheries and set guidelines for protecting marine resources and habitat. Limits on catch and fishing seasons are set by Fisheries Management Councils, and State agencies regulate inshore fishing seasons and limits.

Wetland loss decreases nursery habitat, which includes shelter for larvae and juveniles of many species. Resource management agencies, both Federal and State, set restrictions and permits in an effort to mitigate the effects of development projects, i.e., industry activities. The Federal and State governments are also funding research and coastal restoration projects; however, it may take decades of monitoring to ascertain the long-term feasibility of these coastal restoration efforts.

Overall, the commercial fish and shellfish populations have remained healthy in the GOM in spite of the OCS activities. Since 2005, the major contributors to the lower fisheries catches in the GOM have been hurricanes, fisheries closures, and freshwater diversions. The expected incremental effect of an EPA proposed action remains small when viewed in light of other historic, ongoing, and reasonably foreseeable future factors impacting commercial fishing, such as fishing pressures, habitat loss, and hurricanes.

Recreational Fishing (Chapter 4.1.1.19)

There could be short-term, space-use conflicts with recreational fishermen during the initial phases of an EPA proposed action. An EPA proposed action could also lead to low-level environmental degradation of fish habitat, which would also negatively impact recreational fishing activity. However, these minor negative effects would likely be offset by the beneficial role that oil rigs serve as artificial reefs for fish populations. The degree to which oil platforms would become a part of a particular State's Rigs-to-Reefs program would be an important determinant of the degree to which an EPA proposed action would impact recreational fishing activity in the long term. However, given the small scale of an EPA proposed action, as well as the large distance of the EPA proposed action area from shore, the overall impacts of routine activities on recreational fishing activity should be minimal.

An oil spill would likely lead to recreational fishing closures in the vicinity of the oil spill. Small-scale spills should not affect recreational fishing to a large degree due to the likely availability of substitute fishing sites in neighboring regions. A large spill such as the one associated with the *Deepwater Horizon* explosion and oil spill may have more noticeable effects due to the larger potential closure regions and due to the wider economic implications such closures may have (**Appendix B**). However, the longer-term implications of a large oil spill would primarily depend on the extent to which fish ecosystems recover after the spill has been cleaned.

An EPA proposed action and the broader OCS Program have varied effects on recreational fishing activity. The OCS Program has generally enhanced recreational fishing opportunities due to the role of oil platforms as artificial reefs. This effect depends importantly on the extent to which rigs are removed at decommissioning or are maintained through Rigs-to-Reefs programs. However, oil spills can have important negative consequences on recreational fishing activity due to the resultant fishing closures and longer-term effects oil spills can have on fish populations. The contribution of an EPA proposed action to these positive and negative cumulative effects would be minimal because of the relatively small amount of activity expected with an EPA proposed action. In addition, it is likely that Fisheries Management Plans of the Federal and State governments would serve to keep overall recreational fishing activity reasonably stable through time.

Recreational Resources (Chapter 4.1.1.20)

Routine OCS actions in the EPA can cause disturbances to recreational resources, particularly beaches, through increased levels of noise, debris, and rig visibility. The OCS activities can also change the composition of local economies through changes in employment, land use, and recreation demand. However, the small scale of an EPA proposed action relative to the scale of the existing oil and gas industry suggests that these potential impacts on recreational resources are likely to be minimal.

Spills most likely to result from an EPA proposed action would be small, of short duration, and not likely to impact Gulf Coast recreational resources. The distance of an EPA proposed action from shore makes it quite unlikely that an oil spill would reach resources that are important for recreational activities. However, should an oil spill occur and contact a beach area or other recreational resource, it would cause some minor disruptions during the impact and cleanup phases of the spill. A catastrophic oil spill could have more noticeable effects on recreational resources (**Appendix B**).

An EPA proposed action would contribute to the aesthetic impacts and the space-use conflicts that arise due to the broader OCS Program. Oil spills could also contribute to the overall degradation of beach and wetland-based recreational resources. The incremental contribution of an EPA proposed action is expected to be minimal in light of all non-OCS-related impacts, such as aesthetic impacts (including from other industrial sources), wetland loss, space-use conflicts, and the impacts from economic factors.

Archaeological Resources (Chapter 4.1.1.21)

Historic (Chapter 4.1.1.21.1)

The greatest potential impact to an archaeological resource as a result of an EPA proposed action would result from direct contact between an offshore activity (i.e., platform installation, drilling rig emplacement, dredging, and pipeline emplacement) and a historic site. Archaeological surveys, where required prior to an operator beginning oil and gas activities on a lease, are expected to be effective at identifying possible archaeological sites. The technical requirements of the archaeological resource reports are detailed in NTL 2005-G07, "Archaeological Resource Surveys and Reports." Under 30 CFR § 550.194(c) and 30 CFR § 250.1010(c), lessees are required to notify BOEM and BSEE immediately of the discovery of any potential archaeological resources.

Offshore oil and gas activities resulting from an EPA proposed action could impact an archaeological resource because of incomplete knowledge on the location of these sites in the Gulf. The risk of contact to archaeological resources is greater in instances where archaeological survey data are unavailable. Such an event could result in the disturbance or destruction of important archaeological information. Archaeological surveys, where required, would provide the necessary information to develop avoidance strategies that would reduce the potential for impacts on archaeological resources.

Except for the projected 0-1 new gas processing facilities and 0-1 new pipeline landfalls, an EPA proposed action would require no new onshore oil and gas coastal infrastructure. It is expected that archaeological resources would be protected through the review and approval processes of the various Federal, State, and local agencies involved in permitting onshore activities.

Accidental events producing oil spills may threaten archaeological resources along the Gulf Coast. Should a spill contact a historic archaeological site, damage might include direct impact from oil-spill cleanup equipment, contamination of materials, and/or looting. Previously unrecorded sites could be impacted by oil-spill cleanup operations on beaches and offshore. It is not very likely for an oil spill to occur and contact submerged, coastal, or barrier island historic sites as a result of an EPA proposed action.

The major effect from an oil-spill impact would be visual contamination of a historic coastal site, such as a historic fort or lighthouse. When oil is spilled in offshore areas, much of the oil volatilizes or is dispersed by currents, so it has a low probability of contacting coastal areas. It is expected that any spill cleanup operations would be considered a Federal action for the purposes of Section 106 of the National Historic Preservation Act and would be conducted in such a way as to cause little or no impacts to historic archaeological resources. Recent research suggests that the impact of direct contact of oil on historic properties may be long term and not easily reversible without risking damage to fragile historic materials.

The potential for spills is low, the effects would generally be localized, and the cleanup efforts would be regulated. An EPA proposed action, therefore, is not expected to result in impacts to historic archaeological sites; however, should such impacts occur, unique or significant archaeological information could be lost and this impact could be irreversible.

Several impact-producing factors may threaten historic archaeological resources, all related to bottom-disturbing activities. An impact could result from contact between a historic shipwreck located on the OCS and OCS Program or State oil and gas activities (i.e., pipeline and platform installations, drilling rig emplacement and operation, dredging, anchoring activities, structure removal, and site clearance). Bottom-disturbing activities on the OCS also include maintenance dredging, sand borrowing, transported artificial reef emplacement, LNG facility construction, and renewable energy facility construction. With the exception of maintenance dredging, preconstruction surveys may be required by BOEM or the permitting agency. Impacts resulting from the imperfect knowledge of the location of historic resources may still occur in areas where a high-resolution survey is only required at 984-ft (300-m) survey intervals or not at all. The OCS development prior to requiring archaeological surveys has been documented to have impacted wrecks containing significant or unique historic information. This was amply demonstrated when a pipeline was laid across a previously unknown early 19th-century shipwreck and when a MODU mooring anchor chain cut a shipwreck in half. In certain circumstances, BOEM's Regional Director may require the preparation of an archaeological report to accompany the EP, DPP, or DOCD under 30 CFR § 550.194. As part of the environmental reviews conducted for postlease activities, available information will be evaluated regarding the potential presence of archaeological resources within the EPA proposed-action area to determine if additional archaeological resource surveys and mitigation are warranted.

The loss or discard of steel debris associated with oil and gas exploration and development and trawling activities could result in the masking of historic shipwrecks or the identification of false negatives on archaeological surveys (an anomaly that does not appear to be of historical significance, but actually is).

Damage to or loss of significant or unique historic archaeological information from commercial fisheries (trawling) is highly likely in water depths <600 ft (183 m). It is expected that maintenance dredging, commercial bottom trawling, sport-diving and commercial treasure hunting, and hurricanes and tropical storms have impacted and would continue to impact historic period shipwrecks on the shelf where such activities occur.

Development onshore as a result of an EPA proposed action could result in the direct physical contact between a historic site and pipeline trenching. It is assumed that archaeological investigations prior to construction would serve to mitigate these potential impacts. Based on the currently available information, the expected effects of oil spills on historic coastal resources are generally temporary and reversible.

The effects of the various impact-producing factors discussed in this analysis have likely resulted in the localized loss of significant or unique historic archaeological information. In the case of factors related to OCS Program activities of the past within the cumulative activity area, it is reasonable to assume that most impacts would have occurred prior to 1973 (the date of initial archaeological survey and site-clearance requirements). The incremental contribution of an EPA proposed action is expected to be very small due to the efficacy of remote-sensing surveys and archaeological reports, where required. Future OCS Program activities and the bottom-disturbing activities permitted by BOEM and other agencies may require preconstruction archaeological surveys that, when completed, are highly effective in identifying bottom anomalies that could be avoided or investigated before bottom-disturbing activities begin. When surveys are not required, it is impossible to anticipate what might be imbedded in or lying directly on the seafloor, and impacts to these sites are likely to be major in scale. Despite diligence in site-clearance survey reviews, there is still the possibility of an unanticipated interaction between bottom-disturbing activity (i.e., rig emplacement, pipeline trenching, anchoring, and other ancillary activities) and a historic shipwreck.

Prehistoric (Chapter 4.1.1.21.2)

Water depths in the proposed EPA lease sale area considerably exceed the 60-m (197-ft) depth contour that is generally accepted as the seaward limit of the subaerially exposed land mass that would have been available for human habitation when people migrated into the Gulf region around 12,000 B.P. As a result, prehistoric sites would not be affected by routine development.

Onshore development as a result of an EPA proposed action could result in direct physical contact between the construction of a new facility or a pipeline landfall and a previously unidentified prehistoric site. Direct physical contact with a prehistoric site could destroy fragile artifacts or site features and could disturb the site context. The result would be the loss of information on the prehistory of North America and the Gulf Coast region. There are 0-1 new gas processing facilities and 0-1 new pipeline landfalls expected as a result of an EPA proposed lease sale. Furthermore, any facility or pipeline constructed is subject to coastal use requirements and must receive approval from the pertinent Federal or State agency, county/parish, and/or community involved. Protection of archaeological resources in these cases is expected to be achieved through the various approval processes involved. There should, therefore, be no impact to onshore prehistoric sites from onshore development related to an EPA proposed action.

Impacts to a prehistoric archaeological resource could occur as a result of an accidental oil spill. Impacts from a low-probability, high-volume catastrophic event are included in **Appendix B**. A major effect from an oil spill impact would be contamination of a prehistoric coastal site, such as a shell midden, disturbance as a result of cleanup activities, or looting from the location of the site becoming known after an oil spill.

Other impacts that remain unknown at this time include the effect that the oiling of archaeological resources would have on the ability to conduct future chemical and observational analysis on the artifact assemblage. At present, it is unknown to what extent the release of hydrocarbons or of dispersant would impede the analysis that may help interpret and understand archaeological resources.

Although information on the impacts of a potential spill to archaeological resources is incomplete or unavailable at this time and may be relevant to reasonably foreseeable adverse impacts on these resources, the information is not essential to a reasoned choice among alternatives. An oil spill occurring and contacting an archaeological resource is unlikely, given that oil released tends to rise quickly to the surface where it can be cleaned up and that the average size of any spill would be small.

The major impacts to coastal prehistoric sites from the *Exxon Valdez* spill in Alaska in 1989 were related to cleanup activities such as the construction of helipads, roads, and parking lots and to looting by cleanup crews rather than from the oil itself. As a result, cultural resources were recognized as significant early in the response to the *Deepwater Horizon* explosion and oil spill, and archaeologists were embedded in Shoreline Cleanup and Assessment Team (SCAT's) and were consulting with cleanup crews. Although the process took several weeks to fully form, historic preservation representatives eventually were stationed at both the Joint Incident Command as well as each Area Command under the general oversight of the National Park Service to coordinate response efforts.

Of the cumulative scenario activities, those that could potentially impact prehistoric archaeological resources include the following: (1) the OCS Program; (2) State oil and gas activity; (3) maintenance dredging; (4) OCS sand borrowing; (5) artificial rigs-to-reef development; (6) offshore LNG projects; (7) renewable energy and alternative use conversions; (8) commercial fishing; (9) sport diving and commercial treasure hunting, and (10) hurricanes. However, water depths in the proposed lease sale area considerably exceed the 60-m (197-ft) depth contour that is generally accepted as the seaward limit of the subaerially exposed land mass that would have been available for human habitation when people migrated into the Gulf region around 12,000 B.P. As a result, prehistoric sites in the EPA have not been affected by any of the impact-producing factors identified above.

Onshore and nearshore maintenance dredging in support of activities resulting from an EPA proposed action has the potential to impact prehistoric resources. Impacts from maintenance dredging can be attributed proportionally to the users of the navigation channels. BOEM estimates that, under an EPA proposed action, <1 percent of the ship traffic is related to OCS use. Therefore, the impact to archaeological sites directly attributable to traffic and maintenance dredging as a result of the OCS Program is negligible. Additionally, any such maintenance activities are subject to coastal use requirements and must receive approval from the pertinent Federal or State agency, county/parish, and/or community involved. The protection of archaeological resources in these cases is expected to be achieved through the various approval processes involved. There should, therefore, be no impact to onshore prehistoric sites from maintenance dredging related to an EPA proposed action.

Human Resources and Land Use (Chapter 4.1.1.22)

Land Use and Coastal Infrastructure (Chapter 4.1.1.22.1)

The impacts of routine events associated with an EPA proposed action remain somewhat uncertain due to the post-*Deepwater Horizon* explosion, oil spill, and response; the effects of the drilling suspension; the changes in Federal requirements for drilling safety; and the current pace of permit approvals. BOEM projects 0-1 new gas processing facilities and 0-1 new pipeline landfalls for an EPA proposed action. However, based on the most current information available, there is only a very slim chance that either would result from an EPA proposed action, and if a new gas processing facility were to result, it would likely occur toward the end of the 40-year analysis period. The likelihood of a new gas processing facility or pipeline landfall is much closer to zero than to one. BOEM anticipates that there would be maintenance dredging of navigation channels and an increase in activity at services bases as a result of the EPA proposed action. If drilling activity recovers post-*Deepwater Horizon* explosion, oil spill, and response, and if it increases, there could be new increased demand for a waste disposal services as a result of an EPA proposed action. Because of the current near-zero estimates for a pipeline landfall and gas processing facility construction, the routine activities associated with an EPA proposed action would have little effect on land use.

As a result of the *Deepwater Horizon* explosion, oil spill, and response, it is too early to determine substantial, long-term changes in routine event impacts to land use and infrastructure. The long-standing, well-established system of onshore support for the oil and gas industry is extensive, mature, and not subject to rapid fluctuations. BOEM anticipates any changes would become apparent over time. Therefore, BOEM recognizes the need to continue monitoring all resources for changes that are applicable for land use and infrastructure. In regard to land use and infrastructure, it does not appear that there would be adverse impacts from routine events associated with an EPA proposed action, especially given the small size and limited impact expected for such an action.

Accidental events associated with an EPA proposed action would occur at different levels of severity, based in part on the location and size of event. The typical types of accidental events that could affect land use and coastal infrastructure include oil spills, vessel collisions, and chemical/drilling-fluid spills. These may occur anywhere across the spectrum of severity. Typically, accidental events related to OCS activities are generally smaller in scale based on historic experience, and they must be distinguished from low-probability, high-impact catastrophic events such as the *Deepwater Horizon* explosion and oil spill.

Typically, the impact of small-scale oil spills, vessel collisions, and chemical/drilling fluid spills are not likely to last long enough to adversely affect overall land use or coastal infrastructure in the proposed EPA lease sale area.

The coastal infrastructure supporting an EPA proposed action represents only a tiny portion of the coastal land use and infrastructure throughout the EPA and Gulf of Mexico, and little change is expected to occur due to changing agricultural and extractive (e.g., lumbering, petroleum) uses of onshore land. Many non-OCS-related factors contribute substantially to the cumulative impacts to land use and coastal infrastructure, including the following: housing and other residential developments; the development of private and publically owned recreational facilities; the construction and maintenance of industrial facilities and transportation systems; urbanization; city planning and zoning; changes to public facilities such as water, sewer, educational and health facilities; changes to military bases and reserves; changes in population density; changes in State and Federal land-use regulations; and changes in non-OCS-related demands for water transportation systems and ports. Given the overwhelming contribution of these non-OCS-related factors to the cumulative impacts on land use and coastal infrastructure and the small incremental contribution of an EPA proposed action, the cumulative impacts on land use and coastal infrastructure are also expected to be minor.

Activities relating to the OCS Program and State oil and gas production are expected to minimally affect the current land use of the proposed lease area because most subareas have strong industrial bases and designated industrial parks to accommodate future growth in oil and gas businesses. BOEM projects 0-1 new gas processing facilities and 0-1 new pipeline landfalls for an EPA proposed action, although this is a conservative estimate and the number is much closer to zero than to one. If a new gas processing facility or pipeline landfall were to occur, it would likely be toward the end of the 40-year analysis period. There may be increased demand for waste disposal services as a result of an EPA proposed action, but current excess capacity at existing waste disposal facilities should be able to handle any increase. Any service base expansion in the cumulative case would be limited, would occur on lands designated for such purposes, and would have minimal effects on land use and infrastructure. However, in the cumulative case it is possible that Port Fourchon expansions may eventually be constrained by surrounding wetlands. Based on the available information and current BOEM scenario projections, the cumulative impacts on land use and coastal infrastructure from OCS-related activities are expected to be minor. Therefore, the incremental contribution of an EPA proposed action to the cumulative impacts on land use and coastal infrastructure are also expected to be minor.

Demographics (Chapter 4.1.1.22.2)

An EPA proposed action is projected to minimally affect the demography of the analysis area. Population impacts from an EPA proposed action are projected to be minimal for any economic impact area (EIA) in the Gulf of Mexico region. The baseline population patterns and distributions are expected to remain virtually unchanged as a result of an EPA proposed action.

Accidental events associated with an EPA proposed action, such as oil or chemical spills, blowouts, and vessel collisions, would likely have minimal effects on the demographic characteristics of the Gulf coastal communities. This is because accidental events typically cause only short-term population movements as individuals seek employment related to the event or have their existing employment displaced during the event. This is particularly true given the low likelihood of spills arising from an EPA proposed action.

An EPA proposed action will contribute to the demographic impacts of the overall OCS program, as well as to broader demographic trends that exist along the Gulf Coast. The demographic impacts of the OCS Program are estimated using the mathematical model MAG-PLAN. The broader demographic trends that exist along the Gulf Coast are based on Woods & Poole Economics, Inc. (2011). Given the small scale of EPA activities, an EPA proposed action's impacts on the demography of the Gulf Coast are expected to be minimal.

Economic Factors (Chapter 4.1.1.22.3)

Should an EPA proposed action occur, there would be minimal economic changes in the Texas, Louisiana, Mississippi, Alabama, and Florida economic impact areas (EIA's). The employment impacts that would occur would primarily be felt in Texas (primarily in the EIA TX-3) and in the coastal areas of

Louisiana. An EPA proposed action, irrespective of whether one analyzes the high-case or low-case production scenario, would not cause employment effects >0.1 percent in any EIA along the Gulf Coast.

An oil spill can cause a number of disruptions to local economies. A number of these effects are due to impacts on industries that depend on damaged resources. However, the impacts of an oil spill may be somewhat broader if firms further along industry supply chains are affected. These effects depend on issues such as the effects of cleanup operations and the responses of policymakers to a spill. However, the impacts of small- to medium-sized spills should be localized and temporary. A catastrophic spill along the lines of the *Deepwater Horizon* oil spill would have more noticeable impacts to the economy (**Appendix B**). However, the likelihood of another spill of this scale is quite low.

The cumulative impacts of an EPA proposed action would be determined by the expected path of the economy and by the expected progression of the OCS industry in upcoming years. The expected path of the overall economy is projected using the data provided by Woods & Poole Economics, Inc. (2011). The expected economic impacts of the OCS industry in upcoming years are estimated using the mathematical model MAG-PLAN. The overall OCS industry comprises a modest percentage of the economies of most EIA's. The cumulative impacts of an EPA proposed action should also be viewed in light of the risks of oil spills from the broader OCS Program and in light of the risks of hurricanes. The cumulative impacts of an EPA proposed action to the economies along the Gulf Coast are expected to be fairly small, primarily due to the small scale of an EPA proposed action.

Environmental Justice (Chapter 4.1.1.22.4)

Because of the existing extensive and widespread support system for OCS-related industry and associated labor force, the effects of an EPA proposed action are expected to be widely distributed and to have little impact. This is because a proposed action is not expected to significantly change most of the existing conditions, such as traffic or the amount of infrastructure. Where such change might occur is impossible to predict but, in any case, it would be very limited. Because of Louisiana's extensive oil-related support system, that State is likely to experience more employment effects related to an EPA proposed action than are the other coastal states, and because of the concentration of this system in Lafourche Parish, the parish is likely to experience the greatest benefits from employment benefits and burdens from traffic and infrastructure demand. Impacts related to an EPA proposed action are expected to be economic and to have a limited but positive effect on low-income and minority populations because an EPA proposed action would contribute to the sustainability of current industry and related support services. Given the existing distribution of current OCS-related infrastructure in relationship to concentrations of minority and low-income peoples, an EPA proposed action is not expected to have a disproportionate effect on these populations. An EPA proposed action is not expected to have disproportionate high/adverse environmental or health effects on minority or low-income people.

Chemical and drilling-fluid spills may be associated with exploration, production, or transportation activities that result from an EPA proposed action. Low-income and minority populations might be more sensitive to oil spills in coastal waters than the general population because of their dietary reliance on wild coastal resources, their reliance on these resources for other subsistence purposes such as sharing and bartering, their limited flexibility in substituting wild resources with purchased ones, and their likelihood of participating in cleanup efforts and other mitigating activities. With the exception of a catastrophic accidental event, such as the *Deepwater Horizon* explosion and oil spill, the impacts of oil spills, vessel collisions, and chemical/drilling-fluid spills are not likely to be of sufficient duration to have adverse and disproportionate, long-term effects for low-income and minority communities in the proposed lease sale area.

For the reasons set forth in the analysis, the kinds of accidental events (smaller, shorter time scale) that are likely to result from an EPA proposed action may affect low-income and/or minority populations more than the general population, at least in the short term. These higher risk groups may lack the financial or social resources and may be more sensitive and less equipped to cope with the disruption these events pose. These smaller events, however, are not likely to significantly affect minority and low-income communities in the long term. Detailed analysis of a high-impact, low-probability catastrophic event such as the *Deepwater Horizon* explosion and oil spill is provided in **Appendix B**.

The cumulative impacts of an EPA proposed action would occur within the context of other impact-producing factors on environmental justice, including (1) proposed actions and the OCS Program, (2) State oil and gas activity, (3) existing infrastructure associated with petrochemical processing including refineries and polyvinyl plants, (4) existing waste facilities including landfill, (5) coastal erosion/subsidence, (6) hurricanes, and (7) the lingering impacts of the *Deepwater Horizon* explosion, oil spill, and response.

Because of the presence of an extensive and widespread support system for the OCS and associated labor force, the effects of the cumulative case are expected to be widely distributed and, except in Louisiana, little felt. In general, the cumulative effects of the OCS Program are expected to be economic and to have a limited but positive effect on low-income and minority populations. In Louisiana, these positive economic effects are expected to be greater. In general, who would be hired and where new infrastructure might be located is impossible to predict. Given the existing distribution of the OCS-related industry and the limited concentrations of minority and low-income peoples, the cumulative OCS Program would not have a disproportionate effect on these populations. Lafourche Parish would experience the most concentrated effects of cumulative impacts. These groups are not expected to be differentially affected because Lafourche Parish is not heavily low-income or minority and because the effects of road traffic and port expansion would not occur in areas of low-income or minority concentration.

To summarize, an EPA proposed action is not expected to have disproportionate high/adverse environmental or health effects on minority or low-income people, and in the GOM coastal area, the contribution of an EPA proposed action and the OCS Program to the cumulative effects of all activities and trends affecting environmental justice issues over the next 40 years is expected to be negligible to minor. The cumulative effects would be concentrated in coastal areas, and particularly in Louisiana. Most OCS Program effects are expected to be in the areas of job creation and the stimulation of the economy, and they are expected to make a positive contribution to economic justice. The contribution of the cumulative OCS Program to the cumulative impacts of all factors affecting environmental justice is expected to be minor; therefore, the incremental contribution of an EPA proposed action to the cumulative impacts would also be minor. State offshore leasing programs in Alabama and Louisiana have similar, although more limited effects, due to their smaller scale. Cumulative effects from onshore infrastructure, including waste facilities, is also expected to be minor because existing infrastructure is regulated, because little new infrastructure is expected to result in the cumulative case, and because any new infrastructure would be subject to relevant permitting requirements. Coastal landloss/subsidence, hurricanes, and global warming all raise environmental justice issues, as do the potential long-term effects of the *Deepwater Horizon* explosion, oil spill, and response. The cumulative consequences to environmental justice cannot be determined at this time. Nevertheless, a single OCS lease sale added to existing State and Federal leasing programs and the associated onshore infrastructure would make only minor contributions to these cumulative effects.

Species Considered due to U.S. Fish and Wildlife Service Concerns (Chapter 4.1.1.23)

Because of the mitigations that may be implemented, routine activities (e.g., operational discharges, noise, and marine debris) related to an EPA proposed action are not expected to have long-term adverse effects on the size and productivity of any of these species (i.e., Florida salt marsh vole, American crocodile, aboriginal prickly-apple, and Cape Sable thoroughwort) or populations in the Gulf of Mexico. Lethal effects could occur from ingestion of accidentally released plastic materials from OCS vessels and facilities. However, there have been no reports to date on such incidences. BOEM employs several measures (e.g., marine debris mitigations) to reduce the potential impacts to any animal from routine activities associated with an EPA proposed action. Accidental blowouts, oil spills, and spill-response activities resulting from an EPA proposed action have the potential to impact small to large areas in the GOM, depending on the magnitude and frequency of accidents, the ability to respond to accidents, the location and date of accidents, and various meteorological and hydrological factors (including tropical storms). The incremental contribution of an EPA proposed action would not be likely to result in a significant incremental impact on the species considered due to FWS concerns within the EPA; in comparison, non-OCS-related activities, such as habitat loss and competition, have historically proved to be a greater threat to the species considered due to FWS concerns.

In conclusion, within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting the population of the species considered due to

FWS concerns; therefore, an EPA proposed action would be expected to have little or no effect on these species.

2.3.1.3. Mitigating Measures

At the lease sale stage, BOEM may employ mitigating measures to potential OCS oil and activities, primarily through lease stipulations. Application of lease stipulations will be considered by the ASLM. The inclusion of the stipulations as part of the analysis of an EPA proposed action does not ensure that the ASLM will make a decision to apply the stipulations to leases that may result from a proposed EPA lease sale nor does it preclude minor modifications in wording during subsequent steps in the prelease process if comments indicate changes are necessary or if conditions warrant. Any stipulations or mitigation requirements to be included in a proposed EPA lease sale will be described in the Final Notice of Sale. Mitigation measures in the form of lease stipulations are added to the lease terms and are therefore enforceable as part of the lease.

2.3.1.3.1. Protected Species Stipulation

The Protected Species Stipulation has been applied to all blocks leased in the Gulf of Mexico since 2001. This stipulation was developed in consultation with the Department of Commerce, the National Oceanic and Atmospheric Administration's NMFS, and the Department of the Interior's FWS in accordance with Section 7 of the Endangered Species Act, and it is designed to minimize or avoid potential adverse impacts to federally protected species.

Effectiveness of the Lease Stipulation

The Protected Species Stipulation has been used on leases since 2001, and the resource agencies with the primary responsibility for the protection of the species helped to create it. The stipulation minimizes certain activities and stops others when those actions have the potential to impact marine mammals or sea turtles. These avoidance criteria provide protection by ensuring the animals remain a safe distance from the operations or the activity ceases.

2.3.1.3.2. Military Areas Stipulation

The Military Areas Stipulation has been applied to all blocks leased in military areas since 1977 and reduces or avoids potential conflicts of use and impacts, particularly in regards to safety; but, it does not reduce or eliminate the actual physical presence of oil and gas operations in areas where military operations are conducted. The stipulation contains a "hold harmless" clause (holding the U.S. Government harmless in case of an accident involving military operations) and requires lessees to coordinate their activities with appropriate local military contacts. **Figure 2-1** shows the military warning areas in the Gulf of Mexico.

Effectiveness of the Lease Stipulation

The hold harmless section of the military stipulation serves to protect the U.S. Government from liability in the event of an accident involving the lessee and military activities. The actual operations of the military and the lessee and its agents will not be affected.

The electromagnetic emissions section of the stipulation requires the lessee and its agents to reduce and curtail the use of radio, CB, or other equipment emitting electromagnetic energy within some areas. This serves to reduce the impact of oil and gas activity on the communications of military missions and reduces the possible effects of electromagnetic energy transmissions on missile testing, tracking, and detonation.

The operational section requires notification to the military of oil and gas activity to take place within a military use area. This allows the base commander to plan military missions and maneuvers that will avoid the areas where oil and gas activities are taking place or to schedule around these activities. Prior notification helps reduce the potential impacts associated with vessels and helicopters traveling unannounced through areas where military activities are underway.

This stipulation reduces potential impacts, particularly in regards to safety, but it does not reduce or eliminate the actual physical presence of oil and gas operations in areas where military operations are conducted. The reduction in potential impacts resulting from this stipulation make multiple-use conflicts most unlikely. Without the stipulation, some potential conflict is likely. The best indicator of the overall effectiveness of the stipulation may be that there has never been an accident involving a conflict between military operations and oil and gas activities.

2.3.1.3.3. Evacuation Stipulation

The Evacuation Stipulation has been included on all blocks leased in this area since 2001. The Evacuation Stipulation is designed to protect the lives and welfare of offshore oil and gas personnel. Oil and gas activities have the potential to occasionally interfere with specific requirements and operating parameters for the lessee's activities in accordance with the military stipulation clauses contained herein. If it is determined that the operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize the national defense or to pose unacceptable risks to life and property, then a temporary suspension of operations and the evacuation of personnel may be necessary.

Effectiveness of the Lease Stipulation

This stipulation would provide for the evacuation of personnel and the shut-in of operations during any events conducted by the military that could pose a danger to ongoing oil and gas operations. It is expected that the invocation of these evacuation requirements will be extremely rare.

It is expected that these measures will serve to eliminate dangerous conflicts between oil and gas operations and military operations. Continued close coordination between BSEE and the military may result in improvements in the wording and implementation of this stipulation.

2.3.1.3.4. Coordination Stipulation

The Coordination Stipulation has been included on all blocks leased in this area since 2001. The Coordination Stipulation is designed to increase communication and cooperation between military authorities and offshore oil and gas operators. Specific requirements and operating parameters are established for the lessee's activities in accordance with the military stipulation clauses. For instance, if it is determined that the operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize the national defense or to pose unacceptable risks to life and property, then certain measures become activated and the oil and gas operations may be curtailed in the interest of national defense.

Effectiveness of the Lease Stipulation

This stipulation would provide for the review of pending oil and gas operations by military authorities and could result in delaying oil and gas operations if military activities have been scheduled in the area that may put the oil and gas operations and personnel at risk.

2.3.2. Alternative B—No Action

2.3.2.1. Description

Alternative B is the cancellation of a proposed EPA lease sale. If this alternative is chosen, the opportunity for development of the estimated 0-0.071 BBO and 0-0.162 Tcf of gas that could have resulted from a proposed EPA lease sale would be precluded or postponed. Any potential environmental impacts resulting from a proposed EPA lease sale would not occur or would be postponed to a future lease sale decision. This is also analyzed in the EIS for the Five-Year Program on a nationwide programmatic level.

2.3.2.2. Summary of Impacts

Canceling a proposed EPA lease sale would eliminate the effects described for Alternative A (**Chapter 4.1**). The incremental contribution of a proposed lease sale to the cumulative effects would also be avoided, but effects from other activities, including other OCS lease sales, would remain.

If a single proposed EPA lease sale (e.g., Lease Sale 225) would be canceled, under the OCS Lands Act BOEM would be required to consider any proposed lease sales remaining in the current Five-Year Program, if applicable, or proposed as part of a future Five-Year Program. Therefore, a decision to cancel one lease sale will not alter future decision points for lease sales in the EPA, as required by OCSLA. The decision point is at the individual proposed action or lease sale stage. Selection of the No Action alternative for a single proposed action, i.e., proposed Lease Sale 225, would result in avoiding the drilling of 3-12 exploration wells, the drilling of up to 17 development and production wells, the installation of up to 82 km (51 mi) of pipeline, 144-17,000 service-vessel trips, up to 27 helicopter trips, and the recovery of 0-0.071 BBO and 0-0.162 Tcf of gas over a 40-year period. By selecting the No Action alternative those potential impacts related to proposed Lease Sale 225 would be avoided; however, please be advised that a decision to cancel a single proposed lease sale would not preclude activity related to past lease sales nor decisions on future lease sales. There are a number of currently leased blocks within the proposed lease sale area with proposed plans, and BOEM anticipates another decision point for the next proposed lease sale (e.g., proposed Lease Sale 226) in 2016, which is proposed as part of the current Five-Year Program. Should the No Action alternative be selected, in the interim, industry may explore and develop their existing portfolio of lease holds subject to the terms of those leases and any conditions of approval for plans or permits. Individual or a series of decisions on lease sales in a given planning area may influence industry's decisionmaking or strategy to develop existing leases. In this context, the No Action alternative does not explicitly presume an identical proposal or one only delayed into the future. As noted above, under the OCS Lands Act, BOEM would be required to consider any proposed lease sales remaining in the current Five-Year Program, if applicable, or proposed as part of a future Five-Year Program. As such, each lease sale will have its own decision point.

The cancellation of a proposed EPA lease sale would not significantly change the environmental impacts of overall OCS activity. However, the cancellation of a proposed EPA lease sale may result in direct economic impacts to the individual companies. Revenues collected by the Federal Government (and thus revenue disbursements to the States) would be adversely affected also.

Other sources of energy may substitute for the lost production. Principal substitutes would be additional imports, conservation, additional domestic production, and switching to other fuels. These alternatives, except conservation, have negative environmental impacts of their own. In particular, import tankering of alternative supplies of oil and gas increases the potential risk for oil spills in the Gulf of Mexico.

CHAPTER 3

IMPACT-PRODUCING FACTORS AND SCENARIO

3. IMPACT-PRODUCING FACTORS AND SCENARIO

3.1. IMPACT-PRODUCING FACTORS AND SCENARIO—ROUTINE OPERATIONS

3.1.1. Offshore Impact-Producing Factors and Scenario

This section describes the offshore infrastructure and activities (impact-producing factors) associated with an EPA proposed action (i.e., a typical lease sale) within the EPA that could potentially affect the biological, physical, and socioeconomic resources of the Gulf of Mexico. In addition, this section describes the OCS Program's cumulative activity scenario resulting from past and future lease sales in the WPA, CPA, and EPA that could potentially affect biological, physical, and socioeconomic resources within the GOM. Note that offshore and onshore impact-producing factors and scenarios associated with WPA and CPA proposed actions, i.e., typical lease sales that would result from the proposed actions within the WPA and CPA, as well as OCS Program activity resulting from past and future leases sales in the WPA and CPA, have been disclosed in the 2012-2017 WPA/CPA Multisale EIS.

Offshore is defined here as the OCS portion of the GOM that begins 10 mi (16 km) offshore Florida; 3 nmi (3.45 mi; 5.56 km) offshore Louisiana, Mississippi, and Alabama; and 3 marine leagues (9 nmi; 10.36 mi; 16.67 km) offshore Texas. The OCS extends seaward to the limits of the United States' jurisdiction over the continental shelf in water depths up to approximately 3,346 m (10,978 ft), which comprises the Exclusive Economic Zone (**Figure 1-1**). Coastal infrastructure and activities associated with an EPA proposed action are described in **Chapter 3.1.2**.

Offshore activities are described in the context of scenarios for a proposed action and for the OCS Program within the EPA. BOEM's Gulf of Mexico OCS Region developed these scenarios to provide a framework for detailed analyses of potential impacts of a proposed lease sale. Each scenario is a hypothetical framework of assumptions based on estimated amounts, timing, and general locations of OCS exploration, development, and production activities and facilities, both offshore and onshore. Each proposed action (a typical lease sale) is represented by a set of ranges for resource estimates, projected exploration and development activities, and impact-producing factors, and it is expected to be within the scenario ranges. The scenarios do not predict future oil and gas activities with absolute certainty, even though they were formulated using historical information and current trends in the oil and gas industry. Indeed, these scenarios are only approximate since future factors such as the contemporary economic marketplace, the availability of support facilities, and pipeline capacities are all unknowns. Notwithstanding these unpredictable factors, the scenarios used in this EIS represent the best assumptions and estimates of a set of future conditions that are considered reasonably foreseeable and suitable for presale impact analyses. The development scenarios do not represent BOEM's recommendation, preference, or endorsement of any level of leasing or offshore operations, nor the types, numbers, and/or locations of any onshore operations or facilities.

BOEM projects that the overwhelming majority of the oil and natural gas fields discovered as a result of an EPA proposed action will reach the end of their economic life within a time span of 40 years following a lease sale. Therefore, activity levels are not projected beyond 40 years for this document. Although unusual cases exist where activity on a lease may continue beyond 40 years, BOEM's forecasts indicate that most significant activities associated with exploration, development, production, and abandonment of leases in the GOM occur well within the 40-year analysis period. For the cumulative case analysis, total OCS Program exploration and development activities are also forecast over a 40-year period. For modeling purposes and quantitative OCS Program activity analyses, a 40-year analysis period is also used. Exploration and development activity forecasts become increasingly more uncertain as the length of time of the forecast increases and the number of influencing factors increases.

BOEM uses a series of spreadsheet-based, data analyses tools to develop the forecasts of oil and gas exploration, discovery, development, and production activity for a proposed action and OCS Program scenarios presented in this EIS. Our analyses incorporate all relevant historical activity and infrastructure data, and our resulting forecasts are analyzed and compared with actual historical data to ensure that historical precedent and recent trends are reflected in each activity forecast.

BOEM is confident that our analysis methodology, with adjustments and refinements based on recent activity levels, adequately project Gulf of Mexico OCS activities in both the short term and the long term for the EIS analyses.

The EPA proposed action and the Gulfwide OCS Program scenarios are based on the following factors:

- resource estimates developed by BOEM;
- recent trends in the amount and location of leasing, exploration, and development activity;
- estimates of undiscovered, unleased, economically recoverable oil and gas resources in each water-depth category and each planning area;
- existing offshore and onshore oil and/or gas infrastructure;
- published data and information;
- industry information; and
- oil and gas technologies, and the economic considerations and environmental constraints of these technologies.

The proposed lease sales under the proposed 2012-2017 Five-Year Program within the Gulf of Mexico OCS are EPA Lease Sales 225 and 226; WPA Lease Sales 229, 233, 238, 246, and 248; and CPA Lease Sales 227, 231, 235, 241, and 247. In general, a proposed lease sale in the proposed EPA lease sale area represents less than 1 percent of the total resource estimates in the Gulfwide OCS Program, but it represents 34 percent of the resource estimates in the proposed EPA lease sale area alone based on barrels of oil equivalent. In the WPA, a typical lease sale represents 1 percent of the total Gulfwide OCS Program and 4-5 percent of the OCS Program in the WPA based on barrels of oil equivalent resource estimates. In the CPA, a typical lease sale represents 3 percent of the total Gulfwide OCS Program and 3-4 percent of the OCS Program in the CPA based on barrels of oil equivalent resource estimates.

Specific projections of activities associated with an EPA proposed action (a typical lease sale) are discussed in the following scenario sections. The potential impacts of the projected activities associated with a proposed "typical" lease sale are considered in the environmental analysis section (**Chapter 4.1.1**).

The OCS Program scenario includes all activities that are projected to occur from past, proposed, and future lease sales during the analysis period. This includes projected activity from lease sales that have been held, including the most recent EPA Lease Sale 224 (March 2008), but for which exploration or development has either not yet begun or is continuing. Activities that take place beyond the analysis timeframe as a result of future lease sales are not included in this analysis. The impacts of activities associated with the OCS Program on biological, physical, and socioeconomic resources are analyzed in the cumulative environmental analysis sections (**Chapter 4.1.1**).

3.1.1.1. Resource Estimates and Timetables

3.1.1.1.1. Proposed Action

The proposed action scenario is used to assess the potential impacts of a proposed typical lease sale. The resource estimates for an EPA proposed action are based on two factors: (1) the conditional estimates of undiscovered, unleased, conventionally recoverable oil and gas resources in the proposed lease sale area; and (2) estimates of the portion or percentage of these resources assumed to be leased, discovered, developed, and produced as a result of an EPA proposed action. Due to the inherent uncertainties associated with an assessment of undiscovered resources, probabilistic techniques were employed and the results were reported as a range of values corresponding to different probabilities of occurrence. The estimates of the portion of the resources assumed to be leased, discovered, developed, and produced as a result of an EPA proposed action are based upon logical sequences of events that incorporate past experience, current conditions, and foreseeable development strategies. A number of historical databases and information derived from oil and gas exploration and development activities are available to BOEM and were used extensively in the development of these scenarios. The undiscovered, unleased, conventionally recoverable resource estimates for a proposed action are expressed as ranges, from low to high. This range provides a reasonable expectation of anticipated oil and gas production from a typical lease sale held as a result of a proposed action based on an actual range of historic observations.

Table 3-1 presents the projected oil and gas production for an EPA proposed action and for the OCS Program. **Table 3-2** provides a summary of the major scenario elements of an EPA proposed action, a typical lease sale, and some of the related impact-producing factors. To analyze impact-producing factors for an EPA proposed action and the OCS Program, the proposed lease sale area was divided into an offshore subarea based upon ranges in water depth. **Figure 3-1** depicts the location of the offshore subareas. The water-depth range reflects the technological requirements and related physical and economic impacts as a consequence of the oil and gas potential, exploration and development activities, and lease terms unique to each water-depth range. Estimates of resources and facilities are distributed into each of the subareas.

Proposed Action Scenario (EPA Typical Lease Sale): The estimated amounts of resources projected to be leased, discovered, developed, and produced as a result of a typical proposed EPA lease sale are 0-0.071 BBO and 0-0.162 Tcf of gas. The impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA proposed lease sales have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

The numbers of exploration and delineation wells, production platforms, and development wells projected to develop and produce the estimated resources for an EPA proposed action are given in **Table 3-2**. This table shows the distribution of these factors by the offshore subarea in the proposed lease sale area. **Table 3-2** also includes estimates of the major impact-producing factors related to the projected levels of exploration, development, and production activity.

EPA Cumulative Scenario: Projected reserve/resource production for the OCS Program in the EPA (0-0.211 BBO and 0-0.502 Tcf of gas) represents anticipated production from lands currently under lease in the EPA plus anticipated production from future EPA lease sales over the 40-year analysis period. Projected production represents approximately less than 1 percent of the oil and gas of the total Gulfwide OCS Program. **Table 3-3** presents projections of the major activities and impact-producing factors related to future cumulative OCS Program activities in the EPA. The impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

Exploratory drilling activity typically takes place over an 8-year period, beginning within 1 year after the lease sale. Development activity takes place over a 39-year period, beginning with the installation of the first production platform and ending with the drilling of the last development wells. Production of oil and gas begins by the third year after the lease sale and to the 40th year (and in some limited cases beyond).

3.1.1.1.2. OCS Program

OCS Program Cumulative Scenario (EPA, WPA, and CPA): Projected reserve/resource production for the OCS Program is 18.335-25.640 BBO and 75.886-111.627 Tcf of gas and represents anticipated production from lands currently under lease plus anticipated production from future lease sales over the 40-year analysis period. The OCS Program cumulative scenario includes WPA, CPA, and EPA production estimates. **Table 3-4** presents all anticipated production from lands currently under lease in the WPA, CPA, and EPA plus all anticipated production from future total OCS Program (EPA, WPA, and CPA) lease sales over the 40-year analysis period.

EPA Cumulative Scenario: Projected reserve/resource production for the OCS Program in the EPA (0-0.211 BBO and 0-0.502 Tcf of gas) represents all anticipated production from lands currently under lease in the EPA plus all anticipated production from future EPA lease sales over the 40-year analysis period. Projected production represents approximately less than 1 percent of the oil and gas of the total Gulfwide OCS Program. **Table 3-3** presents projections of the major activities and impact-producing factors related to future cumulative OCS Program activities in the EPA.

WPA Cumulative Scenario: Projected reserve/resource production for the OCS Program in the WPA (2.510-3.696 BBO and 12.539-18.434 Tcf of gas) represents all anticipated production from lands currently under lease in the WPA plus all anticipated production from future WPA lease sales over the 40-year analysis period. Projected production represents approximately 14 percent of the oil and 17 percent of the gas of the total Gulfwide OCS Program. The impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

CPA Cumulative Scenario: Projected reserve/resource production for the OCS Program in the CPA (15.825-21.733 BBO and 63.347-92.691 Tcf of gas) represents all anticipated production from lands currently under lease in the CPA plus all anticipated production from future CPA lease sales over the 40-year analysis period. Projected production represents approximately 85-86 percent of the oil and 83 percent of the gas of the total Gulfwide OCS Program. The impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.1.2. Exploration and Delineation

3.1.1.2.1. Seismic Surveying Operations

Prelease surveys are comprised of seismic work performed on or off leased areas, focused most commonly (but not always) on deeper targets and collectively authorized under BOEM's geological and geophysical permitting process. Typical prelease seismic surveying operations for exploring deep geologic formations are 2D or 3D. Prelease surveys provide beneficial information that help both BOEM and potential bidders determine the economic value of the lease. Postlease, high-resolution seismic surveys collect data on surficial or near-surface geology used to identify potential shallow geologic hazards for engineering and site planning for bottom-founded structures. These surveys are also used to identify environmental resources such as chemosynthetic community habitat, gas hydrates, buried channels and faults, and archaeological resources. Postlease, high-resolution surveys are conducted as authorized under the terms and conditions of the lease agreement (refer to BOEM's regulations at 30 CFR § 550.207). Other postlease surveys include downhole seismic surveying (vertical seismic profiling [VSP]) and deep-focused, 3D surveying with a time component (4D surveys) used to monitor movement and exploitation of gas and fluids in underground reservoirs.

All seismic surveying constitutes a type of remote sensing. During a 2D or 3D survey, a tow vessel pulls an array of airguns and streamers (acoustic receiver cable) behind the vessel 5-10 m (16-33 ft) below the sea surface. Ocean-bottom receiver cables or autonomous nodes may be deployed instead of streamers in shallow water or in areas of dense infrastructure, or when 4D seismic is used postlease to aid in reservoir management. This methodology utilizes hydrophones placed statically on the seafloor. The energy source (airgun arrays) remains the same as those used in streamer methods and is towed behind a source vessel. The airgun array produces a burst of underwater sound by releasing compressed air into the water column, creating an acoustical energy pulse, the echoes of which are detected by hydrophones towed on streamers behind the vessel. Streamer arrays are 3-8 mi (5-12 km) long, depending on survey specifications. Tow vessel speed is typically 3-5 knots (kn) (about 4-6 miles per hour [mph]) with gear deployed.

The 3D surveys conducted by seismic contractors can consist of a few OCS blocks to several hundred OCS blocks. For a typical 3D survey, air in a closed chamber of the airgun is quickly discharged through a port, creating a pressure pulse and air bubble in the water. To release more energy into the pressure pulse and to offset the deleterious effects of bubble oscillations on the pressure pulse, multiple airguns with various chamber sizes are used. These individual airgun chamber sizes vary from 20 to 380 cubic inches (327 to 6,227 cubic centimeters). In some cases, two or three airguns are placed in a cluster to increase the effective chamber size. The individual airguns are suspended in the water from a float system referred to as a sub-array. Each sub-array contains six or seven individual airguns spaced from 2.5 to 3 m (7.5 to 10 ft) apart, making the total sub-array length 14-17 m (46-56 ft) long. Typically, three (sometimes four) sub-arrays are combined to form an array. When three sub-array elements are used, the spacing is 8 m (26 ft) between sub-arrays; when four sub-arrays are used, the spacing is 12 m (39 ft). Thus, the overall width of the array is generally 16-36 m (52-118 ft). The array is towed at an approximate depth of 5-7 m (16-23 ft) below the water surface. Newer acquisition technology involves employing multiple vessels towing airgun arrays as acoustic sources with several of the source vessels also towing streamers (receivers). Multiple source and multiple-streamer technologies are often used for 3D seismic surveys. These surveys are called wide azimuth (WAZ) or coil full azimuth (FAZ) surveys, depending on their acquisitional geometry, and they are typically employed for better subsalt imaging. These 3D WAZ and FAZ surveys increase the illumination of many subsurface areas by increasing their azimuthal data collection and employ the longer offset between source and receiver to better image under otherwise opaque features, such as salt structures. The 3D coil (FAZ) surveys are a navigational variation of WAZ surveys and are acquired in a spiral fashion that allows for a longer acoustical distance between source and receivers.

A 4D (a 3D time-lapse) survey is used to monitor how a reservoir changes after exploitation. It is collected to optimize the amount of hydrocarbon recovered from a reservoir by identifying changes that have occurred in that reservoir after initial production. These surveys are collected using the same acquisition and receiving parameters to highlight what changes have occurred over time.

The VSP is usually done by placing a receiver down a wellbore at different depths and with an external acoustic source near the wellbore (zero-offset VSP) or on a vessel at different distances from the wellbore (called a walk-away VSP or 3D VSP). These surveys are used to obtain information about the nature of the seismic signal, as well as more information about the geology surrounding the vertical array of sensors at varying depths within the wellbore. The VSP data can be cross-correlated with ship-towed seismic survey datasets to refine identification of lithologic changes and the content of formation fluids. Zero offset and walk-away VSP surveys are by far and away the most common VSP surveys conducted in the Gulf of Mexico.

Ocean-Bottom Surveys

Ocean-bottom cable surveys were originally designed to enable seismic surveys in congested geographical areas, such as producing fields, with their many platforms and producing facilities. Autonomous nodes, deployed and retrieved by either cable or remotely operated vehicles (ROV’s), are now used as an alternative to cables. The ocean-bottom cable/nodal surveys have been found to be useful for obtaining 4-component data or multicomponent (i.e., seismic pressure, vertical, and the two horizontal motions of the water bottom, or seafloor) information.

The ocean-bottom cable surveys and autonomous nodal acquisition require the use of multiple ships (i.e., usually two ships for cable or node layout/pickup, one ship for recording, one ship for shooting, and two utility boats). These ships are generally smaller than those used in streamer operations, and the utility boats can be very small. Operations are conducted “around the clock” and begin by dropping the cables off the back of the layout boat or by individual deployment of the nodal receivers by ROV’s. Cable length or the numbers of nodes depend upon the survey demands; it is typically 2.6 mi (4.2 km) but can be up to 7.5 mi (12 km). However, depending on spacing and survey size, hundreds of nodes can be deployed and re-deployed over the span of the survey. Groups of seismic detectors, usually hydrophones and vertical motion geophones, are attached to the cable in intervals of 82-164 ft (25-50 m), or autonomous nodes are spaced similarly. Multiple cables/nodes are laid parallel to each other using this layout method, with a 164-ft (50-m) interval between cables/nodes. Typically, dual airgun arrays are used on a single source vessel. When the cable or nodes are in place, a ship towing an airgun array (which is the same airgun array used for streamer work) passes between the cables/nodes, firing every 82 ft (25 m). Sometimes a faster source ship speed of 7 mph (6 kn), instead of the normal speed of 5.2 mph (4.5 kn), is used with a decrease in time between gun firings. After a source line is shot, the source ship takes about 10-15 minutes to turn around and pass down between the next two cables or line of nodes. When a cable/node is no longer needed to record seismic data, it is picked up by the cable pickup ship and is moved over to the next position where it is needed. The nodes are retrieved by an ROV. A particular cable/node can lay on the bottom anywhere from 2 hours to several days, depending on operation conditions. Normally, a cable will be left in place about 24 hours. However, nodes may remain in place until the survey is completed or recovered and then re-deployed by an ROV.

Location of the cables/nodes on the bottom is done by acoustic pingers located at the detector groups and by using the time of first arrival of the seismic pulse at the detector group. A detector group is a node or group of nodes that enable the seismic ship to accurately determine node location. To obtain more accurate first arrival times, the seismic data are recorded with less electronic filtering than is normally used. This detailed location is combined with normal global positioning system (GPS) navigational data collected on the source ship. In deep water, the process of accurately locating bottom cables/nodes is more difficult because of the effects of irregular water bottoms and the thermal layers, which affect travel times and travel paths, thus causing positioning errors.

As part of the environmental impact analysis required with the exploration plan, (EP), development operations coordination document (DOCD), or development and production plan (DPP), 30 CFR §

550.227(b)(6) and 30 CFR § 550.261(b)(6) require the applicant to submit archaeological information. In certain circumstances, BOEM's Regional Director may require the preparation of an archaeological report to accompany the EP, DOCD, or DPP under 30 CFR § 550.194. The requirements for archaeological reports are clarified in NTL's 2005-G07 and 2011-JOINT-G01, "Archaeological Resource Surveys and Reports" and "The Revisions to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports," respectively. If the archaeological report, where required, indicates that an archaeological resource may be present, the lessee must either locate the site of any operation so as not to adversely affect the area where the archaeological resource may be, demonstrate that an archaeological resource does not exist, or demonstrate that archaeological resources will not be adversely affected by operations. If the lessee discovers any archaeological resource while conducting approved operations, operations must be immediately stopped and the discovery reported to BOEM's Regional Supervisor, Office of Environment, within 48 hours of its discovery.

EPA Proposed Action Scenario (Typical Lease Sale): Because of the cyclic nature in the acquisition of seismic surveys, a prelease seismic survey would be attributable to lease sales held up to 7-9 years after the survey was completed. Based on an amalgam of historical trends in G&G permitting and industry input, BOEM projects that proposed lease sales within the EPA, WPA, and CPA would result in 29,197 OCS blocks surveyed by 2D and 3D deep seismic operations for the years 2012-2017. The breaks down per planning area is as follows: EPA ~583 blocks; CPA ~21,314 blocks; and WPA ~7,300 blocks. (Note that the number of blocks could include multiple surveys on a single block that would then be counted as a unique block survey each time.) For post-lease sale seismic surveys, information obtained from high-resolution seismic contractors operating in the GOM project the proposed actions would result in about 50 vertical seismic profiling (VSP) operations and 629 high-resolution surveys covering approximately 226,400 line miles (364,420 km) of near-surface and shallow penetration seismic for the years 2012-2017.

OCS Program Cumulative Scenario (EPA, WPA, and CPA): Seismic surveys are projected to follow the same trend as exploration activities, which peaked in 2008-2010, steadily decline until 2027, and remain relatively steady throughout the second half of the 40-year analysis period. It is important to note that the cycling of G&G data acquisition is not driven by the 40-year life cycle of productive leasing, but instead it will trend to respond to new production or potential new production driven by new technology. Consequently, some areas will be resurveyed in 2-year cycles, while other areas, considered nonproductive, may not be surveyed for 20 years or more.

Assuming that acoustic-sourced seismic will remain the dominant exploration tool used by industry in the future and that a number of surveyed blocks will be resurveying several more times, BOEM makes the following projections. During the first 5 years of the analysis period, BOEM projects annually there would be 50 VSP operations, 226,400 miles (364,420 km) surveyed by high-resolution seismic, and 29,197 blocks surveyed by deep seismic, including areas that will be resurveyed. Expanding this analysis to the first 20 years, the annual projections would be 60 VSP operations, 400,000 mi (740,800 km) of high-resolution seismic, and 33,000 blocks of 2D/3D deep seismic (10% in the EPA, 60% in the CPA, and 30% in the WPA). During the second half of the 40-year analysis period, it is projected annually there would be ~40 VSP operations, 240,000 mi (444,480 km) surveyed by high-resolution seismic, and 15,000-20,000 blocks surveyed by deep seismic (20% in the EPA, 50% in the CPA, and 30% in the WPA).

3.1.1.2.2. Exploration and Delineation Plans and Drilling

Oil and gas operators use drilling terms that represent stages in the discovery and exploitation of hydrocarbon resources. An exploration well generally refers to the first well drilled on a prospective geologic structure to confirm that a resource exists and to validate how much resource can be expected. If a resource is discovered in quantities that appear economically viable, one or more follow-up delineation wells help define the amount of resource or the extent of the reservoir. Following a discovery, an operator will often temporarily plug and abandon a discovery well to allow time for a development scenario to be generated and for equipment to be built or procured.

In the GOM, exploration and delineation wells are typically drilled with mobile offshore drilling units (MODU's); e.g., jack-up rigs, semisubmersible rigs, submersible, platform rigs, or drill ships. Non-MODU drilling units, such as inland barges, are also used. The type of rig chosen to drill a prospect depends primarily on water depth. Because the water-depth ranges for each type of drilling rig overlap to a degree, other factors such as availability and daily rates play a large role when an operator decides upon the type of rig to contract. The depth ranges for exploration rigs used in this analysis for Gulf of Mexico MODU's are indicated below.

MODU or Drilling Rig Type	Water Depth Range
Jack-up, submersible, and inland barges	≤100 m (328 ft)
Semisubmersible and platform rig	100-3,000 m (328-9,843 ft)
Drillship	≥600 m (1,969 ft)

Historically, drilling rig availability has been a limiting factor for activity in the GOM and is assumed to be a limiting factor for activity projected as a result of a proposed lease sale. Drilling activities may also be constrained by the availability of rig crews, shore-based facilities, risers, and other equipment.

The scenario for a proposed action assumes that an average exploration well will require 30-120 (mean of 60) days to drill. The actual time required for each well depends on a variety of factors, including the depth of the prospect's potential target zone, the complexity of the well design, and the directional offset of the wellbore needed to reach a particular zone. This scenario assumes that the average exploration or delineation well depth will be approximately 4,572-7,010 m (15,000-23,000 ft) below the mudline.

Some delineation wells may be drilled using a sidetrack technique. In sidetracking a well, a portion of the existing wellbore is plugged back to a specific depth, directional drilling equipment is installed, and a new wellbore is drilled to a different geologic location. The lessee may use this technology to better understand their prospect and to plan future wells. Use of this technology may also reduce the time and exploration expenditures needed to help evaluate the prospective horizons on a new prospect.

The cost of an average exploration well can be $40-$150 million or more, without certainty that objectives can be reached. Some recent ultra-deepwater exploration wells (>6,000 ft [1,829 m] water depth) in the GOM have been reported to cost upwards of $200 million. The actual cost for each well depends on a variety of factors, including the depth of the prospect's potential target zone, the complexity of the well design, and the directional offset of the wellbore needed to reach a particular zone.

Figure 3-2 represents a generic well schematic for a relatively shallow exploration well in the deepwater GOM. This well design was abstracted from actual well-casing programs from projects in the Mississippi Canyon and De Soto Canyon OCS leasing areas and from internal BOEM data. A generic well configuration cannot capture all of the possible influences that impact how a well is designed. These influences include (1) unique geologic conditions at a specific well location, (2) directional drilling requirements, (3) potential sidetrack(s), or (4) company preferences. For exploration wells, contingencies (such as anticipated water-flow zones in the formation) must also be considered in the casing program.

The threshold separating shallow-water and deepwater drilling can range from 200 to 457 m (656 to 1,500 ft). For exploration and development, deepwater is defined as water ≥305 m (≥1,000 ft) deep and ultra-deepwater as ≥1,524 (≥5,000 ft) deep. The drilling (spudding) of a deepwater exploration well begins with setting the conductor casing, one of the many sections or strings of casing (steel tube) installed in the wellbore. Each casing section is narrower (of a smaller diameter) than the preceding one, and each change in casing diameter is separated by a "shoe" (**Figure 3-2**). The drillstring (pipe, collar, and bit) drills the wellbore, and the casing is installed at certain depths within the well based on specific engineering and geologic criteria. The first casing set in the sea bottom (or mudline) can be large, approximately 30-40 inches (in) (75-100 centimeters [cm]) in diameter. The larger diameter pipe may be necessary when drilling through salt to reach subsalt objectives because more casing strings may be needed to reach the well's objective. The first string is emplaced by drilling or "jetting" out the unconsolidated sediment with a water jet as the largest casing pipe is set in place. The casing is cemented to the sea bottom and tested. Because the shallow sediments are frequently soft and unconsolidated, the next casing interval (1,000 ft [305 m] or more below mudline) is commonly drilled with treated seawater and without a riser (a steel-jacketed tube that connects the wellhead to the drill rig and within which the drilling mud and cuttings circulate). Drilling mud is generally not used when a riser is included in the system. The formation cuttings are discharged from the wellbore directly to the sea bottom. After the conductor casing is set, a BOP is installed (commonly at the sea bottom), the riser is connected, and circulation for drilling muds and cuttings between the well bit and the surface rig is established.

Next, a repetitive procedure takes place until the well reaches its planned total depth: (1) drill to the next casing point; (2) install the casing; (3) cement the casing; (4) test the integrity of the seal; and (5) drill through the cement shoe and downhole until the next casing point is reached and a narrower casing string is then set. The casing points are determined by downhole formation pressure that is predicted before drilling with seismic wave velocities and by geological information from surrounding wells. As the well deepens, extra lengths of pipe (each about 100 ft [30 m] long) are screwed onto the drill string at the rig floor to extend the length to the cutting bit. As a drill bit wears out from use, it must be replaced. The drilling downtime needed to retrieve the bit and replace it requires the drill string to be disassembled and reassembled. This process is referred to as “tripping” into or out of the hole. “Tripping” will also occur when a casing point is reached. The drill string is removed, the casing is “run” and cemented in the wellbore, the drill string is re-run into the wellbore, and drilling continues. The bottommost portion of a well is commonly left “open” (uncased) when the well reaches its total depth.

As drilling activities occur in progressively deeper waters, operators may consider using MODU’s that have onboard hydrocarbon storage capabilities. This option may be exercised if a well requires extended flow testing, 1-2 weeks or longer, in order to fully evaluate potential producible zones and to justify the higher costs of deepwater development activities. The liquid hydrocarbons resulting from an extended well test could be stored onboard a rig and later transported to shore for processing. Operators may also consider barge shuttling hydrocarbons from test well(s) to shore. There are some dangers inherit with barging operations if adverse weather conditions develop during testing. If operators do not choose to store produced liquid hydrocarbons during the well testing, they must request and receive approval from BSEE to burn test hydrocarbons. The BSEE will only grant permission to flare or vent associated natural gas during well cleanup and for well-testing procedures for a limited period of time.

The BSEE regulations require that operators conduct their offshore operations in a safe manner. Subpart D of BSEE’s regulations (30 CFR part 250) specifies requirements for drilling activities. Refer to **Chapter 1.3.2.1** and Table 1-2 of the 2012-2017 WPA/CPA Multisale EIS, which provide a summary of new safety requirements.

Exploration Plans

The regulation at 30 CFR part 550 subpart B specifies the requirements for the exploration plans (EP’s) that operators must submit to BOEM for approval prior to deploying an exploration program. An EP must be submitted to BOEM for review and decision before any exploration activities, except for ancillary activities, can begin on a lease. The EP describes exploration activities, drilling rig or vessel, proposed drilling and well-testing operations, environmental monitoring plans, oil-spill response plans, and other relevant information, and it includes a proposed schedule of the exploration activities. Guidelines and environmental information requirements for lessees and operators submitting an EP are addressed in 30 CFR § 250.211 and are further explained in NTL 2010-N06, “Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS,” and in NTL 2009-G27, “Submitting Exploration Plans and Development Operations Coordination Documents.” The requirements for shallow-hazard surveys and their reports are clarified in NTL 2008-G05, “Shallow Hazards Program.”

As part of the environment impact analysis required with an EP, DOCD, or DPP, 30 CFR § 550.227(b)(6) and 30 CFR § 550.261(b)(6) require the applicant to submit archaeological information. In certain circumstances, BOEM’s Regional Director may require the preparation of an archaeological report to accompany the EP, DOCD, or DPP, under 30 CFR § 550.194. The requirements for archaeological reports are clarified in NTL’s 2005-G07 and 2011-JOINT-G01, “Archaeological Resource Surveys and Reports” and “Revisions to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports,” respectively. If the archaeological report, where required, indicates that an archaeological resource may be present, the lessee must either locate the site of any operation so as not to adversely affect the area where the archaeological resource may be, demonstrate that an archaeological resource does not exist, or demonstrate that archaeological resources will not be adversely affected by operations. If the lessee discovers any archaeological resource while conducting approved operations, operations must be immediately stopped and the discovery reported to BOEM’s Regional Supervisor, Office of Environment, within 48 hours of its discovery. The BSEE is also provided notice of the discovery if it relates to operations under its jurisdiction.

Tables 3-2, 3-3, and 3-4 show the estimated range of exploration and delineation wells by water-depth range for an EPA typical lease sale, the EPA cumulative case, and the total Gulfwide OCS Program cumulative activities, which includes EPA, WPA, and CPA activities.

EPA Proposed Action Scenario (Typical Lease Sale): BOEM estimates that 3-12 exploration and delineation wells would be drilled as a result of an EPA proposed action (**Table 3-2**).

EPA Cumulative Scenario: BOEM estimates that 10-27 exploration and delineation wells would be drilled as a result of all cumulative OCS Program activities in the EPA (**Table 3-3**).

OCS Program Cumulative Scenario (EPA, WPA, and CPA): BOEM estimates that 6,910-9,827 exploration and delineation wells would be drilled in the EPA, WPA, and CPA as a result of all past OCS Program activity and forecasted activity associated with the 2012-2017 Five-Year Program (**Table 3-4**).

Note that the offshore and onshore impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and are addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.1.3. Development and Production

3.1.1.3.1. Development and Production Drilling

Delineation and production wells are sometimes collectively termed development wells. A development well is designed to extract resources from a known hydrocarbon reservoir. After a discovery, the operator must decide whether or not to complete the well without delay, to delay completion with the rig on station so that additional tests may be conducted, or to temporarily abandon the well site and move the rig off station to a new location and drill another well. Sometimes an operator will decide to drill a series of development wells, move off location, and then return with a rig to complete all the wells at one time. If an exploration well is clearly a dry hole, the operator permanently abandons the well without delay.

When the decision is made to complete the well, a new stage of activity begins. Completing a well involves preparing the well for production. BOEM estimates that approximately 90 percent of development wells would become producing wells. The typical process includes setting and cementing the production casing, installing some downhole production equipment, perforating the casing and surrounding cement, treating the formation, setting a gravel pack (if needed), and installing production tubing. One form of formation treatment is known as “fracking.” Fracking involves pressurizing the well to force chemicals or mechanical agents into the formation. Mechanical agents, such as sand or small microspheres (tiny glass beads), can be used to prop open the created factures that act as conduits to deliver hydrocarbons to the wellbore. Well treatment chemicals are commonly used to improve well productivity. For example, acidizing a reservoir to dissolve cementing agents and improve fluid flow is the most common well treatment in the Gulf of Mexico. After a production test determines the desired production rate to avoid damaging the reservoir, the well is ready to go online and produce.

Development wells may be drilled from movable structures, such as jack-up rigs, fixed bottom-supported structures, floating vertically-moored structures, floating production facilities, and drillships (either anchored or dynamically positioned drilling vessels). The spectrum of these production systems are shown in **Figure 3-3**.

The type of production structure installed at a site depends mainly on water depth, but the total facility lifecycle, the type and quantity of hydrocarbon production expected, the number of wells to be drilled, and the number of anticipated tie backs from other fields can also influence an operator’s procurement decision. The number of wells per structure varies according to the type of production structure used, the prospect size, and the drilling/production strategy deployed for the drilling program and for resource conservation. Production systems can be fixed, floating, or increasingly in deep water, subsea. Advances in the composition of drilling fluids and drilling technology are likely to provide operators with the means to reduce rig costs in the deepwater OCS program.

Until recently, there had been a gradual increase of drilling depth (as measured in true vertical depth [TVD]). Beginning in 1996, the maximum drilling depth increased rapidly, reaching depths below 9,144 m (30,000 ft) in 2002. In 2005, the Transocean *Discoverer Spirit* (Green Canyon Block 512) drilled to a TVD of 10,411 (34,157 ft). The recent dramatic increase in TVD may be attributed to several factors, including enhanced rig capabilities, deeper exploration targets, royalty relief for shallow water, deep gas prospects, and the general trend toward greater water depths.

BOEM has described and characterized production structures in its deepwater reference document (Regg et al., 2000). These descriptions are summarized in **Chapter 3.1.1.3.3.2** and were used in preparing the scenario for this EIS. It is assumed that helipads will be located on 100 percent of the structures in water depths >200 m (656 ft). At water depths >400 m (1,312 ft), platform designs based on rigid attachment to the seafloor are not expected to be used. The 400-m (1,312-ft) isobath appears to be the current economic limit for this type of structure.

A Deepwater Operations Plan (DWOP) is required for all deepwater development projects in water depths ≥1,000 ft (305 m) and for all projects proposing subsea production technology. A DWOP is designed to address industry and BOEM concerns by allowing an operator to know, well in advance of significant expenditures, that their proposed methods of dealing with situations not specifically addressed in the regulations are acceptable to BOEM. The DWOP provides BOEM with information specific to deepwater/subsea equipment issues to demonstrate that a deepwater project is being developed in an acceptable manner with regard to engineering specifics, safety, and the environment. BOEM will review deepwater development activities from a total system perspective, emphasizing the operational safety, environmental protection, and conservation of natural resources. A DWOP is required initially and is usually followed by a DOCD.

Development Operations and Coordination Document

The development operations and coordination document (DOCD) is the chief planning document that lays out an operator's specific intentions for development. The range of postlease development plans is discussed in **Chapter 1.5**. **Table 3-2** shows the estimated range of development wells and production structures for an EPA proposed action. BOEM estimates that approximately 82 percent of development wells would become producing wells.

EPA Proposed Action Scenario (Typical Lease Sale): BOEM estimates that 0-17 development and production wells would be drilled as a result of an EPA proposed action (**Table 3-2**).

EPA Cumulative Scenario: BOEM estimates that 0-40 development and production wells would be drilled as a result of all cumulative OCS Program activities in the EPA (**Table 3-3**).

OCS Program Cumulative Scenario (EPA, WPA, and CPA): It is estimated that 8,530-12,180 development and production wells would be drilled in the EPA, WPA, and CPA as a result of the proposed lease sales and all OCS activity associated with previous lease sales (**Table 3-4)**.

Note that the impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.1.3.2. Infrastructure Emplacement/Structure Installation and Commissioning Activities

Floating structures may be placed over development wells in water depths >800 m (2,625 ft) to facilitate production from a prospect. These structures provide the means to access and control the wells. They serve as a staging area to process and treat produced hydrocarbons from the wells, initiate export of the produced hydrocarbons, conduct additional drilling or reservoir stimulation, conduct workover activities, and carry out eventual abandonment procedures. There is a range of offshore infrastructure installed for hydrocarbon production in water depths >800 m (2,625 ft). Among these are pipelines, floating platforms, casing, wellheads, and conductors. The different types of floating platforms are discussed in **Chapters 3.1.1.3.1 and 3.1.1.3.3.2**.

Subsea wells may also be completed to produce hydrocarbons from on the shelf and in the deepwater portions of the Gulf of Mexico. The subsea completions require a host structure to control their flow and to process their well stream. Control of the subsea well is accomplished via an umbilical from the host.

Pipelines are the primary means of transporting produced hydrocarbons from offshore oil and gas fields to distribution centers or onshore processing points. Pipelines range from small-diameter (generally 4-12 in; 10-30 cm) gathering lines, sometimes called flowlines, that link individual wells and production facilities to large-diameter (as large as 36 in; 91 cm) lines, sometimes called trunklines, for transport to shore. Pipelines are installed by lay barges that are either anchored or dynamically positioned while the pipeline is laid. Pipeline sections may be welded together on a conventional lay barge as it moves forward on its route or they may be welded together at a fabrication site onshore and wound onto a large-diameter spool or reel. Once the reel barge is on location, the pipeline is straightened and lowered to the seafloor on its intended route. Both types of lay barge use a stinger to support the pipeline as it enters the water. The stinger helps to prevent undesirable bending or kinking of the pipeline as it is installed. In some cases, pipelines or segments of pipelines are welded together onshore or along a beachfront area and then towed offshore to their location for installation.

Structure installation and commissioning activities may take place over a period of a week to a month at the beginning of a platform’s 20- to 40-year production life. The time required to complete the myriad of operations to start production at a structure is dependent on the complexity of its facilities.

To keep floating structures on station, a mooring system must be designed and installed. Lines to anchors or piling arrays attach the floating components of the structure. With a tension-leg platform (TLP), tendons stem from a base plate on the sea bottom to the floating portion of the structure. Commissioning activities involve the emplacement, connecting, and testing of the structure's modular components that are assembled on site.

EPA Proposed Action Scenario (Typical Lease Sale): It is estimated that 0-1 production structures would be installed as a result of an EPA proposed action (**Table 3-2**).

EPA Cumulative Scenario: BOEM estimates that 0-2 production structures would be installed as a result of all cumulative OCS Program activities in the EPA (**Table 3-3**).

OCS Program Cumulative Scenario (EPA, WPA, and CPA): It is estimated that 1,435-2,026 production structures would be installed in the EPA, WPA, and CPA as a result of the proposed lease sales and all OCS activity associated with previous lease sales (**Table 3-4**).

Note that the impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.1.3.2.1. Bottom Area Disturbance

Structures emplaced or anchored on the OCS to facilitate oil and gas exploration and production include drilling rigs or MODU’s (jack-ups, semisubmersibles, and drillships), pipelines, and fixed surface, floating, and subsea production systems are described in **Chapters 3.1.1.3.1 and 3.1.1.3.2** above. The emplacement or removal of these structures disturbs small areas of the sea bottom beneath or adjacent to the structure. If mooring lines of steel, chain, or synthetic polymer are anchored to the sea bottom, areas around the structure can also be directly affected by their emplacement. This disturbance includes physical compaction or crushing beneath the structure or mooring lines and the resuspension and settlement of sediment caused by emplacement activities. Movement of floating types of facilities will also cause movement of the mooring lines in its array. Small areas of sea bottom will be affected by this kind of movement. Impacts from bottom disturbance are of concern near sensitive areas such as topographic features, pinnacles, low-relief live bottom features, chemosynthetic communities, high-density biological communities in water depths ≥400 m (1,312 ft), and archaeological sites.

Semisubmersibles can be operated in a wide range of water depths and disturb about 2-3 hectares (ha) (5-7 ac), depending on their mooring configurations. In water depths >600 m (1,969 ft), dynamically positioned drillships could be used; these drillships disturb only a very small area where the bottom template and wellbore are located, approximately 0.25 ha (0.62 ac). Since the advent of synthetic mooring lines, some drillships may be moored to the bottom. Drillships would affect an area of the bottom similar to that of the semisubmersibles, depending on their mooring array at their water depth. Currently, a very small number of moored rigs are used during exploration activities. Most semisubmersible and drillships are dynamically positioned. Note, however, that most production platforms are moored.

At water depths exceeding 400 m (1,312 ft), compliant towers, TLP’s, spars, and floating production systems would be used (**Figure 3-3**). A compliant tower would disturb the same bottom area—about 2 ha (5 ac)—as a conventional, fixed platform. A TLP consists of a floating structure held in place by tensioned tendons connected to the seafloor by pile-driven anchors. The bottom area disturbed by a TLP is dependent on the mooring line configuration and would be about 0.5 ha (1.2 ac) per anchor. A spar platform consists of a large-diameter cylinder supporting a conventional deck, three types of risers (production, drilling, and export), and a hull that is moored by a catenary system of 6-20 lines anchored to the seafloor. A spar would disturb about 1 ha (2.5 ac) of bottom area per mooring line because mooring lines tend to be anchored farther away from the surface structure, which tends to cause more contact and scraping of the sea bottom near the anchor. Where applicable, a taut leg mooring system may be employed. This type of system exerts more tension on the mooring lines and results in fewer impacts to the seafloor.

Subsea production systems located on the ocean floor are connected to surface topsides by a variety of components. These bottom-founded components are an integrated system of flowlines, manifolds, flowline termination sleds, umbilicals, umbilical sleds, blowout preventers, well trees, and production risers that disturb approximately 1 ha (2.5 ac) of sea bottom per well produced.

Emplacement of flowlines and export pipelines disturb between 0.5 ha (1.2 ac) and 1.0 ha (2.5 ac) of seafloor per kilometer of pipeline (Cranswick, 2001). The variation lies in BSEE's requirement to bury pipelines in water depths <200 ft (61 m) to a depth of 3 ft (1 m). Burial is typically done by water jetting a trench followed by placing the pipeline into it. No new pipeline length installed as a result of an EPA proposed action (typical lease sale) nor the EPA cumulative scenario would be in water depths <200 ft (61 m) and require burial.

3.1.1.3.2.2. Sediment Displacement

Displaced sediments are those that have been physically moved "in bulk." Displaced sediments will cover or bury an area of the seafloor, while resuspended sediments will cause an increase in turbidity of the adjacent water column. Resuspended sediments eventually settle, covering the surrounding seafloor. Resuspended sediments may include entrained heavy metals or hydrocarbons.

The chief means for sediment displacement is the overboard discharge of drill cuttings carried to the surface and by drilling mud. Cuttings that outfall from surface platforms settle to the sea bottom as a mound or plume if influenced by the prevailing currents. Sediment displacement can also take place when anchored exploration rigs and production structures are subject to high current energy, such as the Loop Current or sea states associated with hurricanes or strong storms. Mooring lines in contact with the sea bottom can scrape sediment into heaps and mounds as the surface facility moves in response to currents.

Sediment displacement also occurs as a result of the removal of pipelines. It is projected that the number of pipeline removals (or relocations) will increase Gulfwide as the existing pipeline infrastructure ages.

3.1.1.3.3. Infrastructure Presence

3.1.1.3.3.1. Anchoring

Exploration drilling and pipeline emplacement operation rigs on the OCS may require anchors to hold the rig, topside structures, or support vessels in place. Anchors disturb the seafloor and sediments in the area where dropped or emplaced. Anchoring can cause physical compaction beneath the anchor and chains or lines, as well as resuspended sediment. A disturbed area on the sea bottom forms by the swing arc formed by anchor lines scraping across bottom within the range allowed by the anchoring system configuration. However, most exploration drilling rigs are dynamically positioned rigs and are held in position by four or more propeller jets and do not cause anchoring impacts. Most production platforms are moored and would have similar impacts as described above. Conventional pipelaying barges use an array of eight 9,000-kilogram (19,842-pound) anchors to position the barge and to move it forward along the pipeline route. These anchors are continually moved as the pipelaying operation proceeds. The area actually affected by these anchors depends on water depth, wind, currents, chain length, and the size of the anchor and chain. Mooring buoys may be placed near drilling rigs so that service vessels need not anchor or for when they cannot anchor (in deeper water). The temporarily installed anchors for these buoys will most likely be smaller and lighter than those used for vessel anchoring and, thus, will have less impact on the sea bottom. Moreover, installing one buoy will preclude the need for numerous individual vessel-anchoring occasions. Service-vessel anchoring is assumed not to occur in water depths >150 m (492 ft) and only occasionally in shallower waters (vessels would always tie up to a platform or buoy in water depths >150 m [492 ft]). Barges are assumed to always tie up to a production system rather than anchor. Barges and other vessels are also used for both installing and removing structures. Barge vessels use anchors placed away from their location of work.

3.1.1.3.3.2. Offshore Production Systems

Spar

A spar structure is a deep-draft, floating caisson that may consist of a large-diameter (27.4-36.6 m; 90-120 ft) cylinder or a cylinder with a lower tubular steel trellis-type component (truss spar, a second generation design) that supports a conventional production deck. A third generation of spar design is the cell spar. The cell spar's hull is composed of several identically sized cylinders surrounding a center cylinder. The cylinder or hull may be moored via a chain catenary or semi-taut line system connected to 6-20 anchors on the seafloor. Spars are now used in water depths up to 900 m (2,953 ft) and may be used in water depths 3,000 m (9,843 ft) or deeper (NaturalGas.org, 2010; USDOI, MMS, 2006; Oynes, 2006).

Semisubmersibles

Semisubmersible production structures (semisubmersibles) resemble their drilling rig counterparts and are the most common type of offshore drilling rig (NaturalGas.org, 2010). Semisubmersibles are partially submerged with pontoons that provide buoyancy. Their hull contains pontoons below the waterline and vertical columns that connect to the hull box/deck. The structures may keep on station with conventional, catenary or semi-taut, line mooring systems connected to anchors in the seabed. However, most exploration drilling rigs, including semisubmersibles, are dynamically positioned rigs and are held in position by four or more propeller jets and do not cause anchoring impacts. Semisubmersibles can be operated in a wide range of water depths. Floating production systems are suited for deepwater production in depths up to 8,000 ft (26,437 m) (NaturalGas.org, 2010; USDOI, MMS, 2006; Oynes, 2006).

Subsea Production Systems

For some development programs, especially those in deep- and ultra-deepwater, an operator may choose to use a subsea production system instead of a floating production structure. Although the use of subsea systems has recently increased as development has moved into deeper water, subsea systems are not new to the GOM and they are not used exclusively for deepwater development. Unlike wells from conventional fixed structures, subsea wells do not have surface facilities directly supporting them during their production phases. A subsea production system has various bottom-founded components. Among them are well templates, well heads, "jumper" connections between well heads, flow control manifolds, in-field pipelines and their termination sleds, and umbilicals and their termination assemblies. A subsea production system can range from a single-well template connected to a nearby manifold or pipeline, and then to a riser system at a distant production facility; or a series of wells that are tied into the system. Subsea systems rely on a "host" facility for support and well control. Centralized or "host" production facilities in deep water or on the shelf may support several satellite subsea developments. A drilling rig must be brought on location to provide surface support to reenter a well for workovers and other types of well maintenance activities. In addition, should the production/safety system fail and a blowout result, surface support must be brought on location to regain control of the well.

Floating Production, Storage, and Offloading Systems

This Agency prepared an EIS on the potential use of floating production, storage, and offloading (FPSO) systems on the Gulf of Mexico OCS (USDOI, MMS, 2001). In accordance with the scenario provided by industry, the floating production, storage, and offloading EIS addresses the proposed use of FPSO's in the deepwater areas of the CPA and WPA only. In January 2002, this Agency announced its decision to accept applications for FPSO's after a rigorous environmental and safety review. On June 12, 2007, this Agency received a DOCD from Petrobras Americas Inc. proposing to use an FPSO in Walker Ridge to develop two different CPA prospects: Cascade and Chinook. This was the first and is currently the only proposal to use an FPSO in the Gulf of Mexico. The Cascade Prospect (Walker Ridge Block 206 Unit) is located approximately 250 mi (402 km) south of New Orleans, Louisiana, and about 150 mi (241 km) from the Louisiana coastline in approximately 8,200 ft (2,499 m) of water. The Chinook Prospect (Walker Ridge Block 425 Unit) is located about 16 mi (26 km) south of the Cascade Prospect. The FPSO was approved by this Agency in March 2011 and began production in March 2012.

3.1.1.3.3.3. Space-Use Requirements

Leasing on the OCS results in operations that temporarily occupy sea bottom and water surface area for dedicated uses. The OCS operations include the deployment of seismic vessels, bottom surveys, and the installation of surface or subsurface bottom-founded production structures with anchor cables and safety zones. While in use, these areas become unavailable to commercial fishermen or any other competing use.

Seismic surveys would be required but limited to deepwater areas and would not likely interfere with commercial fishing trawling activities because the proposed EPA lease sale area is located at least 125 mi (201 km) from the nearest shoreline in water depths greater than 800 m (2,625 ft). Virtually all commercial trawl fishing in the GOM is performed in water depths less than 200 m (656 ft) (Louisiana Dept. of Wildlife and Fisheries, 1992). There is the possibility that seismic surveys could interfere with other commercial fishing activities such as pelagic longline fishing, which generally occurs from around the 200-m (656-ft) depth contour and seaward to deeper water, with some sets made a little shallower than 200 m (656 ft) (in particular off the mouth of the Mississippi River and the Dry Tortugas).

In water depths greater than 450 m (1,476 ft), production platforms will be compliant towers or floating structures (such as TLP's and spars); this is beyond the range of typical commercial bottom trawling, but it is within the range for pelagic longline fishing. However, the EPA lease sale area is relatively far from shore (125 mi; 201 km) and it is not an established longline fishing area; also, an EPA proposed action is forecasted to result in only one platform, which would likely be a subsea structure. If there were interference in longline fishing activities, it would likely be temporary during structure emplacement. Even though production structures in deeper water are larger and individually will take up more space, there will be fewer of them compared with the great numbers of bottom-founded platforms in shallower water depths. Production structures in all water depths have a life expectancy of 20-30 years.

Coastal restoration, beach nourishment, and levee reconstruction are crucial to mitigate future coastal erosion, landloss, flooding, and storm damage in the GOM, especially along coastal Louisiana. The long-term success of these efforts depends on locating and securing significant quantities of OCS sediment resources that are compatible with the target environments being restored. Offshore sand resources, like upland sources, are extremely scarce where most needed. Additionally, sizable areas of these relatively small offshore sand resources are not extractable because of the presence of oil and gas infrastructure, archaeologically sensitive areas, and biologically sensitive areas. BOEM has identified significant sediment resources where dredging activities are likely to occur in the future. Additionally, BOEM has implemented new measures to help safeguard the most significant OCS sediment resources, reduce multiple-use conflicts, and minimize interference with oil and gas operations. Bottom-disturbing activities (including surface or near-surface emplacement of platforms, wells, drilling rigs, pipelines, umbilicals, and cables) must avoid, to the maximum extent practicable, significant OCS sediment resources.

Dredging of sand and the associated presence of an ocean-going dredge vessel could present some use conflicts with commercial fishing should the blocks be occupied by dredging barges and associated transport infrastructure.

EPA Proposed Action Scenario (Typical Lease Sale): A maximum of 6 ha (15 ac) (1 production structure of approximately 6 ha [15 ac]) of surface area will be lost to commercial fishing and other uses as a result of an EPA proposed action.

EPA Cumulative Scenario: A maximum of 12 ha (30 ac) (2 production structures of approximately 6 ha [15 ac]) of surface area will be lost to commercial fishing and other uses as a result of the EPA cumulative activities.

The net effect on total area available for commercial trawling and other uses will also be affected by structure removals. Approximately 10 percent of eligible structures removed are eventually used for rigs-to-reefs. Those structures that may become artificial reefs would open space where removed and take space where reefed. Even when platforms are transported to designated artificial reef planning areas, which already effectively prevent trawling, the net effect would again be additional trawling area. If platform removals are set against those installed in the EPA, there is no net effect as a result of an EPA proposed action and the cumulative activities because everything installed would be removed. An EPA proposed action would result in one structure added and one removed. The total cumulative activities for the EPA would result in two structures installed and two removed.

OCS Program Cumulative Scenario (EPA, WPA and CPA): The total number of production structure installations projected for the total Gulfwide OCS Program is 1,435-2,026 for all depth ranges. If platform removals are set against those installed, the effective net area taken for temporary OCS use because of additional platforms is a maximum of 189 platforms added to OCS waters, representing a net area taken of 1,134 ha (2,835 ac).

Note that the impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.1.3.3.4. Aesthetic Quality

The presence of drilling and production platforms visible from land, increased vessel and air traffic, and noise are aesthetic impacts usually associated with a lease sale and routine events. For lease sales within the CPA and WPA, there is the potential visibility of fixed structures in local GOM waters due to the close proximity of the planning areas to the shoreline; however, the area where proposed EPA Lease Sales 225 and 226 would occur is 125 mi (201 km) from the shoreline and would not be of concern to business operators, local chambers of commerce, and organizations promoting tourism.

Though visibility of fixed structures would not be an adverse impact associated with an EPA proposed action, it is also noted that installed facilities and increased vessel and air traffic add a component of additional noise as well as their physical presence on the seascape.

Additional impact-producing factors associated with offshore oil and gas activities are oil spills and trash and debris. These are the most widely recognized as major threats to the aesthetics of coastal lands, especially recreational beaches. These factors, individually or collectively, may adversely affect the fishing industry, resort use, and the number and value of recreational beach visits. The effects of an oil spill on the aesthetics of the coastline depend on factors such as season, extent of pollution, beach type and location, condition and type of oil washing ashore, tidal action, and cleanup methods (if any).

3.1.1.3.3.5. Workovers and Abandonments

Completed and producing wells may require periodic reentry that is designed to maintain or restore a desired flow rate. These procedures are referred to as a well "workover." Workover operations are also carried out to evaluate or reevaluate a geologic formation or reservoir (including recompletion to another strata) or to permanently abandon a part or all of a well. Examples of workover operations are acidizing the perforated interval in the casing, plugging back, squeezing cement, milling out cement, jetting the well in with coiled tubing and nitrogen, and setting positive plugs to isolate hydrocarbon zones. Workovers on subsea completions require that a rig be moved on location to provide surface support. Workovers can take from 1 day to several months to complete depending on the complexity of the operations, with a median of 7 days. Current oil-field practices include preemptive procedures or treatments that reduce the number of workovers required for each well. On the basis of historical data, BOEM projects a producing well may expect to have seven workovers or other well activities during its lifetime.

There are two types of well abandonment operations—temporary and permanent. An operator may temporarily abandon a well to (1) allow detailed analyses or additional delineation wells while deciding if a discovery is economically viable, (2) save the wellbore for a future sidetrack to a new geologic bottom-hole location, or (3) wait on design or construction of special production equipment or facilities. The operator must meet specific requirements to temporarily abandon a well. Permanent abandonment operations are undertaken when a wellbore is of no further use to the operator (i.e., the well is a dry hole or the well's producible hydrocarbon resources have been depleted). During permanent abandonment operations, equipment is removed from the well, and specific intervals in the well that contain hydrocarbons are plugged with cement. A cement surface plug is also required for the abandoned wells. This serves as the final isolation component between the wellbore and the environment.

3.1.1.4. Operational Waste Discharged Offshore

The bulk of waste materials produced during offshore oil and gas exploration are drilling fluids (muds) and cuttings. The bulk of waste materials produced during oil and gas development are produced waters. Discharged wastes may also include various waters (e.g., bilge, ballast, fire, and cooling), deck drainage, sanitary wastes, and domestic wastes. During production activities, additional wastes may include produced sand, and well treatment, workover, and completion fluids. Secondary discharges occur from numerous sources. These discharges may include desalination unit discharges, blowout preventer fluids, boiler blowdown discharges, excess cement, several fluids used in subsea production, and uncontaminated freshwater and saltwater.

The USEPA establishes effluent limitation guidelines through a rigorous process to evaluate potential impacts, solicit public review and comment, and set restrictions on the volume and composition of discharges to comply with applicable water quality standards, which are then incorporated into the NPDES permitting process. The USEPA, through general permits issued by the USEPA Region that has jurisdictional oversight, regulates all waste streams generated from offshore oil and gas activities. The USEPA Region 4 has jurisdiction over the eastern portion of the Gulf of Mexico OCS, including all of the EPA and a portion of the CPA off the coasts of Alabama and Mississippi, which includes the area for proposed EPA Lease Sales 225 and 226. The current Region 4 general permit (GEG460000) was issued on March 15, 2010; became effective on April 1, 2010; and expires on March 31, 2015 (USEPA, 2011a).

3.1.1.4.1. Drilling Fluids (Muds) and Cuttings

Drilling fluids (also known as drilling muds) and cuttings represent a large quantity of the discharge generated by drilling operations. Drilling fluids are used in rotary drilling to remove cuttings from beneath the bit, to control well pressure, to cool and lubricate the drill string and its bit, and to seal the well. Drill cuttings are the fragments of rock generated during drilling and carried to the surface with the drilling fluid. Drilling discharges of fluids and cuttings are regulated by USEPA through the NPDES permitting process.

The composition of drilling fluids is complex. Drilling fluids used on the OCS are divided into two categories: water based and nonaqueous based (i.e., hydrophobic), in which the continuous phase is not soluble in water. Clays, barite, and other chemicals are added to the base fluid, which can be mineral or diesel oil-based fluids (OBF), synthetic-based fluids (SBF), or freshwater or saltwater in water-based fluids (WBF). Additional chemicals are added to improve the performance of the drilling fluid (Boehm et al., 2001). Drilling muds can be discharged into the ocean only if they meet U.S. Environmental Protection Agency NPDES permit requirements, which include testing for toxicity prior to discharge. If they fail the toxicity tests, the materials cannot be discharged to the ocean. The discharges cannot exceed set discharge rates.

The OBF are used to improve drilling through difficult formations. The base mud for OBF is typically diesel or mineral oil. Mineral oil OBF are more advantageous than diesel because mineral oil is less toxic than diesel. Because these oils often contain toxic materials such as polycyclic aromatic hydrocarbons (PAH's), the discharge of OBF or cuttings wetted with OBF is *prohibited*. Oil-based drilling fluids are rarely used in deepwater drilling operations and only occasionally on the shelf. The use of OBF is likely to continue to decrease because of the advantages of SBF (Neff et al., 2000).

Synthetic-based drilling fluids were developed as an alternative to OBF when drilling activities began moving into deeper waters. The base fluid is a synthetic material, typically an olefin or ester, free of toxic PAH's (International Association of Oil and Gas Producers, 2003). Discharge of SBF is *prohibited*. However, SBF-wetted cuttings may be discharged after the majority of the synthetic-based mud (SBM) has been removed. The SBF mud system also contains additives such as emulsifiers, clays, wetting agents, thinners, and barite. Since 1992, SBF have been increasingly used, especially in deep water, because they perform better than WBF and OBF. The SBF reduce drilling times and costs incurred from expensive drilling rigs. By 1999, about 75 percent of all wells drilled in waters deeper than 305 m (1,000 ft) were drilled with SBF in the GOM (CSA, 2004b).

Water-based drilling fluids are used at some stage during all well drilling. The primary components of WBF are fresh or saltwater, barite, clay, caustic soda, lignite, lignosulfonates, and water-soluble polymers. The specific composition depends on the type of formation (i.e., layers of rocks sharing common properties) being drilled. In the Gulf of Mexico, WBF and WBF-wetted cuttings may be discharged as long as the requirements of the NPDES permit have been met.

Discharge of WBF results in alteration of sediment characteristics because of coarse material in cuttings, the trace metal content of the muds, and increased turbidity in the water column. Occasionally, formation oil may be discharged with the cuttings, adding hydrocarbons to the discharge. In shallow environments, WBF are rapidly dispersed in the water column immediately after discharge and rapidly descend to the seafloor (Neff, 1987). In deep waters, fluids dispersed near the water surface would disperse over a wider area than fluids dispersed in shallow waters.

A literature review (Neff et al., 2000) discussed knowledge about the fate and effects of SBF discharges on the seabed. Like OBF, the SBF are hydrophobic, do not disperse in the water column, and therefore, are not expected to adversely affect water quality. The SBF-wetted cuttings settle close to the discharge point and affect the local sediments. Cuttings piles with a maximum depth of 8-10 in (20-25 cm) were noted in a seabed study of shelf and slope locations where cuttings drilled with SBF were discharged. The primary effects are smothering of the benthic community, alteration of sediment grain size, and addition of organic matter, which can result in localized anoxia during the time it takes the SBF to degrade (Melton et al., 2004).

Bioaccumulation tests indicate that SBF and their degradation products should not bioaccumulate (Neff et al., 2000). In a study to measure degradation rates of SBF on the seafloor and to characterize the microbial populations, the sulfate-reducing bacterial counts increased in sediments incubated with SBF under deep-sea conditions (Roberts and Nguyen, 2006). Biodegradation proceeded after a lag period of up to 28 weeks influenced by both the SBF type and prior exposure of the sediments to SBF. Sulfate depletion in the test sediments because of microbial activity coincided with SBF degradation. In the joint industry study required as part of the USEPA Region 6 NPDES permit in the western portion of the Gulf of Mexico, sediment recovery was noted during the 1-year interval between the first and second sample collections as indicated by a decrease in SBF concentrations. Deposited cuttings and measurable sediment effects indicative of organic enrichment were concentrated within 250 m (820 ft) distance in both shelf and slope sites (CSA, 2004b). The SBF concentrations in sediments at drill locations contained average internal olefin SBF concentrations of 500-13,000 ppm on the shelf and concentrations of 2,000-11,750 ppm on the slope, 1-4 years after discharge. Ongoing research is aimed at better understanding how changes in the chemical structure of SBF's can influence environmental fates and effects in order to continue to improve the environmental performance of the fluids. For example, recent testing showed that less branching of alpha and internal olefins positively impacted both sediment toxicity and anaerobic biodegradation (Dorn et al., 2011).

Barite, comprising barium sulfate, is used as a weighting agent and is a major component of all drilling fluid types. The quantity of barite used has declined with advances in SBM technology and drilling. Mercury and other trace metals are naturally occurring impurities in barite. Since 1993, USEPA has required the concentrations of mercury and cadmium to be less than or equal to 1 ppm and 3 ppm, respectively, in the stock barite used to make up drilling muds. Through mercury and cadmium regulation, USEPA can also control levels of other trace metals in barite. This reduces the addition of mercury to values similar to the concentration of mercury found in marine sediments throughout the GOM (Avanti Corporation, 1993a and 1993b; USEPA, 1993a). Concentrations of total mercury in uncontaminated estuarine and marine sediments generally are 0.2 micrograms/gram (μg/g) dry weight or lower. Surface sediments collected 20-2,000 m (66-6,562 ft) away from four oil production platforms in the northwestern GOM contained 0.044-0.12 μg/g total mercury. These amounts are essentially background concentrations for mercury in surficial sediments on the Gulf of Mexico OCS (Neff, 2002). A comparative study of surface and subsurface sediment samples from six offshore drill locations showed higher levels of total mercury found in the sediments closest to the drilling sites as compared with the sites greater than 3 km (1.9 mi) distant. The higher total mercury concentrations corresponded to the higher barium concentrations also present. The higher total mercury levels in nearfield sediments did not translate to higher methylmercury concentration in those sediments, with a few exceptions (Trefry et al., 2002). Sediment redox conditions and organic content influence methylmercury formation.

Atmospheric mercury deposition is believed to be the main source of anthropogenic mercury inputs into the marine environment. Mercury in fish tissue is a concern, and mercury in barite has been suggested as a secondary source in the Gulf of Mexico. However, barite is nearly insoluble in seawater, thus trapping mercury and other trace metals in the barite mineral structure. Therefore, unless the mercuric sulfide in the barite can be microbially methylated, this source of mercury is relatively unavailable for uptake into the marine food web. The barite mineral structure would have to dissolve for trace metals such as mercury to be available. The dissolution of barite, including barite samples that do not meet current USEPA standards for trace metals, was studied under simulated seafloor conditions (Crecelius et al., 2007). The solubility of the associated mercury in seawater at two pH concentrations tended to increase with time for at least several months, but it remained well below the USEPA water quality criterion. The studies conducted at varying pH levels to mimic digestive tract conditions showed that very little (<0.1%) of the mercury in barite became biologically available.

3.1.1.4.2. Produced Waters

Produced water is brought up from the hydrocarbon-bearing strata along with produced oil and gas. This waste stream can include formation water; injection water; well treatment, completion, and workover compounds added downhole; and compounds used during the oil and water separation process. Formation water originates in the permeable sedimentary rock strata and is brought up to the surface commingled with the oil and gas. Injection water is water that was injected to enhance oil production and oil recovery.

In addition to the added chemical products, produced water contains chemicals that have dissolved into the water from the geological formation where the water was stored. Dissolved solids in produced waters can be more concentrated than dissolved solids in seawater. Produced water contains inorganic and organic chemicals and radionuclides (226Ra and 228Ra). The composition of the discharge can vary greatly in the amounts of organic and inorganic compounds. The USEPA Region 4 general NPDES permit (USEPA, 2011a), as well as the Region 6 permit, allows the discharge of produced water on the OCS provided the produced water meets discharge criteria. The produced water is treated to separate free oil from the water. Since the oil and water separation process does not completely separate all of the oil, some hydrocarbons remain with the produced water and often the water is treated to prevent the formation of sheen. Produced water may be discharged if the oil and grease concentration does not exceed 42 milligrams per liter (mg/L) daily maximum or 29 mg/L monthly average. The discharge must also be tested for toxicity. Discharge is not permitted within 1,000 m (3,281 ft) of an area of biological concern or any federally designated dredged material ocean disposal site. The flow is also required to be monitored. Studies have indicated that produced-water discharges do not significantly contribute to hypoxia, especially when compared with the volume of nutrients contributed by the Mississippi and Atchafalaya Rivers (USEPA, 2007a; Rabalais, 2005).

Estimates of the volume of produced water generated per well vary because the percent water is related to well age and hydrocarbon type. Usually, produced-water volumes are small during the initial production phase and increase as the formation approaches hydrocarbon depletion. Produced water volumes range from 2 to 150,000 barrels (bbl)/day (USEPA, 1993a). In some cases, a centralized platform is used to process water from several surrounding platforms. Some of the produced water may be reinjected into the well. Reinjection occurs when the produced water does not meet discharge criteria or when the water is used as part of operations.

BOEM maintains records of the volume of water produced from each block on the OCS and its disposition—injected on lease, injected off lease, transferred off lease, or discharged overboard. The amount discharged overboard for the years 2000-2012 is summarized by water depth in **Table 3-5** The total volume for all water depths during this 12-year period ranged from 489.0 to 648.2 MMbbl, with the largest fraction (69-88%) coming from operations on the shelf. The total volume of produced water generally decreased after 2004, reflecting an overall decrease in contributions from the shelf. The contribution of produced water from deep water (>400 m [1,312 ft] water depth) and ultra-deepwater (>1,600 m [5,249 ft] water depth) production has been increasing. The contribution from these operations (deep and ultra-deepwater together) increased from 6 percent in 2000 to 27 percent in 2012 of the total produced water volume, contributing 37.8 and 138.2 MMbbl in each year, respectively (calculated from data in **Table 3-5**). The low temperature and high-pressure conditions found in deeper water can result in flow problems such as hydrate formation in the lines. Additional quantities of chemicals are used to assure production, and even with recovery systems, some of these chemicals will be present in produced water (Regg et al., 2000). For deepwater operations, new technologies are being developed that may discharge or reinject produced water at the seafloor or at "minimal surface structures" before the production stream is transported by pipeline to the host production facility.

3.1.1.4.3. Well Treatment, Workover, and Completion Fluids

Wells are drilled using a base fluid and a combination of other chemicals to aid in the drilling process. Fluids (drilling muds) present in the borehole can damage the geologic formation in the producing zone. Completion fluids are used to displace the drilling fluid and protect formation permeability. "Clear" fluids consist of brines made from seawater mixed with calcium chloride, calcium bromide, and/or zinc bromide. These salts can be adjusted to increase or decrease the density of the brine to hold back-pressure on the formation. Additives, such as defoamers and corrosion inhibitors, are used to reduce problems associated with the completion fluids. Recovered completion fluids can be recycled for reuse.

Workover fluids are used to maintain or improve existing well conditions and production rates on wells that have been in production. Workover operations include casing and subsurface equipment repairs, re-perforation, acidizing, and fracturing stimulation. During some of the workover operations, the producing formation may be exposed, in which case fluids like the aforementioned completion fluids are used. In other cases, such as acidizing and fracturing (also considered stimulation or well treatment), hydrochloric acid and other acids are used. Both procedures are used to increase the permeability of the formation. The acids dissolve limestone, sandstone, and other deposits. Because of the corrosive nature of acids, particularly when hot, corrosion inhibitors are added. Since the fluids are altered with use, they are not recovered and recycled; however, these products may be mixed with the produced water.

Production treatment fluids are chemicals applied during the oil and gas extraction process. Production chemicals are used to dehydrate produced oil or treat the associated produced water for reuse or disposal. A wide variety of chemicals are used including corrosion and scale inhibitors, bactericides, paraffin solvents, demulsifiers, foamers, defoamers, and water treatment chemicals (Boehm et al., 2001). Some of the production chemicals mix with the production stream and are transported to shore with the product. Other chemicals mix with the produced water. Most produced water cannot be discharged without some chemical treatment. Even water that is reinjected downhole must be cleaned to protect equipment. The types and volumes of chemicals that are used changes during the life of the well. In the early stages, defoamers are used. In the later stages, when more water than oil is produced, demulsifiers and water-treatment chemicals are used more extensively.

Both USEPA Regions 4 and 6 prohibit the discharge of well-treatment, completion, and workover fluid with additives containing priority pollutants. Additives containing priority pollutants must be monitored. Some well treatment, workover, and completion chemicals are discharged with the drilling muds and cuttings or with the produced-water streams. These discharges must meet the general toxicity limits in the NPDES general permit. Discharge and monitoring records must be kept.

3.1.1.4.4. Production Solids and Equipment

The USEPA defines produced sands as slurried particles, which surface from hydraulic fracturing, and the accumulated formation sands and other particles including scale, which is generated during production (USEPA, 1993a). This waste stream also includes sludges generated in the produced-water treatment system, such as tank bottoms from oil/water separators and solids removed in filtration. The guidelines do not permit the discharge of produced sand, which must be transported to shore and disposed of as nonhazardous oil-field waste according to State regulations. A variety of solid wastes are generated, including construction/demolition debris, garbage, and industrial solid waste. No equipment or solid waste may be disposed of in marine waters.

3.1.1.4.5. Bilge, Ballast, and Fire Water

Bilge, ballast, and fire water all constitute lesser discharges generated by offshore oil and gas production activities, which are allowed to be discharged to the ocean, as long as USEPA guidelines are followed (USEPA, 2011a). Uncontaminated bilge and ballast water are included in the miscellaneous discharges category of the USEPA general permit. Ballast water is untreated seawater that is taken on board a vessel to maintain stability. Ballast water contained in segregated ballast tanks never comes into contact with either cargo oil or fuel oil. Newly designed and constructed floating storage platforms use permanent ballast tanks that become contaminated with oil only in emergency situations when excess ballast must be taken on. Bilge water is seawater that becomes contaminated with oil and grease and with solids such as rust, when it collects at low points in the bilges. With the right equipment on board, dirty bilge and ballast water can be processed in a way that separates most of the oil from the water before it is discharged into the sea. The USEPA prohibits the discharge of free oil and requires monitoring for visual sheen related to miscellaneous discharges, such as bilge and ballast water.

Offshore drilling rigs and the offshore production facilities used to process oil have special fire protection requirements. Fire water is excess seawater or freshwater that permits the continuous operation of fire control pumps, as well as water released during training of personnel in fire protection. Fire control system test water is seawater, sometimes treated with a biocide that is used as test water for the fire control system on offshore platforms. Fire protection can also include a barrier of water that is sometimes used during flaring to provide protection between flaring systems and personnel, equipment, and facilities. The USEPA general permit allows for the discharge of fire water that meets their specified limitations (USEPA, 2011a). The requirements include regulations and monitoring for treatment chemicals, discharge rate, free oil, and toxicity.

3.1.1.4.6. Cooling Water

Cooling water is defined as water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. Seawater is drawn through an intake structure on the drilling rig, ship, or platform to cool power generators and other machinery, and produced oil or water. Organisms are killed through impingement or entrainment. When fish and other aquatic life become trapped against the screen at the entrance to the cooling water intake structure through the force of the water being drawn through the intake structure, it is termed impingement. Impingement causes mortality through physical injury and exhaustion. When eggs and larvae are sucked into the heat exchanger and eventually discharged from the facility, it is termed entrainment. The entrained organisms pass through the cooling system where they are exposed to pressure changes, thermal shock, and antifouling chemicals such as chlorine. At the population level, these impacts can affect threatened or endangered species or reduce ecologically critical organisms within the food web (*Federal Register*, 2006a).

The Clean Water Act, Section 316 (b) Phase III established categorical regulations for offshore oil and gas cooling water intake structures. The NPDES permit incorporated these regulations in NPDES General Permit GEG460000 for USEPA Region 4 for new facilities, where construction began after July 17, 2006, and that take in more than 2 million gallons per day of seawater with more than 25 percent used for cooling (USEPA, 2011a). The new requirements have several tracks depending on whether the facility is a fixed or nonfixed facility and whether it has a sea chest intake or not. Some of the requirements include cooling water intake structure design requirements to meet a velocity of <0.5 ft (0.2 m) per second, construction to minimize impingement and/or entrainment, entrainment monitoring, recordkeeping, and completion of a source water biological study. Alteration to a sea chest intake structure on a mobile facility could render the facility less seaworthy, so is not required. The requirements include baseline study that characterizes the biological community in the vicinity of the structure or monitoring.

3.1.1.4.7. Deck Drainage

Deck drainage includes all wastewater resulting from platform washings, deck washings, rainwater, and runoff from curbs, gutters, and drains including drip pans and work areas. The USEPA general guidelines for deck drainage require that no free oil be discharged, as determined by visual sheen.

The quantities of deck drainage vary greatly depending on the size and location of the facility. An analysis of 950 GOM platforms during 1982-1983 determined that deck drainage averaged 50 bbl/day/platform (USEPA, 1993a). The deck drainage is collected, the oil is separated, and the water is discharged to the sea. Impacts from the discharge of deck drainage are assumed to be negligible for a proposed action.

3.1.1.4.8. Treated Domestic and Sanitary Wastes

Domestic wastes originate from sinks, showers, laundries, and galleys. Sanitary wastes originate from toilets. For domestic waste, no solids or foam may be discharged. In addition, the discharge of all food waste within 12 nmi (14 mi; 22 km) from the nearest land is prohibited. In sanitary waste, floating solids are prohibited. Facilities with 10 or more people must meet the requirement of total residual chlorine greater than 1 mg/L and maintained as close to this concentration as possible. There is an exception in both general permits for the use of marine sanitation devices.

In general, a typical manned platform will discharge 35 gallons per person per day of treated sanitary wastes and 50-100 gallons per person per day of domestic wastes (USEPA, 1993a). It is assumed that these discharges are rapidly diluted and dispersed; therefore, no analysis of the impacts will be performed for a proposed action.

3.1.1.4.9. Additional Discharges

Additional discharges include all other discharges not already discussed that may result during oil and gas operations. Minor or miscellaneous wastes include desalination unit discharge, blowout preventer fluid, boiler blowdown, excess cement slurry, uncontaminated freshwater and saltwater, and miscellaneous discharges at the seafloor, such as subsea wellhead preservation and production control fluid, umbilical steel tube storage fluid, leak tracer fluid, and riser tensioner fluids. In all cases, no free oil shall be discharged with the waste. Unmanned facilities may discharge uncontaminated water through an automatic purge system without monitoring for free oil. The discharge of freshwater or seawater that has been treated with chemicals is permitted providing that the prescribed discharge criteria are met. No projections of volumes or contaminant levels of minor discharges are made for a proposed action because the impacts are considered negligible.

3.1.1.4.10. Vessel Operational Wastes

The USCG defines an offshore supply/service vessel as a vessel propelled by machinery other than steam that is of more than 15 gross tons and less than 500 gross tons and that regularly carries goods, supplies, individuals in addition to the crew, or equipment in support of exploration, exploitation, or production of offshore mineral or energy resources (46 CFR §§ 90.10-40). Operational waste generated from supply vessels that support oil and gas operations include bilge and ballast waters, trash and debris, and sanitary and domestic wastes.

Bilge water is water that collects in the lower part of a ship. The bilge water is often contaminated by oil that leaks from the machinery within the vessel. The discharge of any oil or oily mixtures is prohibited under 33 CFR § 151.10; however, discharges may occur in waters >12 nmi (14 mi; 22 km) from land if the oil concentration is less than 100 ppm. Discharges may occur within 12 nmi (14 mi; 22 km) of land if the concentration is less than 15 ppm.

Ballast water is used to maintain stability of the vessel and may be pumped from coastal or marine waters. Generally, the ballast water is pumped into and out of separate compartments and is not usually contaminated with oil; however, the same discharge criteria apply as for bilge water (33 CFR § 151.10).

The final Vessel General Permit, issued by USEPA, became effective on December 19, 2008. This permit is in addition to already existing NPDES permit requirements and has now increased the NPDES regulation so that discharges incidental to the normal operation of vessels operating as a means of transportation are no longer excluded unless exempted from NPDES permitting by Congressional legislation (USEPA, 2008a). The next Vessel General Permit will include numeric concentration-based ballast water limits, as required by a recent court settlement (Showstack, 2011).

The discharge of trash and debris is prohibited (33 CFR §§ 151.51-77) unless it is passed through a comminutor and can pass through a 25-millimeter (mm) (1-in) mesh screen. All other trash and debris must be returned to shore for proper disposal with municipal and solid waste.

All vessels with toilet facilities must have a marine sanitation device that complies with 40 CFR part 140 and 33 CFR part 159. Vessels complying with 33 CFR part 159 are not subject to State and local marine sanitation device requirements. However, a State may prohibit the discharge of all sewage within any or all of its waters. Domestic waste consists of all types of wastes generated in the living spaces on board a ship, including gray water that is generated from dishwasher, shower, laundry, bath, and washbasin drains. Gray water from vessels is not regulated in the Gulf of Mexico. Gray water should not be processed through the marine sanitation device, which is specifically designed to handle sewage.

3.1.1.4.11. Other Waste and Discharge Issues

Distillation and reverse osmosis brine means the concentrated seawater (brine) produced as a byproduct of the processes used to generate freshwater from seawater. At present, rigs and platforms support individual desalinization units. The discharge from these units is included under Miscellaneous Discharges in the NPDES general permit for Offshore Oil and Gas. As the industry moves offshore, individual larger platforms will support more and more activity over a larger geographic area using subsea production technology. Desalinization may be performed from water supply vessels that are specially equipped for desalinization. Although the vessel rather than the platform will discharge the waste brine, it will have similar characteristics as when generated on the platform. The Vessel General Permit may not apply depending on the location of the rig/vessel. The Vessel General Permit, geographically, only covers inland waters out to 3 mi (5 km). Secondly, the Vessel General Permit applies to vessels acting as a means of transportation. If the vessel is moored to a rig generating an amount of water that is greater than what it takes for the normal operation of a vessel, the Vessel General Permit would not apply to the brine production.

Discharges from Diverter Actuation and Flow Testing (30 CFR § 250.433): The BSEE requires actuation of the diverter system and flow testing of the vent lines. When the system is first tested, seawater is discharged. Seawater discharge is already included in the NPDES permit. Actuation of the diverter valves must be repeated weekly throughout drilling operations. This important safety requirement has the potential to cause the discharge of SBF to the Gulf of Mexico. Such a discharge would be a violation of the existing NPDES permit. During the weekly tests, BSEE prefers that a person be stationed at the valves to confirm valve actuation. The SBF does not need to be discharged to confirm valve actuation. Alternatively, design changes can be made so that the discharge of SBF is not necessary.

3.1.1.5. Air Emissions

In 1990, pursuant to Section 328 of the Clean Air Act Amendments and following consultation with the Commandant of the U.S. Coast Guard and the Secretary of the Interior, USEPA assumed air quality responsibility for the OCS waters east of longitude 87.5^{o} W. The area of the EPA proposed action is under USEPA jurisdiction for air emissions.

Air pollutants are emitted from the OCS emission sources that include any equipment that combusts a fuel, transports and/or transfers hydrocarbons, or results in accidental releases of petroleum hydrocarbons or chemicals, causing air emissions of pollutants. Some of these pollutants are precursors to ozone, which is formed by complex photochemical reactions in the atmosphere. Air pollutants are generated during exploration and production activities when fuels are combusted to run drilling equipment, power generators, and engines. During production, fugitive emissions, including volatile organic compounds, escape from valves and flanges. The criteria pollutants, set by USEPA in NAAQS to have the potential to negatively impact human health and environment, are generated along routes from shore bases to OCS leases by vessels transporting supplies and workers.

Certain air pollutants subject to the NAAQS are also released during both venting and flaring. A combustion flare or cold vent is a specially designed boom or stack used to dispose of hydrocarbon vapors or natural gas. Unlike cold vents, the hydrocarbons are ignited during flaring. Flares can be used routinely to control emissions as part of unloading/testing operations that are necessary to remove potentially damaging completion fluids from the wellbore and to provide sufficient reservoir data for the operator to evaluate a reservoir and development options; they can also be used during emergency process upsets. The BSEE regulations provide for some limited volume, short duration flaring, or venting of oil and natural gas upon approval by BSEE (2-14 days, typically). Through 30 CFR § 250.1162, BSEE may allow operators to burn liquid hydrocarbons if they can demonstrate that transporting them to market or re-injecting them into the formation is not technically feasible or poses a significant risk of harm to the environment.

3.1.1.6. Noise

Noise associated with OCS oil and gas development results from seismic surveys, the operation of fixed structures such as offshore platforms and drilling rigs, and helicopter and service-vessel traffic. Noise generated from these activities can be transmitted through both air and water, and may be extended or transient. Offshore drilling and production involves various activities that combine with other anthropogenic and natural noises that produce a composite underwater noise field. The intensity level and frequency of the noise emissions are highly variable, both between and among the various industry sources. Noise from proposed OCS activities may affect resources. Whether a sound is or is not detected by marine organisms (including fish and invertebrates) would depend both on the acoustic properties of the source (spectral characteristics, intensity, and transmission patterns) and sensitivity of the hearing system in the marine organism (Hawkins and Popper, 2012). Extreme levels of noise can cause physical damage or death to an exposed animal; intense levels can damage hearing; and loud or novel sounds may induce disruptive behavior (such as interrupting feeding).

When the Marine Mammal Protection Act was enacted in 1972, the concept that underwater sounds of human origin could adversely affect marine mammals was not considered or recognized (Marine Mammal Commission, 2002). Concern on the effects of underwater noise on marine mammals and the increasing levels of manmade noise introduced into the world's oceans has since become a major environmental issue (Jasny, 1999). It is generally recognized that commercial shipping is a dominant component of the ambient, low-frequency background noise in modern world oceans (Gordon and Moscrop, 1996) and that OCS-related, service-vessel traffic would contribute to this. Another sound source more specific to OCS operations originates from seismic operations. Airguns produce an intense but highly localized sound energy and represent a noise source of acoustic concern. This Agency completed a Programmatic EA on G&G permit activities in the Gulf of Mexico (USDOI, MMS, 2004). The Programmatic EA includes a detailed description of the seismic surveying technologies, energy output, and operations; these descriptions are hereby incorporated by reference.

Marine seismic surveys (refer to **Chapter 3.1.1.2**) direct a low-frequency energy wave (generated by an airgun array) into the ocean floor and record the reflected energy waves' response and return arrival time. The pattern of reflected waves, recorded by a series of hydrophones embedded in cables (streamers) towed by the seismic vessel or ocean bottom cables or nodes placed on the ocean floor, can be used to "map" subsurface layers and features. Seismic surveys can be used to check for foundation stability, detect groundwater, locate mineral deposits (coal), and search for oil and gas.

In the past, sound-energy levels were expected to be less than 200 dB re^{-1}µPa-m (standard unit for source levels of underwater sound: 200 decibels (dB), reference pressure 1 microPascal, reference range 1 m [3 ft]) at distances beyond 90 m (295 ft) from the source (Gales, 1982). Gulland and Walker (1998) state a typical source would output approximately 220 dB re^{-1}µPa-m, although the peak-to-peak source level directly below a seismic array can be as high as 262 dB re^{-1}µPa-m (Davis et al., 1998). Acoustic calibration for the National Science Foundation's *R/V Marcus* Langseth and its seismic array, conducted by Tolstoy et al. (2009) in the Gulf of Mexico suggests that, for deep water (~1,600 m; 5,249 ft), the 180-dB radii would occur at less than 1 km (0.6 mi) from the source; while in shallow waters (~50 m; 164 ft), the 180-dB radii would be considerably larger (e.g., ~1.1 km; 0.7 mi). The 180 dB re^{-1}µPa-m level is an estimate of the threshold of sound energy that may cause hearing damage in cetaceans (U.S. Dept. of the Navy, 2001). Until further studies are completed, NMFS continues to use this estimated threshold. When this is complete, NMFS will state which measurements of a seismic pulse provide the most helpful indications of its potential impact on marine mammals. Gordon et al. (1998) speculate that peak broadband pressure and pulse time and duration would be most relevant at short ranges (hearing damage range) while sound intensity in 1/3 octave bands is a more useful measurement at distance (behavioral effects).

As documented in studies in Alaskan waters, drilling operations often produce noise that includes strong tonal components at low frequencies, including infrasonic frequencies in some cases. Drillships are noisier than semisubmersibles (Richardson et al., 1995). Sound and vibration paths to the water are through either the air or the risers, in contrast to the direct paths through the hull of a drillship. Richardson et al. (1995) stated that sound was measured at three ring-caisson sites in the Arctic. Sound was measured from the 20- to 1,000-Hertz (Hz) band levels at a range of 1.8 km (1.1 mi) at levels of 113-126 dB re: 1µPa. The received sound levels varied based on the activity of the support vessels. These estimated levels were higher than drilling activities on an artificial island but lower than on drillships (Richardson et al., 1995).

Machinery noise generated during the operation of fixed structures can be continuous or transient, and variable in intensity. Underwater noise from fixed structures ranges from about 20 to 40 dB above background levels within a frequency spectrum of 30-300 Hz at a distance of 30 m (98 ft) from the source (Gales, 1982). These levels vary with type of platform and water depth. Underwater noise from platforms standing on metal legs would be expected to be relatively weak because of the small surface area in contact with the water and the placement of machinery on decks well above the water.

Aircraft and vessel support may further contribute to acoustic pollution around a production facility, as well as the transit area. Noise generated from helicopter and service-vessel traffic is transient in nature and extremely variable in intensity. Helicopter sounds contain dominant tones (resulting from rotors) generally below 500 Hz (Richardson et al., 1995). For example, a Bell 212 helicopter may operate at 22-Hz tone and have an estimated received level of 149 dB re: 1µPa (Richardson et al., 1995). Surface tension ensures that little sound propagates into the water column; thus, underwater noise is generally brief in duration, compared with the duration of audibility in the air. Helicopters, while flying offshore, generally maintain altitudes above 700 ft (213 m) during transit to and from the working area and an altitude of about 500 ft (152 m) while between platforms.

Service vessels transmit noise through both air and water. The primary sources of vessel noise are propeller cavitation, propeller singing, and propulsion; other sources include auxiliaries, flow noise from water dragging along the hull, and bubbles breaking in the wake (Richardson et al., 1995). Propeller cavitation is usually the dominant noise source. The intensity of noise from service vessels is roughly related to ship size, laden or not, and speed. Large ships tend to be noisier than small ones; and ships underway with a full load (or towing or pushing a load) produce more noise than empty vessels. For example, a 16-m (52-ft) crewboat may have a 90-Hz tone with a source level of 156 dB re: 1µPa, and a small ship may have a broadband source level of 170-180 dB re: 1µPa (Richardson et al., 1995). For a given vessel, relative noise also tends to increase with increased speed. Commercial vessel noise is a dominant component of manmade ambient noise in the ocean (Jasny, 1999). In the immediate vicinity of a service vessel, noise could disturb marine mammals; however, this effect would be limited in area and duration.

3.1.1.7. Major Sources of Oil Inputs in the Gulf of Mexico

The Gulf of Mexico comprises one of the world's most prolific offshore oil-producing provinces as well as having heavily traveled tanker routes. Nevertheless, inputs of petroleum from onshore sources far outweigh the contribution from offshore activities. Human use of petroleum hydrocarbons is generally concentrated in major municipal and industrial areas situated along coasts or large rivers that empty into coastal waters.

Petroleum hydrocarbons can enter the GOM from a wide variety of sources. The major sources of oil inputs in the GOM are natural seepage, permitted produced-water discharges, land-based discharges, and accidental spills. Numerical estimates of the contributions for these sources to the GOM coastal and offshore waters are shown in **Tables 3-6 and 3-7**. The information presented in this chapter is primarily based on the National Research Council's (NRC's) *Oil in the Sea III: Inputs, Fates, and Effects* (NRC, 2003) and is summarized below. These values include permitted oil discharges and not just spills.

3.1.1.7.1. Natural Seepage

Natural seeps provide the largest petroleum input to the offshore GOM, about 95 percent of the total. Mitchell et al. (1999) estimated a range of 280,000-700,000 bbl/year (40,000-100,000 tonnes per year), with an average of 490,000 bbl (70,000 tonnes) for the northern GOM, excluding the Bay of Campeche. Using this estimate and assuming seep scales are proportional to surface area, the NRC (2003) estimated annual seepage for the entire GOM at ~980,000 bbl (140,000 tonnes) per year, or about three times the estimated amount of oil spilled by the 1989 *Exxon Valdez* event (~270,000 bbl) (Steyn, 2010) or a quarter of the amount released by the *Deepwater Horizon* explosion and oil spill (4.9 MMbbl of oil from the well) (Lubchenco et al., 2010). As seepage is a natural occurrence, the average rate of ~980,000 bbl (140,000 tonnes) per year is expected to remain unchanged throughout the 40-year cumulative analysis period.

3.1.1.7.2. Produced Water

During OCS operations, water in the oil reservoir is also pumped to the surface where it is either treated to separate free crude oil and discharged overboard subject to USEPA regulations or injected back into the reservoir. The NRC (2003) estimated the discharge of 4,130 bbl (590 tonnes) per year petroleum hydrocarbons from 1990 through 1999 to the coastal GOM offshore Louisiana and Texas and 11,900 bbl (1,700 tonnes) to the offshore GOM for both Louisiana and Texas through produced-water discharges. For both the coastal and offshore areas adjacent to the States of Mississippi, Alabama, and Florida, the NRC (2003) estimated only a trace annual discharge of petroleum through produced-water discharges for this same time period. Based on the volume of produced water generated annually, it is estimated that an average of about 11,900 bbl (1,700 tonnes) of oil is discharged in the entire Gulf of Mexico OCS each year (Etkin, 2009). Additional information on produced water is discussed in **Chapter 3.1.1.4.2**.

3.1.1.7.3. Land-Based Discharges

Land-based sources provide the largest petroleum input to the coastal waters of both the western and eastern Gulf of Mexico. For coastal waters, 77,000 bbl (11,000 tonnes) of petroleum hydrocarbons enter the western GOM and 11,200 bbl (1,600 tonnes) enter the eastern GOM from land-based discharges. Land-based sources include residual petroleum hydrocarbons in municipal and industrial wastewater treatment facility discharges as well as urban run-off. The Mississippi River carries the majority of petroleum hydrocarbons into GOM waters from land-based drainage that occurs far upriver. With increased urbanization, particularly in coastal areas, the amount of impervious paved surface increases and oil contaminants deposited on these roads and parking lot surfaces are washed into adjacent streams and waterbodies.

3.1.1.7.4. Spills

Oil spills can occur during the exploration for and production, transportation, and consumption of oil. The composition of spilled hydrocarbons includes crude oil, refined fuels such as diesel during transport, and storage and spills during consumption. In the GOM, spills will vary according to activities conducted in the area. For coastal waters, 6,230 bbl (890 tonnes), 5,390 bbl (770 tonnes), and 5,180 bbl (740 tonnes) entered the GOM offshore Louisiana and Texas from pipeline spills, tank vessel spills during transportation, and coastal facility spills, respectively from 1990 through 1999 (NRC, 2003). For offshore waters, much less oil was spilled during this timeframe due to pipeline breaks (420 bbl [60 tonnes]) than in coastal waters. The pipelines are less accessible in deeper waters and are therefore less vulnerable. However, in offshore Texas and Louisiana waters from 1990 through 1999, much more oil was spilled from tank vessels (10,500 bbl [1,500 tonnes]). The large volume of transportation-related spills is due to the extensive petroleum industry in the region, including production, refining, and distribution.

For coastal waters, trace amounts (<10 tonnes), 1,022 bbl (140 tonnes), and 73 bbl (10 tonnes) enter the GOM offshore Mississippi, Alabama, and Florida from pipeline spills, tank vessel spills during transportation, and coastal facility spills, respectively (NRC, 2003). Less oil was spilled from tank vessels (73 bbl [10 tonnes]) in offshore Mississippi, Alabama, and Florida waters from 1990 through 1999.

The volume spilled from tank vessels has declined over the years due to more stringent requirements including double-hulled vessels. The amount of oil spilled in U.S. waters from tankers (tank ships) has decreased by 90 percent in the decade 1998-2007, compared with the previous decade 1988-1997 (Etkin, 2009). This drastic decrease does include the 1989 *Exxon Valdez*. The decrease is only 78 percent between decades if the *Exxon Valdez* spill volume is omitted. Tank barges in U.S. waters showed a nearly 67 percent reduction in the same period compared with the previous decade (Etkin, 2009).

The sum of spills for the Gulf of Mexico from marine platforms (50 tonnes per year) and pipelines (60 tonnes per year) was 770 bbl/year during the years 1990-1999 (110 tonnes per year) (NRC, 2003). The volume rises to a total of 7,630 bbl/year when platform and pipeline spills in GOM coastal waters are added to marine water spills. A far greater cumulative amount of oil enters coastal waters from human activities than enters offshore waters. However, as illustrated by the *Deepwater Horizon* explosion and oil spill, offshore activities have the potential to cause a catastrophic spill.

3.1.1.7.4.1. Trends in Reported Spill Volumes and Numbers

Several additional reports that characterize global or national spill statistics have been published more recently than *Oil in the Sea III: Inputs, Fates, and Effects* (NRC, 2003). Although the values may not be comparable, they provide interesting details about relative spill volumes and trends.

Due to the occurrence of tar on beaches and the dissolution into adjacent waters at locations that were distant from any natural sources, the Oil Input Working Group of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) prepared an estimate of global oil inputs to the sea (GESAMP, 1993 and 2007). The Group paid particular attention to improving methods to estimate oil releases from shipping activities. The amounts of oil from operational discharges and spills are both included. The estimated global average annual inputs of oil entering the marine environment from ships and other sea-based activities, based on 1988-1997 data, are shown in **Table 3-8**. Inputs from offshore exploration and production in this table include operational discharges and spills.

The global estimate for operational discharges is 114,450 bbl/year, and the accidental releases from marine platforms and pipelines are 23,800 bbl/yr. The total amount of the oil released to global oceans from offshore oil and gas activities as well as accidents is 140,000 bbl/year or 2 percent of the volume entering the marine environment.

The USCG prepared the report, *Polluting Incidents In and Around U.S. Waters, A Spill/Release Compendium* (USDHS, CG, 2011). The most recent version, 1969-2011, was published in December 2012 (USDHS, CG, 2012a). This document summarizes spills reported to the USCG that occurred on navigable waters including rivers, lakes and harbors, the territorial seas (0-3 mi [0-5 km] from the coastline), the contiguous zone (3-12 mi [5-19 km] from the coastline), and the marine environment. The data include over 100 different petroleum and nonpetroleum oils (food oils) and over 50 sources including barges, tanks, pipelines, and waterfront facilities.

In the accumulated data, the USCG notes that the greatest volume spills are crude and heavy oil. Most spills and spill volume occurred in the GOM coastal waters and the Mississippi, Ohio, and Arkansas Rivers. For the 37-year period ending in 2009, USCG databases for U.S. waters contained investigations of more than 270,000 oil spills. The total spill amount during that period was 240.7 million gallons. The majority of spills through the years of this report involved discharges between 1 and 100 gallons. Thus, the oil discharged from the *Macondo* well is 86 percent of all oil discharged in the preceding 37 years (USDHS, CG, 2012a). In 1991-2011, non-tank vessels accounted for 75.4 percent of the number of spills that occurred (USDHS, CG, 2012a). Historically, tank vessels (ships and barges) accounted for most of the volume spilled in U.S. waters. However, since passage of the Oil Pollution Act of 1990, the distribution of spill volumes has shifted away from tank vessel sources. For example, at the national level, for the years 1999 through 2011, 29 percent of the volume of oil spilled came from tank vessels (e.g., ships/barges) compared with 41 percent from facilities and other non-vessels (*Deepwater Horizon* well not included). Furthermore, in 2010, the largest oil spill in U.S. waters emanated from the exploratory *Macondo* oil well in the Gulf of Mexico. However, with the exception of rare but extreme incidents such as the *Deepwater Horizon* oil spill, the overall number and volume of spills in U.S. waters has been on a steady downward trend since 1973. In fact, 2010, the year of the largest recorded spill in U.S. waters, was followed by a record low annual volume of 210,270 gallons in 2011 (USDHS, CG, 2012a).

The number and volume of oil spilled in the Gulf of Mexico from 2001 through 2009, as reported to USCG and complied in its 2011 compendium, is presented in **Table 3-9** (USDHS, CG, 2011). The 2012 USCG compendium shows that for 2010, the GOM region, which includes inland areas not included in **Table 3-9**, experienced 455 spills having a combined volume of 206,990,317 gallons, which represents 15.1 percent of the total U.S. spills and 99.7 percent of the total spillage in the U.S. waterways for that year. The 2012 USCG compendium also shows that in 2011, 498 spills having a combined volume of 20,276 gallons occurred in the GOM region, which includes inland areas not included in **Table 3-9**. This represents 16.2 percent of the total U.S. spills and 9.6 percent of the total spillage in the U.S. waterways for 2011 (USDHS, CG, 2012a).

Etkin (2009) examined spills in the United States related to both onshore and offshore activities through 2007. The most recent decade analyzed overlaps with the final 2 years of the NRC data (NRC, 2003). For the decade 1998-2007, all of the oil spilled from offshore platforms was spilled on the OCS in Federal waters. No spills from platforms in State waters were reported. The volume of oil type spilled was about equally divided between crude oil and diesel fuel. However, the amount of diesel spilled in 2005 was three times greater than the amount spilled in any other year due to the hurricanes that occurred in the Gulf of Mexico. From 1998 through 2007, an average of 1,273 bbl of oil/year spilled from GOM platforms and 2,613 bbl of oil/year spilled from GOM pipelines. Only about 10 bbl of oil/year spilled from vessels that supply the offshore industry during the same 10-year interval. For all regions, the Gulf of Mexico, Pacific, and Alaska, total spillage was reduced by 61 percent in the 10-year period from 1998 through 2007, as compared with the previous decade of 1989 through 1997. If the *Exxon Valdez* spill is excluded from the calculations, total spillage was reduced by only 40 percent in the 10-year period from 1998 through 2007, as compared with the previous decade of 1989 through 1997.

Etkin (2009) examined the most common causes of spill incidents and the volume associated with the incident. For the decade 1998 through 2007, the causes of platform spills are as follows: hurricanes were associated with 47 percent of spill incidents and 85 percent of the spill volume; structural failure such as corrosion was associated with 26 percent of spill incidents and 4 percent of spill volume; and operator error was associated with 18 percent of incidents and 8 percent of volume. The cause and volume of pipeline spills during this same 10-year period were as follows: hurricanes were associated with 58 percent of incidents and 43 percent of volume; structural issues were associated with 29 percent of incidents and 41 percent of volumes; and lastly, vessel damage such as anchor drag were associated with 5 percent of incidents and 15 percent of volume. Etkin (2009) determined that, for the 10-year period 1998 through 2007, 0.0000012 bbl of oil was spilled per barrel of oil produced. Etkin (2009) estimates that offshore platforms and pipelines spilled 3,887 bbl of oil/year from 1998 through 2007.

Anderson et al. (2012) examined spills on the OCS from platforms, pipelines, vessels, and on the OCS and in coastal and offshore waters for tankers and barges. They did not include oil from permitted discharges or oil from sources unrelated to oil production or transportation. Crude oil and refined petroleum products are included.

In the previous report (Anderson and LaBelle, 2000), Anderson and LaBelle examined oil-spill incidents through 1999. In this report, they review the entire record of spills and several shorter intervals from the past 15 or 20 years, through 2009 and 2010 to show how the *Deepwater Horizon* oil spill influenced the spill statistics. The report also notes the external factors that have influenced spill rates. These include the six highly destructive hurricanes between 2002 and 2008 that destroyed or extensively damaged 305 platforms, 76 drilling rigs, and over 1,200 pipeline segments; the inclusion of “passive spills” petroleum missing based on pre-storm platform inventories; and the phasing out of single-hulled tankers. The rate of OCS platform/rig spills of ≥1,000 bbl increases in the most recent 15 years—from 0.13 (1985-1999) to 0.25 (1996-2010)—due to Hurricanes Katrina and Rita structure destruction in 2005 and the *Deepwater Horizon* oil spill in 2010. Prior to these two incidents, the last United States OCS platform/rig spill of ≥10,000 bbl was in 1980. The United States OCS pipeline rate for spills ≥1,000 bbl declined from 1.38 (1985-1999) to 0.88 spills/billion barrels (Bbbl) (1996-2010).

3.1.1.7.4.2. Projections of Future Spill Events

Anderson et al. (2012) was used to examine historical spill volumes, source types, and locations; the USCG database was used for both OCS areas and in State offshore waters off the States of Texas, Louisiana, Mississippi, Alabama, and Florida. The information on the larger spills is more reliable than the information on the small spills, in part, due to the shortcomings in the USCG data mentioned in this section. The distribution of spill sizes is likely to be similar to those identified in Anderson et al. (2012) for OCS spills. Ninety-six percent of spills are <1 bbl (average size = 0.05 bbl) and 98 percent of spills are <10 bbl (average size for spills 1-9 bbl = 3 bbl).

The USCG data have some shortcomings that should be noted. The data are collected from reports called into the National Response Center. The USCG does not visually verify each spill. Therefore, the volume spilled may be the initial estimate of the caller and is not updated as the actual volume of the spill is discovered. For spills of unknown source, the caller may also guess as to what type of oil, crude or fuel, was released. The database includes a latitude and longitude GPS position for each spill, as well as a verbal description of location. The verbal description may not match the position. For example, the verbal description could be Mississippi Sound, but the GPS position is actually on the OCS. For this report, location was based on the GPS position, not the verbal description of the location.

3.1.1.7.4.3. OCS-Related Offshore Oil Spills

To facilitate a discussion of projected accidental spills, spills are subdivided into categories of ≥1,000 bbl and <1,000 bbl. The spills ≥1,000 bbl are routinely reported and well documented, and are thus more comprehensive and reliable than those for smaller spills.

A discussion of projected spills ≥1,000 bbl is presented in **Chapter 3.2.1.5**. The estimates are based on rates derived from historical records as discussed in Anderson et al. (2012). For the lease sale area, less than 1 spill ≥1,000 bbl is estimated as potentially occurring. If a spill were to occur, a volume of 2,200 bbl is anticipated (**Table 3-10**).

Estimates for the number of spills <1,000 bbl on the OCS related to oil and gas exploration and production are also shown in **Table 3-10**. The following number of spills are projected over the life of an EPA proposed action (see **Table 3-10** for median spill sizes):

- for the up to 1.0-bbl spill size category, it is estimated that <1-143 spills could occur;

- for the 1.1- to 9.9-bbl spill size category, it is estimated that <1-4 spills could occur;
- for the 10.0- to 49.9-bbl spill size category, it is estimated that <1-1 spill could occur
- for the 50.0- to 499.9-bbl spill size category, it is estimated that <1-1 spill could occur; and
- for the 500.0-999.9 bbl spill size category, it is estimated that <1 spill could occur.

The range of spills projected for all of the above combined spill size categories <1-999.9 bbl spilled is <1-149 spills from an accident related to rig, platform, or pipeline activities supporting a proposed EPA lease sale over a 40-year timeframe.

3.1.1.7.4.4. Non-OCS-Related Offshore Spills

Non-OCS-related offshore spills ≥1,000 bbl will occur from the extensive maritime barging and tankering operations that occur in offshore waters of the Gulf of Mexico. The analysis of spills from tankers and barges ≥1,000 bbl is based on data obtained from USCG and analyzed by BOEM. From 1996 through 2009, the USCG database indicates that three spills ≥1,000 bbl occurred in the CPA for which the source is unknown and no spills ≥1,000 bbl occurred in the EPA. Non-OCS-related offshore spills <1,000 bbl are most likely to occur from the extensive operations that occur in offshore waters of the CPA. From 1996 through 2009, there were 3,039 spills <1,000 bbl in the CPA where the source was not related to OCS exploration and production activity. There were also 4,081 spills reported where the source was unknown and so might have been related to OCS exploration and exploration activity. Most of these spills were <1 bbl in size.

For the same time period, there were 14 spills <1,000 bbl in the EPA where the source was not related to OCS exploration and production activity. There were also 10 spills reported where the source was unknown and so might have been related to OCS exploration and exploration activity. The average size of the known spills <1,000 bbl was 20 bbl.

3.1.1.7.4.5. OCS-Related Coastal Spills

The OCS-related spills ≥1,000 bbl may occur in coastal waters. Pipeline ruptures, fuel spills during supply vessel and service-vessel trips, and spills that occur on the OCS but that are transported into State offshore waters are all potential Federal activity-related sources for the oil observed in State offshore waters. Very few spills of ≥1,000 bbl occurred in coastal waters. None of the spills occurring in coastal waters were related to OCS activity; however, oil from the OCS may impact coastal waters. For example, the tanks that were blown over by Hurricanes Katrina and Rita may have contained oil from the OCS, and the *Deepwater Horizon* oil spill, which occurred offshore traversed into the coastal waters of Louisiana, Mississippi, Alabama, and Florida.

The OCS-related spills <1,000 bbl may occur in coastal waters. Spill sizes are likely to be similar to those identified by Anderson et al. (2012) for OCS spills. Ninety-six percent of spills are <1 bbl (average size = 0.05 bbl) and 98 percent of spills are <10 bbl (average size for spills 1-9 bbl = 3 bbl).

Reported spills from 1996 through 2009 in the State offshore waters 0-3 nmi (0-3.4 mi; 0-6 km) from the coast of Texas, Louisiana, Mississippi, Alabama, and Florida were counted and are discussed further in **Chapter 3.2.1.6.1**. An estimate of the volume of oil released to coastal waters due to the recorded events is provided in **Chapter 3.2.1.4**.

3.1.1.7.4.6. Non-OCS-Related Coastal Spills

Non-OCS-related spills <1,000 bbl occur regularly in coastal waters, particularly Louisiana waters. Commercial shipping, the extensive fish and shellfish industry, and State offshore oil and gas activities are all potential sources for the oil observed in State offshore waters. For spills <1,000 bbl, there are many spills that are observed and reported but for which the source is unknown. These spills were assumed to be related to OCS exploration and production activity and are discussed within **Chapter 3.2.1.6.1**. Further discussion of these records and an estimate of the volume of oil released to coastal waters are provided in **Chapter 3.2.1.4**.

Spill sizes are estimated to likely be similar to those identified in Anderson et al. (2012) for OCS spills. Ninety-six percent of spills are <1 bbl (average size = 0.05 bbl) and 98 percent of spills are <10 bbl (average size for spills 1-9 bbl = 3 bbl).

3.1.1.7.4.7. Other Sources of Oil

Volatile organic components (VOC's) present in the crude or refined hydrocarbons escape to the atmosphere during all phases of production, transportation, and consumption. They are then deposited into surface waters through wet and dry deposition and gas absorption. In both coastal and offshore areas, the greatest amount of VOC's released to the atmosphere is during the consumption of petroleum, and sources include emissions during internal combustion, from power generating plants, and from industrial manufacturing. In the offshore OCS, 19,600 bbl (2,800 tonnes) are released to the Gulf of Mexico (NRC, 2003). These totals include emissions of VOC's from petroleum consumption during from shore-based, coastal, and marine activities, which are then transported and deposited in the offshore waters.

On occasion, aircraft carry more fuel than they can safely land with so fuel is jettisoned into offshore marine waters. The amount of 1,120 bbl (160 tonnes) per year was estimated for the offshore Gulf of Mexico.

Air pollution issues have prompted USEPA to address the incomplete combustion of fuel and fuel additives in two-stroke engines, including outboard engines, lawn mowers, chain saws, and jet skis. The increased population in coastal areas uses an increased number of recreational water vessels such as motor boats and jet skis. *Oil in the Sea III: Inputs, Fates, and Effects* (NRC, 2003) was able to quantify the losses of petroleum hydrocarbons from recreational vessels to the coastal waters of the GOM as 5,390 bbl (770 tonnes) per year.

3.1.1.8. Offshore Transport

3.1.1.8.1. Pipelines

Pipelines are the primary method used to transport a variety of liquid and gaseous products between OCS production sites and onshore facilities around the Gulf of Mexico. A mature pipeline network exists in the GOM to transport oil and gas production from the OCS to shore. There are currently 109 OCS-related pipeline landfalls (pipelines that have at one time or another carried hydrocarbon product from the OCS) in the Louisiana Coastal Area (LCA) (USDOI, MMS, 2007a; **Table 3-11** of this EIS). Included in this number of pipeline landfalls is a subset of 47 pipeline systems under DOT jurisdiction originating in Federal waters and terminating onshore or in Louisiana State waters (Gobert, official communication, 2010; **Figure 3-4** of this EIS). The BSEE and DOT share responsibility for pipeline regulation on the OCS in the transition between Federal and State waters. The BSEE has jurisdiction over producer-operated pipelines that extend upstream from the wellbore to the point downstream (the last valve on production infrastructure) on the OCS at which responsibility transfers from a producing operator to a transporting operator. The DOT's jurisdiction lies with transporter-operated pipelines that tend to be larger diameter trunklines that service multiple facilities or pipeline tie-ins from offshore.

The OCS-related pipelines nearshore and onshore may merge with pipelines carrying materials produced in State lands for transport to processing facilities or to connections with pipelines located farther inland. At present, all gas production and >99 percent of oil production from the offshore GOM is transported to shore by pipeline. Gas pipelines account for 62 percent of the total pipeline length approved in deep water since 1990.

Natural gas transportation by means other than pipelines, for example as liquefied natural gas, is possible, but is not part of an EPA proposed action or the OCS Program scenario.

Newer installation methods have allowed the pipeline infrastructure to extend farther into deep water. At present, the deepest pipeline in the Gulf is in water 2,700 m (8,858 ft) deep. More than 500 pipelines reach water depths of 400 m (1,312 ft) or more, and over 400 of those pipelines reach water depths of 800 m (2,625 ft) or more. These technical challenges are described in more detail in *Deepwater Gulf of Mexico 2006: America's Expanding Frontier* (USDOI, MMS, 2006).

Pipeline Installation and Maintenance

Pipeline installation activities in deepwater areas can be difficult both in terms of route selection and construction. Depending on the location, the sea-bottom surface can be extremely irregular and present engineering challenges (e.g., high hydrostatic pressure, cold temperatures, and darkness, as well as varying subsurface and bottom current velocities and directions). Rugged seafloor may cause terrain-induced pressures within the pipe that can be operationally problematic, as the oil must be pumped up and down steep slopes. An uneven seafloor could result in unacceptably long lengths of unsupported pipeline, referred to as "spanning," which in turn could lead to pipe failure from bending stress early in the life of the line. It is important to identify areas where significant lengths of pipeline may go unsupported. Accurate, high-resolution geophysical surveying becomes increasingly important in areas with irregular seafloor. Recent advances in surveying techniques have significantly improved the capabilities for accurately defining seafloor conditions, providing the resolution needed to determine areas where pipeline spans may occur. After analyzing survey data, the operator chooses a route that minimizes pipeline length and avoids areas of seafloor geologic structures and obstructions that might cause excessive pipe spanning, unstable seafloor, and potential benthic communities.

The BSEE's minimum cathodic protection design criteria for pipeline external corrosion protection is 20 years. For the most part, pipelines have a designed life span greater than 20 years and, if needed, can be retrofitted to increase the life span. As for internal corrosion mitigation, operators are required to monitor products transported through pipelines for corrosiveness. Based on the type of production, a company then enhances the pipeline internal corrosion protection by injecting appropriate corrosion inhibitors and monitoring effectiveness to prevent pipeline failures, thus extending the life of a pipeline. It should be noted that different products have different corrosive characteristics. Should a pipeline need to be replaced because of integrity issues, a replacement pipeline is installed or alternate routes are used to transport the products, or a combination of the two. Besides replacement because of integrity issues, a pipeline may also require replacement as a result of storm or other damages. The BSEE estimates that the overall pipeline replacement over the past few years is about 1 percent of the total installed.

The greater pressures and colder temperatures in deep water present difficulties with respect to maintaining the flow of crude oil and gas through pipelines. Under these conditions, the physical and chemical characteristics of the produced hydrocarbons can lead to the accumulation of gas hydrate, paraffin, and other substances within the pipeline. These accumulations can restrict and eventually block flow if not successfully prevented and/or abated. There are physical and chemical techniques that can be applied to manage these potential accumulations. The leading strategy to mitigate these deleterious effects is to minimize heat loss from the system by using insulation. Other measures include forcing plunger-like "pigging" devices through the pipeline to scrape the pipe walls clean and the continuous injection of flow-assurance chemicals (e.g., methanol or ethylene glycol) into the pipeline system to minimize the formation of flow-inhibiting substances. However, the great water depths of the OCS and the extreme distance to shore-side facilities make these flow-assurance measures difficult to implement and can significantly increase the cost to produce and transport the product. Companies are continuously looking for and developing new technologies such as electrically and water-heated pipelines and burial of pipelines in deep water for insulation purposes.

The long-distance transport of multiphase well-stream fluids can be achieved with an effectively insulated pipeline. There are several methods to achieve pipeline insulation: pipe-in-pipe systems, which included electrically and water-heated pipelines; pipe with insulating wrap material; and as previously mentioned, buried pipelines where the soils act as an insulator. The design of all of these systems seeks a balance between the high cost of the insulation, the intended operability of the system, and the acceptable risk level. Such systems minimize the costs, revenue loss, and risks from the following:

- hydrate formation during steady state or transient flowing conditions;
- paraffin accumulation on the inner pipe wall that can result in pipeline plugging or flow rate reductions;
- adverse fluid viscosity effects at low temperatures that lead to reduced hydraulic performance or to difficulties restarting a cooled system after a short shut-in; and

- additional surface processing facilities required to heat produced fluids to aid in the separation processes.

The formation of gas hydrates in deepwater operations is a well-recognized and potentially hazardous operational problem in water depths >1,000 ft (305 m). Seabed conditions of high pressure and low temperature become conducive to gas hydrate formation in deep water. Gas hydrates are ice-like crystalline solids formed by low-molecular-weight hydrocarbon gas molecules (mostly methane) combining with produced water. The formation of gas hydrates is potentially hazardous because hydrates can restrict or even completely block fluid flow in a pipeline, resulting in a possible overpressure condition. The interaction between the water and gas is physical in nature and is not a chemical bond. Gas hydrates are formed and remain stable over a limited range of temperatures and pressures.

Hydrate prevention is normally accomplished through the use of methanol, ethylene glycol, or tri-ethylene glycol as inhibitors, and the use of insulated pipelines and risers. Chemical injection is sometimes provided both at the wellhead and at a location within the well just above the subsurface safety valve. Wells that have the potential for hydrate formation can be treated with either continuous chemical injection or intermittent or "batch" injection. In many cases, batch treatment is sufficient to maintain well flow. In such cases, it is necessary only to inject the inhibitor at well start-up, and the well will continue flowing without the need for further treatment. In the event that a hydrate plug should form in a well that is not being injected with a chemical, the remediation process would be to depressurize the pipelines and inject the chemical. Hydrate formation within a gas line can be eliminated by dehydrating the gas with a glycol dehydrating system prior to input of gas into the line. In the future, molecular sieve and membrane processes may also be options for dehydrating gas. Monitoring of the dew point downstream of the dehydration tower should take place on a continuous basis. In the event that the dehydration equipment is bypassed because it may be temporarily out of service, a chemical could be injected to help prevent the formation of hydrates if the gas purchaser agrees to this arrangement beforehand.

Hydrocarbon flows that contain paraffin or asphaltenes may begin to block pipelines as these substances, which have relatively low melting points, form deposits on the interior walls of the pipe. To help ensure product flow under these conditions, an analysis should be made to determine the cloud point and hydrate formation point during normal production temperatures and pressures. To minimize the formation of paraffin or hydrate depositions, wells can be equipped with a chemical injection system. If, despite treatment within the well, it still becomes necessary to inhibit the formation of paraffin in a pipeline, this can be accomplished through the injection of a solvent such as diesel fuel into the pipeline.

Clearance of pipeline interiors is carried out by "pigs." Pigging is a term used to describe a mechanical method of displacing a liquid in a pipeline or to clean accumulated paraffin from the interior of the pipeline by using a mechanized plunger or pig. Paraffin is a waxy substance associated with some types of liquid hydrocarbon production. The physical properties of paraffin are dependent on the composition of the associated crude oil, and temperature and pressure. At atmospheric pressure, paraffin is typically a semisolid at temperatures above about 100 ^{o}F (38 ^{o}C) and will solidify at about 50 ^{o}F (10 ^{o}C). Paraffin deposits will form inside pipelines that transport liquid hydrocarbons and, if some remedial action such as pigging is not taken, the deposited paraffin will eventually completely block all fluid flow through the line. The pigging method involves moving a pipeline pig through the pipeline to be cleaned. Pipeline pigs are available in various shapes and are made of various materials, depending on the pigging task to be accomplished. A pipeline pig can be a disc or a spherical or cylindrical device made of a pliable material such as neoprene rubber and having an outside diameter nearly equal to the inside diameter of the pipeline to be cleaned. The movement of the pig through the pipeline is accomplished by applying pressure from gas or a liquid such as oil or water to the back or upstream end of the pig. The pig fits inside the pipe closely enough to form a seal against the applied pressure. The applied pressure then causes the pig to move forward through the pipe. As the pig travels through the pipe, it scrapes the inside of the pipe and sweeps any accumulated contaminants or liquids ahead of it. In deepwater operations, pigging will be used to remove any paraffin deposition in the pipelines as a normal part of production operations. Routine pigging will be required of oil sale lines at frequencies determined by production rates and operating temperatures. The frequency of pigging could range from several times a week to monthly or longer, depending on the nature of the produced fluid. In cases where paraffin accumulation cannot be mitigated, extreme measures can be taken in some cases such as coil tubing entry into a pipeline to allow washing (dissolving) of paraffin plugs. If that fails, then it could result in having to replace a pipeline.

Pipeline Landfalls

Due to the small size of the proposed lease sale area and relatively small amount of forecasted oil and gas that would result from an EPA proposed action or the EPA cumulative scenario, the oil and gas activities within the EPA are not expected to result in a new pipeline landfall. BOEM anticipates that pipelines from most of the new offshore production facilities will tie in to the existing pipeline infrastructure offshore or in State waters, which will result in few new pipeline landfalls. Refer to **Chapter 3.1.2.1.6** for a further discussion of pipeline landfalls. Due to the relatively small oil and gas forecasts associated with the proposed lease sale area, production from an EPA proposed action would not likely contribute to reaching capacity of existing and future pipelines and would not result in a new pipeline landfall. According to BSEE's regulations (30 CFR § 250.1003(a)(1)), pipelines with diameters ≥8⅝ in (22 cm) that are installed in water depths <60 m (200 ft) are to be buried to a depth of at least 3 ft (1 m) below mudline. The regulations also provide for the burial of any pipeline, regardless of size, if BSEE determines that the pipeline may constitute a hazard to other uses of the OCS in the Gulf of Mexico.

EPA Proposed Action Scenario (Typical Lease Sale): BOEM projects 0-82 km (0-51 mi) of new offshore pipelines as a result of an EPA proposed action (**Table 3-2**). For an EPA proposed action, BOEM projects 0-1 pipeline landfalls as a result of an EPA proposed action due to the small size of the proposed lease sale area and relatively small amount of forecasted oil and gas resources.

EPA Cumulative Scenario: BOEM projects 0-233 km (0-145 mi) of new offshore pipelines as a result of EPA cumulative activities (**Table 3-3**). BOEM projects that, for the EPA cumulative scenario, there would be 0-12 new pipeline landfalls expected over the 40-year analysis period due to the small size of the proposed lease sale area and relatively small amount of forecasted oil and gas resources.

OCS Program Cumulative Scenario (EPA, WPA, and CPA): BOEM projects 30,428-69,749 km (18,907-43,340 mi) of new pipelines as a result of the total Gulfwide OCS Program and all activity associated with previous lease sales (**Table 3-4**). For the OCS Program, which includes proposed lease sales in the EPA, WPA, and CPA, 0-12 new pipeline landfalls are projected.

Note that the impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

The length of new pipelines was estimated using the amount of production, the number of structures projected as a result of an EPA proposed action and the location of the existing pipelines. The range in length of pipelines projected is because of the uncertainty of the location of new structures, which existing or proposed pipelines would be used, and where they tie in to existing lines. Many factors would affect the actual transport system, including company affiliations, amount of production, product type, and system capacity.

3.1.1.8.2. Service Vessels

Service vessels are one of the primary modes of transporting personnel between service bases and offshore platforms, drilling rigs, derrick barges, and pipeline construction barges. In addition to offshore personnel, service vessels carry cargo (i.e., freshwater, fuel, cement, barite, liquid drilling fluids, tubulars, equipment, and food) offshore. A trip is considered the transportation from a service base to an offshore site and back, in other words a round trip. Based on BOEM's calculations, each vessel makes an average of eight round trips per week for 42 days in support of drilling an exploration well and six round trips per week for 45 days in support of drilling a development well. A platform in shallow water (<800 m; 2,624 ft) is estimated to require one vessel trip every 10 days over its 25-year production life. A platform in deep water (>800 m; 2,624 ft) is estimated to require one vessel trip every 1.75 days over its 25-year production life. All trips are assumed to originate from the designated service base.

While these proposed actions are within the EPA, service vessels and support activities for OCS oil and gas activities are anticipated to originate from currently used Louisiana, Mississippi, and Alabama ports and supply and service bases. There are currently no OCS-related supply bases in Florida, but there is one OCS-related service base in Panama City, Florida (**Tables 3-11 and 3-13**). There are five OCS-related ports in Florida that may have supported OCS oil and gas activities in the past and that could potentially support them in the future (**Table 3-11**); however, with offshore pipeline activity slowing and no additional acreage opened for leasing within the EPA, there is limited to no support activities coming from Florida, and no additional support activity is currently anticipated (Dismukes, official communication 2013a). Nevertheless, infrastructure utilization is largely driven by economics. Most of the support activities will originate from current, highly utilized service bases and ports (e.g., Port Fourchon) because that is where those companies are currently located. However, depending on contractual relationships, availability of infrastructure, vessels, and regulatory restrictions (e.g., Jones Act for foreign G&G vessels) or capacity limitations of existing infrastructure, operators can change where they operate.

Note that seismic vessels conducting both permitted (typically off-lease) and nonpermitted (typically on-lease) G&G activities have the potential to use Florida ports (e.g., Tampa); however, as noted above, port and infrastructure utilization is largely driven by economics. For a proposed action in the proposed EPA lease sale area, most, if not all of the support activities will originate from current, highly utilized service bases and ports in the CPA (e.g., Port Fourchon).

EPA Proposed Action Scenario (Typical Lease Sale): An EPA proposed action is estimated to generate 144-17,000 service-vessel trips over the 40-year period (**Table 3-2**) or 3-425 trips annually. **Table 3-12** indicates approximately 0.9 million service-vessel trips occurred on Federal navigation channels, ports, and waterways in 2011. The number of service-vessel trips projected annually for an EPA proposed action would represent <1 percent of the total annual traffic on these waterways.

EPA Cumulative Scenario: The EPA cumulative activities are estimated to generate 480-35,000 service-vessel trips over the 40-year period (**Table 3-3**) or approximately 12-875 trips annually. **Table 3-12** indicates approximately 0.9 million service-vessel trips occurred on Federal navigation channels, ports, and waterways in 2011. The number of service-vessel trips projected annually for the EPA cumulative activities would represent <1 percent of the total annual traffic on these waterways.

OCS Program Scenario (EPA, WPA, and CPA): BOEM estimates the total Gulfwide OCS Program would generate 3,310,000-4,382,000 service-vessel trips over the 40-year period (**Table 3-4**) or 82,750-109,550 trips annually. **Table 3-12** indicates approximately 0.9 million service-vessel trips occurred on Federal navigation channels, ports, and waterways in 2011. The number of service-vessel trips projected annually for the total Gulfwide OCS Program activities would represent 9-12 percent of the total annual traffic on these waterways.

Note that the impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.1.8.3. Helicopters

Helicopters are one of the primary modes of transporting personnel between service bases and offshore platforms, drilling rigs, derrick barges, and pipeline construction barges. Helicopters are routinely used for normal crew changes and at other times to transport management and special service personnel to offshore exploration and production sites. In addition, equipment and supplies are sometimes transported. An operation is considered a takeoff and landing.

Deepwater operations require helicopters that travel farther and faster, carry more personnel, are all-weather capable, and have lower operating costs. There are several issues of concern for the helicopter industry's future. Since the tasks the offshore helicopter industry provides are the same tasks supply vessels provide, they are competition for one another. Fast boats are beginning to erode the helicopter industry's share of the offshore transportation business, particularly in shallow water. The exploration and production industry is outsourcing more and more operations to oil-field support companies who are much more cost-conscious and skeptical about the high cost of helicopters. Another consideration for the helicopter industry is new technology such as subsea systems. These systems decrease the number of platforms and personnel needed offshore, therefore reducing the amount of transportation needed.

To meet the demands of deepwater activities, the offshore helicopter industry is purchasing new helicopters that travel farther and faster, carry more personnel, are all-weather capable, and have lower operating cost. Also, instead of running their own fleets, oil and gas companies are increasingly subcontracting all helicopter support to independent contractors who are very cost-conscious. The number of helicopters operating in the GOM is expected to decrease in the future, and helicopters that do operate are expected to be larger and faster.

An EPA proposed action, the EPA cumulative activities, and the total Gulfwide OCS Program scenarios below use the current level of activity as a basis for projecting future helicopter operations.

Helicopters are one of the primary modes of transporting personnel between service bases and offshore platforms, drilling rigs, derrick barges, and pipeline construction barges. Helicopters are routinely used for normal crew changes and at other times to transport management and special service personnel to offshore exploration and production sites. In addition, equipment and supplies are sometimes transported by helicopter. The Federal Aviation Administration regulates helicopter flight patterns. Because of noise concerns, the Federal Aviation Administration's Circular 91-36C encourages pilots to maintain higher than minimum altitudes near noise sensitive areas. Corporate policy (for all helicopter companies) states that helicopters should maintain a minimum altitude of 700 ft (213 m) while in transit offshore and 500 ft (152 m) while working between platforms and drilling rigs. When flying over land, the specified minimum altitude is 1,000 ft (305 m) over unpopulated areas and coastlines, and 2,000 ft (610 m) over populated areas and sensitive areas including national parks, recreational seashores, and wildlife refuges. In addition, guidelines and regulations issued by NMFS under the authority of the Marine Mammal Protection Act include provisions specifying helicopter pilots to maintain an altitude of 1,000 ft (305 m) within 100 yards (91 m; 300 ft) of marine mammals.

According to the Helicopter Safety Advisory Conference (2010), from 1996 to 2010, helicopter operations (take offs and landings) in support of total Gulfwide OCS operations have averaged, annually, about 1.4 million operations, 3.0 million passengers, and 400,000 flight hours. There has been a decline in helicopter operations from 1,668,401 in 1996 to 1,397,508 in 2009 and to 938,690 in 2010 (Helicopter Safety Advisory Conference, 2010).

While these proposed actions are within the EPA, service vessels and support activities are anticipated to originate from currently used Louisiana, Mississippi, and Alabama ports and supply bases. There are currently no supply bases and helicopter hubs in Florida, but there is one OCS-related service base in Panama City, Florida (**Tables 3-11 and 3-13**). There are five OCS ports in Florida (**Table 3-11**) that may have supported OCS oil and gas activities in the past and that could potentially support them in the future; however, with offshore pipeline activity slowing and no additional acreage opened for leasing within the EPA, there is limited to no support activities coming from Florida, and no additional support activity is currently anticipated (Dismukes, official communication 2013a). Nevertheless, infrastructure utilization is largely driven by economics. Most of the support activities will originate from current, highly utilized service bases and ports (e.g., Port Fourchon) because that is where those companies are currently located. However, depending on contractual relationships, availability of infrastructure, vessels, and regulatory restrictions (e.g., Jones Act for foreign G&G vessels) or capacity limitations of existing infrastructure, operators can change where they operate.

Note that seismic vessels conducting both permitted and nonpermitted G&G activities have the potential to use Florida ports (e.g., Tampa); however, as noted above, port and infrastructure utilization is largely driven by economics. For a proposed action in the proposed EPA lease sale area, most of the support activities including helicopter operations will originate from current, highly utilized service bases and ports in the CPA (e.g., Port Fourchon).

EPA Proposed Action Scenario (Typical Lease Sale): There are 0-27 helicopter trips projected over the 40-year period for an EPA proposed action (**Table 3-2**), or less than 1 trip annually.

EPA Cumulative Scenario: There are 0-54 helicopter trips projected over the 40-year period for EPA cumulative activities (**Table 3-3**), or approximately 0-2 trips annually.

OCS Program Cumulative Scenario (EPA, WPA, and CPA): BOEM projects 28-56 million helicopter trips for the total Gulfwide OCS Program for the years 2012-2051 (**Table 3-4**). This equates to an average rate of 700,000-1,400,000 operations annually across the Gulf of Mexico.

Note that the impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.1.9 Safety Issues

3.1.1.9.1. Hydrogen Sulfide and Sulfurous Petroleum

Sulfur may be present in oil as elemental sulfur, within gas as H_2S, or within organic molecules, all three of which vary in concentration independently. Safety and infrastructure concerns include the following: irritation, injury, and lethality from leaks; exposure to sulfur oxides produced by flaring; equipment and pipeline corrosion; and outgassing and volatilization from spilled oil.

Sour oil and gas occur sporadically throughout the Gulf of Mexico OCS, primarily off the Louisiana, Mississippi, and Alabama coasts. Sour hydrocarbon tends to originate in carbonate source or reservoir rocks that may not have abundant clay minerals that serve as a binder for elemental sulfur. If not bound in clay minerals, it remains free and can become a part of any hydrocarbon produced or sourced from that rock.

Deep gas reservoirs on the GOM continental shelf are likely to have high corrosive content, including H_2S. There is some evidence that petroleum from deepwater areas may be sulfurous, but exploration wells have not identified deepwater areas that are extraordinarily high in H_2S concentration.

BOEM reviews all exploration and development plans in the Gulf of Mexico OCS for the possible presence of H_2S in the area(s) identified for exploration and development activities. Activities determined to be associated with a presence of H_2S are subjected to further review and requirements. The BSEE regulations at 30 CFR § 250.490 require all lessees, prior to beginning exploration or development operations, to request a classification of the potential for encountering H_2S. The classification is based on previous drilling and production experience in the areas surrounding the proposed operations, as well as other factors.

All operators on the OCS involved in the production of sour gas or oil (i.e., >20 ppm) are also required to file an H_2S Contingency Plan. This plan lays out procedures to ensure the safety of the workers on the production facility. In addition, all operators are required under 30 CFR § 250.107 to adhere to the National Association of Corrosion Engineers' (NACE) *Standard Material Requirements—Methods for Sulfide Stress Cracking and Stress Corrosion Cracking Resistance in Sour Oilfield Environments* (NACE MR0175-2003) (NACE, 2003) as best available and safest technology. These engineering standards preserve the integrity of infrastructure through specifying equipment to be constructed of materials with metallurgical properties that resist or prevent sulfide stress cracking and stress corrosion cracking in the presence of sour gas. The BSEE and BOEM issued a final rule (30 CFR § 250.490 and 30 CFR § 550.215, respectively; *Federal Register*, 2011a) governing requirements for preventing hydrogen sulfide releases, detecting and monitoring hydrogen sulfide and sulfur dioxide, protecting personnel, providing warning systems and signage, and establishing requirements for hydrogen sulfide flaring and venting.

3.1.1.9.2. Shallow Hazards

The types of high-resolution seismic surveys that are deployed to collect the data used for shallow hazards analyses are described in **Chapter 3.1.1.2.1**.

Shallow hazard assessments are required by 30 CFR §§ 550.214 and 550.244. The NTL 2008-G05, "Shallow Hazards Program," explains the requirements for these surveys and their reports. Included in shallow hazard assessment is a structural and stratigraphic interpretation of seismic data to qualitatively delineate abnormal pressure zones, shallow free gas, seafloor instability, shallow waterflow, and gas hydrates.

The objective of the shallow hazard assessment is to identify, map, and delineate seafloor, shallow subsurface geologic features, and man-caused obstructions that may impact proposed oil and gas operations, which include the following:

- seafloor geologic hazards such as fault scarps, gas vents, unstable slopes, and reefs;
- shallow subsurface geologic hazards such as faults, gas hydrates and gas-charged sediments, buried channels, and abnormal pressure zones; and
- synthetic hazards such as pipelines, wellheads, shipwrecks, military ordnance (offshore disposal sites), and debris from oil and gas operations.

The shallow hazards survey is also used to identify and map geologic features in the vicinity of proposed wells, platforms, anchors and anchor chains, mounds or knolls, acoustic void zones, gas- or oil-charged sediments, or seeps associated with surface faulting that may be indicative of ocean-bottom chemosynthetic communities.

Since 1987, operators have reported shallow waterflow events to this Agency. These events are a phenomenon encountered in water depths exceeding 600 ft (183 m). Reported waterflows are between a few hundred feet to more than 4,000 ft (1,219 m) below the seafloor. Water flowing up and around the well casing and annulus may deposit sand or silt on the seafloor within a few hundred feet of the wellhead. Although in most cases there is no gas content in the waterflow, in these water depths a stream of gas bubbles may form frozen gas hydrates at the sea bottom and on flat surfaces of seafloor drilling equipment. Shallow waterflows can result from buried channels filled with more permeable sediment. Abnormally pressured shallow sands may result from either rapid slumping or rotating faults or from reworked cut-and-fill channels sealed by impermeable mud or clay. In rare cases, hydrates below the mudline could be a source of shallow waterflow by melting down hydrates during oil production. Shallow waterflow events can cause additional expenditure of time and money for the driller to maintain well control and can lead to drilling difficulty up to and including a decision to permanently plug and abandon the well. Unanticipated shallow hazards can lead to downhole pressure kicks that range from minor and controllable to significant and uncontrollable; up to and including a serious blowout condition.

3.1.1.9.3. New and Unusual Technology

Technologies continue to evolve to meet the technical, environmental, and economic challenges of deepwater development. This Agency prepared a Programmatic EA to evaluate the potential effects of deepwater technologies and operations (USDOI, MMS, 2000a). As a supplement to the Programmatic EA, this Agency prepared a series of technical papers that provides a profile of the different types of development and production structures that may be employed in the GOM deep water (Regg et al., 2000). The Programmatic EA and technical papers were used in the preparation of this EIS.

The operator must identify new or unusual technology in exploration and development plans. Some of the technologies proposed for use by the operators are actually extended applications of existing technologies and interface with the environment in essentially the same way as well-known or conventional technologies. These technologies are reviewed by BOEM for alternative compliance or departures that may trigger additional environmental review. Some examples of new technologies that do not affect the environment differently and are being deployed in the Gulfwide OCS Program include synthetic mooring lines, subsurface safety devices, and multiplex subsea controls.

Some new technologies differ in how they function or interface with the environment. These include equipment or procedures that have not been installed or previously been used in Gulf of Mexico OCS waters. Having no operational history, they have not been assessed by BOEM through technical and environmental reviews. New technologies may be outside the framework established by BOEM regulations and, thus, their performance (safety, environmental protection, efficiency, etc.) has not been studied by BOEM. The degree to which these new technologies interface with the environment and the potential impacts that may result are considered in determining the level of NEPA review that would be initiated if an operator wishes to deploy it.

BOEM has developed a new or unusual technology matrix to help facilitate decisions on the appropriate level of engineering and environmental review needed for a proposed technology. Technologies will be added to the new or unusual technology matrix as they emerge, and technologies will be removed as sufficient experience is gained in their implementation. From an environmental perspective, the matrix characterizes new technologies into three components: technologies that may affect the environment; technologies that do not interact with the environment any differently than "conventional" technologies; and technologies for which BOEM does not have sufficient information to determine its potential impacts to the environment. In this later case, BOEM will seek to gain the necessary information from operators or manufacturers regarding the technologies to make an appropriate determination on its potential effects on the environment.

Alternative Compliance and Departures: BOEM's project-specific engineering safety review ensures that equipment proposed for use is designed to withstand the operational and environmental condition in which it would operate. When an OCS operator proposes the use of technology or procedures not specifically addressed in established BOEM regulations, the operations are evaluated for alternative compliance or departure determination. Any new technologies or equipment that represent an alternative compliance or departure from existing BOEM regulation must be fully described and justified before it would be approved for use. For BOEM to grant alternative compliance or departure approval, the operator must demonstrate an equivalent or improved degree of protection as specified in 30 CFR § 550.141. Comparative analysis with other approved systems, equipment, and procedures is one tool that BOEM uses to assess the adequacy of protection provided by alternative technology or operations.

Actual operational experience is necessary with alternative compliance measures before BOEM would consider them as proven technology.

In addition to new and unusual technology for drilling, as a result of the *Deepwater Horizon* explosion and oil spill, many technologies or applications were developed in attempting to stop the spill and cap the well. The NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources," applies to operators conducting operations using subsea BOP's or surface BOP's on floating facilities. BOEM will assess whether each lessee has submitted adequate information demonstrating that it has access to and can deploy surface and subsurface containment resources that would be adequate to promptly respond to a blowout or other loss of well control. Containment resources could consist of, but are not limited to, subsea containment and capture equipment including containment domes and capping stacks, subsea utility equipment including hydraulic power, hydrate control, and dispersion injection equipment.

3.1.1.10. Decommissioning and Removal Operations

During exploration, development, and production operations, the seafloor around activity sites within the proposed lease sale area becomes the repository of temporary and permanent equipment and structures. In compliance with Section 22 of BOEM's Oil and Gas Lease Form (BOEM-2005) and BSEE's regulations (30 CFR §§ 250.1710 to 250.1717—wellheads/casings and 30 CFR §§ 250.1725 to 250.1754 —platforms and other facilities), lessees are required to remove all seafloor obstructions from their leases within 1 year of lease termination or relinquishment. These regulations require lessees to sever bottom-founded structures and their related components at least 5 m (15 ft) below the mudline to ensure that nothing would be exposed that could interfere with future lessees and other activities in the area. The structures are generally grouped into two main categories depending upon their relationship to the platform/facilities (piles, jackets, caissons, templates, mooring devises, etc.) or the well (i.e., wellheads, casings, casing stubs, etc.).

There are possible exemptions to the 1-year deadline, including the exemptions stated in Section 388 of the Energy Policy Act of 2005. Section 388 clarifies the Secretary's authority to allow an offshore oil and gas structure, previously permitted under the OCSLA, to remain in place after oil and gas activities have ceased in order to allow the use of the structure for other energy and marine-related activities. This authority provides opportunities to extend the life of facilities for non-oil and gas purposes, such as research, renewable energy production, aquaculture, etc., before being removed.

A varied assortment of severing devices and methodologies has been designed to cut structural targets during the course of decommissioning activities. These devices are generally grouped and classified as either nonexplosive or explosive, and they can be deployed and operated by divers, ROV's, or from the surface. Which severing tool the operators and contractors use takes into consideration the target size and type, water depth, economics, environmental concerns, tool availability, and weather conditions.

Nonexplosive severing tools are used on the OCS for a wide array of structure and well decommissioning targets in all water depths. Based on 10 years of historical data (1994-2003), nonexplosive severing is employed exclusively on about 58 (~37%) removals per year (USDOI, MMS, 2005). Since many decommissionings use both explosive and nonexplosive technologies (prearranged or as a backup method), the number of instances may be much greater. Common nonexplosive severing tools consist of abrasive cutters (e.g., sand cutters and abrasive water jets), mechanical (carbide) cutters, diver cutting (e.g., underwater arc cutters and the oxyacetylene/oxy-hydrogen torches), and diamond wire cutters.

With the exception of minor air and water quality concerns (i.e., exhaust from support equipment and toxicity of abrasive materials), nonexplosive severing tools generally cause little to no environmental impacts; therefore, there are very few regulations regarding their use. However, the use of nonexplosive cutters leads to greater human health and safety concerns, primarily because (1) divers are often required in the methodology (e.g., torch/underwater arc cutting and external tool installation and monitoring), (2) more personnel are required to operate them (increasing their risks of injury in the offshore environment), (3) lower success rates require that additional cutting attempts be made, and (4) the cutters can only sever one target at a time, taking on average 30 minutes to several hours for a complete cut (USDOI, MMS, 2005). The last two items are often hard to quantify and assign risks to the cutters, but the main principle is that there is a linear relationship between the length of time any offshore operation is staged and on-site (exposure time) and the potential for an accident to occur (Twachtman Snyder & Byrd, Inc. and Louisiana State University, Center for Energy Studies, 2004). Therefore, even if there are no direct injuries or incidents involving a diver or severing technicians, the increased "exposure time" needed to successfully sever all necessary targets could result in unrelated accidents involving other barge/vessel personnel.

Explosive severance tools can be deployed on almost all structural and well targets in all water depths. Historically, explosive charges are used in about 98 (~63%) decommissioning operations annually (USDOI, MMS, 2005), often as a back-up cutter when other methodologies prove unsuccessful. Explosives work to sever their targets by using (1) mechanical distortion (ripping), (2) high-velocity jet cutting, and (3) fracturing or "spalling."

Mechanical distortion is best exhibited with the use of explosives such as standard and configured bulk charges. If the situation calls for minimal distortion and an extremely clean severing, most contractors rely upon the jet-cutting capabilities of shaped charges. In order to "cut" with these explosives, the specialized charges are designed to use the high-velocity forces released at detonation to transform a metal liner (often copper) into a thin jet that slices through its target. The least used method of severing currently in use on the Gulf of Mexico OCS is fracturing, which uses a specialized charge to focus pressure waves into the target wall and use refraction forces to spall or fracture the steel on the opposing side (NRC, 1996a).

This Agency prepared a Programmatic EA, *Structure-Removal Operations on the Gulf of Mexico Outer Continental Shelf* (USDOI, MMS, 2005), to evaluate the full range of potential environmental impacts of structure-removal activities in all water depths in the CPA and WPA and in the Sale 181/189 area in the EPA of the Gulf of Mexico. The activities analyzed in the Programmatic EA include vessel and equipment mobilization, structure preparation, nonexplosive- and explosive-severance activities, post-severance lifting and salvage, and site-clearance verification. The impact-producing factors of structure removals considered in the Programmatic EA include seafloor disturbances, air emissions and water discharges, pressure and acoustic energy from explosive detonations, and space-use conflicts with other OCS users. No potentially significant impacts were identified for air and water quality; marine mammals and sea turtles; fish, benthic, and archaeological resources; or other OCS pipeline, navigation, and military uses. On the basis of this Programmatic EA, this Agency determined that an EIS was not required and prepared a Finding of No Significant Impact.

In water depths >800 m (2,625 ft), OCS regulations would offer the lessees the option to avoid the jetting by requesting alternate removal depths for well abandonments (30 CFR § 250.1716(b)(3)) and facilities (30 CFR § 250.1728(b)(3)). Above mudline cuts would be allowed with reporting requirements on the remnant's description and height off of the seafloor to BSEE—data necessary for subsequent reporting to the U.S. Navy. In some cases, industry has indicated that it could use the alternate removal depth options, coupled with quick-disconnect equipment (i.e., detachable risers, mooring disconnect systems, etc.) to fully abandon in-place wellheads, casings, and other minor, subsea equipment in deep water without the need for any severing devices.

After bottom-founded objects are severed and the structures are removed, operators are required to verify that the site is clear of any obstructions that may conflict with other uses of the OCS. The NTL 98-26, "Minimum Interim Requirements for Site Clearance (and Verification) of Abandoned Oil and Gas Structures in the Gulf of Mexico," provides the requirements for site clearance. The lessee must develop, and submit to BSEE for approval, a procedural plan for the site clearance verification procedures. For platform and caisson locations in water depths of <91 m (300 ft), the sites must be trawled over 100 percent of the designated area in two directions (i.e., N-S and E-W). Individual well-site clearances may use high-frequency (500 kHz) sonar searches for verification. Site-clearance verification must take place within 60 days after structure-removal operations have been conducted.

EPA Proposed Action Scenario (Typical Lease Sale): **Table 3-2** shows platform removals as a result of an EPA proposed action. Of the 0-1 production structures estimated to be removed as a result of an EPA proposed action, none would be expected to be removed using explosives.

EPA Cumulative Scenario: **Table 3-3** shows platform removals as a result of EPA cumulative activities. Of the 0-2 production structures estimated to be removed as a result of EPA cumulative activities, none would be expected to be removed using explosives.

OCS Program Scenario (EPA, WPA, and CPA): **Table 3-4** shows platform removals for the total Gulfwide OCS Program. Of the 233-350 production structures estimated to be removed from the WPA during 2012-2051, 160-241 production structures (installed landward of the 800-m isobath) are likely to be removed using explosives. Of the 1,046-1,485 production structures estimated to be removed from the CPA during 2012-2051, 988-1,406 production structures (installed landward of the 800-m isobath) are likely to be removed using explosives. Again, of the 0-2 production structures estimated to be removed as a result of EPA cumulative activities, none would be expected to be removed using explosives.

Note that the impact-producing factors, affected environment, and environmental consequences related to the WPA and CPA cumulative OCS Program activities have been disclosed and addressed in the 2012-2017 WPA/CPA Multisale EIS.

3.1.2. Coastal Impact-Producing Factors and Scenario

3.1.2.1. Coastal Infrastructure

The following sections discuss coastal impact-producing factors and provide scenario projections for onshore coastal infrastructure that may potentially result from a single EPA proposed action in the Five-Year Program). This discussion describes the potential need for new facility construction and expansions of existing ones. Detailed descriptions of the baseline affected environment for land use and coastal infrastructure in the EPA is provided in **Chapter 4.1.1.22.1.1**.

Oil and gas exploration, production, and development activities on the OCS are supported by an expansive onshore industry that supports thousands of jobs; its direct and indirect economic impacts ripple through the Gulf Coast economy. This industry includes large and small companies providing a wealth of services from construction facilities, service bases, and waste disposal facilities to crew, supply, and product transportation, as well as processing facilities. The onshore, OCS-related infrastructure associated with this industry is a long-standing feature of the built environment and regional economy.

This infrastructure has been developed over many decades as the result of long-term industry trends. As such, it is an extensive and mature system of support that is not subject to rapid fluctuations. In this context, the potential for new facilities and expansion at existing facilities depends foremost on OCS activity levels, which have been gradually increasing in the post-*Deepwater Horizon* explosion, oil spill, and response recovery period. The scenario projections outlined below reflect the already well-established industrial infrastructure in the GOM regions and current OCS activity levels.

Chapter 4.1 addresses incomplete or unavailable information, including information related to or as a result of the *Deepwater Horizon* explosion, oil spill, and response. Infrastructure projections reflect long-term industry trends, and any changes to these trends that might be due to the *Deepwater Horizon* explosion, oil spill, and response could not be determined conclusively at the time this EIS was prepared. However, currently, there are no indications that long-term industry trends would change, or have changed, as a direct result of the *Deepwater Horizon* explosion, oil spill, and response alone. Therefore, BOEM expects that OCS activity levels will continue to gradually recover and eventually return to pre-*Deepwater Horizon* explosion, oil spill, and response levels. BOEM makes conservative infrastructure scenario estimates; a projection of between zero and one is more likely to be zero than one. These scenario estimates have become more conservative in the aftermath of the *Deepwater Horizon* explosion, oil spill, and response and are especially conservative given the small size and expected impact of an EPA proposed action (Dismukes, official communication, 2012a). BOEM will continue to collect new data and to monitor changes in infrastructure demands in order to support scenario projections that reflect current and future industry conditions.

There is no expectation that an EPA proposed action would significantly change existing OCS-related service bases or require any additional service bases, given the small size and limited impact of an EPA proposed action. Rather, an EPA proposed action would contribute to the use of existing service bases in a very limited way (Dismukes, official communication, 2012a).

Increasing onshore shale gas development, declining offshore gas production, and the increasing efficiency and capacity of existing gas processing facilities are trends that have combined to lower the need for new gas processing facilities along the Gulf Coast. Sufficient land exists to construct a new gas processing facility in the very unlikely event that one should be needed. BOEM projects that 0-1 new gas processing facilities may be constructed as a result of an EPA proposed action. However, the likelihood of a new gas processing facility has moved closer to zero and farther from one (Dismukes, official communication, 2012a).

BOEM's exploration and development scenario calls for the possibility of a single new pipeline that may be constructed as a result of an EPA proposed action, and it is expected that this pipeline would connect to the existing offshore pipeline infrastructure to the west of the analysis area. Given the reality that, in the majority of cases, it is more economically feasible for new pipelines to tie into already existing pipeline infrastructure (Dismukes, official communication, 2012a), BOEM expects it to be unlikely that an EPA proposed action would result in a new pipeline landfall, but maintains a conservative projection. Therefore, BOEM projects 0-1 pipeline landfalls as a result of an EPA proposed action.

While an EPA proposed action would contribute to the continued need for maintenance dredging of existing navigation channels, a mature network of navigation channels already exists in the analysis area; therefore, no new navigation channel construction would be expected as a direct result of an EPA proposed action.

Existing solid-waste disposal infrastructure is adequate to support both existing and projected offshore oil and gas drilling and production needs. BOEM analyses indicate that there is an abundance of solid-waste capacity in the GOM region and, thus, it is highly unlikely that any new waste facilities would be constructed. Recent research shows that the volume of OCS waste generated is closely correlated with the level of offshore drilling and production. In the months following the *Deepwater Horizon* oil spill, activity levels temporarily decreased and then began to gradually increase (Dismukes, official communication, 2012a). Given the excess capacity at existing facilities and the current OCS activity levels, BOEM is not projecting any new waste facilities as a result of an EPA proposed action.

The following sections provide the current trends and outlook for the varied infrastructure categories. No new facilities are projected as a result of an EPA proposed action; however, a proposed action may contribute to the use of existing facilities.

The primary sources for the information on coastal infrastructure and activities presented here are BOEM's Gulf of Mexico Fact Books: (1) *OCS-Related Infrastructure in the Gulf of Mexico Fact Book* (The Louis Berger Group, Inc., 2004); (2) *Fact Book: Offshore Oil and Gas Industry Support Sectors* (Dismukes, 2010); and (3) *OCS-Related Infrastructure Fact Book; Volume I: Post-Hurricane Impact Assessment* (Dismukes, 2011) and (4) *OCS-Related Infrastructure Fact Book; Volume II: Communities in the Gulf of Mexico* (Kaplan, et al., 2011). Within the last 5 years, this Agency analyzed historical data and validated past scenario projections of new pipeline landfalls and new onshore waste disposal sites (USDOI, MMS, 2007a; Dismukes et al., 2007).

3.1.2.1.1. Service Bases

A service base is a community of businesses that load, store, and supply equipment, supplies, and personnel that are needed at offshore work sites. Although a service base may primarily serve the OCS planning area and EIA's in which it is located, it may also provide significant services for the other OCS planning areas and EIA's. **Table 3-13** shows the 50 services bases the OCS currently uses. An EPA proposed action is expected to impact only those ports that currently have facilities used by the oil and gas industry as offshore service bases. The ports of Fourchon, Venice, and Morgan City, Louisiana; Pascagoula, Mississippi; and Theodore, Alabama, are each potential service bases for the proposed EPA Lease Sales 225 and 226 lease sale area, although it is expected that Port Fourchon would be the most likely service base (Dismukes, official communication, 2012a).

Summary: Given the small size of the area of available blocks for lease, the >800-m (2,625-ft) water depth, and the minimal production forecast—with only one platform predicted in BOEM's exploration and development scenario (**Table 3-2**), BOEM assumes that the primary service base would be Port Fourchon, Louisiana. An EPA proposed action will not require any new service bases to be constructed nor would it change any of the existing identified service bases. The OCS Program will require no additional service bases.

3.1.2.1.2. Helicopter Hubs

Helicopter hubs or "heliports" are facilities where helicopters can land, load, and offload passengers and supplies, refuel, and be serviced. These hubs are used primarily as flight support bases to service the offshore oil and gas industry. Most of the helicopter operations originate at helicopter hubs in coastal Texas and Louisiana. There are 123 identified heliports within the analysis area that support OCS activities; 115 in Louisiana, 4 in Mississippi, 4 in Alabama, and 0 in Florida. Industry consolidation has resulted in a small number of large helicopter service providers. The Gulf is served primarily by three large operators, which account for nearly 80 percent of the aircraft available in the Gulf. **Figure 3-5** shows the locations of the major helicopter service providers. A few major oil companies operate and maintain their own fleets, although this is a decreasing trend since oil and gas companies are increasingly subcontracting the whole operation to independent contractors. Another consideration for the helicopter industry is new technology such as subsea systems. These systems decrease the number of platforms and personnel needed offshore, therefore reducing the amount of transportation needed (Dismukes, 2010). This is particularly relevant for an EPA proposed action because BOEM's scenario calls for one subsea system that ties back into existing pipeline infrastructure, rather than transporting product to shore via tanker or a new pipeline landfall.

Summary: Helicopter operations for an EPA proposed action are projected at 27 round-trip operations (**Table 3-2**). No new heliports are projected as a result of the OCS Program; however, if activity levels increase, they may expand at current locations. Due to the small scenario forecast for infrastructure to be emplaced in the proposed EPA lease sale area as a result of a proposed EPA lease sale, BOEM projects that only 54 helicopter operations related to OCS activities would occur over the 2012-2051 period (**Table 3-3**). This equates to an average rate of 7.4 operations annually.

3.1.2.1.3. Construction Facilities

3.1.2.1.3.1. Platform Fabrication Yards

Chapter 4.1.1.22.1.1 describes platform fabrication yards in the analysis area. Platform fabrication is highly dependent on the structural nature of the oil and gas industry. As oil prices fluctuate, platform fabrication yards adjust accordingly. When oil prices are low, they have to diversify their operations into other marine-related activities or scale back on the overall scope of their operations. The variety of diversification strategies may include drilling rig maintenance and re-builds, barge or vessel fabrication, dry-docking, and equipment survey. There are 42 platform fabrication yards in the analysis area, with the highest concentration in Louisiana at 37; there are 4 in Mississippi, 1 in Alabama, and 0 in Florida (Dismukes, 2011).

With respect to deepwater development, the challenges for the fabrication industry stem from the greater technical sophistication and the increased project complexity of the deepwater structures, such as compliant towers and floating structures. Deepwater projects are necessarily larger, more sophisticated, and costly, which results in two important trends for the fabrication industry. First, there is a greater degree of industry consolidation, at least with respect to the deepwater projects. Second, there is closer integration—through alliances, special project relationships, and joint ventures—among the fabrication yards and engineering firms. As technical and organizational challenges continue to mount up, it is expected that not every fabrication yard will find adequate resources to keep pace with the demands of the oil and gas industry.

Summary: No new facilities are expected to be constructed as a result of an EPA proposed action. No new facilities are expected to be constructed in support of OCS Program activities. Some current yards may close, be bought out, or merge over the 2012-2051 period, resulting in fewer active yards in the analysis area.

3.1.2.1.3.2. Shipbuilding and Shipyards

Chapter 4.1.1.22.1.1 describes shipbuilding and shipyards in the analysis area. The shipbuilding and repair industry has struggled over the last few decades. Since the mid-1990's, there has been some industry stabilization, but the outlook for shipbuilding and shipyards is uncertain. The industry is overly dependent on military contracts and faces numerous economic challenges, such as lack of international competitiveness, workforce development challenges, availability of capital, and the lack of research and development funding. In the GOM region, there is a direct correlation between oil and gas activities and the demand or opportunities for expanding shipbuilding and offshore supply/service vessels. There are 105 shipyards located within the analysis area (**Table 3-11**). Several large companies dominate the oil and gas shipbuilding industry. Most yards in the analysis area are small. Generally, as oil and gas drilling and production increase, the demand for an expanded shipbuilding effort also increases. BOEM expects that as activity levels gradually return to pre-*Deepwater Horizon* explosion, oil spill, and response levels, the prospects for shipbuilding and shipyards should improve.

Summary: No new facilities are expected to be constructed as a result of an EPA proposed action. There is more than an adequate supply of shipyard resources in the Gulf of Mexico. No new facilities are expected to be constructed in support of OCS Program activities. Some shipyards may be closed, bought-out, or merge over the 2012-2051 period, resulting in fewer active yards in the analysis area.

3.1.2.1.3.3. Pipecoating Facilities and Yards

Chapter 4.1.1.22.1.1 describes pipecoating facilities and yards in the analysis area. There are currently 10 pipecoating plants in the analysis area **Table 3-11**. Pipecoating facilities receive manufactured pipe, which they then coat the surfaces of with metallic, inorganic, and organic materials to protect from corrosion and abrasion and to add weight to counteract the water's buoyancy. Two to four sections of pipe are then welded at the plant into 40-ft (12-m) segments. The coated pipe is stored (stacked) at the pipe yard until it is needed offshore.

Over the past several years, to meet deepwater demand, pipecoating companies were expanding capacity or building new plants. In the few months after the *Deepwater Horizon* oil spill, activity levels dropped temporarily. As activity gradually increases in the GOM post-*Deepwater Horizon* explosion, oil spill, and response, the demand for pipecoating services will recover and also increase, but these would most likely be met by expansions at existing facilities.

Summary: No new facilities are expected to be constructed as a result of an EPA proposed action. Current capacity, supplemented by expansions at already existing facilities, is anticipated to meet OCS Program demand. No new facilities are expected to be constructed in support of OCS Program activities.

3.1.2.1.4. Processing Facilities

3.1.2.1.4.1. Refineries

Chapter 4.1.1.22.1.1 describes refineries in the analysis area. Although Texas is generally not considered part of this area, most of the region's refineries are located in Texas and Louisiana (**Table 3-11**). Louisiana has 18 operable refineries, with a total capacity of over 3 MMbbl/day, which is 18 percent of the total U.S. capacity. Mississippi and Alabama each have 3 operable refineries, with a total capacity of 364,000 bbl/day and 120,100 bbl/day, respectively (USDOE, Energy Information Administration, 2013c).

A crude oil refinery is a group of industrial facilities that turns crude oil and other inputs into finished petroleum products. A refinery's capacity refers to the maximum amount of crude oil designed to flow into the distillation unit of a refinery, also known as the crude unit. For all domestic refineries, distillation capacity is projected to stay at a steady rate of 17.5-17.6 MMbbl/day over the 40-year period (USDOE, Energy Information Administration, 2013d). For many years financial, environmental, and legal considerations have restrained the building of new refineries in the United States, which restricts companies to expand and retrofit existing facilities. Domestic refinery expansions are largely being driven by unconventional sources of oil, primarily Canadian oil sands (Sreekumar, 2013). The Canadian heavy crude is cheaper to buy but costlier to refine, and many refineries planning to take advantage of the newest discoveries are expanding their facilities to handle the higher volumes of impurities associated with heavier crude oils (Rigzone, 2013).

Summary: No new facilities are expected to be constructed as a result of an EPA proposed action. For many years financial, environmental, and legal considerations have restrained the building of new refineries in the United States, and this is expected to continue. Therefore, over the 2012-2051 period, any increases will likely result from the expansion of existing refineries rather than from the building of new ones.

3.1.2.1.4.2. Gas Processing Facilities

Chapter 4.1.1.22.1.1 describes gas processing facilities in the analysis area. As of July 1, 2011, there were 98 OCS-related gas processing facilities in the BOEM-identified 13 EIA's along the Gulf Coast. Most gas processing facilities are located in Louisiana (44) and Texas (39), followed by Alabama (13), Mississippi (1), and Florida (1) (**Table 3-11**).

Offshore natural gas production, partially due to an increasing emphasis on onshore shale gas development, which provides larger per well production opportunities and reserve growth, is less expensive to produce and is closer to consumers. Also, there has been a trend toward more efficient gas processing facilities with greater processing capacities (Dismukes, 2011). In recent years, these three trends (increasing onshore shale gas development, declining offshore gas production, and increasing efficiency/capacity of existing gas processing facilities) have combined to lower the need for new gas processing facilities along the Gulf Coast.

It is likely that a large share of any future needs for natural gas processing capacity will likely be met through investments at existing facilities in expansions and/or to replace depreciated capital equipment. The reasons for this include the following: lower development costs because of existing structures and utility services; existing interconnections to pipelines, natural gas liquid lines, and fractionators; incremental labor requirements relative to those of new facility staffing; the advantages of existing support, logistical, and supply relationships such as vendors and maintenance support; and general economies of scale (Dismukes, official communication, 2012a).

Summary: BOEM projects that 0-1 new gas processing facilities may be constructed as a result of an EPA proposed action. However, current trends move the likelihood closer to zero and farther from one that a new gas processing facility will result from an EPA proposed action. Projections for new gas processing facilities during the period 2012-2051 resulting from the OCS Program are dependent on long-term market trends that are not easily predictable over the next 40 years.

3.1.2.1.4.3. Liquefied Natural Gas Facilities

Chapter 4.1.1.22.1.1 describes liquefied natural gas (LNG) facilities in the analysis areas. The GOM area has a wide variety of pipeline systems and delivery markets that make it attractive to LNG developers. Also, the GOM has some of the largest refinery, petrochemical, and paper-pulp facilities in the world, which consume large quantities of natural gas for production purposes or transform the gas into high quality fuels or products. From 2002 to 2007, the amount of U.S. natural gas imports sharply increased as a percent of total consumption. There were several terminal expansions in the 2006-2007 timeframe. Since 2008, the amount of natural gas imported to the U.S. has sharply decreased, as have announcements for new regasification facilities along the Gulf Coast. The United States' imports of natural gas are expected to continue to decline. Onshore natural gas production has increased to the point that existing Gulf Coast LNG facilities are seeking to export natural gas to foreign countries. Offshore natural gas production has been declining, a trend that is expected to continue (Dismukes, official communication, 2012b).

In 2008, projections indicated that the U.S. would need to ramp up its natural gas imports, and industry began constructing LNG containers along Gulf ports to accommodate the influx (Helman, 2013). In 2013, onshore unconventional natural gas production has increased to the point that existing Gulf Coast LNG facilities are seeking to export natural gas to foreign countries. In 2011, Cheniere's Sabine Pass, Louisiana, facility received approval from the U.S. Department of Energy to export to any country in the world (Helman, 2013; U.S. Dept. of Energy, Federal Energy Regulatory Commission, 2013). Seventeen additional project sponsors have applied to DOE for authorization to export domestically produced LNG to free trade agreement and non-free trade agreement countries (Dismukes, 2013b and c; U.S. Dept. of Energy, Federal Energy Regulatory Commission, 2013).

Summary: BOEM projects that expansions at existing facilities and construction of new facilities would not occur as a direct result of an EPA proposed action or the OCS Program. Any expansion and construction would be the result of onshore, rather than offshore, production.

3.1.2.1.5. Pipeline Shore Facilities, Barge Terminals, and Tanker Port Areas

Chapter 4.1.1.22.1.1 describes pipeline shore facilities, barge terminals, and tanker port areas in the analysis area. "Pipeline shore facility" is a broad term for an onshore location where the first stage of processing occurs for OCS pipelines carrying different combinations of oil, condensate, gas, and produced water. While some processing occurs offshore at platforms, this chapter only addresses onshore facilities. Pipelines carrying only dry gas do not require such shore facilities; the dry gas is piped directly to gas processing facilities. Therefore, new pipeline shore facilities are projected to only result from oil pipeline landfalls. Because a pipeline shore facility may support several pipelines, new pipeline shore facilities are projected to only result from larger pipelines (>12 in; 30 cm). Although facilities may be found in wetlands, current permitting programs prohibit or discourage the construction of any new facilities in wetlands. Also, it is more cost effective for companies to tie into the existing offshore pipeline network. No new pipeline shore facilities are projected as a result of an EPA proposed action. It is projected that an EPA proposed action would represent a small percent of the resources handled by existing and projected shore facilities. As a result of the OCS Program, there may be a need, in some rare instance, for new shore facilities to support new larger oil pipeline landfalls, but this is not likely.

Barging of OCS production is expected to remain stable. There are over 250 barge terminals in the Gulf of Mexico region. However, BOEM's scenario estimates that all EPA proposed action production will utilize subsea tiebacks. Therefore, no major modifications or new barge terminals are expected to be constructed in the foreseeable future to support an EPA proposed action or OCS Program operations (**Tables 3-3 and 3-4**).

The transport of OCS-produced oil from FPSO operations to inside or shore-side facilities would be accomplished with shuttle tankers rather than oil pipelines. However, BOEM's exploration and development scenario calls for <0.01 percent tankered product for an EPA proposed action or OCS Program operations (**Tables 3-3 and 3-4**). Therefore, it is highly unlikely, and BOEM does not expect, that any product will be tankered to shore as a result of an EPA proposed action.

3.1.2.1.6. Coastal Pipelines

Chapter 4.1.1.22.1.1 describes coastal pipelines in the analysis area. The OCS pipelines nearshore and onshore may join pipelines carrying production from State waters or territories for transport to processing facilities or to distribution pipelines located farther inland.

The long-term trend since the mid-1980's is for new OCS pipelines to tie into existing systems rather than creating new landfalls. Since 1986, the 5-year moving average of new OCS pipeline landfalls has been below two per year. Over the last 15 years (1996-2011), there has been an average of slightly under one new OCS pipeline landfall per year (0.80). **Table 3-14** lists the OCS pipeline landfalls that have been installed since 1996. To project the likely number of new OCS pipeline landfalls, BOEM examined the historical relationships between new pipeline landfalls and a variety of factors including platforms installed, oil and gas production, and the total number of new pipelines (USDOI, MMS, 2007a). Oil and gas companies have a strong financial incentive to reduce costs by utilizing, to the fullest extent possible, the mature pipeline network that already exists in the Gulf of Mexico. Economies of scale are a factor in pipeline transportation; maximizing the amount of product moved through an already existing pipeline decreases the long-term average cost of production. Additional considerations include mitigation costs for any new wetland and environmental impacts and various landowner issues at the landfall point. Because of these strong incentives to move new production into existing systems and to avoid creating new landfalls, BOEM projects that the majority of new pipelines constructed as a result of an EPA proposed action would connect to the existing pipeline infrastructure. In the rare instance that a new pipeline would need to be constructed, it will likely be because there are no existing pipelines reasonably close and because constructing a pipeline to shore is considered more cost effective, although it is highly unlikely for an operator to choose this contingency (Dismukes, official communication, 2012a).

Summary: BOEM projects that 0-1 new landfalls may occur for an EPA proposed action, although the likelihood of a new pipeline landfall has moved closer to zero and farther from one. In comparison, the OCS Program may result in a range from 0 to 12 new pipeline landfalls.

3.1.2.1.7. Coastal Barging

It is projected that OCS oil barged from offshore platforms to onshore barge terminals will continue to represent a small portion of the total amount of oil barged in coastal waters. There is a tremendous amount of barging that occurs in the coastal waters of the GOM, and no estimates exist of the volume of this barging that is attributable to the OCS industry. Secondary barging of OCS oil often occurs between terminals or from terminals to refineries. Oil that is piped to shore facilities and terminals is often subsequently transported by barge up rivers, through the Gulf Intracoastal Waterway, or along the Gulf Coast.

BOEM's scenario estimates that all EPA proposed action production will utilize subsea tiebacks and that no tankering of product is expected. Therefore, the current rate of OCS barging is expected to continue at current levels with no increase as a result of an EPA proposed action.

3.1.2.1.8. Navigation Channels

Navigation channels undergo maintenance dredging that is essential for sustaining proper water depths to allow ships to move safely through the waterways to ports, services bases, and terminal facilities. In the northern GOM, the existing system of navigation channels is projected to be adequate to allow proper accommodation for vessel traffic that will occur as a result of a single EPA proposed action. The Gulf-to-port channels and the Gulf Intracoastal Waterway that support prospective OCS ports are maintained by regular dredging and are generally sufficiently deep and wide to handle OCS-related traffic (**Figure 3-6**). The COE is the Federal agency responsible for the regulation and oversight of navigable waterways. The maintained depth for each waterway is shown in **Table 3-12**. All single lease sales contribute to the level of demand for offshore supply vessel support; hence, they also contribute to the level of vessel traffic that travels through the navigation channels to support facilities. While maintenance dredging is essential for vessels to safely reach support facilities, it is a controversial process because it necessarily occurs in or near environmentally sensitive resources such as valuable wetlands, estuaries, and fisheries.

Summary: An EPA proposed action would contribute slightly to the continued need for maintenance dredging of existing navigation channels. However, no additional maintenance dredging is expected to be scheduled or new navigation channels are expected to be constructed as a direct result. There is no current expectation for new navigation channels to be authorized and constructed during the years 2012-2051 as a direct result of the OCS Program. One major Federal channel, the Mississippi River Gulf Outlet, was taken out of service and sealed with a rock dike in 2009.

3.1.2.1.9. Disposal and Storage Facilities for Offshore Operational Wastes

Chapter 4.1.1.22.1.2 describes coastal impacting factors arising from the infrastructure network needed to manage the spectrum of waste generated by OCS activity and disposal onshore in the Gulf of Mexico. The Agency-funded research by Dismukes et al. (2007) further supports past conclusions that existing solid-waste disposal infrastructure is adequate to support both existing and projected offshore oil and gas drilling and production needs. Recently, there is a trend toward incorporating more innovative methods for waste handling in an attempt to reduce the chance of adverse environmental impacts. Some of these innovative methods include hydrocarbon recovery/recycling programs, slurry fracture injection, treating wastes for reuse as road base or levee fill, and segregating waste streams to reduce treatment time and improve oil recovery (Dismukes, 2011).

Before the *Deepwater Horizon* explosion, oil spill, and response, this Agency's analyses indicated that there was an abundance of solid-waste capacity in the GOM region and, thus, it is highly unlikely that any new waste facilities would be constructed. Recent research shows that the volume of OCS waste generated is closely correlated with the level of offshore drilling and production activity. If offshore activities increase to the extent that a need for more capacity develops, it will probably be met by expansion of existing facilities. However, it is now unclear whether this will remain true; therefore, more research is needed. In the post-*Deepwater Horizon* explosion, oil spill, and response environment, there has been a very gradual increase in OCS activity that has leveled off in recent months, and experts are unable to predict exactly how long it will take for activity levels to recover to pre-*Deepwater Horizon* explosion, oil spill, and response levels (Dismukes, official communication, 2012a). Since there is not enough information at this time to draw a solid conclusion, BOEM will continue to monitor waste disposal demands and activity levels.

Summary: For an EPA proposed action, existing onshore facilities would continue to be used to dispose of wastes generated offshore. However, no new disposal facilities are expected to be licensed as a direct result of an EPA proposed action. There is no current expectation for new onshore waste disposal facilities to be authorized and constructed during the 2012-2051 period as a direct result of the OCS Program. If needed, existing facilities may undergo expansion, but no new disposal facilities are expected.

3.1.2.2. Discharges and Wastes

3.1.2.2.1. Onshore Facility Discharges

The primary onshore facilities that support offshore oil and gas activities include service bases, helicopter hubs at local ports/service bases, construction facilities (platform fabrication yards, pipe yards, and shipyards), processing facilities (refineries, gas processing facilities, and petrochemical plants), and terminals (pipeline shore facilities, barge terminals, and tanker port areas). Detailed descriptions of these facilities are given in **Chapter 4.1.1.22.1.1**. Water discharges from these facilities are from either point sources, such as a pipe outfall, or nonpoint sources, such as rainfall run-off from paved surfaces. The USEPA or the USEPA-authorized State program regulates point-source discharges as part of NPDES. Facilities are issued general or individual permits that limit discharges specific to the facility type and the waterbody receiving the discharge. Other wastes generated at these facilities are handled by local municipal and solid waste facilities, which are also regulated by USEPA or an USEPA-authorized State program.

3.1.2.2.2. Coastal Service-Vessel Discharges

Operational discharges from vessels include sanitary and domestic waters, bilge waters, and ballast waters. Support-vessel operators servicing the OCS offshore oil and gas industry may still legally discharge oily bilge waters in coastal waters, but they must treat the bilge water to limit its oil content to 15 ppm prior to discharge in accordance with both Annex 1 of the International Convention for the Prevention of Pollution from Ships (1973, as modified by the Protocol of 1978 [MARPOL]) and with the Act to Prevent Pollution from Ships. The Clean Water Act (CWA) prohibits the discharge of oil in harmful quantities that violate applicable water quality standards or that cause a visible sheen on the water. Sanitary wastes are treated on-board ships prior to discharge in accordance with Annex IV of MARPOL, 33 CFR part 159, and 33 U.S.C. § 1322 of the CWA. State and local governments regulate domestic or gray water discharges.

The USEPA currently regulates vessel discharges with the Vessel General Permit (VGP), a Clean Water Act NPDES permit that authorizes, on a nationwide basis, discharges incidental to the normal operation of nonmilitary and nonrecreational vessels greater than or equal to 79 ft (24 m) in length. The current permit, the 2008 Vessel General Permit, is in effect until December 19, 2013. On March 28, 2013, USEPA issued the 2013 draft VGP, which for the first time, contains numeric ballast water discharge limits for most vessels. The draft VGP also contains more stringent effluent limits for oil-to-sea interfaces and exhaust gas scrubber washwater. There is also a Small Vessel General Permit (sVGP), which if finalized, would authorize discharges incidental to the normal operation of nonmilitary and nonrecreational vessels less than 79 ft (24 m) in length and commercial fishing vessels (USEPA, 2013).

3.1.2.2.3. Offshore Wastes Disposed Onshore

Wastes that are not permitted for offshore disposal are brought to shore for disposal or recycling. Operational wastes that may be discharged offshore are discussed in **Chapter 3.1.1.4**. An NPDES permit is required to discharge offshore. The wastes disposed of onshore may be a waste type that is never included in the permit (e.g., produced sand), may be a batch that although typically permitted for discharge, cannot meet permit requirements (cuttings that have become oil-contaminated), or may be recyclable (used lubricating oil). Wastes that are typically transported to shore include produced sand, aqueous fluids such as wash water from drilling and production operations, naturally occurring radioactive materials such as tank bottoms and pipe scale, industrial wastes, municipal wastes, and other exploration and production wastes (Dismukes, 2011). Most oil-based fluids are recycled. The synthetic-based drilling fluid is either reused offshore, transferred to shore for regeneration followed by reuse, or disposed of. If the physical and chemical properties of the drilling fluids have degraded, they may be disposed of or treated and reused for purposes other than drilling. Different reuses of treated muds include use as fill material, daily cover material at landfills, aggregate or filler in concrete, and brick or block manufacturing. The OBF cuttings are disposed of onshore or are injected onsite (USEPA, 1999). Although the NPDES permit allows for the discharge of most drill cuttings, if the cuttings are contaminated with hydrocarbons from the reservoir fluid, they must be disposed of onshore or reinjected into a disposal well.

Treatment, workover and completion (TWC) fluids that do not meet NPDES permit requirements, such as small facilities, store spent TWC fluid in tanks on tending workboats or on the platform and then later transport the spent fluid to shore on supply boats or workboats. Once onshore, the TWC wastes are transferred to commercial waste-treatment facilities and are disposed of in commercial disposal wells. Offshore wells are projected to generate an average volume of 200 bbl from either a well treatment or workover job every 4 years. Each new well completion would generate about 150 bbl of completion fluid.

Produced sands are accumulated for transport to shore in cutting boxes (15- to 25-bbl capacities), 55-gallon steel drums, and cone-bottom portable tanks. The produced sands are transported to shore via offshore service vessels. Total produced sand from a typical platform is estimated to be 0-35 bbl/day (USEPA, 1993b). Both Texas and Louisiana have State oversight of exploration and production waste management facilities (Veil, 1999).

3.1.2.2.4. Beach Trash and Debris

Marine debris originates from both land-based and ocean-based sources. Forty-nine percent of marine debris originates from land-based sources, 18 percent originates from ocean-based sources, and 33 percent originates from general sources (sources that are a combination of land-based and sea-based activities) (USEPA, 2009a). Some of the sources of land-based marine debris are beachgoers, storm-water runoff, landfills, solid waste, rivers, floating structures, and ill-maintained garbage bins. Marine debris also comes from combined sewer overflows and typically includes medical waste, street litter, and sewage. Ocean-based sources of marine debris include galley waste and other trash from ships, recreational boaters, fishermen, and offshore oil and gas exploration and production facilities. Commercial and recreational fishers produce trash and debris by discarding plastics (e.g., ropes, buoys, fishing line and nets, strapping bands, and sheeting), wood, and metal traps. Some trash items, such as glass, pieces of steel, and drums with chemical or chemical residues, can be a health threat to local water supplies, to beachfront residents, and to users of recreational beaches. To compound this problem, there is population influx along the coastal shorelines. These factors, combined with the growing demand for manufactured and packaged goods, have led to an increase in nonbiodegradable solid wastes in our waterways.

The discharge of marine debris by offshore oil and gas industry and supporting activities is subject to a number of laws and treaties. These include the Marine Debris Research, Prevention, and Reduction Act; the Marine Plastic Pollution Research and Control Act; and the MARPOL-Annex V treaty. Regulation and enforcement of these laws is conducted by a number of agencies such as USEPA, NOAA, and USCG. BOEM's policy regarding marine debris prevention is outlined in NTL 2012-G01, "Marine Trash and Debris Awareness and Elimination." This NTL instructs OCS operators to post informational placards that outline the legal consequences and potential ecological harms of discharging marine debris. This NTL also states that OCS workers should complete annual marine debris prevention training; operators are also instructed to develop a certification process for the completion of this training by their workers. These various laws, regulations, and NTL's will likely minimize the discharge of marine debris from OCS operations.

3.2. IMPACT-PRODUCING FACTORS AND SCENARIO—ACCIDENTAL EVENTS

3.2.1. Oil Spills

Oil spills are unplanned, accidental events but their frequency and volume can be estimated from past occurrences. The following sections discuss spill prevention and spill response, and analyze the risk of spills that could occur as a result of activities associated with an EPA proposed action. Public input through scoping meetings and Federal and State agencies' input through consultation and coordination indicate that oil spills are perceived to be a major issue, especially in the wake of the *Deepwater Horizon* explosion and oil spill. The following section analyzes the risk of spills that could occur as a result of a typical EPA proposed action, as well as information on the number and sizes of spills from non-OCS sources. In addition, **Appendices B and C** provide an analysis of the potential impacts of and likelihood of contact from catastrophic spill events, which are considered to be low in probability.

Past OCS Spills

BOEM's spill-event database includes records of past spills from activities that are regulated by BOEM. These data include oil spills >1 bbl that occurred in Federal waters from OCS facilities and pipeline operations. Spills from facilities include spills from drilling rigs, drillships, and storage, processing, or production platforms that occurred during OCS drilling, development, and production operations. Spills from pipeline operations are those that have occurred on the OCS and that are directly attributable to the transportation of OCS oil. Anderson et al. (2012) was utilized in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS to characterize spill rates and provide analysis for average and median volumes. Spills also occur in coastal waters at shoreline storage, processing, and transport facilities supporting the OCS oil and gas industry. Coastal spills occur in State offshore waters and in navigation channels, rivers, and bays from barges and pipelines carrying OCS-produced oil.

A search of BSEE's oil-spill database (USDOI, BSEE, 2013) was performed to assess new spill information during the 2011-2012 period, which was not covered by Anderson et al. (2012). This search provides an update to the Anderson et al. (2012) analyses, which covered the period of 1964 through 2010. During 2011-2012, there were 35 spills from OCS oil and gas activities of <1,000 bbl in size, totaling 815 bbl overall. The BSEE database (USDOI, BSEE, 2013) indicated that there was one spill each in 2011 and 2012 that was in the range of 50-500 bbl in size. The spill in 2011 equaled 67 bbl and was the result of equipment failure from a platform leak located in Garden Banks Block 72. The spill in 2012 tentatively was estimated at 480 bbl and resulted from an explosion on a platform located in West Delta Block 32. However, the 2012 spill is still under investigation and observations collected during the spill suggest that the spill volume was actually much smaller. In summary, two spills >50 bbl occurred in the CPA during 2011-2012 and zero spills in this size category occurred in the WPA during this same time period. This is an outcome that is well within the range of spills estimated to occur in Table 3-12 of the 2012-2017 WPA/CPA Multisale EIS, and thus, this additional information did not change the validity of the scenario previously presented.

The breakdown of the 35 spills <1,000 bbl that occurred in 2011 and 2012 from OCS oil and gas activities into size classes is as follows: 19 spills of 1-4 bbl; 5 spills of 5-9 bbl; 9 spills of 10-49 bbl; 1 spill of 50-99 bbl; 1 spill of 100-999 bbl; and 0 spills of ≥1,000 bbl. The majority of the spills resulted from OCS platforms/rigs, followed by vessels, and lastly by OCS pipelines. These 2011-2012 spill data were compared with the estimated number and sizes of spills presented in Table 3-12 of the 2012-2017 WPA/CPA Multisale EIS, and it was found that the new spill data were well within the spill numbers estimated in the previous document. The new data also concurred with the previous finding that the most likely source of a spill would be from platforms, rigs, or vessels. Thus, a review of recent information does not change the risk analyses for spills <1,000 bbl previously provided in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

3.2.1.1. Spill Prevention

Beginning in the 1980's, this Agency established comprehensive pollution-prevention requirements that include redundant safety systems, as well as inspection and testing requirements to confirm that these devices are working properly (**Chapter 1.5**). Until the *Deepwater Horizon* oil spill, an overall reduction in spill volume had occurred during the previous 40 years, while oil production had generally increased. A characterization of spill rates, average and median volumes from 1995 to 2009 compared with 1996-2010, which includes the *Deepwater Horizon* oil spill, is provided in *Update of Oil Spill Occurrence Rates for Offshore Oil Spills* (Anderson et al., 2012). BOEM attributes this improvement to BOEM's operational requirements, ongoing efforts by the oil and gas industry to enhance safety and pollution prevention, and the evolution and improvement of offshore technology.

3.2.1.2. Characteristics of OCS Oil

The physical and chemical properties of oil greatly affect its transport and fate. Crude oils are a natural mixture of hundreds of different compounds, with liquid hydrocarbons accounting for up to 98 percent of the total composition. The chemical composition of crude oil can vary significantly from different producing areas; thus, the exact composition of oil being produced in OCS waters varies throughout the Gulf. For a complete discussion of OCS oil characteristics, refer to Chapter 3.2.1.3 of the

2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference (USDOI, BOEM, 2012c).

There are currently 39 different oils collected from the Gulf of Mexico (U.S. waters) in Environment Canada's (2011) oil properties database. For each of these oils, the details of their chemical composition include hydrocarbon groups (i.e., saturates, aromatics, resins, and asphaltenes), VOC's (such as benzene, toluene, ethylbenzene, and xylene), sulfur content, biomarkers, and metals. For more information on the properties and persistence of oil components, see Table 3-7, "Properties and Persistence by Oil Component Group," of the WPA 233/CPA 231 Supplemental EIS, which is hereby incorporated by reference. Light sweet crude oil (such as from the *Deepwater Horizon* oil spill) is preferred by refineries and is referred to as "sweet" because of its low sulfur content. The composition of oil will change substantially following release during an oil spill, due to weathering processes such as evaporation. The API gravities for the oils identified in the Environment Canada (2011) database range from 16.4^{o} to 50.2^{o}. This is similar to the range identified in an Agency-funded study of 22.8^{o} to 58.6^{o} API for data from 67 plays (Trudel et al., 2001). It is expected that a typical oil spilled as a result of an accident associated with an EPA proposed action would be within the range of 30^{o}-35^{o} API. The oil at the light end of the range would have little asphaltenes, would not emulsify, and would not form tarballs. The oil at the heavier end of the range, or enriched in heavy components after weathering, would more likely emulsify and form tarballs.

3.2.1.3. Overview of Spill Risk Analysis

There are many factors that BOEM evaluates to determine the risk of impact occurring from an oil spill. Estimated information includes likely spill sources, locations, and sizes; the likelihood and frequency of occurrence for different size spills; timeframes for the persistence of spilled oil; volumes of oil removed due to weathering and cleanup; and the likelihood of transport by wind and waves, resulting in contact to specified environmental features. BOEM uses data on past OCS production and spills, along with estimates of future production, to evaluate the risk of future spills. An analysis is also conducted to estimate the risks associated with a possible future catastrophic or high-volume, long-duration oil spill (**Appendix C**).

The BSEE maintains records of spills on its website (USDOI, BSEE, 2012a). The dataset does not include oil from permitted discharges or spills from OCS barging operations and from other service vessels that support the OCS oil and gas industry. The BSEE dataset excludes spills ≤1 bbl; these small spills are reported to the National Response Center and are documented in the USCG Marine Information for Safety and Law Enforcement (2001-present) or prior information systems. The USCG database does not include the source of oil (OCS versus non-OCS) or in the case of spills from vessels, the type of vessel operations; such information is needed to determine if a particular spill occurred as a result of OCS operations. Anderson et al. (2012) provided information on OCS oil spills ≥1,000 bbl that have occurred offshore in the GOM for the entire period that records have been kept (1964-present) (USDOI, BSEE, 2012a; **Tables 3-15 and 3-16** of this EIS).

The most recent, published analysis of trends in OCS spills was used to project future spill risk for this EIS (Anderson et al., 2012). This report presents an analysis of the most recent 15 years of data (1996-2010 data) as well as the previous 15 years (1985-1999 data). Data for the most recent period reflect spill prevention and occurrence conditions. The 15-year record was chosen because it reflects how the spill rates have changed while still maintaining a significant portion of the record.

BOEM uses a numerical model to calculate the likely trajectory of spills and analyzes the historical database to make other oil-spill projections. Estimates are based on historical spills and do not consider the effects of recent measures taken to prevent spills (e.g., retirement of older platforms and pipelines). A description of the trajectory model, called the OSRA (oil-spill risk analysis) model, and its results are summarized in this EIS. The OSRA model simulates thousands of spills launched throughout the Gulf of Mexico OCS and calculates the probability of these spills being transported and contacting specified environmental resources. The OSRA modeling results in a numerical expression of risk based on spill rates, projected oil production, and trajectory modeling. The OSRA modeling does not include the effects of weathering and thus provides a conservative estimate of risk assessment. Thus, a discussion of weathering based on separate analyses will be included in the following sections.

The following discussions provide separate risk information for offshore spills ≥1,000 bbl, offshore spills <1,000 bbl, and coastal spills that may result from an EPA proposed action. Only spills ≥1,000 bbl are addressed using OSRA because smaller spills may not persist long enough to be simulated by trajectory modeling. Another consideration is that these large spills are likely to be identified and reported; therefore, these records are more comprehensive than those of smaller spills.

3.2.1.4. Risk Analysis for Offshore Spills ≥1,000 bbl

This section addresses the risk of spills ≥1,000 bbl that could occur from accidents associated with activities resulting from an EPA proposed action. The following analyses are based on a combination of the production and transportation scenario for an EPA proposed action (**Chapter 3.1.1.1**), historical spill data for the last 15 years (Anderson et al., 2012), and results from the OSRA and SIMAP models. During the last 15 years (1996-2010), there have been two platform/rig and seven pipeline spills ≥1,000 bbl in the Gulf of Mexico, including (1) the *Deepwater Horizon* oil spill (4.9 million bbl from the well; April 20, 2010), (2) Hurricane Rita-caused rig/platform spills (event total 5,066 bbl; September 24, 2005), (3) Pennzoil E&P pipeline spill (1,211 bbl; January 26, 1998), (4) Chevron pipeline spill (8,212 bbl; September 29, 1998), (5) Seashell pipeline spill (3,200 bbl; July 23, 1999), (6) Equilon pipeline spill (2,240 bbl; January 21, 2000), (7) Taylor Energy pipeline spill (1,720 bbl; September 15, 2004), (8) Hurricane Ike pipeline spill (1,316 bbl; September 13, 2008), and (9) Shell pipeline spill (1,500 bbl; July 25, 2009).

3.2.1.4.1. Estimated Number of Offshore Spills ≥1,000 bbl and Probability of Occurrence

The number of spills ≥1,000 bbl estimated to occur as a result of an EPA proposed action is provided in **Table 3-10**. The mean number of spills estimated for an EPA proposed action is <1 (mean number equal to 0-0.08 bbl). The range of the mean number of spills reflects the range of oil production volume estimated as a result of a proposed action. The mean number of future spills ≥1,000 bbl is calculated by multiplying the spill rate for spills ≥1,000 bbl (1.13 spills/Bbbl of crude oil handled) by the volume of oil estimated to be produced as a result of a proposed action. This spill rate is the sum of rates for OCS platforms (0.25 spills/Bbbl) and OCS pipelines (0.88 spills/Bbbl) based on historical data from 1996 to 2010 (Anderson et al., 2012). Spill rates were calculated based on the assumption that spills occur in direct proportion to the volume of oil handled and are expressed as number of spills per billion barrels of oil handled (spills/Bbbl).

Using OSRA, the probabilities were calculated of a particular number of offshore spills ≥1,000 bbl resulting from a proposed action during the 40-year analysis period, including for facility spills, pipeline spills, and total spills (**Tables 3-17**). For an EPA proposed action, there is a 0-7 percent chance of one spill ≥1,000 bbl occurring, and a 0-<0.5 percent chance of two spills ≥1,000 bbl occurring. Overall, there is a 0-8 percent chance of one or more spills ≥1,000 bbl occurring.

A report by BOEM's scientists provides more information on OCS spill-rate methodologies and trends (Anderson et al., 2012). A discussion of how the range of resource estimates was developed is provided in **Chapter 3.1.1.1**.

3.2.1.4.2. Most Likely Source of Offshore Spills ≥1,000 bbl

Table 3-17 indicates the probabilities of one or more spills ≥1,000 bbl occurring from OCS facility or pipeline operations related to a proposed action. The most likely cause of a spill ≥1,000 bbl is a pipeline break at the seafloor, with seven of the nine spill events ≥1,000 bbl during 1996-2010 caused by pipeline damage (Anderson et al., 2012). The various circumstances responsible for pipeline breaks during this period included damage by an anchor, mudslide damage during a hurricane, a jack-up rig barge crushing the pipeline when it sat down on it, and microfractures from chronic contacts at a pipeline crossing where separators between the pipelines were missing.

3.2.1.4.3. Most Likely Size of an Offshore Spill ≥1,000 bbl

The median size of spills ≥1,000 bbl that occurred during 1996-2010 is 2,240 bbl. This size was calculated based on the nine spills (both platforms/rigs and pipelines) that occurred during this timeframe and included the oil spill resulting from the *Deepwater Horizon* explosion. Based on this median size, BOEM estimates that the most likely size of a spill ≥1,000 bbl from a proposed action would be 2,200 bbl **Table 3-10**.

3.2.1.4.4. Fate of Offshore Spills ≥1,000 bbl

ASA SIMAP Oil-Spill Model

BOEM uses various publicly available and purchased models to numerically model potential spill fate and effects to (1) estimate the likely amount of oil remaining on the ocean surface as a function of time, (2) predict the composition of any remaining oil, and (3) determine the extent and severity of possible shoreline oiling. Example environmental scenarios for an EPA proposed action were simulated using the ASA SIMAP model. Information on SIMAP can be found in French McCay et al. (2005) and Applied Science Associates, Inc. (ASA, 2012). Hypothetical analyses were performed for a simulated pipeline break spilling 2,200 bbl of South Louisiana Crude (API 34.5^{o}). The spill scenario modeled was a surface leak over a 12-hour period, with a total model duration of 30 days. The modeled spill location was a point at approximately the northernmost boundary of the sale area (28.5^{o}N. latitude, 87^{o}W. longitude). Two model runs were performed, including a winter (January 1993) and a summer scenario (July 1993), using winds from a National Data Buoy Center buoy in the northern Gulf, currents from the Princeton Ocean Model, and mean surface water temperatures (~20^{o}C [68 ^{o}F] in January and ~30°C [88 ^{o}F] in July) (**Tables 3-18 and 3-19**).

Persistence on Water Surface

The persistence of an offshore oil slick is strongly influenced by how rapidly it spreads and weathers and by the effectiveness of oil-spill response in removing the oil from the water surface. In the case of the spill simulated here for an EPA proposed action, it was assumed that no response activities would occur given the distance from shore and the spill size. The expected persistence time of a spill was estimated —specifically, how long it might last as a cohesive mass on the surface of the water, capable of being tracked and moved by winds and currents. Based on scenario runs, BOEM estimated that the spill would dissipate from the water surface in approximately 15 days (summer scenario; **Table 3-19**) and 25 days (winter scenario; **Table 3-18**)—assuming no spill-response activities. By comparison, an OCS pipeline spill in the summer on September 29, 1998, of 8,212 bbl, for which a panel investigation report was available, contained overflight information of the oil spill that showed the spill persisted for 5 days on the surface (USDOI, MMS, 1999a). Longer persistence times would be appropriate for catastrophic spill events, even though BOEM does not consider it part of an EPA proposed action and not reasonably foreseeable. For example, oil from the oil spill resulting from the *Deepwater Horizon* explosion was last observed on the surface by overflight 19 days following capping of the well (OSAT, 2010).

Spreading

The GOM oils having API gravities between 30^{o} and 35^{o} will float, except under turbulent mixing conditions, such as during a large storm offshore. Once spilled, it is expected that some portion of GOM oils would rise and reach the surface of the open Gulf, depending on the circumstances of the spill and whether a subsurface plume forms. On the sea surface, the oil would rapidly spread out, forming a slick that is initially a few millimeters in thickness in the center and much thinner around the edges. The rate of spreading depends upon the viscosity of the spilled oil, whether or not the oil is released at the water surface or subsurface, and whether the spill is instantaneous or continuous for some period. The spilled oil would continue to spread until its thickest part is about 0.1 mm. Once it spreads thinner than 0.1 mm, the slick would begin to break up into small patches, forming a number of elongated slicks, with an even thinner sheen trailing behind each patch of oil.

Weathering

Immediately upon being spilled, oil begins reacting with the environment. This process is called weathering. A number of processes alter the chemical and physical characteristics of the original hydrocarbon mixture, which reduces the oil mass over time. Weathering processes include evaporation of volatile hydrocarbons into the atmosphere, dissolution of soluble components, dispersion of oil droplets into the water column, emulsification and spreading of the slick on the surface of the water, chemo- or photo-oxidation of specific compounds (creating new components that are often more soluble), and biodegradation. Weathering and the existing meteorological and oceanographic conditions determine the time that the oil remains on the surface of the water, and the characteristics of the oil at the time of contact with a particular resource also influence the persistence time of an oil slick. Oil-spill cleanup timing and effectiveness would also be determining factors.

Chemical, physical, and biological processes operate on spilled oil to change its hydrocarbon compounds, reducing many of the components until the slick can no longer continue as a cohesive mass floating on the surface of the water. By spreading out, the oil's more volatile components are exposed to the atmosphere and up to about two-thirds of the oil evaporates rapidly.

Some crude oils mix with water to form an emulsion that is much thicker and stickier than the original oil (USDOC, NOAA, 2006). Winds and waves continue to stretch and tear the oil patches into smaller pieces, or tarballs. While some tarballs may be as large as pancakes, most are coin-sized. Tarballs are very persistent in the marine environment and can travel hundreds of miles.

BOEM numerically modeled weathering processes to (1) estimate the likely amount of oil remaining on the ocean surface as a function of time and (2) predict the composition of any remaining oil. The results of BOEM's weathering analyses were as follows. For a simulated pipeline break of 2,200 bbl, in the winter and summer scenarios, by 2 days after the spill approximately 36-38 percent would have been dissipated by natural weathering, with 35 percent evaporated to the atmosphere, 0-2 percent into the water column via natural dispersion, and 1 percent lost to decay (**Tables 3-18 and 3-19**). After 25 days, in the winter scenario, 58 percent of the mass would have been dissipated by natural weathering and the remaining 42 percent of the spill had washed ashore. After 15 days, in the summer scenario, 52 percent of the mass would have been dissipated by natural weathering and the remaining 48 percent of the spill had washed ashore. However, the maximum hydrocarbon concentration in the water when oil washes ashore in both winter and summer is estimated to be at concentrations of <1 parts per billion (ppb).

Seafloor Release

Movement of the oil and gas industry into the deep waters of the Gulf of Mexico increasingly relies on subsea production infrastructure, possibly increasing the risk of seafloor releases. As noted earlier, the behavior of a spill depends on many factors, including the characteristics of the oil being spilled as well as oceanographic and meteorological conditions. An experiment in the North Sea indicated that the majority of oil released during a deepwater blowout would quickly rise to the surface and form a slick (Johansen et al., 2001). In such a case, impacts from a deepwater oil spill would occur at the surface where the oil is likely to be mixed into the water and dispersed by wind and waves. The oil would undergo natural physical, chemical, and biological degradation processes including weathering. However, data and observations from the *Deepwater Horizon* explosion and oil spill challenged the previously prevailing thought that most oil from a deepwater blowout would quickly rise to the surface. Due in part to the application of subsea dispersants, measurable amounts of hydrocarbons (dispersed or otherwise) were detected in the water column as subsurface plumes and on the seafloor in the vicinity of the release (e.g., Diercks et al., 2010; OSAT, 2010). After the *Ixtoc I* blowout in 1979, located 50 mi (80 km) offshore in the Bay of Campeche, Mexico, some subsurface oil also was observed dispersed within the water column (Boehm and Fiest, 1982); however, the scientific investigations were limited (Reible, 2010). The water quality of marine waters would be affected by the dissolved components and oil droplets that are small enough that they do not rise to the surface or are mixed down by surface turbulence. In the case of subsurface oil plumes, it is important to remember that these plumes would be affected by subsurface currents and could be diluted over time. Even in the subsurface, oil would undergo natural physical, chemical, and biological degradation processes including weathering.

3.2.1.4.5. Transport of Spills ≥1,000 bbl by Winds and Currents

Using the OSRA computer model, BOEM estimates the likely trajectories of hypothetical offshore spills ≥1,000 bbl. The trajectories, combined with estimated spill occurrence, are used to estimate the risk of future spills occurring and contacting environmental features.

The OSRA model simulates the trajectory of a point launched from locations in the proposed lease sale area mapped onto a gridded area. The gridded area represents an area of the Gulf and Mexico and

South Atlantic Bight, and the point's trajectory simulates a spill's movement on the surface of water using modeled ocean current and wind fields. The model uses temporally and spatially varying, numerically computed ocean currents and winds.

The OSRA model can simulate a large number of hypothetical trajectories from each launch point. Spill trajectories are launched once per day from each origin point and are time stepped every hour until a statistically valid number of simulations have been run to characterize the risk of contact. The simulated oil spills for this EIS were "launched" from a subset of the approximately 6,000 points uniformly distributed 6-7 mi (10-11 km) apart within the Gulf OCS. This spacing between launch points is sufficient to provide a resolution that created a statistically valid characterization of the entire area (Price et al., 2001).

The model tabulates the number of times that each trajectory moves across or touches a location (contact) occupied by polygons mapped on the gridded area. These polygons represent locations of various environmental features. The OSRA model compiles the number of contacts to each environmental feature that result from all of the modeled trajectory simulations from all of the launch points for a specific area. Contact occurs for offshore features if the trajectory simulation passes through the polygon. Contact occurs for land-based features if the trajectory simulation touches the border of the feature. The simulation stops when the trajectory contacts the lines representing the land/water boundary or the borders of the domain. The probability of contact to an environmental feature is calculated by dividing the number of contacts by the number of trajectories started at various launch locations in the gridded area.

The output from this component of the OSRA model provides information on the likely trajectory of a spill by wind and current transport, should one occur and persist for the time modeled in the simulations; the calculations for this EIS were modeled for 10 and 30 days. All contacts that occurred during these periods were tabulated.

As well, the OSRA model was used to estimate the risks associated with a possible future catastrophic or high-volume, long-duration oil spill (**Appendix C**). This analysis modeled a spill that continued for 90 consecutive days, with each trajectory tracked for up to 60 days. The OSRA for this analysis was conducted for only the trajectories of oil spills from one hypothetical spill location to various land segments. The probability of a catastrophic spill occurring was not calculated. Thus, *conditional probabilities* were calculated (the condition being that a spill is assumed to have occurred), which reflect the probability of an oil spill contacting a specific land segment within a given time of travel from a certain location or spill point.

3.2.1.4.6. Length of Coastline Affected by Offshore Spills ≥1,000 bbl

BOEM estimated the length of shoreline that could be contacted if a spill ≥1,000 bbl occurred as a result of an accident associated with a proposed action (USDOI, MMS, 2007b). The length of shoreline contacted is dependent upon many factors, including the original spill size, location, and duration, winds and currents, and the volume of oil removed by natural weathering and offshore cleanup operations prior to the slick making shoreline contact. Shoreline oiling is an output of the SIMAP model and simply requires division by the assumed width of shoreline to calculate length of shoreline oiled. The maximum length of shoreline affected by a spill of 2,200 bbl was estimated to be approximately 30-55 mi (48-89 km) of shoreline. Because the slick spread and thinned out over time as it was transported, shoreline coverage would be patchy rather than continuous. Some redistribution of the oil due to longshore currents and further smearing of the slick from its original landfall could also occur.

3.2.1.4.7. Likelihood of an Offshore Spill ≥1,000 bbl Occurring and Contacting Modeled Locations of Environmental Resources

A more complete measure of spill risk was calculated by multiplying the probability of contact generated by the OSRA model by the probability of occurrence of one or more spills ≥1,000 bbl as a result of a proposed action. This provides a risk factor that represents the probability of a spill occurring as a result of a proposed action and contacting the resource of concern. These numbers are often referred to as "combined probabilities" because they combine the risk of occurrence of a spill from OCS sources and the risk of such a spill contacting sensitive environmental resources. The combined probabilities are provided for each resource of concern in **Figures 3-7 through 3-23**. A discussion of spill risk to the resources is provided in **Chapter 3.2.1.7**.

3.2.1.5. Risk Analysis for Offshore Spills <1,000 bbl

The following section addresses the risk of spills <1,000 bbl resulting from an EPA proposed action. To discuss spills <1,000 bbl, information is broken into size groups as shown in **Table 3-10**. Analysis of historical data shows that most offshore OCS oil spills have been ≤1 bbl (Anderson et al., 2012). Although spills of ≤1 bbl have made up 96 percent of all OCS-related spill occurrences, spills of this size have contributed very little (2%) to the total volume of OCS oil that has been spilled. Most of the total volume of OCS oil spilled (95%) has been from spills ≥10 bbl.

3.2.1.5.1. Estimated Number of Offshore Spills <1,000 bbl and Total Volume of Oil Spilled

The number of spills <1,000 bbl estimated to occur over the next 40 years as a result of an EPA proposed action is provided in **Table 3-10**. The spill sizes analyzed in **Table 3-10** and their associated spill rates (Anderson et al., 2012) are as follows: 0-1.0 bbl (2,020 spills/Bbbl of crude oil handled), 1.1-9.9 bbl (57.4 spills/Bbbl), 10.0-49.9 bbl (17.4 spills/Bbbl), 50.0-499.9 bbl (11.3 spills/Bbbl), and 500.0-999.9 bbl (1.63 spills/Bbbl). The number of spills is estimated by multiplying the oil-spill rate for each of the different spill size groups by the projected oil production as a result of a proposed action (**Table 3-1**). As spill size increases, the occurrence rate decreases and so the number of spills estimated to occur decreases. The estimated number of spills in each size category is as follows for an EPA proposed action (**Table 3-10**): 0-1.0 bbl (<1-143 spills), 1.1-9.9 bbl (<1-4 spills), 10.0-49.9 bbl (<1-1 spill), 50.0-499.9 bbl (<1-1 spill), and 500.0-999.9 bbl (<1 spill).

Multiplying the estimated number of spills by the median or average spill sizes for each size group yields the volume of oil estimated to be spilled as a result of a proposed action over the 40-year analysis period. The volume of oil estimated to be spilled in each size category as a result of an EPA proposed action is as follows (**Table 3-10**): 0-1.0 bbl (median spill size of <0.024 bbl), 1.1-49.9 bbl (median spill size of 3.0 bbl), and 50.0-999.9 bbl (median spill size of 130.0 bbl). A total of <1-140 bbl of oil is estimated from spills <1,000 bbl as a result of an EPA proposed action. For the OCS cumulative, including all of the planning areas (WPA, CPA, and EPA), a total of 1,092-2,213 bbl of oil is estimated from spills <1,000 bbl in size.

3.2.1.5.2. Most Likely Source and Type of Offshore Spills <1,000 bbl

Most spills <1,000 bbl on the OCS would likely occur from a mishap on a production facility, most likely related to a failure related to storage of oil. From 1996 to 2010, there were 15,630 spills <1,000 bbl on OCS platforms, and 1,234 spills from OCS pipelines (Anderson et al., 2012). Spills on platforms and rigs could be crude or refined (diesel, hydraulic) oil, and reported pipeline spills are likely to be crude oil. For spills <1,000 bbl, a total of 18,196 bbl were released to OCS waters from platforms, and 7,985 bbl were released from pipelines.

3.2.1.5.3. Most Likely Size of Offshore Spills <1,000 bbl

Table 3-10 provides the most likely volume of oil estimated to be spilled for each of the spill-size groups. The median spill size is used for all spill sizes. During the 40-year analysis period, 96 percent of all spills estimated to occur as a result of an EPA proposed action would be small spills (≤1 bbl), and 2 percent of the volume of oil spilled would be the result of spills ≤1 bbl (Anderson et al., 2012).

3.2.1.5.4. Persistence, Spreading, and Weathering of Offshore Oil Spills <1,000 bbl

It is expected that slicks from spills <1,000 bbl will persist a few minutes (<1 bbl), a few hours (<10 bbl), or a few days (10-1,000 bbl) on the open ocean. Spilled oil would rapidly spread out, evaporate, and weather, and become dispersed into the water column. Most spills <1,000 bbl are expected to be diesel, which dissipates very rapidly. Diesel is a distillate of crude oil and does not contain the heavier components that contribute to crude oil's longer persistence in the environment.

3.2.1.5.5. Transport of Spills <1,000 bbl by Winds and Currents

To be transported by winds and currents, an oil slick must remain a drifting cohesive mass. Only spills >50 bbl have a chance of remaining a cohesive mass long enough to be transported any distance.

3.2.1.5.6. Likelihood of an Offshore Spill <1,000 bbl Occurring and Contacting Modeled Locations of Environmental Resources

Because spills <1,000 bbl are not expected to persist as a slick on the surface of the water beyond a few days and because spills on the OCS would occur at least 3-10 nmi (3.5-11.5 mi; 5.6-18.5 km) from shore, it is unlikely that any spills would make landfall prior to breaking up. For an offshore spill <1,000 bbl to make landfall, the spill would have to occur proximate to State waters (defined as 3-12 mi [5-19 km] from shore). If a spill were to occur proximate to State waters, only a spill >50 bbl would be expected to have a chance of persisting long enough to reach land. Spills >50 and <1,000 bbl are very infrequent. Should such a spill occur, the volume that would make landfall would be expected to be extremely small (a few barrels).

3.2.1.6. Risk Analysis for Coastal Spills

Spills in coastal waters could occur at storage or processing facilities supporting the OCS oil and gas industry or from the transportation of OCS-produced oil through State offshore waters and along navigation channels, rivers, and through coastal bays. BOEM projects that almost all (>99%) oil produced as a result of a proposed action will be brought ashore via pipelines to oil pipeline shore bases, stored at these facilities, and eventually transferred via pipeline or barge to Gulf coastal refineries. Because oil is commingled at shore bases and cannot be directly attributed to a particular lease sale, this analysis of coastal spills addresses spills that could occur prior to the oil arriving at the initial shoreline facility. It is also possible that non-OCS oil may be commingled with OCS oil at these facilities or during subsequent secondary transport.

3.2.1.6.1. Estimated Number and Most Likely Sizes of Coastal Spills

The USCG provided the database used to prepare *Polluting Incidents In and Around U.S. Waters Spill/Release Compendium, 1969-2009* (USDHS, CG, 2011). The data for the most recent 14 years, 1996-2009, were used. There were more than 18,000 spill records during this time in coastal and OCS waters across the Gulf of Mexico. The data were mapped using the latitude and longitude provided, and some points that were inland or outside of the GOM were omitted. Some broad assumptions were made in the use of these data. States vary on the distance from the coast considered to be State offshore waters or territorial seas. For the purpose of comparing spill events across GOM coastal waters, spills in rivers, estuaries, and bays and 0-3 nmi (0-3.5 mi) from shore were counted as coastal spills. The number of GOM coastal spills from eight sources associated with State or Federal offshore production and international importation was determined from the data (**Table 3-20**). Louisiana and Texas have extensive oil and gas activity occurring in their territorial seas, as well as in Federal waters on the OCS. The sources that were counted are fixed platforms, MODU's, offshore marine facilities, offshore supply/service vessels, offshore pipelines, and unknown sources. Counts for tank ships and barges are shown but were not included as sources since <1 percent of oil production is barged. The following sources were counted when present and were considered to not be related to oil and gas exploration and production in Federal waters: aircraft; deepwater port; commercial vessel; designated waterfront facility; facility particular hazard; factory; fishing boat; freight barge; freight ship; industrial facility; industrial vessel; land facility nonmarine; land vehicle; unknown; marine; MARPOL reception; unclassified tow/tug; tank truck; oil recovery; municipal facility; onshore pipeline; other onshore marine facility; passenger; unclassified public vessels; recreational; research vessel; shipyard/repair facility; and shoreline. The USCG database is comprised of four information systems, which sometimes differed in how a location or spill source was described.

In the waters 0-3 nmi (0-3.5 mi) off the Louisiana coast, there were a total of 3,026 spills reported from 1996 to 2009, or about 3,023 spills <1,000 bbl. Roughly one-quarter of the spills were from oil and gas sources, one-quarter were due to activities not related to oil and gas, and half were due to unknown sources. The only spills ≥1,000 bbl to occur in coastal waters occurred in Louisiana where there were two spills from platforms in State waters (1,200 bbl and 1,000 bbl) and one spill from a waterfront facility (25,420 bbl). Assuming that all spills designated as an unknown source were actually due to State or Federal oil and gas activity, there were close to a total of 2,300 spills <1,000 bbl (160 spills <100 bbl/year) in the Louisiana coastal waters.

In the waters 0-3 mi (0-5 km) off the Mississippi coast, there were a total of 432 spills reported from all sources, and all of these spills were <1,000 bbl. Twelve spills were from sources related to State or Federal oil and gas exploration and production, and 40 spills were from unknown sources.

In the waters 0-3 nmi (0-3.5 mi) off the Alabama coast, there were a total 125 spills reported from all sources from 1996 to 2009, or about 10 spills <1,000 bbl/year. Twenty-two spills were from sources related to State or Federal oil and gas exploration and production, and seven spills were from unknown sources.

In the waters 0-3 nmi (0-3.5 mi) off the Florida coast, there were a total 389 spills reported from all sources from 1996 to 2009, all were <1,000 bbl. One spill was from sources related to State or Federal oil and gas exploration and production, and 40 spills were from unknown sources. Using the same average spill size and size distributions described by BOEM for the year 2009, roughly 40 bbl/year entered coastal waters in the CPA and roughly 3 bbl/year entered the coastal waters in the EPA (Anderson et al., 2012; **Figure 3-24** of this EIS).

The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past as long as the level of energy-related commercial and recreational activities remain the same. Therefore, the coastal waters of Louisiana, Mississippi, Alabama, and Florida will have a total of 200, 30, 10, and 30 spills <1,000 bbl/year, respectively, from all sources. When limited to just oil- and gas-related spill sources such as platforms, pipelines, MODU's, and support vessels, Louisiana, Mississippi, Alabama, and Florida will have a total of 130-170, 3-5, 2, and about 2-3 spills <1,000 bbl/year, respectively. Louisiana is the state most likely to have a spill ≥1,000 bbl occur in coastal waters.

3.2.1.6.2. Likelihood of Coastal Spill Contact

Louisiana coastal waters are the most likely location for the occurrence of a coastal spill associated with a proposed EPA lease sale since the primary pipeline system anticipated to service the proposed EPA lease sale area lies in offshore Louisiana waters and continues to shore in this state and because onshore support and service bases are anticipated to be utilized within the Louisiana coastal area. A spill that occurs in Federal waters could also be transported to State waters. The coastal area that could be affected by a spill that occurs in Federal waters would depend upon the location of the spill, the volume spilled, the persistence of the spilled oil (whether it will form an emulsion), and the weather and oceanographic conditions at the time of a spill. Because of the extensive infrastructure and development offshore Louisiana, it is anticipated that the coastal waters of this state would be the area most likely contacted should a spill occur and be transported towards shore. However, the *Deepwater Horizon* explosion and oil spill has shown that large spills that continue for a long period of time from a single spill event can be transported over an extensive area and into the coastal waters of several Gulf Coast States.

3.2.1.7. Risk Analysis by Resource

BOEM analyzed risk to resources from oil spills and oil slicks that could occur as a result of an EPA proposed action. The risk results are based on BOEM's estimates of likely spill locations, sources, sizes, frequency of occurrence, physical fates of different types of oil slicks, and probable transport that are described in more detail in the preceding spill scenarios. For offshore spills, combined probabilities were calculated using the OSRA model, which includes both the likelihood of a spill from a proposed action occurring and the likelihood of the oil slick reaching areas where known environmental resources exist. The analysis of the likelihood of direct exposure and interaction of a resource with an oil slick and the sensitivity of a resource to the oil is provided under each resource category in **Chapter 4.1** and in **Figures**

3-7 through 3-23. Coastal spills are estimated from historic counts; the estimate is not a rate tied to an anticipated production volume or a probability.

The environmental resources considered in the OSRA modeling were selected by BOEM analysts. This selection incorporated input from FWS and NOAA's National Marine Fisheries Service. BOEM additionally used information from its Environmental Studies Program results, general literature reviews, and professional exchange with other scientists. A total of 130 onshore and 184 offshore resources were selected as input to the OSRA model. Onshore resources included the following primary categories: counties/parishes, states, birds, sea turtle habitats, manatee habitats, beach mice habitats, fish, and recreational beaches. Offshore resources included the following primary categories: State waters, islands, EFH, seagrass, *Sargassum*, Habitat Areas of Particular Concern (HAPC's) and protected areas, seafloor, recreational diving, and marine mammal habitat. Details on the individual species covered by the above resource categories and the seasonalities associated with each are provided under each resource category in **Chapter 4.1**. As well, a detailed analysis of risk to each resource from oil spills and oil slicks is provided under each resource category in **Chapter 4.1**.

In terms of the risk to resources from offshore spills, BOEM estimates that about <1-2,400 bbl of oil would be spilled in offshore waters over the 40-year life of an EPA proposed action. These estimates include volumes from spill incidents in all size groups (**Table 3-10**). A ≥10,000-bbl size group was not included in this analysis because the catastrophic *Deepwater Horizon* explosion and oil spill was the only ≥10,000-bbl spill during the last 15 years (1996-2010); thus, meaningful statistics could not be calculated for this size group using historical spill rates (Anderson et al., 2012). However, output from the OSRA model provides oil-spill occurrence probability estimates for offshore spills ≥1,000 bbl and ≥10,000 bbl for both the proposed actions and OCS Program. The mean numbers of total spills ≥1,000 bbl estimated for an EPA proposed action is 0-0.08, and for the Eastern Planning Area OCS Program, the mean numbers of total spills is 0-0.24 **(Table 3-21**). The mean numbers of total spills ≥10,000 bbl estimated for an EPA proposed action is 0-0.02, and for the Eastern Planning Area OCS Program, the mean numbers of total spills is 0-0.07 **(Table 3-22**).

The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past as long as the levels of energy-related industry, commercial, and recreational activities remain the same. Therefore, the coastal waters of Louisiana, Texas, Mississippi, Alabama, and Florida will have a total of 200, 20, 30, 10, and 30 spills <1,000 bbl/year, respectively, from all sources. When limited to just oil- and gas-related spill sources such as platforms, pipelines, MODU's, and support vessels, Louisiana, Texas, Mississippi, Alabama, and Florida will have totals of 130-170, 5-10, 3-5, ~2, and ~3 spills <1,000 bbl/year, respectively. Louisiana and Texas are the states most likely to have a spill ≥1,000 bbl occur in coastal waters. The most likely cause is from platforms located in State waters.

For offshore spills <1,000 bbl, only those >50 bbl would be expected to have a chance of persisting as a cohesive slick long enough for the slick to reach coastal waters. Few offshore spills 50-1,000 bbl in size are estimated to occur as a result of an EPA proposed action (**Table 3-10**), and few of these slicks are expected to occur proximate to State waters. Should a slick from such a spill reach coastal waters, the volume of oil remaining in the slick is expected to be small.

3.2.1.8. Spill Response

3.2.1.8.1. BOEM and BSEE Spill-Response Requirements and Initiatives

As a result of the Oil Pollution Act of 1990, DOI was tasked with a number of oil-spill-response duties and planning requirements. Although many of these tasks are connected to BOEM's responsibility to assess exploration, development, and production plans submitted for the OCS, the Bureau of Ocean Energy Management, after the October 2011 reorganization, now relies upon BSEE for the satisfactory completion of these tasks. These DOI requirements are implemented according to BSEE's regulations at 30 CFR parts 250 and 254:

- requires immediate notification for spills >1 bbl—all spills require notification to USCG, and BOEM receives notification from the USCG of all spills ≤1 bbl;
- conducts investigations to determine the cause of a spill;

- assesses civil and criminal penalties, if needed;
- oversees spill source control and abatement operations by industry;
- sets requirements and reviews and approves oil-spill-response plans for offshore facilities;
- conducts unannounced drills to ensure compliance with oil-spill-response plans;
- requires operators to ensure that their spill-response operating and management teams receive appropriate spill-response training;
- conducts inspections of oil-spill-response equipment;
- requires industry to show financial responsibility to respond to possible spills; and
- provides research leadership to improve the capabilities for detecting and responding to an oil spill in the marine environment.

As indicated above, as a result of BOEMRE's reorganization in October 2011, BSEE is now responsible for the review and approval of Oil-Spill Response Plans (OSRP). BOEM's regulations require that an operator must have an approved OSRP prior to BOEM's approval of an operator-submitted exploration, development, or production plan. Hence, BOEM relies heavily upon the BSEE's expertise to ensure that the OSRP demonstrates the ability of an operator to respond to a worst-case discharge and complies with all pertinent environmental laws and regulations.

This Agency issued NTL's and guidance documents that clarify additional oil-spill requirements after the *Deepwater Horizon* explosion, oil spill, and response occurred. The spill-response-related NTL's and guidance documents issued by BOEMRE and subsequently transferred to BOEM and BSEE include the following:

BOEM—NTL 2010-N06, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS"

This NTL, effective June 18, 2010, explains the procedures for the lessee or operator to submit supplemental information for new or previously submitted EP's, DPP's, or DOCD's. The required supplemental information includes the following: (1) a description of the blowout scenario as required by 30 CFR §§ 550.213(g) and 550.243(h); (2) a description of their assumptions and calculations used in determining the volume of the worst-case discharge required by 30 CFR § 550.219(a)(2)(iv) (for EP's) or 30 CFR § 550.250(a)(2)(iv) (for DPP's and DOCD's); and (3) a description of the measures proposed that would enhance the ability to prevent a blowout, to reduce the likelihood of a blowout, and to conduct effective and early intervention in the event of a blowout, including the arrangements for drilling relief wells and any other measures proposed. The early intervention methods of the third requirement could actually include the surface and subsea containment resources that this Agency announced in NTL 2010-N10, which states that BOEM will begin reviewing to ensure that the measures are adequate to promptly respond to a blowout or other loss of well control.

BSEE—NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources"

This NTL, effective November 8, 2010, applies only to operators conducting operations using subsea or surface BOP's on floating facilities. It explains that lessees and operators submit a statement signed by an authorized company official with each application for a well permit indicating that they will conduct all of their authorized activities in compliance with all applicable regulations, including the Increased Safety Measures Regulations announced in 75 FR 63346. The NTL also informs lessees that BSEE will be evaluating whether or not each operator has submitted adequate information demonstrating that it has access to and can deploy surface and subsea containment resources that would be adequate to promptly respond to a blowout or other loss of well control. The NTL notifies the operator that BSEE intends to evaluate the adequacy of each operator to comply in the operator's current OSRP; therefore, there is an incentive for voluntary compliance.

Approval Requirements for Activities that Involve the Use of a Subsea Blowout Preventer (BOP) or a Surface BOP on a Floating Facility (BOEMRE Guidance Document)

On December 13, 2010, BOEMRE issued a press release and a guidance document to provide a clear path forward for the safe resumption of deepwater drilling operations (USDOI, BOEMRE, 2010a). This guidance clarifies, in part, that although operators are not required to amend their OSRP's to include additional subsea containment information, they may do so voluntarily. The guidance further indicates that BSEE will review OSRP's for the following specific information relating to subsea containment, in addition to that listed in NTL 2010-N10:

- source abatement through direct intervention;
- relief wells;
- debris removal; and
- if a capping stack is the single containment option offered, the operator must provide the reasons that the well design is sufficient to allow shut-in without broach to the seafloor.

BSEE—NTL 2012-N06, "Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans"

In an effort to provide greater clarity and consistency, BSEE issued an NTL to the offshore oil and natural gas industry regarding the development of OSRP's that was effective on August 10, 2012. This NTL did not change existing regulations, but instead provided clarification of the BSEE's application of existing regulations concerning the preparation and submittal of a regional OSRP, incorporating lessons learned from the 2010 *Deepwater Horizon* explosion, oil spill, and response.

The NTL provides insight regarding how BSEE's Oil Spill Response Division reviews each OSRP submitted by industry to ensure that the overall proposed strategy includes the necessary resources to deal with the anticipated worst-case discharge in a given offshore region, including access to capping and containment equipment necessary to control a subsea blowout. The NTL also indicates that BSEE may require the incorporation of a range of strategies into an OSRP, as appropriate, such as (1) the use of aerial and subsea dispersants, (2) technologically advanced mechanical response equipment, (3) vessels with more effective recovery rates, (4) in-situ burning, and (5) surveillance equipment, such as X-band radar that would make night operations possible.

3.2.1.8.2. Offshore Response, Containment, and Cleanup Technology

In the event of a spill, particularly a loss of well control, there is no single method of containment and removal that would be 100 percent effective. Spill cleanup is a complex and evolving technology. There are many situations and environmental conditions that necessitate different approaches. New technologies constantly evolve, but they provide only incremental benefits. Each new tool then becomes part of the spill-response tool kit. Each spill-response technique/tool has its specific uses and benefits (Fingas, 1995). Removal and containment efforts to respond to an ongoing spill offshore would likely require multiple technologies, including source containment, mechanical cleanup, in-situ burning of the slick, and chemical dispersants. Even with the deployment of all of these spill-response technologies, it is likely that, with the operating limitations of today's spill-response technology, not all of the oil can be contained and removed offshore.

Because no single spill-response method is 100 percent effective, it is likely that larger spills under the right conditions will require the simultaneous use of all available cleanup methods (i.e., source containment, mechanical cleanup, dispersant application, and in-situ burning). Accordingly, the response to the *Deepwater Horizon* oil spill, employed all of these options simultaneously. The cleanup technique chosen for a spill response will vary depending upon the unique aspects of each situation. The selected mix of countermeasures will depend upon the shoreline and natural resources that may be impacted; the size, location, and type of oil spilled; weather; and other variables. The overall objective of on-water recovery is to minimize the risk of impact by preventing the spread of free-floating oil. The physical and chemical properties of crude oil can greatly affect the effectiveness of containment and recovery equipment, dispersant application, and in-situ burning. It is expected that oil found in the majority of the proposed EPA lease sale area could range from medium weight oil to condensate. The variety of standard cleanup protocols that were used for removing *Deepwater Horizon* oil from beaches, shorelines, and offshore water are identified in **Table 3-23**.

Most oil-spill-response strategies and equipment are based upon the simple principle that oil floats. However, as evident during the *Deepwater Horizon* explosion, oil spill, and response, this is not always true. Sometimes it floats and sometimes it suspends within the water column or sinks to the seafloor. Oil suspended in the water column and moving with the currents is difficult to track, and therefore recover, using standard visual survey methods (Coastal Response Research Center, 2007).

Source Containment

To address the new improved containment systems' expectations to rapidly contain a spill as a result of a loss of well control from a subsea well addressed in NTL 2010-N10, several oil and gas industry majors initiated the development of a new, rapid response system. This system is designed to fully contain oil flow in the event of a potential future underwater blowout and to address a variety of scenarios. The system would consist of specially designed equipment constructed, tested, and available for rapid response. It is envisioned that this system could be fully operational within days to weeks after a spill event occurs. The system is designed to operate in up to 10,000-ft (3,048-m) water depth and adds containment capability of 100,000 bbl of oil/day (4.2 million gallons/day). This new $1 billion investment can be expanded and adapted for new technologies. The companies that originated this system have formed a nonprofit organization, the Marine Well Containment Company (MWCC), to operate and maintain the system (MWCC, 2010). The MWCC will provide fully trained crews to operate the system, will ensure the equipment is operational and ready for rapid response, and will conduct research on new containment technologies. The MWCC interim capability was available on February 17, 2011. The MWCC's initial response system includes a subsea capping stack with the ability to shut in flow or to flow the oil via flexible pipes and risers to surface vessels. This interim system can operate in water depths up to 10,000 ft (3,048 m) and has storage and processing capacity for up to 60,000 bbl/day of liquids (MWCC, 2011). The first-ever, full-scale deployment of critical well control equipment to exercise the oil and gas industry's response to a potential subsea blowout in the deepwater of the Gulf of Mexico was conducted by BSEE in July 2012. The MWCC's capping stack system, a 30-ft (9-m) tall, 100-ton piece of equipment similar to the one that stopped the flow of oil from the *Macondo* well following the *Deepwater Horizon* explosion in 2010, was successfully tested during this unannounced deployment drill. During this exercise, the capping stack was deployed from its storage location near Houston, Texas, to an area in the Gulf of Mexico nearly 200 mi (322 km) from shore. Once on site, the system was lowered to a simulated wellhead (a pre-set parking pile) on the ocean floor in nearly 7,000 ft (2,134 m) of water, connected to the wellhead, and then pressurized to 10,000 pounds per square inch. Another option for source control and containment is through the use of the equipment contracted by another nonprofit organization, Helix Well Containment Group (HWCG) (Driver, 2010). The HWCG's initiative involves more than 24 smaller energy companies. The HWCG has contracted the equipment that it found useful in the *Deepwater Horizon* explosion, oil spill, and response and offered it to oil and gas producers for use beginning January 1, 2011. This system focuses on the utilization of the *Helix Producer I* and the *Q4000* vessels. Each of these vessels played a role in the *Deepwater Horizon* explosion, oil spill, and response and is continually working in the Gulf. The HWCG's system has the ability to fully operate in up to 10,000 ft (3,048 m) of water and has intervention equipment to cap and contain a well with the mechanical integrity to be shut-in. The HWCG's system also has the ability to capture and process 55,000 bbl of oil per day (Helix Well Containment Group, 2010).

In addition, industry has a multitude of vendors available within the GOM region that can provide the services and supplies necessary for debris removal capability, dispersant injection capability, and top-hat deployment capability. Many of these vendors are already cited for use by MWCC and HWCG.

The BSEE has indicated to BOEM that it will not allow an operator to begin drilling operations until adequate subsea containment and collection equipment, as well as subsea dispersant capability is determined by BSEE to be available to the operator and is sufficient for use in response to a potential incident from the proposed well(s).

Mechanical Cleanup

Generally, mechanical containment and recovery is the primary oil-spill-response method used (33 CFR § 153.305(a)). Mechanical recovery is the process of using booms and skimmers to pick up oil from the water surface. It is expected that the oil-spill-response equipment needed to respond to an offshore spill in the proposed lease sale area could be called out from one or more of the following oil-spill equipment base locations: New Iberia, Belle Chasse, Cameron, Cocodrie, Morgan City, New Orleans, Sulphur, Houma, Fourchon, Fort Jackson, and Venice, Louisiana; Louisiana; Theodore and Mobile, Alabama; or Pensacola, Fort Lauderdale, Panama City, and Tampa, Florida. In addition, additional equipment could be procured from Corpus Christi, Aransas Pass, Houston, La Porte, Ingleside, Port Arthur, and Galveston, Texas; and Lake Charles, Louisiana. Response times for any of this equipment would vary, dependent on the location of the equipment, the staging area, and the spill site; and on the transport requirements for the type of equipment procured. It is anticipated that equipment would be procured from the closest available oil-spill equipment bases.

In rough seas, a large spill of low viscosity oil, such as a light or medium crude oil, can be scattered over many square kilometers within just a few hours. Oil recovery systems typically have swath widths of only a few meters and move at slow speeds while recovering oil. Therefore, even if this equipment can become operational within a few hours, it would not be feasible for them to encounter more than a fraction of a widely spread slick (ITOPF, 2010). For this reason, it is assumed that a maximum of 10-30 percent of an oil spill in an offshore environment can be mechanically removed from the water prior to the spill making landfall (U.S. Congress, Office of Technology Assessment, 1990). Some newer oil skimming equipment procured internationally displayed faster recovery speed during the response to the *Deepwater Horizon* explosion, oil spill, and response and some changes were also made in the logistics of how skimmers and booms were positioned offshore during this response that increased the equipment's swath width. However, for the *Deepwater Horizon* explosion, oil spill, and response, it was estimated that only 3 percent of the total oil spilled was picked up by mechanical equipment offshore (Lubchenco et al., 2010).

A common difficulty when deploying booms and skimmers to recover oil is coordinating vessel activities to work the thickest areas of oil (ITOPF, 2010). It is a rule of thumb that 90 percent of the oil is in 10 percent of the area. The 10 percent of the oil that makes up 90 percent of a slick is typically sheen. For this reason, containment and recovery operations on water require extensive logistical support to direct the response effort. Additionally, the limitations that poor weather and rough seas impose on spill-response operations offshore are seldom fully appreciated. Handling wet, oily, slippery equipment on vessels that are pitching and rolling is difficult and can raise safety considerations. Winds, wave action, and currents can drastically reduce the ability of a boom to contain and a skimmer to recover oil. It is important to select equipment for a response that is suitable for the type of oil and the prevailing weather and sea conditions for a region. Efforts should generally be made to target the heaviest oil concentrations and areas where collection and removal of the oil will reduce the likelihood of oil reaching sensitive resources and shorelines. As oil weathers and increases in viscosity, cleanup techniques and equipment should be reevaluated and modified (ITOPF, 2010).

Practical limitations of strength, water drag, and weight mean that generally only relatively short lengths of boom (tens to a few hundred meters) can be deployed and maintained in a working configuration. Towing booms at sea (e.g., in U or J configurations, which increase a skimmers swath width) is a difficult task requiring specialized vessels and trained personnel (ITOPF, 2010). Additional boom limitations are discussed in **Chapter 3.2.1.4.4**. Because skimmers float on the water surface, they experience many of the operational difficulties that apply to booms, particularly those posed by wind, waves, and currents (ITOPF, 2010). The effectiveness of any skimmer depends upon a number of factors, in addition to the ambient weather and sea conditions, including the type of oil, the thickness of the oil, the presence of debris in the oil or in the water, and the location of the spill (Fingas, 1995). Even moderate wave motion can greatly reduce the effectiveness of most skimmer designs (ITOPF, 2010). In high sea-state conditions, many skimmers, especially weir and suction skimmers, take up more water than oil (Fingas, 1995). Because of the various constraints placed upon skimmers in the field, their design capacities are rarely realized. Experience from numerous spills has consistently shown that skimmer recovery rates reported under test conditions cannot be sustained during a spill response (ITOPF, 2010). The availability of sufficient oil-storage facilities is necessary to ensure continuous oil-spill recovery. This storage needs to be easy to handle and easy to empty once full so that it can be used repeatedly with the least interruption in recovery activity (ITOPF, 2010).

There are no proven methods for the containment of submerged oil, and methods for recovery of submerged oils have limited effectiveness. Efforts to mechanically contain and/or recover suspended oil have focused on different types of nets, either the ad hoc use of fishing nets or specially designed trawl nets. There has been some research conducted on the design of trawl nets for the recovery of emulsified fuels. However, the overall effectiveness for large spills is expected to be very low. The suspended oil can occur as liquid droplets or semisolid masses in sizes ranging from millimeters to meters in diameter (Coastal Response Research Center, 2007). At spills where oil has been suspended in the water column, responders have devised low technology methods for tracking the presence and spread of oil over space and time. For suspended oil, these methods include stationary systems such a snare sentinels, which can consist of any combination of the following: a single length of snare on a rope attached to a float and an anchor; one or more crab traps on the bottom that are stuffed with snare; and minnow or other type of traps that are stuffed with snare and deployed at various water depths. The configuration would depend upon the water depth where the oil is located within the water column. At present, it is not possible to determine the particle size, number of particles, or percent oil cover in the water column based upon the visual observations of oil on these systems (Coastal Response Research Center, 2007).

Spills involving submerged oil trigger the need for real-time data on current profiles (surface to bottom), wave energy, suspended sediment concentrations, detailed bathymetry, seafloor sediment characteristics, and sediment transport patterns and rates. These data are needed to validate or calibrate models (both computer and conceptual), direct sampling efforts, and predict the behavior and fate of the submerged oil. This information might be obtained through the use of acoustic Doppler current profilers, dye tracer studies, rapid seafloor mapping systems, and underwater camera or video systems that could record episodic events (Coastal Response Research Center, 2007). During the *Deepwater Horizon* explosion, oil spill, and response, fluorometers were used successfully to detect the presence of submerged oil.

If an oil spill occurs during a storm, spill response from shore would occur following the storm. Spill response would not be possible while storm conditions continued, given the sea-state limitations for skimming vessels and containment boom deployment. However, oil released onto the ocean surface during a storm event would be subject to accelerated rates of weathering and dissolution (i.e., oil and water would be agitated, forcing oil into smaller droplets and facilitating dissolution of the high end aromatic compounds present).

Dispersants

When dispersants are applied to spilled crude oil, the surface tension of the oil is reduced, allowing wind and wave action to break the oil into tiny droplets that are dispersed into the upper portion of the water column. Oil that is chemically dispersed at the surface will move into the top 20 ft (6 m) of the water column where it will mix with surrounding waters and begin to biodegrade (U.S. Congress, Office of Technology Assessment, 1990, page 19). Dispersant use, in combination with natural processes, breaks up the oil into smaller components that allows them to dissipate into the water and degrade more rapidly (Nalco, 2010). Dispersion increases the likelihood that the oil will be biodegraded, both in the water column and at the surface. While there is more analysis to be done to quantify the rate of biodegradation in the GOM after the *Deepwater Horizon* oil spill, early observations and preliminary research results seemed to indicate that the oil biodegraded quickly; however, there are still ongoing studies assessing this issue. Bacteria that break down the dispersed and weathered surface oil are abundant in the GOM in large part because of the warm water, the favorable nutrient and oxygen levels, and the fact that oil enters the GOM through natural seeps regularly (Lubchenco et al., 2010).

Dispersant use must be in accordance with the Regional Response Team's (RRT) Preapproved Dispersant Use Manual and with any conditions outlined within a RRT's site-specific, dispersant approval given after a spill event. Consequently, dispersant use would be in accordance with the restrictions for specific water depths, distances from shore, or monitoring requirements. At this time, this manual does not give preapproval for the application of dispersant use subsea. However, USEPA is presently revisiting these RRT preapprovals in light of the dispersant issues, such as subsea application, that arose during the *Deepwater Horizon* oil spill. The USEPA issued a letter dated December 2, 2010, that provided interim guidance on the use of dispersants for major spills that are continuous and uncontrollable for periods greater than 7 days and for expedited approval of subsurface applications. This letter outlined the following exceptions to the current preapprovals until they are updated:

- dispersants may not be applied to major spills that are continuous in nature and uncontrollable for a period greater than 7 days;
- additional dispersant monitoring protocols and sampling plans may be developed that meet the unique needs of the incident; and
- subsurface dispersants may be approved on an incident-specific basis as requested by the USCG On-Scene Commander.

More robust documentation may be required. This documentation would include daily reports that contain the products used, the specific time and locations of application, equipment used for each application, spotter aircraft reports, photographs, vessel data, and analytical data.

For a deepwater (>1,000-ft; >305-m water depth) spill ≥1,000 bbl, dispersant application may be a preferred response in the open-water environment to prevent oil from reaching a coastal area, in addition to mechanical response. However, the window of opportunity for successful dispersant application may be somewhat narrower for some deepwater locations that are dependent upon the physical and chemical properties of oil, which tend to be somewhat heavier or more likely to emulsify than those found closer to shore. A significant reduction in the window of opportunity for dispersant application may render this response option ineffective.

Based on the present location of dispersant stockpiles and dispersant application equipment in the GOM, it is expected that the dispersant application aircraft initially called out for an oil-spill response to an offshore spill in the proposed lease sale area will come from Houma, Louisiana; Stennis, Mississippi; or Mesa, Arizona. The dispersants will come from locations primarily in Texas and Louisiana. Response times for this equipment would vary, depending on the spill site and on the transport time for additional supplies of dispersants to arrive at a staging location. Based on historic information, dispersant application will be effective on 20-50 percent of the treated oil (S.L. Ross Environmental Research Ltd., 2000).

If an oil spill occurs during a storm, the dispersant application would occur following the storm. Aerial and vessel dispersant application would not be possible while storm conditions continued. However, oil released onto the ocean surface during a storm event would be subject to accelerated rates of weathering and dissolution (i.e., oil and water would be agitated, forcing oil into smaller droplets and facilitating dissolution of the high-end aromatic compounds present).

In-situ Burning

In-situ burning is an oil-spill cleanup technique that involves the controlled burning of the oil at or near a spill site. The use of this spill-response technique can provide the potential for the removal of large amounts of oil over an extensive area in less time than other techniques. In-situ burning involves the same oil collection process used in mechanical recovery, except instead of going into a skimmer, the oil is funneled into a fire boom, which is a specialized boom that has been constructed to withstand the high temperatures from burning oil. While in-situ burning is another method for disposing of oil that has been collected in a boom, this method is typically more effective than skimmers when the oil is highly concentrated. In-situ burning was successfully used in 411 burns during the *Deepwater Horizon* oil-spill response, successfully eliminating between 220,000 and 300,000 bbl of oil from the water surface (Allen, 2010), approximately 5 percent of the *Macondo* oil spilled (Lubchenco et al., 2010).

Because of the successful use of this technology during the *Deepwater Horizon* oil-spill response, the Gulf of Mexico's Oil Spill Removal Organizations have procured fire boom, which they have strategically stockpiled throughout the GOM region. Response times for bringing a fire-resistant boom onsite would vary, depending on the location of the equipment, the staging area, and the spill site. If an oil spill occurs during a storm, in-situ burning would occur following the storm. In-situ burning would not be possible while storm conditions continued.

Natural Dispersion

Depending upon environmental conditions and spill size, the best response to a spill may be to allow the natural dispersion of a slick to occur. Natural dispersion may be a preferred option for smaller spills of lighter nonpersistent oils and condensates that form slicks that are too thin to be removed by conventional methods and that are expected to dissipate rapidly, particularly if there are no identified potential impacts to offshore resources and a potential for shoreline impact is not indicated. In addition, natural dispersion may also be a preferred option in some nearshore environments, such as a marsh habitat, when the potential damage caused by a cleanup effort could cause more damage than the spill itself.

3.2.1.8.3. Onshore Response and Cleanup

Offshore response and cleanup is preferable to shoreline cleanup; however, if an oil slick reaches the coastline, it is expected that the specific shoreline cleanup countermeasures identified and prioritized in the appropriate Area Contingency Plans (ACP's) for various habitat types would be used. The sensitivity of the contaminated shoreline is the most important factor in the development of cleanup recommendations. Shorelines of low productivity and biomass can withstand more intrusive cleanup methods such as pressure washing. Shorelines of high productivity and biomass are very sensitive to intrusive cleanup methods and, in many cases, the cleanup is more damaging than allowing natural recovery.

Oil-spill-response planning in the U.S. is accomplished through a mandated set of interrelated plans. The ACP's cover subregional geographic areas and represent the third tier of the National Response Planning System mandated by Oil Pollution Act of 1990. The ACP's are a focal point of response planning, providing detailed information on response procedures, priorities, and appropriate countermeasures. The Gulf coastal area that falls within USCG District 8 is covered by the One Gulf Plan ACP, which includes separate Geographic Response Plans for areas covered by USCG Sector Corpus Christi, Sector Houston/Galveston, Sector Port Arthur, Sector Morgan City, Sector New Orleans, and Sector Mobile. The Miami ACP covers the remaining Gulf coastal area. The ACP's are written and maintained by Area Committees assembled from Federal, State, and local governmental agencies that have pollution response authority; nongovernmental participants may attend meetings and provide input. The coastal Area Committees are chaired by respective Federal On-Scene Coordinators from the appropriate USCG Office and are comprised of members from local or area-specific jurisdictions. Response procedures identified within an ACP or its Geographic Response Plan(s) reflect the priorities and procedures agreed to by members of the Area Committees.

If an oil slick reaches the coastline, the responsible party will be required to use the specific shoreline cleanup countermeasures identified and prioritized for the various habitat types potentially impacted in the appropriate ACP's that cover these areas. However, due to the lack of specific and detailed response information in the existing Gulf of Mexico ACP's, the response to the *Deepwater Horizon* explosion and oil spill required that separate, more detailed plans be developed for the protection of these shoreline areas after much additional consultation between the Unified Command and local government agencies. The USCG is presently working to address these data gaps in the current ACP's. BOEM relies upon BSEE to ensure that the approved OSRP's that BOEM accepts (in order to approve exploration, development. or production plans) are in full compliance with the appropriate response strategies for the identified environmental resources included within all of the Gulf of Mexico region ACP's.

The single, most-frequently recommended, spill-response strategy for the areas identified for protection in all of the applicable ACP's or its Geographic Response Plans is the use of a shoreline boom to deflect oil away from coastal resources such as seagrass beds, marinas, resting areas for migratory birds, bird and turtle nesting areas, etc. Since oil spilled at sea tends to move and spread rapidly into very thin layers, boom is deployed to corral the oil on the water to enhance recovery effectiveness of skimmers and other response technologies. Boom is also used to protect shoreline areas and to minimize the consequences of an oil spill reaching shore. There are tradeoffs in deciding where and when to place boom because, once deployed, boom is time consuming to tend and to relocate. For example, booming operations are sensitive to wind, wave, and currents and need to be tethered and secured to keep them from moving. Rough seas can tear, capsize, or shred boom. Currents over 1.5 kn (1.7 mph) or even a wake from a boat can send oil over or under a boom. Untended boom can become a barricade to wildlife and to ship traffic. Boom anchors can damage some habitats. During the *Deepwater Horizon* explosion, oil spill, and response, it was discovered that hard boom often did more damage than anticipated in the marsh it was intended to protect after weather conditions ended up stranding the boom back into the marsh (USDOC, NOAA, 2010a).

If a shoreline is oiled, the selection of the type of shoreline remediation to be used will depend on the following: (1) the type and amount of oil on the shore; (2) the nature of the affected coastline; (3) the depth of oil penetration into the sediments; (4) the accessibility and the ability of vehicles to travel along the shoreline; (5) the possible ecological damage of the treatment to the shoreline environment; (6) weather conditions; (7) the current state of the oil; and (8) jurisdictional considerations. To determine which cleanup method is most appropriate during a spill response, decisionmakers must assess the severity and nature of the injury using Shoreline Cleanup and Assessment Team survey observations. These onsite decisionmakers must also estimate the time it will take for an area to recover in the absence of cleanup (typically considering short term to be 1-3 years, medium term to be 3-5 years, and long term greater than 5 years) (National Response Team, 2010).

The variety of standard cleanup protocols that were used for removing *Deepwater Horizon* oil from beaches, shorelines, and offshore water is identified in **Table 3-23**. In general during the *Deepwater Horizon* oil-spill response, oiling conditions included surface and buried oil layers, surface and buried oil/sand balls, stained sand, and sunken oil in the adjacent subtidal waters. Waste minimization was a core principle for sand beaches with the intent to remove as little sediment as practical from the shore zone. Treatment methods for sand beaches comprised manual and mechanical removal, an on-site treatment plant, and sediment relocation. Mechanical removal involved a range of commercial self-propelled or towed machines designed primarily to sieve debris and litter on recreational beaches. Field trials were conducted to evaluate which specific mechanisms were more appropriate for the different oiling conditions. The beach cleaners were used as scrapers on the more heavily oiled beaches in Louisiana, whereas the sieving function was more appropriate to recover oil particles on the beaches of Mississippi, Alabama, and Florida. Oiled wetlands included *Spartina* salt marshes and *Phragmites* ("roseau cane") brackish-freshwater wetlands in the Mississippi Delta. Because previous spills in this region provided an understanding of the recovery potential for the oiled wetlands, natural recovery was the preferred strategy in most cases based on the generally light oiling conditions. Natural attenuation was relatively rapid if an area was only lightly oiled, as the *Deepwater Horizon* oil type had an API gravity of 35. A guiding principle for wetland treatment was to minimize physical intrusion and work from floating platforms, skiffs or shallow-draft barges, whenever possible. Floating mechanical flushing machines, using concrete pump arms, were used on a limited scale to reach into oiled fringe wetlands to wash and recover mobile oil. Oiled rip rap, breakwaters, groins and jetties, were treated through manual removal of bulk oil and washed using a range of temperatures and pressure depending on the character of the oil (Owens et al., 2011). For further information regarding the ongoing effort to clean the shorelines impacted by the oil spill resulting from the *Deepwater Horizon* explosion, refer to **Appendix B**.

Shoreline Cleanup Countermeasures

The following assumptions regarding the cleanup of spills that contact coastal resources in the area of consideration reflect a generalization of the site-specific guidance provided in the current ACP's or their Geographic Response Plans applicable to the Gulf of Mexico. The cleanup countermeasures discussed are for a medium-weight oil. The ACP's applicable to the Gulf coastal area cover a vast geographical area. The differences in the response priorities and procedures among the various ACP's or its Geographic Response Plans reflect the differences in the identified resources needing spill protection in the area covered by each ACP or the Geographic Response Plans.

- *Barrier Island/Fine Sand Beaches Cleanup*: After the oiling of a barrier island/fine sand beach with a medium-weight oil, applicable cleanup options are manual removal, trenching (recovery wells), sediment removal, cold-water deluge flooding, shore removal/replacement, and warm-water washing. Other possible shoreline countermeasures include low-pressure cold-water washing, burning, and nutrient enhancement. Responders are requested to avoid the following countermeasures: no action; passive collection (sorbents); high-pressure, cold-water washing; hot-water washing; slurry sand blasting; vacuum; and vegetation cutting.

- *Fresh or Salt Marsh Cleanup*: In all cases, cleanup options that avoid causing additional damage to the marshes will be selected. After the oiling of a fresh or salt marsh with medium-weight oil, a preferred cleanup option would be to take no action. Another applicable alternative would be trenching (recovery wells). Shore removal/replacement, vegetation cutting, or nutrient enhancement could be used. The option of using vegetation cutting as a shoreline countermeasure will depend upon the time of the year and will be considered generally only if the re-oiling of birds is possible. Chemical treatment, burning, and bacterial addition are countermeasures under consideration. Responders are advised to typically avoid manual removal; passive collection; debris removal/heavy equipment; sediment removal; cold-water flooding; high- or low-pressure, cold-water washing; warm-water washing; hot-water washing; slurry sand blasting; and shore removal/ replacement.

- *Coarse Sand/Gravel Beaches Cleanup*: After the oiling of coarse sand/gravel beach with medium-weight oil, applicable cleanup options are manual removal, trenching (recovery wells), sediment removal, cold-water deluge flooding, and shore removal/ replacement. Other possible shoreline countermeasures include low-pressure, cold-water washing; burning; warm-water washing; and nutrient enhancement. Responders are requested to avoid the following countermeasures: no action; passive collection (sorbents); high-pressure, cold-water washing; hot-water washing; slurry sand blasting; vacuum; and vegetation cutting.

- *Exposed or Sheltered Tidal Flats Cleanup*: After the oiling of an exposed or sheltered tidal flat with medium-weight oil, the preferred cleanup option is no action. Other applicable shoreline countermeasures for this resource include trenching (recovery wells) and cold-water deluge flooding. Other possible shoreline countermeasures listed include low-pressure, cold-water washing; vacuum; vegetation cutting; and nutrient enhancement. Responders are requested to avoid manual removal; passive collection; debris removal/heavy equipment; sediment removal; high-pressure, cold-water washing; warm-water washing; hot-water washing; slurry sand blasting; and shore removal/replacement.

- *Seawall/Pier Cleanup*: After the oiling of a seawall or pier with a medium-weight oil, the applicable cleanup options include manual removal; cold-water flooding; low- and high-pressure, cold-water washing; warm-water washing; hot-water washing; slurry sand blasting; vacuum; and shore removal replacement. Other possible shoreline countermeasures listed include burning and nutrient enhancement. Responders are requested to avoid no action, passive collection (sorbents), trenching, sediment removal, and vegetation cutting.

3.2.2. Losses of Well Control

The BSEE requires that all losses of well control be reported to BSEE. Effective June 8, 2010, this Agency clarified the loss of well control incident reporting in NTL 2010-N05, “Increased Safety Measures for Energy Development on the OCS.” Operators are required to document any loss of well control event, even if temporary, and the cause of the event by mail or email to the addressee indicated in the NTL. The operator does not have to include “kicks” that were controlled but should include the release of fluids through a flow diverter (a conduit used to direct fluid flowing from a well away from the drilling rig).

The current definition for loss of well control is as follows:

- uncontrolled flow of formation or other fluids (the flow may be an exposed formation [an underground blowout] or at the surface [a surface blowout]);
- uncontrolled flow through a diverter; and/or
- uncontrolled flow resulting from a failure of surface equipment or procedures.

A loss of well control can occur during any phase of development, i.e., exploratory drilling, development drilling, well completion, production, or workover operations. A loss of well control can occur when improperly balanced well pressure results in sudden, uncontrolled releases of fluids from a wellhead or wellbore (PCCI Marine and Environmental Engineering, 1999; Neal Adams Firefighters, Inc., 1991). From 2006 to 2010, of the 27 loss of well control events reported in the GOM, 7 (22%) resulted in loss of fluids at the surface or underground (USDOI, BOEMRE, 2010b). In addition to spills, the loss of well control can resuspend and disperse bottom sediments. Historically, since 1971, most OCS blowouts have resulted in the release of gas; blowouts resulting in the release of oil have been rare.

The *Macondo* well blowout occurred in Mississippi Canyon Block 252 on April 20, 2010. Although this is statistically a rare event, the subsea blowout resulted in the release of 4.9 million bbl of oil from the well (Lubchenco et al., 2010) and large quantities of gas. To date, a gas volume release for *Macondo* has not been officially calculated as a Government estimate, but BOEM has made an estimate of 15 Bcf of gas released by *Macondo*, in absence of any other attempt at quantifying the release (DeCort, official communication, 2010).

Prior to the *Deepwater Horizon* explosion and oil spill, two of the largest spills resulting from blowouts on the Gulf of Mexico OCS occurred in 1970, releasing 30,000 and 40,000 bbl of oil, respectively. From 1970 through November 2012, there has been a total of 15 losses of well control events that have resulted in >50 bbl of oil being spilled. Excluding the volume spilled during the *Deepwater Horizon* oil spill, a total of 87,442 bbl of oil was spilled during these 14 spill events. Most of these losses of well control were of short duration, more than one-half lasting less than a day (USDOI, BOEMRE, 2010b). In contrast, the *Deepwater Horizon* oil spill continued uncontained for 87 days, between April 20 and July 15, 2010.

As shown by the *Deepwater Horizon* explosion and oil spill, the loss of well control in deep water has presented obstacles and challenges that would not be encountered during a loss of well control in shallow waters. Although many of the same techniques used for wild well control efforts in shallow water were used to attempt to control the *Macondo* well, these well control efforts were hindered by water depth, which required reliance solely upon the use of ROV’s for all well intervention efforts. This is a concern in deep water because the inability to quickly regain control of a well increases the size of a spill, as occurred during the *Deepwater Horizon* explosion and oil spill. The *Deepwater Horizon* explosion and oil spill required that the operator attempt well control efforts at the seabed in very deep water depths (over 5,000 ft; 1,524 m), and after the explosions and fire that sunk the *Deepwater Horizon*, key personnel were missing who could have accessed surface switches to shut down the well if a functional BOP was installed.

As indicated by Neal Adams Firefighters, Inc. (1991) and by the *Deepwater Horizon* explosion and oil spill, there are several options that could be attempted to control a well blowout. Common kill techniques include (1) bridging, (2) capping/shut-in, (3) capping/diverting, (4) surface stinger, (5) vertical intervention, (6) offset kill, and (7) relief wells (Neal Adams Firefighters, Inc. 1991). Although much has been learned about well control in deep water as a result of the *Deepwater Horizon* explosion and oil spill, if a deepwater subsea blowout occurs in the future, it is likely that an operator would be required to immediately begin to drill one or more relief wells to gain control of the well. This may be required whether or not this is the first choice for well control because the relief well is typically considered the ultimate final solution for regaining well control in such circumstances.

Although it can take months, the actual amount of time required to drill the relief well depends upon the following: (1) depth of formation below mudline; (2) complexity of the intervention; (3) location of a suitable rig; (4) type of operation that must be terminated in order to release the rig (e.g., may need to complete a casing program before releasing the rig); and (5) any problems mobilizing personnel and equipment to the location.

The major differences between a blowout during the drilling phase versus the completion or workover phases is the drilling well tendency to “bridge off.” Bridging is a phenomenon that occurs when severe pressure differentials are imposed at the well/reservoir interface and the formation around the wellbore collapses and seals the well. Deepwater reservoirs are susceptible to collapse under “high draw down” conditions. However, a completed well may not have the same tendency to passively bridge off as would a drilling well involving an uncased hole. Bridging would have a beneficial effect for spill control by slowing or stopping the flow of oil from the well (PCCI Marine and Environmental Engineering, 1999). There is a difference of opinion among blowout specialists regarding the likelihood of deepwater wells bridging naturally in a short period of time. Completed wells, or those in production, present more severe consequences in the event of a blowout due to the hole being fully cased down to the producing formation, which lowers the probability of bridging (PCCI Marine and Environmental Engineering, 1999). Therefore, the potential for a well to bridge is greatly influenced by the phase of a well. Refer to **Chapter 3.2.1.4** for a discussion of planned well-source containment options that were designed to address an ongoing loss of well control event.

In 2007, this Agency (Izon et al., 2007) looked at the occurrences of blowouts during a 15-year period. From 1992 to 2006, 39 blowouts occurred at a rate of one blowout for every 387 wells drilled. These numbers are down from the previous 15-year period where 87 blowouts occurred at a rate of one blowout for every 246 wells drilled. The majority of blowouts (84%) occurred at water depths <500 ft (152 m), which corresponds to where most of the wells in the GOM have been drilled. Forty-one percent of the blowouts lasted 1-7 days, and cementing problems were associated with 18 of the 39 blowouts. Flow diverters, which channel drilling fluid under normal circumstances but during a blowout would channel oil or gas, were used in 20 of the 39 blowouts with success reported in 16 out of 20. The occurrence of loss of well control events has improved over the last 25 years, and most loss of well control events are recoverable onsite and result in no environmental releases. Industry challenges remain as operators move into ultra-deepwater areas and seek deeper geologic prospects with little knowledge of the subsurface environment and with the use of new technologies in both familiar and unfamiliar environments.

Blowout Preventers

A BOP is a device with a complex of choke lines and hydraulic rams mounted atop a wellhead designed to close the wellbore with a sharp horizontal motion that may cut through or pinch shut casing and sever tool strings. Depending on how it is configured, a BOP could weigh 375 tons and cost from $35 to $40 million, and higher. The BOP's were invented in the early 1920's and have been instrumental in ending dangerous, costly, and environmentally damaging oil gushers on land and in water. The BOP's have been required for OCS oil and gas operations from the time offshore drilling began in the late 1940's.

The BOP's are actuated as a last resort upon imminent threat to the integrity of the well or the surface rig. For cased wells, the normal situation, the hydraulic ram may be closed if oil or gas from an underground zone enters the wellbore to destabilize it. By closing a BOP, usually by redundant surface-operated and hydraulic actuators, the drilling crew can prevent explosive pressure release and allow control of the well to be regained by balancing the pressure exerted by a column of drilling mud with formation fluids or gases from below.

Surface BOP's typically differ from subsea BOP's by the reduced redundancy in the stack. This is in part due to the ease of maintenance and repair to the stack at the surface in comparison to the subsea BOP, which may have to be retrieved for these issues. As there are typically less components, the surface BOP stacks are lighter as a result.

Both annular and shear rams are typically configured together in the subsea BOP stack to create redundancy. Because BOP's are important for the safety of the drilling crew, as well as the rig and the wellbore itself, BOP's are regularly inspected, tested, and refurbished. The post-*Deepwater Horizon* explosion, oil spill, and response regulations and inspection program required for BOP's is discussed below and in **Chapter 1.3.2**. Among the changes are new provisions for BOP testing.

The most important components of the BOP for regaining control of a wild well are rams. There are four types of rams: pipe ram; annular preventer; shear ram; and blind-shear ram (MCS Advanced Subsea Engineering, 2010, pages 17-20).

Pipe Ram

A pipe ram is an element that acts as a seal in the BOP. There are rams for high-pressure and low-pressure applications. Pipe rams were historically comprised of two half circles that were designed to seal around the drill pipe; however, there are newer styles of rams that are variable and that fit a range of pipe sizes.

Annular Preventer

The annular preventer is a component of the pressure control system in the BOP that is usually situated at the top of the stack. It is a device that can form a seal in the annular space around any object in the wellbore or upon itself, enabling well control operations to commence. A reinforced elastomer packing element is compressed by hydraulic pressure to affect the seal.

Blind Ram and Blind-Shear Ram

A blind ram is used to seal an open hole when there are no tools or drill string in the bore. Blind-shear rams have a cutting edge that is designed to shear drill string, casing, or production tubing that may be in the hole, allowing the blind rams to seal the hole. Blind rams are intended to seal against each other to effectively close the hole; they are not intended to seal against any drill pipe or casing.

Subsea Isolation Device

A subsea isolation device allows a well to be sealed below the BOP stack to allow the rig or drillship to move off location in case of an emergency disconnect situation, such as an approaching hurricane. Where there is the need to disconnect from the wellhead in a blowout or other well control situation, a subsea isolation device may be used. The subsea isolation device is placed at the mudline with riser and wellhead connectors set up to allow emergency disconnect if needed. The subsea isolation devices have different names depending on the operator and manufacturer. They can be called a subsea isolation device, environmental safety guard, surface disconnect system, or subsea shut-off device, just to name a few. The subsea isolation device is not designed for typical well control and is not considered a BOP. It is designed to seal the well and disconnect the riser from the seafloor if required, allowing safe well abandonment and the possibility to enter the well at a later point. The subsea isolation devices are typically activated with an acoustic trigger or from an ROV control panel.

Choke Valves

Choke valves are the means of controlling the BOP or subsea isolation device functions. They can either be fixed or adjustable. An adjustable valve has the advantage of allowing more control over fluid control parameters; however, under prolonged use, they may be more susceptible to erosion than fixed valves.

This Agency's role during the efforts to actuate the BOP after the sinking of the *Deepwater Horizon* drilling ship was evaluated in Staff Working Paper 6 for the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling (Oil Spill Commission, 2011a, pages 4-7). The staff's evaluation described limited supervision by this Agency in the early spill containment effort, but it was in line with this Agency's established role in overseeing deepwater drilling in general. The Commission staff attributed this Agency's role to stem from a lack of resources and absence of important operational expertise (Oil Spill Commission, 2011a, pages 7-8).

Blowout Preventer Effectiveness

The Technology Assessment & Research (TA&R) Program is a research element within BOEM's Regulatory Program. The TA&R Program supports research associated with operational safety and pollution prevention, as well as oil-spill response and cleanup capabilities. The TA&R Program was established in the 1970's to ensure that industry operations on the OCS incorporated the use of the best available and safest technologies, subsequently required through the 1978 OCSLA amendments and Energy Policy Act of 2005. The TA&R Program is comprised of three functional research activities: operational safety and engineering research; oil-spill-response research; and renewable energy research. There is no automatic connection between TA&R research outputs and changes to BOEM requirements. Management discretion is involved between the research outputs produced by TA&R and how or if they lead to a change in regulation.

The studies carried out by this Agency on the effectiveness of BOP's over the last 12 years have resulted in a mixed assessment of their effectiveness. An unavoidable condition involved in any BOP study to sample unit effectiveness is that a test is destructive for the casing or drill string components elected as representative and is also unique to the conditions under which the test was deployed. Tests should be as realistic as possible of in-situ conditions and materials used. As a review of the TA&R studies that have been undertaken shows (below), this is not often the case. This Agency has never required destructive testing; such a program has not been proposed in recent BOEM, post-*Deepwater Horizon* explosion, oil spill, and response regulations (**Chapter 1.3.2**). Routine destructive testing of equipment like a BOP may diminish its lifespan making such a test program costly.

Another train of assumption that underpins effectiveness testing would be (1) that other BOP units from a manufacturer are assumed to be representative of the same type and design, (2) that units are maintained according to specification, and (3) that all modifications or maintenance for BOP units available for deployment have been carried out under a system of design control and configuration management so that rig crews know that a properly maintained or modified unit is deployed, and so that if a crew has occasion to actuate a BOP in an emergency, they have access to accurate drawings for any modification that may have been made to it. For example, there were apparently modifications made to the *Macondo* BOP in a maintenance overhaul. The spill-response engineers seeking to activate the BOP with ROV's did not understand what modifications had been made and did not have accurate drawings of its modified configuration (Webb, 2010).

Tetrahedron, Inc. (1996) conducted a study using data provided by the oil industry to determine BOP failure rates when tested at 7- and 14-day time intervals. The regulation 30 CFR § 250.57 at that time required that a BOP must be tested when

- installed;
- before drilling each string of casing or before continuous operations in cases where the cement is not drilled out; and
- at least once a week, but not exceeding 7 days between pressure tests, alternating between control stations. A period of more than 7 days between BOP tests is allowed when there is a stuck pipe or there are pressure control operations and remedial efforts are being performed, provided that the pressure tests are conducted as soon as possible and before normal operation resumes.

Prior to the Increased Safety Measures Final Rule, which was published in 2012, when a unit was deployed on a well site and installed, BOEM required a pressure-up and hold time test for the ram components without actually actuating the rams in the field. Tests succeeded or failed on the ability for the system to hold specified pressures at intervals from 3 to 5 minutes. Tetrahedron, Inc. (1996) used the data to look at BOP component failures as well as failure rates between surface BOP's and subsea BOP's. For this study, a test of BOP failure was reported when any piece of equipment had to be physically repaired or sent to the shop for repairs for both initial and subsequent tests. Data were collected from 155 BOP (surface and subsea) tests, from which 63 were reported as failures (41%). When looking at surface versus subsea BOP's, 22 out of 50 surface tests failed (44%) and 12 out of 56 subsea tests failed (21%).

As a result of this study, this Agency proposed a rule change to lengthen the pressure testing interval to not exceed 14 days (*Federal Register*, 1997) and expanded on how testing was to be carried out for BOP's in general. This Agency concluded that no statistical difference existed in failure rates for BOP's tested between 0- to 7-day intervals and 8- to 14-day intervals (*Federal Register*, 1998a, page 29604). That is to say, the testing interval was not a controlling factor. This Agency, in effect, accepted that whether tested every 7 days or every 14 days, equivalent marginal test results were obtained. The rule was finalized (*Federal Register*, 1998a), amending 30 CFR §§ 250.406, 250.407, 250.515, and 250.516 in line with the proposed changes to expand required BOP testing to the longer interval.

Holand (1999) conducted a study on the reliability of subsea BOP's for deepwater applications reported for 83 wells drilled in the years 1997 and 1998. He looked at the number of days the BOP's were in service and the number of hours lost due to reported BOP failures. The failures were also classified as safety noncritical and safety critical. Safety noncritical failures are failures that occur on the rig during operation and testing of the BOP, whereas safety critical failures occur after testing and during a period in which the BOP is acting as a barrier. There were 117 BOP safety critical failures reported during 4,009 BOP service days, with a total of 3,637.5 hours lost. The failure rate for safety critical systems, the point at which the BOP was preventing a gas or fluid release, was 57 percent. The main cause of BOP failures were the ram preventers and the main control systems.

Holand and Skalle (2001) conducted a study looking at BOP performance and deepwater kicks. This study ties back to the Holand (1999) study that reported 117 BOP failures for 83 wells drilled in the years 1997 and 1998. There were 48 pressure kicks reported during the drilling of the 83 wells. There are various techniques used to suppress and equalize pressure kicks (kick-killing operations), and Holand and Skalle concluded that kick killing operations were a likely contributor to four of the BOP failures.

West Engineering Services (2002) conducted a study on the shearing capability of the BOP shear ram based on results of fully actuated BOP's from operator-provided effectiveness tests. Data were provided from seven rigs that conducted tests without hydrostatic pressure and from six rigs that tested with hydrostatic pressure. This study looked at both operational and nonoperational conditions. Five of the seven tests passed (71%) the test without the hydrostatic pressure, but only three of the six passed (50%) the test that accounted for increased hydrostatic pressure. The study acknowledged that different grades of casing were not tested.

When shear tests are conducted, operational parameters, such as the increased hydrostatic pressure at deepwater depths or the complete range of casing steel or pipe thicknesses, are rarely factored in. If a BOP is actuated at a casing joint, the casing is greatly overthickened at that point. Barstow et al. (2010) reported that pipe joints can make up almost 10 percent of the drill pipe's length. Should the shear ram be opposite the threading or upset (the thickening of the pipe to compensate for the threads that may be externally or internally expressed on the pipe wall) of a pipe joint, the ram would be trying to shear a pipe overthickened perhaps beyond its design specifications. However, if two rams are part of the BOP configuration, at least one ram is likely to be opposite pipe without a joint at all times. The BOP's account for such a condition by using both pipe and annular rams at different levels in the BOP stack; the assumption being that a redundant system would be failsafe. Double ram configurations, however, were not required by this Agency or by current post-*Deepwater Horizon* explosion, oil spill, and response BOEM regulations (**Chapter 1.3.2**).

West Engineering Services (2004) conducted a study to evaluate if a rig's BOP equipment could shear pipe to be used in a given drilling program at the most demanding condition to be expected. The study was prompted by the advances in drilling pipe metallurgy combined with larger and heavier pipe sizes used in deepwater drilling programs. West Engineering Services' (2004, page 3-1) evaluation followed their 2002 study that referred to the 2002 results as "a grim snapshot" of industry's preparedness. West Engineering Services reported that the latest generation of high-ductility drilling pipe has been seen in some cases to double the shearing pressures required to sever the pipe compared with lower ductility pipe of the same weight, diameter, and grade through which only careful record keeping aboard the rig can determine which pipe is of what specification. West Engineering Services (2004) concluded that pressures that should be considered when predicting successful pipe shear often are not, such as net hydrostatic pressure at water depth (combined pressure effects of seawater, BOP hydraulic fluid, and drilling mud) and closing rams against the pressure in a wellbore kick. The following are among West Engineering Services' recommendations: (1) design BOP stack for drilling programs using the worst-case information, such as maximum anticipated drilling pipe specifications, and compensatory pressures at depth acting to require a higher shear strength to separate pipe; (2) establish a maximum length for tool joints and upsets; (3) stop designating drill pipe weight per foot in favor of actual pipe wall thickness; (4) establish an industry-wide database of shear forces/pressures in materials tests carried out by prescribed procedure with prescribed test parameters and material test specifications; and (5) encourage industry to share data, which is a role for BSEE. Part of the post-*Deepwater Horizon* explosion, oil spill, and response spill regulatory changes for 30 CFR § 250.416(e) is that third-party verification is required for all BOP's that the blind-shear rams installed in the BOP stack are capable of shearing the drill pipe in the hole under maximum anticipated surface pressure.

West Engineering Services (2006) conducted a study to assess the acceptability and safety of using equipment, particularly BOP's and wellhead components, at pressures in excess of rated working pressure. Running equipment in excess of the maximum operating pressure is considered a poor practice and is rarely seen except for accidental or emergency use. If equipment is damaged during operation over maximum working pressure, the study implied that a downgrade would be a temporary remedy until the system is removed from service or until repaired.

Melendez et al. (2006) wrote his Master's Thesis at Texas A&M University on the risk assessment of surface versus subsea BOP's on MODU's. Melendez et al. determined that the reliability of the surface

BOP system compared with the subsea BOP system was nearly equal. This was the case even as the subsea BOP system used more redundant components than the surface BOP system. Melendez et al. (2006) also determined that the addition of a subsea isolation device improved the system's reliability and recommended subsea isolation devices be used for deepwater operations in the Gulf of Mexico.

MCS Advanced Subsea Engineering (2010) conducted a risk analysis on the use of surface BOP's. MCS Advanced Subsea Engineering concluded that a surface BOP carries more potential risk to the vessel and personnel, but it may not increase the overall risk of the operation. Although the BOP is closer to the vessel and allows easy access by rig personnel, the crew exposure time during a wild well condition is lessened because of a simpler and cleaner kill operation at the surface. Proper inspections and maintenance is critical because the BOP is the only barrier between the vessel and personnel during a catastrophic blowout condition.

Despite a mixed assessment of BOP effectiveness over the last 12 years, BSEE made no changes in regulation for BOP's at that time in the face of such ambiguous results. The need for redundant well control systems was recognized and judged desirable in TA&R studies. The TA&R studies concluded that the failure rate for surface BOP's was worse than for subsea BOP's (Tetrahedron, Inc., 1996) but that both types of units approached 50 percent failure rates in effectiveness studies. No TA&R study was carried out under strictly controlled conditions that simultaneously accounted for different BOP ram types, rig mount locations, the metallurgy and thickness of casing steel, or deepwater pressure and temperature conditions. However, BSEE's new, post-*Deepwater Horizon* explosion, oil spill, and response safety requirements that were put in place on August 22, 2012 (*Federal Register*, 2012a), included several added regulations to improve the safety of well control systems (**Chapter 1.3.2**).

The BSEE issued a final Safety and Environmental Management Systems (SEMS II) rule on April 5, 2013, which became effective on June 4, 2013. The SEMS II Final Rule updates the Workplace Safety Rule that was issued in October 2010 and provides greater protection by supplementing operators' SEMS programs with employee training, empowering field level personnel with safety management decisions, and strengthening auditing procedures by requiring them to be environmental management systems. The SEMS is a performance-focused tool for integrating and managing offshore operations. The purpose of SEMS is to enhance the safety of operations by reducing the frequency and severity of accidents. There are four principal SEMS objectives:

(1) focus attention on the influences that human error and poor organization have on accidents;

(2) continuous improvement in the offshore industry's safety and environmental records;

(3) encourage the use of performance-based operating practices; and

(4) collaborate with industry in efforts that promote the public interests of offshore worker safety and environmental protection (*Federal Register,* 2013).

In addition, on April 30, 2013, BSEE and USCG entered into an MOA: OCS-07 entitled "Safety and Environmental Management Systems (SEMS) and Safety Management Systems (SMS)." The purpose of this MOA is to

- establish a process to determine areas relevant to safety and environmental management within the jurisdiction of both USCG and BSEE where joint policy or guidance is needed;
- ensure that any future OCS safety and environmental management regulations do not place inconsistent requirements on industry; and
- establish a process to develop joint policy or guidance on safety and environmental management systems (*Federal Register*, 2013).

3.2.3. Pipeline Failures

Significant sources of damages to OCS pipeline infrastructure are mass sediment movements and mudslides that can exhume or push the pipelines into another location, impacts from anchor drops or boat collisions, and accidental excavation or breaching because the exact whereabouts of a pipeline are uncertain.

The uncertain location of pipelines is an ongoing safety and environmental hazard. On October 23, 1996, in Tiger Pass, a channel through the Mississippi River Delta into the Gulf of Mexico near Venice, Louisiana, the crew of the Bean Horizon Corporation dredge *Dave Blackburn* dropped a stern spud (a large steel shaft that is dropped into the river bottom to serve as an anchor and a pivot during dredging operations) into the bottom of the channel in preparation for continued dredging operations. The spud struck and ruptured a 12-in (30-cm) diameter, submerged natural gas steel pipeline owned by Tennessee Gas Pipeline Company. The pressurized natural gas (about 930 psig) released from the pipeline enveloped the stern of the dredge and an accompanying tug, the *G.C. Linsmier*. Within seconds of reaching the surface, the natural gas ignited. The resulting fire destroyed the dredge and the tug. Twenty-eight crew members from the dredge vessel and tug boat abandoned ship or boarded nearby vessels (USDOT, National Transportation Safety Board, 1998). A description of the incident in a National Transportation and Safety Board safety recommendation (USDOT, National Transportation Safety Board, 1998) indicates that lack of awareness of the precise location of the pipeline was a major contributing factor to this accident.

On December 5, 2003, this Agency received an incident report that a cutterhead dredge barge ruptured a 20-in (51-cm) diameter condensate pipeline in Eugene Island Block 39. Dredging operations by COE were taking place in Atchafalaya Channel. No injuries were reported, but a small condensate spill and subsequent fire damaged the dredge barge. The incident was apparently caused by inaccurate knowledge of the pipeline's location. The global positioning system beacon was located on the barge tug rather than on the bow of the dredge barge where the suction cutterhead operated. Therefore, the true position of the pipeline relative to the suction cutterhead was in error by at least the length of the dredge barge (about 400 ft; 121 m). Lack of awareness of the precise location of the pipeline was the major contributing factor to this accident as well.

Following the 2004, 2005, and 2008 hurricane seasons, this Agency commissioned studies to examine the failure mechanisms of offshore pipelines (Atkins et al., 2006 and 2007; Energo Engineering, 2010). **Table 3-24** shows pipelines damaged after the 2004-2008 hurricanes passed through the CPA and WPA. Much of the reported damage is riser or platform-associated damage, which typically occurs when a platform is toppled or otherwise damaged.

Table 3-25 shows the hurricane-associated spills from pipelines >50 bbl. The largest spills are typically due to pipeline movements, mudslides, anchor drops, and collisions of one type or another. Most pipeline damage occurs in shallow (<200 ft; 61 m) water because of the potential for increasing impacts of the storm on the seabed in shallow water, the relative density of pipelines, or the age and design standards of the pipeline or the platforms to which the pipelines are connected.

The future impact of hurricanes on damage to pipelines is uncertain. As oil production shifts from shallow to deeper water, there may be a consolidation of pipeline utilization.

An OCS-related spill ≥1,000 bbl would likely be from a pipeline accident; the median spill size is estimated to be 2,200 bbl for rig/platform and pipeline activities supporting an EPA proposed action (**Table 3-10**). For an EPA proposed action, 0-1 spill of this size is estimated to occur.

3.2.4. Vessel Collisions

This Agency revised operator incident reporting requirements in a final rule effective July 17, 2006 (*Federal Register*, 2006b). The new incident reporting rule more clearly defines what incidents must be reported, broadens the scope to include incidents that have the potential to be serious, and requires the reporting of standard information for both oral and written reports. As part of the incident reporting rule, BSEE's regulations at 30 CFR § 250.188(a)(6) requires an operator to report all collisions that result in property or equipment damage greater than $25,000. "Collision" is defined as the act of a moving vessel (including an aircraft) striking another vessel, or striking a stationary vessel or object (e.g., a boat striking a drilling rig or platform).

This Agency's data show that, from 1996 to 2012, there were 255 OCS-related collisions. Most collision mishaps are the result of service vessels colliding with platforms or vessel collisions with pipeline risers. Approximately 10 percent of vessel collisions with platforms in the OCS caused diesel spills. Fires resulted from hydrocarbon releases in several of the collision incidents. To date, the largest diesel spill associated with a collision occurred in 1979 when an anchor-handling boat collided with a drilling platform in the Main Pass leasing area, spilling 1,500 bbl. Diesel fuel is the product most frequently spilled, while oil, natural gas, corrosion inhibitor, hydraulic fluid, and lube oil have also been released as the result of a vessel collision. Human error accounts for approximately half of all reported vessel collisions from 2006 to 2010.

Safety fairways, traffic separation schemes, and anchorages are the most effective means of preventing vessel collisions with OCS structures. In general, fixed structures such as platforms and drilling rigs are prohibited in fairways. Temporary underwater obstacles, such as anchors and attendant cables or chains attached to floating or semisubmersible drilling rigs, may be placed in a fairway under certain conditions. A limited number of fixed structures may be placed at designated anchorages. The USCG's requirements for indicating the location of fixed structures on nautical charts and for lights, sound-producing devices, and radar reflectors to mark fixed structures and moored objects also help minimize the risk of collisions. In addition, the USCG 8th District's Local Notice to Mariners (monthly editions and weekly supplements) informs GOM users about the addition or removal of drilling rigs and platforms, locations of aids to navigation, and defense operations involving temporary moorings. Marked platforms often become aids to navigation for vessels (particularly fishing boats and vessels supporting offshore oil and gas operations) that operate in areas with high densities of fixed structures.

The National Offshore Safety Advisory Committee (NOSAC, 1999) examined collision avoidance measures between a generic deepwater structure and marine vessels in the Gulf of Mexico. The NOSAC offered three sets of recommendations: (1) voluntary initiatives for offshore operators; (2) joint government/industry cooperation or study; and (3) new or continued USCG action. The NOSAC (1999) proposes that oil and gas facilities be used as aids-to-navigation because of their proximity to fairways, fixed nature, well-lighted decks, and inclusion on navigational charts. Mariners intentionally set and maintain course toward these facilities, essentially maintaining a collision course. Unfortunately, most deepwater facilities do not install collision avoidance radar systems to alert offshore facility personnel of a potentially dangerous situation. The NOSAC estimates that 7,300 large vessels (tankships, freight ships, passenger ships, and military vessels) pass within 35 mi (56 km) of a typical deepwater facility each year. This estimate resulted in approximately 20 transits per day for the 13 deepwater production structures existing in 1999. The NOSAC found the total collision frequency to be approximately one collision per 250 facility-years (3.6×10^{-3} per year). The NOSAC estimated that, if the number of deepwater facilities increases to 25, the estimated total collision frequency would increase to one collision in 10 years. A cost-benefit analysis within the report did not support the use of a dedicated standby vessel for the generic facility; however, the analysis did support the use of a radar system on deepwater facilities if the annual costs of the system were less than or equal to $124,500.

The OCS-related vessels could collide with marine mammals, turtles, and other marine animals during transit. One standard lease stipulation states, "The Lessee and its operators must:…observe for marine mammals and sea turtles while on vessels, reduce vessel speed to 10 knots or less when assemblages of cetaceans are observed, and maintain a distance of 90 meters or greater from whales, and a distance of 45 meters or greater from small cetaceans and sea turtles; and employ mitigations measures prescribed by BOEM/BSEE or the National Marine Fisheries Service (NMFS) for all seismic surveys, including the use of an "exclusion zone" based upon the appropriate water depth, ramp-up and shut-down procedures, visual monitoring, and reporting…" Further, the lessee and its operators, personnel, contractors, and subcontractors, while undertaking activities authorized under this lease, must implement and comply with the specific mitigation measures outlined in the following: (1) NTL 2012-JOINT-G01 ("Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"); (2) NTL 2012-JOINT-G02 ("Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program"); and (3) NTL 2012-BSEE-G01 ("Marine Trash and Debris Awareness and Elimination"). The frequency of vessel collisions with marine mammals, turtles, or other marine animals probably varies as a function of spatial and temporal distribution patterns of the living resources, the pathways of maritime traffic (coastal traffic is more predictable than offshore traffic), and as a function of vessel speed, the number of vessel trips, and the navigational visibility.

To prevent any further incidents in regard to collisions with submerged or destroyed platforms following Hurricanes Katrina and Rita, in December 2005, this Agency published a safety alert that provided the location of all facilities that were destroyed during the storms.

3.2.5. Chemical and Drilling-Fluid Spills

Chemical Spills

Chemicals are stored and used to condition drilling muds during production and in well completions, stimulation, and workover procedures. The relative quantity of their use is reflected in the largest volumes spilled. Completion fluids are the largest quantity used and are the largest accidental releases. The most common chemicals spilled are methanol, ethylene glycol, and zinc bromide. Additional production chemicals are needed in deepwater operations where gas hydrates tend to form. The volumes spilled during each event are anticipated to remain about the same, but spill frequency can be expected to improve because of advances in subsea processing.

A study of chemical spills from OCS activities determined that only two chemicals could potentially impact the marine environment—zinc bromide and ammonium chloride (Boehm et al., 2001). Both of these chemicals are used for well treatment or completion and, therefore, are not in continuous use. Most other chemicals are either nontoxic or used in small quantities.

Zinc bromide is of particular concern because of the toxic nature of zinc. The study modeled a spill of 45,000 gallons of a 54-percent aqueous solution, which would result in an increase in zinc concentrations to potentially toxic levels. Direct information on the toxicity of zinc to marine organisms is not available; however, the toxicity of zinc to a freshwater crustacean (*Ceriodaphnia dubia*) indicated that exposure to 500 ppb zinc results in measurable effects. One factor not considered in the model is the rapid precipitation of zinc in marine waters, which would minimize the potential for impact.

Ammonium chloride was modeled using potassium chloride as a surrogate. The model looked at a spill of 4,717 kilograms (10,399 pounds) of potassium chloride powder. The distribution of potassium would overestimate the distribution of ammonia released during a spill. The model indicated that, close to the release point, ammonia concentrations could exceed toxic levels for time scales of hours to days. Additional information on the degradation of ammonia in seawater would be needed for a more complete evaluation.

In a study of sublethal effects of production chemicals on fish associated with platforms, the simultaneous exposure to methanol and ethylene glycol had a greater effect than exposure to either chemical alone. Swimming performance was the outcome studied (Baltz and Chesney, 2005).

Synthetic-Based Fluid Spills

Synthetic-based fluids (SBF) or muds (SBM) have been used since the mid 1990's. In deepwater drilling, SBF are preferred over water-based muds because of the SBF superior performance properties. The synthetic oils used in SBF's are relatively nontoxic to the marine environment and have the potential to biodegrade. However, it should be noted that SBF's are not permitted to be discharged; only cuttings wetted with SBF may be discharged after the majority of synthetic fluid has been removed (refer to Chapter 3.1.1.4.1. of the 2012-2017 WPA/CPA Multisale EIS).

Originally, the entire volume of the spill was recorded. However, the volume of the synthetic portion of the drill fluid rather than the total volume of the drill fluid is now used to describe spill size. Accidental riser disconnects could result in the release of large quantities of drilling fluids and are of particular concern when SBF are used. Most SBF releases of ≥1,000 bbl occur as a result of unplanned riser disconnect or equipment failure. This rate is expected to decrease in the future because improvements are made after each accident is investigated and publicized.

The BSEE tracks spill incidents of ≥1 bbl in size of chemical and SBF resulting from OCS oil and gas activities. The BSEE has historically produced counts and summaries for spills ≥50 bbl (2,100 gallons). **Table 3-26** provides information related to the number and volume of chemical and SBF spills in the Gulf of Mexico based on BSEE's counts and summaries. These data have been updated since the WPA 233/CPA 231 Supplemental EIS, which covered spills during the period of 2002-2009. Since 2013 is still in progress, a summary of 2013 data is not yet available. However, a query of the National Response Center's database for standard reports searching for drilling mud under the material field revealed one spill of ≥1,000 bbl, which was a spill of 1,531 bbl in April 2013 due to an unplanned riser disconnect (USDHS, CG, 2013). The updated chemical and SBF spills are within the range of data presented in the 2012-2017 WPA/CPA Multisale EIS (Table 3-27) and WPA 233/CPA 231 Supplemental EIS. Thus, this new information did not change the validity of the chemical and SBF spills previously presented.

3.3. Cumulative Activities Scenario

The preceding sections of **Chapter 3** discuss the impact-producing factors and scenario for routine activities and accidental events associated with an EPA proposed action that could potentially impact the physical, environmental, and socioeconomic resources that are analyzed in this EIS. This section presents a summary of other factors that may cumulatively impact those resources. These factors include OCS Program oil and gas activities, State oil and gas activities, and pipeline infrastructure. Other activities that occur in the offshore areas of the Gulf Coast States while OCS activity takes place at the same time include dredged material disposal, OCS sand borrowing, marine transportation, military activities, artificial reefs and rigs-to-reef development, offshore LNG projects and deepwater ports, and renewable energy and alternative use projects. Other activities that occur in the coastal areas of the Gulf Coast States include sea-level rise and subsidence, Mississippi River hydromodifications, maintenance dredging activities, and coastal restoration programs. In addition, there are natural events and processes, including hurricanes and physical oceanographic processes, that cumulatively impact the physical, environmental, and socioeconomic resources that are analyzed in this EIS.

The following summarizes some of these factors. Due to the relatively small area and the projected level of activities associated with an EPA proposed action as compared with WPA and CPA proposed actions, as well as the geographical location and distance offshore of the proposed EPA lease sale area, the following does not include all of the activities listed above. For a more complete and detailed discussion of topics related to cumulative activities, refer to Chapter 3.3 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

3.3.1. OCS Program

The OCS Program cumulative scenario includes all activities that are projected to occur from past, proposed, and future lease sales during the 40-year activity period. Projected reserve/resource production for the OCS Program (**Table 3-1**) is 18.34-25.64 BBO and 75.886-111.627 Tcf of gas. **Tables 3-3 through 3-4** present projections of the major activities and impact-producing factors related to future Gulfwide OCS Program activities.

The level of OCS activity is connected to oil prices, resource potential, cost of development, and rig availability rather than just the amount of acreage leased. The impacts of activities associated with the OCS Program on biological, physical, and socioeconomic resources are analyzed in the cumulative impacts analysis sections of **Chapter 4**.

3.3.2. State Oil and Gas Activity

All of the five Gulf Coast States have had some historical oil and gas exploration activity, and with the exception of Florida and Mississippi, all currently produce oil and gas in State waters. Based on 2010 data on oil and gas activity from State-regulated land and water bottoms, Texas is the number one producer of crude oil and Louisiana is fifth in the United States. However, Louisiana ranks first and Texas second when the numbers from Federal OCS production are added to the State figures. Texas also ranks first in gas production and Louisiana ranks third when only using State-specific data. Mississippi falls behind several other states and is ranked twelfth in gas production. If the Federal OCS data are factored in, Louisiana ranks second behind Texas for gas (Louisiana Dept. of Natural Resources, 2012). The coastal infrastructure that supports the OCS Program also supports State oil and gas activities.

State oil and gas infrastructure consists of the wells that extract hydrocarbon resources, facilities that produce and treat the raw product, pipelines that transport the product to refineries and gas plants for further processing, and additional pipelines that transport finished product to points of storage and final consumption. The type and size of infrastructure that supports production depends upon the size, type, and location of the producing field, the time of development, and the life cycle stage of operations. For a more complete and detailed discussion of State oil and gas activity for Texas and Louisiana, refer to Chapter 3.3.2 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

Texas

The most recent oil and gas lease sale occurred on April 10, 2013. One hundred and eighty-two parcels (182) containing more than 91,950 ac of State lands were offered for oil and gas leasing in the offshore area by Texas State University Lands (State of Texas, General Land Office, 2013). BOEM expects that Texas will conduct regular oil and gas lease sales during the 40-year cumulative activities scenario for OCS activity, although the lease sale's regularity could differ from current practices.

Louisiana

The most recent oil and gas lease sale occurred on May 10, 2013. Thirty-five leases containing more than 33,304 ac were offered for oil and gas leasing by the Office of Mineral Resources on the behalf of the State Mineral Board for Louisiana. Though the May 10, 2013, State lease sale contained no offshore area, 64 offshore leases containing more than 2,590 ac were offered during the 2012-2013 State fiscal year. Of these, only 13 leases were awarded. BOEM expects that Louisiana will conduct regular oil and gas lease sales during the 40-year cumulative activities scenario for OCS activity, although the lease sale's regularity could differ from current practices (Louisiana Department of Natural Resources, 2013).

Mississippi

Currently, Mississippi has only an onshore oil and gas leasing program, but in the near future the State will start issuing leases for offshore activity in State waters. In 2004, the Mississippi Legislature limited offshore natural oil and gas exploration to areas located predominantly south of the barrier islands. After this legislation went into effect, the State Mineral Leasing Office was moved to the Mississippi Development Authority, and the Mississippi Development Authority was given the responsibility to publish rules and regulations regarding offshore mineral leasing and seismic activity. The rules and regulations will allow the State of Mississippi to issue seismic permits and lease mineral rights for natural gas and oil exploration and production (Mississippi Development Authority, 2011). On December 19, 2011, the Mississippi Development Authority published draft regulations, and the public comment period closed on January 20, 2012 (Mississippi Development Authority, 2011).

Most of the State's onshore crude oil is located in southern Mississippi. Compared with other states, the production is small and accounts for 1.2 percent share of the United States' production. In 2010, the State produced 23,642 thousand barrels of oil and 73,721 million cubic feet of natural gas (USDOE, Energy Information Administration, 2013b). Mississippi falls behind several other states and is ranked twelfth in gas production. In 2007, Mississippi was selected by the U.S. Department of Energy as a new storage site for the Strategic Petroleum Reserve. The new site is a group of salt domes located inland in Richton, Mississippi (USDOE, Energy Information Administration, 2013b).

BOEM expects Mississippi to institute a lease sale program in the near future and to be leasing in State waters during the 40-year cumulative activities scenario for OCS activity analyzed in this EIS.

Alabama

In 1884 in Cullom Springs, Alabama, the first well was drilled for oil, but the well produced gas. Later, in 1944 the discovery of oil in Choctaw County made the State an oil producer. Since 1980, the number of producing wells increased from 1,000 to nearly 6,531 in 2007 (Hall and Bolin, 2009). Over $2.4 billion worth of oil and gas are produced annually in Alabama. There were 384 fields in Alabama and 6,710 producing wells as of 2008 (Mineral Web, 2012).

Alabama has no established schedule of lease sales. The limited number of blocks in State waters has resulted in the State not holding regularly scheduled lease sales. The last lease sale was held in 1997. BOEM does not expect Alabama to institute a lease sale program in the near future, although there is at least a possibility of a lease sale in State waters during the 40-year cumulative activities scenario for OCS activity analyzed in this EIS.

Florida

Gulf Oil drilled the first offshore exploration wells in Florida in 1947; these wells were in Florida Bay south of Cape Sable in Monroe County. In 1956, Humble Oil drilled an exploration well in the State waters of Pensacola Bay in Santa Rosa County. All wells drilled in State waters were dry holes. Florida banned drilling in State waters in 1992. In 2005, Florida's Governor Jeb Bush and the Florida Cabinet signed a historic settlement agreement to buy out any existing leases in State waters and to eliminate the potential for oil drilling there. Between 1987 and 1995, Chevron made commercial gas discoveries in the

Destin Dome leasing area, which is 25 mi (40 km) south of the western end of the Florida Panhandle in Federal OCS waters. The State of Florida objected to plans to produce the discovery. In May 2002, the U.S. Government agreed to buy back seven leases from Chevron, Conoco, and Murphy Oil for $115 million and to hold in abeyance any further development of the Destin Dome discovery until 2012. With the enactment of the Gulf of Mexico Energy Security Act, areas within 100 mi (161 km) of the coastline of the State of Florida are not to be offered for leasing, preleasing, or any related activity. This extended the abeyance of the development of the Destin Dome discovery until 2022.

In April 2009, three committees of the Florida House of Representatives approved a bill that would allow offshore drilling in State waters >3 mi (4.8 km) from the eastern Gulf shore. The bill passed the Florida House in April 2009 but died soon after in the Florida Senate.

BOEM does not expect Florida to institute a lease sale program in the near future, although it is possible that a change in policy that could lead to leasing on the OCS or in State waters during the 40-year cumulative activities scenario for OCS activity analyzed in this EIS.

Pipeline Infrastructure

The existing pipeline network in the Gulf Coast States is the most extensive in the world and it has unused capacity (USDOI, MMS, 2007a, page 4-63). The network carries oil and gas onshore and inland to refineries and terminals, and a network of pipelines distributes finished products such as diesel fuel or gasoline to and between refineries and processing facilities onshore (Peele et al., 2002, Figure 4.1). Expansion of this network is projected to be primarily small-diameter pipelines to increase the interconnectivity of the existing network and a few major interstate pipeline expansions. However, there is spare capacity in the existing pipeline. For a more complete and detailed discussion of State oil and gas activity, refer to Chapter 3.3.2 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

Cumulative Activities Scenario: Pipeline landfalls in the GOM peaked in the 1970's. The total length of OCS-related pipeline emplaced would be partially based on future OCS leasing activity. For the OCS Program in the EPA between the years 2012 and 2051, a range of 0-233 km (0-145 mi) of pipeline is projected to be emplaced. For the Gulf of Mexico (EPA, WPA, and CPA) between the years 2012 and 2051, a range of 30,428-69,749 km (18,907-43,340 mi) of pipeline are projected to be emplaced.

3.3.3. Other Major Factors Influencing Offshore Environments

Other influencing factors occur in the offshore areas of the Gulf Coast States while OCS activity takes place at the same time. Some of these factors are (1) dredged material disposal, (2) OCS sand borrowing, (3) marine transportation, (4) military activities, (5) artificial reefs and rigs-to-reefs development, (6) offshore LNG projects, (7) development of gas hydrates, and (8) renewable energy and alternative use.

Cumulative impacts to biological, physical, and socioeconomic resources from these types of non-OCS activities are analyzed in the cumulative impacts analysis sections in **Chapters 4.1** of this EIS, Chapter 4.2.1 of the 2012-2017 WPA/CPA Multisale EIS, and Chapters 4.1.1 and 4.2.1 of the WPA 233/CPA 231 Supplemental EIS.

3.3.3.1. Dredged Material Disposal

Dredged material is described at 33 CFR part 324 as any material excavated or dredged from navigable waters of the United States. Materials from maintenance dredging are primarily disposed of offshore on existing dredged-material disposal banks and in ocean dredged-material disposal sites (ODMDS's), which are regulated by USEPA. Additional dredged-material disposal areas for maintenance or new-project dredging are developed as needed and must be evaluated and permitted by COE and relevant State agencies prior to construction.

If funds are available, dredged materials disposed offshore are available for potential beneficial uses to restore and create habitat, beach nourishment projects, and industrial and commercial development—a use called the beneficial use of dredge materials program by COE (**Chapter 3.3.4.3**). Virtually all ocean dumping that occurs today is maintenance dredging of sediments from the bottom of channels and waterbodies in order to maintain adequate channel depth for navigation and berthing. There are four small ODMDS's offshore Louisiana and Mississippi along open-water stretches of the main Gulf

Intracoastal Waterway between Louisiana and Mississippi: in Louisiana ODMDS 66 (1,593 ac; 645 ha); and in Mississippi ODMDS's 65A (1,962 ac; 794 ha), 65B (815 ac; 330 ha), and 65C (176 ac; 71 ha) (U.S. Dept. of the Army, COE, 2008, Table 1). Dredged materials from the Gulf Intracoastal Waterway are sidecast at these ODMDS locations. The ODMDS's utilized by COE in the cumulative activities area include those shown in Table 3-30 of the 2012-2017 WPA/CPA Multisale EIS.

There are two primary Federal environmental statutes governing dredge material disposal. The Marine Protection, Research, and Sanctuaries Act (also called the Ocean Dumping Act) governs transportation for the purpose of disposal into ocean waters. Section 404 of the Clean Water Act governs the discharge of dredged or fill material into U.S. coastal and inland waters. The USEPA and COE are jointly responsible for the management and monitoring of ocean disposal sites. The responsibilities are divided as follows: (1) COE issues permits under the Clean Water Act and the Marine Protection, Research, and Sanctuaries Act; (2) USEPA has lead for establishing environmental guidelines/criteria that must be met to receive a permit under either statute; (3) permits for ODMDS disposal are subject to USEPA review and concurrence; and (4) USEPA is responsible for identifying recommended ODMDS's.

The COE's Ocean Disposal Database reports the amount of dredged material disposed in ODMDS's by district (U.S. Dept. of the Army, COE, 2010). **Table 3-27** shows the quantities of dredged materials disposed of in ODMDS's between 2005 and 2010 by the Mobile and New Orleans Districts.

Current figures vary for how much of the average annual 70 million yd^3 (53,518,840 m^3) that is dredged by the New Orleans District is available for the beneficial use of dredge materials program; from 15 million yd^3 (11,468,320 m^3) (U.S. Dept. of the Army, COE, 2009a) to 30 million yd^3 (22,936,650 m^3) (Green, 2006, page 6), or between 21 and 43 percent of the total. The remaining 79 to 57 percent of the total material dredged yearly by COE's New Orleans District is disposed of in ODMDS's or is stored in temporary staging areas located inland (e.g., the Pass a Loutre Hopper Dredge Disposal Site at the head of the Mississippi River's main "birdfoot" distributary channel system).

Cumulative Activities Scenario: BOEM anticipates that, over the next 40 years, the amount of dredged material disposed at ODMDS's will fluctuate generally within the trends established by the COE district offices. Over the last 5 years, the New Orleans District has averaged about 15.4 million yd^3 of dredged material dredged disposed at ODMDS's, while the Mobile District is about one-quarter of that quantity, or 4.5 million yd^3 **Table 3-27**. Quantities disposed at ODMDS's may decrease as more beneficial uses of dredged material onshore are identified and evaluated. For a more complete and detailed discussion of dredged material disposal activities, refer to Chapter 3.3.3.1 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

3.3.3.2. OCS Sand Borrowing

If OCS sand is desired for coastal restoration or beach nourishment, BOEM uses the following two types of lease conveyances: a noncompetitive negotiated agreement that can only be used for obtaining sand and gravel for public works projects funded in part or whole by a Federal, State, or local government agency; and a competitive lease sale in which any qualified person may submit a bid. BOEM has issued 31 noncompetitive negotiated agreements, but it has never had a competitive lease sale for OCS sand and gravel resources. The OCS Program continues to focus on identifying sand resources for coastal restoration, investigating the environmental implications of using those resources, and processing noncompetitive use requests.

BOEM has participated in the multiagency Louisiana Sand Management Working Group since 2003 to identify, prioritize, and define a pathway for accessing sand resources in the near-offshore OCS of Louisiana, an area where competitive space use mainly involves OCS oil and gas infrastructure such as wells, platforms, and pipelines. Table 3-32 of the 2012-2017 WPA/CPA Multisale EIS shows the projected OCS sand uses for coastal restoration projects over approximately the next 5 years. Approximately 76 million yd^3 (58 million m^3) are expected to be needed for coastal restoration projects as reported by the Gulf of Mexico OCS Region's Marine Minerals Program. To visualize such a dimension, this volume of sand could fill the Louisiana Superdome 16.5 times.

BOEM received earmarked funds in 2005 to conduct offshore sand studies to investigate available sources of OCS sand for restoring coastal areas in Louisiana, Texas, Alabama, and Mississippi that were damaged by Hurricanes Katrina and Rita. Sand sources identified through BOEM's cooperative effort with Louisiana will likely serve as the major source of material for the restoration of the barrier islands planned as part of the Louisiana Coastal Area ecosystem restoration study (U.S. Dept. of the Army, COE, 2004), projects identified in the Louisiana 2012 Coastal Master Plan (State of Louisiana, Coastal Protection and Restoration Authority, 2012a), and projects developed under the *Deepwater Horizon* NRDA and 2012 RESTORE Act (Resources and Ecosystems Sustainability, Tourist Opportunities and Revived Economies of the Gulf Coast States Act) barrier island restoration efforts. The Louisiana Coastal Protection and Restoration Authority and Louisiana State University have undertaken joint efforts, funded in part through BOEM, to identify potential sand resources in the Trinity and Tiger Shoal complex, located in the Vermilion and South Marsh Island leasing areas, and to examine the long-term effects of dredging sand on Ship Shoal, a large potential borrow area about 15 mi (24 km) offshore Isle Dernieres, south-central Louisiana. Meanwhile, the General Lands Office in Texas has collected new geologic and geophysical data to describe potential resources in buried Pleistocene Sabine and Colorado River paleochannels, located offshore Jefferson and Brazoria Counties.

Since the dredging of OCS sand and the associated activities of oceangoing dredge vessels could present some use conflicts on blocks also leased for oil and gas extraction, this Agency initiated a regional offshore sand management program in Louisiana in 2003, which, over the course of 10 years and several meetings, has developed options and recommendations for an orderly process to manage the competing use of OCS sand resources in areas of existing OCS infrastructure. With input from the Sand Management Working Group, BOEM has developed guidelines for sand resource allocations, maintaining a master schedule of potential sand dredging projects, developing procedures for accessing sand under emergency conditions, and establishing environmental requirements for the use of offshore borrow areas.

No sand leases have ever been issued for OCS sand in the WPA. The following seven leases for OCS sand have been issued in the CPA: (1) Holly Beach, Cameron Parish, Louisiana; (2) the South Pelto test area, Terrebonne Parish, Louisiana; (3) Pelican Island shoreline restoration, Plaquemines Parish, Louisiana; (4) Raccoon Island marsh creation, Terrebonne Parish, Louisiana; (5) St. Bernard Shoals, St. Bernard and Plaquemines Parishes, Louisiana; (6) Ship Shoal in South Pelto Area for Caminada Headland restoration in Lafourche and Jefferson Parishes, Louisiana; and (7) Sabine Bank in West Cameron Area for Cameron Parish shoreline restoration, Cameron Parish, Louisiana. Two new leases are expected to be issued in 2013 for the Whiskey Island Restoration Project in Terrebonne Parish and Phase Two of the Caminada Headland Restoration Project in Lafourche and Jefferson Parishes in Louisiana.

The NTL 2009-G04 identifies BOEM's responsibility as stewards of significant sand resources on the OCS and provides guidance for the avoidance and protection of significant OCS sediment resources essential to coastal restoration initiatives in BOEM's Gulf of Mexico OCS Region.

Cumulative Activities Scenario: Over the next 40 years, great uncertainty exists regarding OCS sand mining projects in the WPA. The boundary between the OCS and Texas State waters (9 nmi [10 mi; 16 km]) allows that some offshore sand is within the jurisdiction of the State; however, the easternmost portion of the shelf in Texas State waters is relatively devoid of beach-quality sand deposits. The Texas General Lands Office, in cooperation with BOEM and the Texas Bureau of Economic Geology, has investigated the potential for use of Heald and Sabine Banks as borrow for beach restoration projects; however, no specific projects have been identified. Some uncertainty exists for how much OCS sand offshore the State of Louisiana will eventually be sought. The Louisiana Coastal Area Ecosystem Restoration plan potentially may use up to 60 million yd^3 (46 million m^3) (U.S. Dept. of the Army, COE, 2009a). There has been a recent increase in State-funded projects in Louisiana requesting OCS sand resources. It is anticipated that this trend of State-led projects will continue into the future as restoration funding is made available directly to the State through the Coastal Impact Assistance Program, restitution (i.e., fines and penalties, associated with the *Deepwater Horizon* explosion, oil spill, and response), and the Gulf of Mexico Energy Security Act.

3.3.3.3. Marine Transportation

Freight and cruise ship passenger marine transportation within the analysis area should continue to grow at a modest rate or remain relatively unchanged based on historical freight traffic statistics under current conditions. The Port of New Orleans was the sixth largest port and the Port of Houston was the second largest port in the United States in 2011. Tankers carrying mostly petrochemicals account for about 60 percent of the vessel calls in the Gulf of Mexico. Dry-bulk vessels including bulk vessels, bulk containerships, cement carriers, ore carriers, and wood-chip carriers accounted for another 17 percent of the vessel calls. The Gulf supports a popular cruise industry. In 2011, there were 149 cruise ship departures from Galveston, 139 cruise ship departures from New Orleans, and 199 cruise ship departures from Tampa (USDOT, MARAD, 2012).

Total port use in the U.S. is increasing as a whole, and total port use within the GOM is also increasing. Gulf of Mexico port use represents approximately 32 percent of total U.S. port use. Trends for Gulf of Mexico port use relative to total U.S. port use show an approximate 3 percent average increase of Gulf of Mexico port use over the last decade (USDOT, MARAD, 2013a) (**Table 3-28**). The trends for port use only within the GOM from 2002 to 2011 show an increase in total GOM port calls from 17,673 to 22,989, which is an average annual increase of approximately 3 percent during that time. The estimated number of vessel trips that would occur as a result of an EPA proposed action is presented in **Table 3-2**. Use by the OCS Program represents a small percentage of the total marine transportation in the GOM, <1 percent of reported usage for Federal channels (**Chapter 3.1.1.4.4**).

Cumulative Activities Scenario: BOEM anticipates that, over the next 40 years, the total amount of GOM port usage when compared with total U.S. port use will be bounded by a lower limit of the approximate levels of current use and a higher limit consisting of a steady increase of approximately 3 percent each decade. It is expected that the usage of GOM ports will continue to increase by approximately 3 percent annually over the next 40 years. As such, it is anticipated that port calls by all ship types will be bounded by a lower limit of current use and an upper limit of approximately 85,000 vessel port calls.

3.3.3.4. Military Activities

A standard military warning areas stipulation has been applied to all blocks leased in military areas in the GOM since 1977. The air space over the GOM is used by the DOD for conducting various military operations. Twelve military warning areas (MWA's) and six Eglin Water Test Areas (EWTA's) are located within the Gulf (**Figure 2-1**). These warning and water test areas are multiple-use areas where military operations and oil and gas development have coexisted without conflict for many years. Several military stipulations are planned for leases issued within identified military areas.

The EPA has 64,563,679 total acres; approximately 43,217,494 acres are in EWTA's and 15,670,911 acres are in MWA's. The EWTA's and MWA's account for 91 percent of the acreage in the EPA. The proposed lease sale area for proposed EPA Lease Sales 225 and 226 is not within any of the MWA's; however, the entire proposed lease sale area (657,905 ac) is within EWTA boundaries. In addition to the previously noted standard Military Areas Stipulation, the EWTA will require the following special stipulations:

- *Evacuation Stipulation*: Lessee is required to evacuate, upon receipt of a directive from BOEM's Regional Director, all personnel from structures on the lease. Lessee must also shut-in and secure all wells and other equipment, including pipelines, on the lease.
- *Coordination Stipulation*: Lessee is required to consult with the appropriate military command headquarters regarding the location, density, and the planned periods of operation of surface structures on the lease, and to maximize exploration while minimizing conflicts with DOD activities prior to approval of an exploration plan by BOEM's Regional Director.

Cumulative Activities Scenario: BOEM anticipates that, over the next 40 years, the military use areas currently designated in the EPA, WPA, and CPA will remain the same and that none of them would be released for nonmilitary use. Over the cumulative activities scenario, BOEM expects to continue to require military coordination stipulations in these areas. The intensity of the military's use of these areas, or the type of activities conducted in them, is anticipated to fluctuate with the military mission needs.

For a more complete and detailed discussion of military activities, refer to Chapter 3.3.3.4 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

3.3.3.5. Artificial Reefs and Rigs-to-Reefs Development

Artificial reefs have been used along the coastline of the U.S. since the early 19th century. Stone (1974) documented that the use of obsolete materials to create artificial reefs has provided valuable habitat for numerous species of fish in areas devoid of natural hard bottom. Stone et al. (1979) found reefs in marine waters not only attract fish but, in some instances, also enhance the production of fish. All of the five Gulf Coast States—Texas, Louisiana, Mississippi, Alabama, and Florida—have artificial reef programs and plans.

Most OCS platforms have the potential to serve as artificial reefs. Offshore oil and gas platforms began providing artificial reef substrate in the GOM with the first platform's installation in 1942. Currently, approximately 12 percent of the platforms decommissioned in the Gulf OCS have been used in the Rigs-to-Reefs Program. It is anticipated that approximately 10 percent of platforms installed as a result of a WPA or CPA proposed action would be converted to a reef after decommissioning. This factor is prompting increased public attention on the ecologic value of oil and gas structures for their reef effects. Ongoing studies aim at evaluating the ecology of offshore structures and may lead to a greater emphasis on the creation of artificial reefs through the Rigs-to-Reefs Program. At present, Texas, Louisiana, and Mississippi participate in the Rigs-to-Reefs Program.

WPA and CPA Proposed Actions Scenario (Typical Lease Sale): The number of platform removals projected for a WPA and CPA proposed action is 15-23 and 35-67, respectively (**Table 3-2** of this EIS and Table 3-3 of the 2012-2017 WPA/CPA Multisale EIS). The number of platforms anticipated to be part of the Rigs-to-Reefs Program as a result of a WPA or CPA proposed action is approximately 10 percent of the projected removals, or 1-2 in the WPA and 3-7 in the CPA.

OCS Program Scenario: For the OCS Program from the years 2012-2051, a total of 1,279-1,837 platforms in OCS waters are projected to be removed during the 40-year cumulative activities scenario (**Table 3-3**). If approximately 10 percent of these structures are accepted into the Rigs-to-Reefs Program, there may be as many as 128-184 additional artificial reefs installed in the WPA, CPA, and EPA. Note that offshore and onshore impact-producing factors and scenarios associated with a WPA or CPA proposed action (i.e., a typical lease sale that would result from the proposed lease sales within the WPA or CPA, as well as OCS Program activity resulting from past and future leases sales in the WPA or CPA) are disclosed in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

3.3.3.6. Offshore Liquefied Natural Gas Projects and Deepwater Ports

There are currently no LNG terminals operating on the OCS in the Gulf of Mexico. The following provides updates to the status of LNG projects and deepwater ports in the GOM as provided in Chapter 3.3.3.6 of the 2012-2017 WPA/CPA Multisale EIS.

Louisiana

Gulf Gateway Energy Bridge. On February 22, 2012, Excelerate Energy notified the U.S. Department of Transportation's Maritime Administration (MARAD) and USCG of its intention to decommission the Gulf Gateway Energy Bridge deepwater port, the only operational LNG terminal operation on the Gulf of Mexico OCS. Excelerate's decision to decommission the facility was due to irreparable hurricane damage to pipelines interconnecting with the deepwater port and a changing natural gas market, which impacted the operator's ability to receive consistent shipments. After careful review and evaluation of the proposed removal plans, MARAD and other Federal agencies authorized Excelerate's decommissioning program for the Gulf Gateway Energy Bridge deepwater port (USDOT, MARAD, 2013b).

Main Pass Energy Hub. Due to significant financial challenges over the past several years, Freeport McMoRan was unable to comply with the conditions of the Record of Decision. As such, on January 2, 2012, the Maritime Administration moved forward to rescind approval of the Record of Decision for the Freeport McMoRan project (USDOT, MARAD, 2013b).

Texas

Texas Offshore Port System. On April 12, 2010, the applicant submitted a letter to the Maritime Administration to withdraw its application, due to its inability to secure necessary financing. The Maritime Administration, in a letter dated May 5, 2010, acknowledged Texas Offshore Port System's withdrawal, and thereafter, terminated the application and all processing activities. This project remains closed with the Maritime Administration (USDOT, MARAD, 2013c).

Florida

Port Dolphin. On March 29, 2007, Port Dolphin Energy LLC filed an application with the Maritime Administration to construct a deepwater port located in Federal waters approximately 28 mi (45 km) offshore of Tampa, Florida. The applicant is a wholly owned subsidiary of Höegh LNG. The proposed port will consist of two Submerged Turret Loading (STL) buoys similar to those used in the Northeast Gateway and Neptune projects. On October 26, 2009, the Maritime Administration issued a Record of Decision approving, with conditions, the Port Dolphin Energy Deepwater Port License application, and on April 19, 2010, the official license was issued. Port Dolphin is currently working with the relevant Federal and State of Florida agencies to obtain the required authorizations and permits for construction and operation of the facility. It is anticipated that construction of the Port Dolphin facility will commence later in 2013 (USDOT, MARAD, 2013b).

3.3.3.7. Development of Gas Hydrates

Gas hydrates are a unique, energy-rich, and poorly understood class of chemical substances in which molecules of one material (in this case solid-state water ─ ice) form an open lattice that physically encloses molecules of a certain size (in this case ─ methane) in a cage-like structure without chemical bonding (Berecz and Balla-Achs, 1983; Henriet and Mienert, 1998; Collett, 2002). The DOE and cooperating agencies have conducted a multiyear characterization program of naturally occurring methane hydrates (gas hydrates) in the GOM. The first cruise for characterizing GOM gas hydrates took place in 2005, and the second took place in 2009. The following provides an update to the Joint Industry Project (JIP) information in Chapter 3.3.3.7 of the 2012-2017 WPA/CPA Multisale EIS.

> Following the events of the Deepwater Horizon incident in the Gulf of Mexico, the conditions and requirements for drilling operations in the Gulf of Mexico underwent a dramatic change that resulted in a substantial and detailed evaluation of what is plausible (and affordable) during the remainder of the project. As a result of this evaluation, the JIP and DOE have determined to focus the remainder of the project on the development and testing of an integrated suite of pressure coring and pressure core handling and analysis devices in collaboration with research and development experts from government, academia, and industry. The coring tools will have the flexibility to be used from various platforms in future DOE marine hydrate research expeditions. A decision has been made that a Leg III drilling / pressure coring expedition will not be conducted as part of this project" (USDOE, National Energy Technology Laboratory, 2013a).

Methodologies for the extraction of methyl hydrates are being developed in a collaborative field trial between ConocoPhillips-Japan Oil, Gas, and Metals National Corporation and DOE at the Iġnik Sikumi well site in Alaska. The Iġnik Sikumi gas hydrate test well was drilled and logged during the winter of 2010/2011, and gas hydrate production testing was carried out there during the winter of 2011/2012. A production method was tested by injecting a combination of carbon dioxide and nitrogen gas into the methane hydrate reservoir. The injection phase was followed by an extended period of depressurization and flowback of gas (including methane) to the surface. The data from this study are still being analyzed but the effort represents the first extraction of methane gas (USDOE, National Energy Technology Laboratory, 2013b).

A multiyear project is also underway in Japan. This project is being led by the Japan Oil, Gas, and Metals National Corporation and Japan's National Institute of Advanced Industrial Science and Technology, and it is being led in collaboration with the USGS Gas Hydrates Project, researchers from Georgia Tech, and DOE. The JIP is also underway in Japan. In 2012, researchers retrieved and preserved pressurized sediment cores containing gas hydrates from the Nankai Trough offshore Japan. They are also conducting the first offshore production test to track how much methane can be released from deepwater gas hydrate deposits (USDOI, GS, 2013).

This does not change BOEM's anticipation that within 40 years, it is likely that the first U.S. domestic production from hydrates may occur in Alaska, where gas obtained from onshore hydrates will either support local oil and gas field operations or be available for commercial sale if and when a gas pipeline is constructed to the lower 48 states. However, Moridis et al. (2008) stated that it is not possible to discount the possibility that the first U.S. domestic production of gas hydrates could occur in the GOM. Despite the substantially increased complexity and cost of offshore operations, there is a mature network of available pipeline capacity and easier access to markets in the Gulf of Mexico.

3.3.3.8. Renewable Energy and Alternative Use

The two primary categories of renewable energy that have the potential for development in the coastal and OCS waters of the U.S. are (1) wind turbines and (2) marine hydrokinetic systems. Chapter 3.3.3.8 of the 2012-2017 WPA/CPA Multisale EIS describes renewable energy and alternative use programs and potential action within the OCS.

3.3.4. Other Major Factors Influencing Coastal Environments

3.3.4.1. Sea-Level Rise and Subsidence

All coastlines of the world have been experiencing a gradual absolute rise of sea level that is based on measurements across the globe extending across the influence of a single sedimentary basin. There are two aspects of sea-level rise during the most geologically recent 10,000 years (Holocene Epoch): absolute rise and relative rise. Absolute sea-level rise refers to a net increase in the volume of water in the world's oceans. Relative sea-level rise refers to the appearance of sea-level rise, a circumstance where subsidence of the land is taking place at the same time that an absolute sea-level change is occurring.

The central Gulf (Mississippi and Louisiana) is part of a continental-scale depositional center (a delta) built over the last 7,000 years by sediment carried downstream by the Mississippi River. These young sediments have been subjected to high rates of subsidence that results from compaction and fault movement. Chapter 3.3.4.1 of the 2012-2017 WPA/CPA Multisale EIS discusses the Louisiana Coastal Area (LCA) and the subsidence that this deltaic system is experiencing.

The eastern Gulf of Mexico (Alabama and Florida) is underlain by a stable carbonate platform (limestone) that is not subject to subsidence to any significant degree and so is predominantly influenced by absolute sea-level rise.

Penland and Ramsey (1990, Table 1 and Figure 3a) calculated rates of relative sea-level rise based on mid- to late 20th century sea levels recorded at National Ocean Survey tidal gauge stations located around the Gulf of Mexico to show the differential rates of relative sea-level rise around the circumference of the Gulf of Mexico. What is clear is how stable the shorelines are, either to the east or west, away from the Mississippi Delta complex and the LCA. The tidal gauges at Pensacola, Cedar Key, St. Petersburg, and Key West, Florida, show an average relative sea-level rise of 2.1 mm/year, whereas the tidal gauge stations at Eugene Island and Grand Isle, Louisiana, show an average relative sea-level rise of 11.1 mm/year (Penland and Ramsey, 1990, Table 1). The relative sea-level rise along more stable parts of the coastline, the northeastern Gulf and western coast of Florida, can be interpreted to be dominated by absolute sea-level rise, whereas the LCA coast is dominated by subsidence.

Results from the National Assessment of Coastal Vulnerability to Sea Level Rise estimates the rate of sea-level rise in the Gulf of Mexico, in particular the areas around Eugene Island, Louisiana, to have the greatest rates (~9.6 mm/year [0.38 in/year]) in the United States (Pendleton et al., 2010). This classification is based upon variables such as coastal geomorphology, regional coastal slope, rate of sea-level rise, wave and tide characteristics, and historical shoreline change rates. As much as 88 percent of the northern Gulf of Mexico falls within the high vulnerability category. Areas ranked as very low vulnerability category still have some sea-level rise (1.38 mm/year [0.054 in/year] at Apalachicola, Florida. Given this range, BOEM anticipates that, over the next 40 years, the northern Gulf of Mexico will likely experience a minimum relative sea-level rise of 55.2 mm (2.17 in) and a maximum relative sea-level rise of 384 mm.(15.1 in). Sea-level rise and subsidence together have the potential to affect many important areas including the OCS oil and gas industry, waterborne commerce, commercial fishery landings, and important habitat for biological resources (State of Louisiana, Coastal Protection and Restoration Authority, 2012a). Oil and gas infrastructure located within 15 in (38 cm) of the highest high tide in coastal areas along the Gulf could potentially be affected by sea-level rise during this program. Programmatic aspects of climate change relative to the environmental baseline for the Gulf of Mexico OCS Program are discussed in Appendix G.3 of the 2012-2017 WPA/CPA Multisale EIS.

Cumulative Activities Scenario: Using the relative sea-level rise rates calculated by Penland and Ramsey (1990) as representative of the sampled areas, BOEM anticipates that over the next 40 years the LCA would experience a total relative sea-level rise of approximately 45 cm (18 in). The amount will be lower in the eastern Gulf and western coast of Florida, approximately 8.4 cm (3.3 in) over the next 40 years.

For a more complete and detailed discussion of sea-level rise and subsidence, refer to Chapter 3.3.4.1 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

3.3.4.2. Mississippi River Hydromodification

The Mississippi River has been anchored in place by engineered structures built in the 20th century and has been hydrologically isolated from the delta it built. The natural processes that allowed the river to flood and distribute alluvial sediments across the delta platform and channels to meander have been shut down. Hydromodifying interventions include construction of (1) levees along the river and distributary channel systems, (2) upstream dams and flood control structures that impound sediment and meter the river flow rate, and (3) channelized canals with earthen or armored banks. Once the natural processes that act to add sediment to the delta platform to keep it emergent are shut down, subsidence begins to outpace deposition of sediment.

Of total upstream-to-downstream flow, the Old River Control Structure (built 1963) diverts 70 percent of flow down the levee-confined channels of the Mississippi River and 30 percent down the unconfined Atchafalaya River, which has been actively aggrading its delta plain since 1973 (LaCoast.gov, 2011). Blum and Roberts (2009) reported that the time-averaged sediment load carried by the Mississippi and Atchafalaya Rivers before installation of the Old River Control Structure was ~400-500 million tons per year and that the average suspended load available to either river after construction of the Old River Control Structure was ~205 million tons per year (Blum and Roberts, 2009, Figure 2). Modern sediment loads are, therefore, less than half that required to build and maintain the modern delta plain, a figure largely in agreement with previous work reporting decreases in suspended sediment load of nearly 60 percent since the 1950's (Turner and Cahoon, 1987, Figure 3-8; Tuttle and Combe, 1981).

Blum and Roberts (2009) posited four scenarios for subsidence and sea-level rise, and concluded sediment starvation alone would cause ~2,286 mi^2 (592,071 ha) of the modern delta plain to submerge by 2100 without any other impacting factors contributing to landloss. The use of sediment budget modeling, a relatively new tool for landloss assessment, appears to indicate that hydrographic modification of the Mississippi River has been the most profound man-caused influence on landloss in the LCA. Sediment starvation of the deltaic system is allowing rising sea level and subsidence to outpace the constructive processes building and maintaining the delta.

BOEM anticipates that, over the next 40 years, there might be minor sediment additions resulting from new and continuing freshwater diversion projects managed by COE. Of the 196 projects in the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) program (LaCoast.gov, 2013), 8 involve the introduction of sediment or the reestablishment of natural water and sediment flow regimes to allow the delta plain to replenish and build up, 9 are freshwater diversion projects, 8 are outfall management, 3 are sediment diversion, and 49 are marsh creations. Insofar as these projects represent land additions to the LCA, they are already accounted for in the discussion below under coastal restoration programs.

3.3.4.3. Maintenance Dredging and Federal Channels

The Gulf Intracoastal Waterway is the main Federal channel in Florida. The Gulf Intracoastal Waterway is a shallow-draft navigation channel constructed to provide a domestic connection between Gulf ports after the discovery of oil in East Texas in the early 1900's and to serve the growing need for the interstate transport of steel and other manufacturing materials. It extends approximately 1,400 mi (2,253 km) along the Gulf Coast from St. Marks, south of Tallahassee, in northwestern Florida to Brownsville, Texas. The length of Gulf Intracoastal Waterway along the Florida coast is approximately 186 mi (300 km), along Alabama approximately 50 mi (80 km), along Mississippi approximately 70 mi (112 km), and along Louisiana approximately 990 mi (1,600 km) (Good et al., 1995, page 9), which does not include the length of subsidiary channels included in COE maintenance programs. Maintenance dredging is performed by COE on an as-needed basis along the Gulf Intracoastal Waterway and the subsidiary channels that directly or indirectly connect to it or open water. Typically, COE schedules surveys every 2 years for each navigation channel under its responsibility in order to maintain channel depth to specified standards.

The Tampa Bay Estuary Program and COE have developed a long-term plan for maintenance dredging and use of dredged material (Tampa Bay Estuary Program, 2012). Dredging to maintain the Tampa Bay shipping channel and other nautical channels generates about a million cubic yards of material each year (Tampa Bay Estuary Program, 2012), almost all of which has been deposited on two manmade spoil islands or is used onshore for other beneficial uses, rather than deposited offshore in ODMDS's. The existing capacity for onshore beneficial use is currently at its limit in the Tampa Bay area (Tampa Bay Estuary Program, 2012), indicating that increased disposal in ODMDS's can be expected for dredged materials.

Maintenance dredging activity from 2005 through 2010 for Federal channels by COE's New Orleans and Mobile Districts are reported in COE's Ocean Disposal Database (**Table 3-27** of this EIS; U.S. Dept. of the Army, COE, 2011).

There are 10 Federal navigation channels in the Louisiana Coastal Area, ranging in depth from 4 to 14 m (12 to 45 ft) and in width from 38 to 300 m (125 and 1,000 ft). These channels were constructed as public works projects beginning in the 1800's (Good et al., 1995, Table 1) and serve to move people and materials from inland ports and harbors that support, among other uses, the oil and gas industry on the OCS. The combined length of these channels is reported to be between 1,600 (Good et al., 1995, page 9) and 2,000 km (994 and 1,243 mi) (USDOI, MMS, 2007b, page 4-316). The proportion of OCS traffic in relation to all traffic was reported to be about 9-12 percent by comparing the total vessel trips and those attributed to OCS activities in 2011.

Direct cumulative impacts include the displacement of wetlands by channel excavation and disposal of the dredged material; however, authorization for new construction of access canals or navigation channels is rare with onshore peak oil and gas production in Louisiana having peaked 40 years ago (Ko and Day, 2004, page 398).

Cumulative Activities Scenario: The construction of Federal channels is not a growth industry, and at least one Louisiana channel (Mississippi River Gulf Outlet) has been decommissioned and sealed with a rock barrier as of July 2009 (Shaffer et al., 2009, page 218). Current research has shown that "canal erosion rates have slowed in recent years, with an average canal widening rate of -0.99 m/year (-3.25 ft/year) for the 1996/1998-2005/2006 time period compared with -1.71 m/year (-5.61 ft/year) for the earlier 1978/1979-1996/1998 time period" (Thatcher et al., 2011). "The mean annual rates of total canal widening or narrowing ranged from -6.47 m/year (-21.23 ft/year) (measured as shoreline retreat) for the Theodore Ship Channel, Alabama, to 2.58 m/year (8.46 ft/year) for the Atchafalaya River, Louisiana (measured as shoreline advancement)" (Thatcher et al., 2011, Table 7). To estimate the effect of vessel traffic on the erosion of navigational canals, 30 percent of all banks were assumed to be armored either by rock rip-rap, degraded rock rip-rap, or with bulkheads (Thatcher et al., 2011).

Using BOEM's conservative estimate of approximately 4,850 km (3,013 mi) of Federal navigation channels, bayous, and rivers potentially exposed to OCS traffic in the EPA, CPA, and WPA (**Table 3-12**) and the average canal widening rate of -0.99 m/year (-3.25 ft/year), a total annual landloss of approximately 831 ac/year (336 ha/year) may be estimated. Therefore, during the 40-year cumulative activities scenario, landloss in Federal navigation channels could be approximately 33,221 ac (13,444 ha). Total landloss in these areas can be caused by saltwater intrusion, hurricanes, or vessel traffic among other sources. Assuming that vessel traffic alone is the source of erosion, the rate of landloss would be related to the usage of those canals by OCS Program-related vessels and other vessel traffic. The OCS program-related traffic constitutes a larger percent of the total vessel traffic (OCS program-related and non-OCS program-related) in the CPA (12-16%) than in the WPA (3-5%) (**Tables 3-3 and 3-12**). All service vessels associated with EPA actions are assumed to use CPA navigational canals while inland and constitutes <1 percent of the total vessel traffic. BOEM estimates the OCS Program's contribution to bank erosion over the 40-year cumulative scenario to be 2,766-3,645 ac (1,119-1,475 ha). This number is considered conservative because open waterways were included in the total length of Federal navigation channels, vessel size was not taken into consideration, and there are source of erosion to navigation canals other than vessel traffic alone.

In the Louisiana Coastal Master Plan (State of Louisiana, Coastal Protection and Restoration Authority, 2012a), it is estimated that up to 1,750 mi^2 (4,500 km^2) of land will be lost in the next 50 years (or approximately 896,000 ac [362,600 ha] of land in the next 40 years). Using BOEM's conservative estimate of approximately 2,360 km (1,470 mi) of Federal navigation channels, bayous, and rivers potentially exposed to OCS traffic in the LCA (**Table 3-12**) and the average canal widening rate of -0.99 m/year (-3.25 ft/year), a total landloss of approximately 16,190 ac (6,550 ha) may be estimated over the next 40 years. Using this estimate and comparing it with the total expected landloss in coastal Louisiana over the next 40 years, BOEM estimates that approximately 2 percent of the total landloss in Louisiana will to occur due to salt intrusion, hurricanes, and vessel traffic (OCS Program-related and non-OCS Program-related) in navigation canals. Because OCS Program-related vessel traffic constitutes only 12-16 percent of the total vessel traffic in the CPA, BOEM conservatively estimates that OCS Program-related vessel traffic would contribute < 0.5 percent (or <2,647 ac [1,071 ha]) of the landloss in coastal Louisiana in the next 40 years.

BOEM anticipates that, over the next 40 years, if current trends in the beneficial use of dredged sand and sediment are simply projected based on past land additions (U.S. Dept. of the Army, COE, 2009b), approximately 50,000 ac (20,234 ha) may be created or protected in the LCA through dredged materials programs. Subtracting projected landlosses of 16,190 ac (6,550 ha) caused by bank widening of navigation channels in the LCA from land added or protected by beneficial uses of dredged material, an estimated net gain of 33,800 ac (13,700 ha) between the years 2013 and 2063 could occur.

For a more complete and detailed discussion of maintenance dredging and Federal channels, refer to Chapter 3.3.4.3 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference. For more information on coastal restoration programs, see **Chapter 3.3.4.4** of this EIS.

3.3.4.4. Coastal Restoration Programs

The Mississippi Delta sits atop a pile of Mesozoic and Tertiary-aged sediments up to 7.5 mi (12.2 km) thick at the coast and it may be as much as 60,000 ft (18,288 m) or 11.4 mi (18.3 km) thick offshore (Gagliano, 1999). Five major lobes are generally recognized within about the uppermost 50 m (164 ft) of sediments (Britsch and Dunbar, 1993; Frazier, 1967, Figure 1). The oldest lobe contains peat deposits dated as 7,240 years old (Frazier, 1967, page 296). The youngest delta lobe of the Mississippi Delta is the Plaquemines-Balize lobe that has been active since the St. Bernard lobe was abandoned about 1,000 years ago. The lower Mississippi River has shifted its course to the Gulf of Mexico every thousand years or so, seeking the most direct path to the sea while building a new deltaic lobe. Older lobes were abandoned to erosion and subsidence as the sediment supply was shut off. Because of the dynamics of delta building and abandonment, the LCA (U.S. Dept. of the Army, COE, 2004) experiences relatively high rates of subsidence relative to more stable coastal areas eastward and westward.

The first systematic program authorized for coastal restoration in the LCA was the 1990 Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), otherwise known as the "Breaux Act." Individual CWPPRA projects are designed to protect and restore between 10 and 10,000 ac (4 and 4,047 ha), require an average of 5 years to transition from approval to construction, and are funded to operate for 20 years (U.S. Government Accountability Office, 2007), which is a typical expectation for project effectiveness (Campbell et al., 2005).

The 1990 CWPPRA introduced an ongoing program of relatively small projects to partially restore the coastal ecosystem. As the magnitude of Louisiana's coastal landlosses and ecosystem degradation became more apparent, so too appeared the need for a more systematic approach to integrate smaller projects with larger projects to restore natural geomorphic structures and processes. Projects have ranged from small demonstration projects to projects that cost over $50 million. The Coast 2050 Report (Louisiana Dept. of Natural Resources, 1998) combined previous restoration planning efforts with new initiatives from private citizens, local governments, State and Federal agency personnel, and the scientific community to converge on a shared vision to sustain the coastal ecosystem. The LCA Ecosystem Restoration Study (U.S. Dept. of the Army, COE, 2004) built upon the Coast 2050 Report. The LCA's restoration strategies generally fell into one of the following categories: (1) freshwater diversion; (2) marsh management; (3) hydrologic restoration; (4) sediment diversion; (5) vegetative planting; (6) beneficial use of dredge material; (7) barrier island restoration; (8) sediment/nutrient trapping; and (9) shoreline protection, as well as other types of projects (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2006, Table 1).

Following Hurricanes Katrina and Rita in 2005, an earlier emphasis on coastal or ecosystem restoration of the LCA was reordered to at least add an equal emphasis on hurricane flood protection. The Department of Defense Appropriations Act of 2006 authorized COE to develop a comprehensive hurricane protection analysis to present a full range of flood control, coastal restoration, and hurricane protection measures for south Louisiana (U.S. Dept. of the Army, COE, 2009b). The Appropriations Act required Louisiana to create a State organization to sponsor the hurricane protection and restoration projects that resulted. The State legislature established the Coastal Protection and Restoration Authority and charged it with coordinating the efforts of local, State, and Federal agencies to achieve long-term, integrated flood control and wetland restoration. The Coastal Protection and Restoration Authority produced a comprehensive master plan for a sustainable coast (State of Louisiana, Coastal Protection and Restoration Authority, 2007) as their vision of an integrated program of what had been separate areas of activity—flood protection and coastal restoration. The Coastal Protection and Restoration Authority's Annual Plans prioritize the types of projects undertaken each fiscal year. It is not entirely clear how coordination between the State and Federal authorities is undertaken in order to develop the range of projects selected for the State's Coastal Protection and Restoration Authority's Annual Plan and COE's plan (U.S. Dept. of the Army, COE, 2009a).

As of May 2013, COE reported 196 authorized CWPPRA projects, 99 of which have been constructed. Another 20 projects are under construction, 34 are in the engineering and design phase, and 43 have been deauthorized or transferred to another program. Over 81,000 "anticipated total acres" (32,780 ha) have been projected from constructed projects and 60 not yet completed as of mid-2013 are reported to result in 33,297 anticipated total acres (13,474 ha) (LaCoast.gov, 2013). Of the 99 completed projects listed on LaCoast.gov (2013), more than half were one of three categories types: shoreline protection projects (29 projects); hydrolic restoration projects (24 projects); and marsh creation projects (16 projects).

Louisiana's Coastal Protection & Restoration Authority released a Final Coastal Master Plan in 2012. The objectives of the plan focus on flood protection, harnessing natural processes, supporting coastal habitats, sustaining cultural heritage, and promoting a working coast (State of Louisiana, Coastal Protection and Restoration Authority, 2012a).

There is no simple way to anticipate what projects under the protection of the State's Coastal Protection and Restoration Authority are admitted to its Annual Plan and completed. There is also no simple way to anticipate what projects are undertaken for COE's comprehensive range of flood control, coastal restoration, and hurricane protection measures for the LCA, which will feed into the Coastal Protection and Restoration Authority's Annual Plan for authorization, and there is no simple way to anticipate which ones will be ultimately completed. Because these projects are chosen on the basis of annual appropriations, there is no simple way to establish projections for land added or preserved over the cumulative activities scenario.

Coastal Impact Assistance Program

The Energy Policy Act of 2005 was signed into law by President Bush on August 8, 2005. Section 384 of the Energy Policy Act of 2005amended Section 31 of the OCSLA (43 U.S.C. 1356(a)) to establish the Coastal Impact Assistance Program (CIAP). The authority and responsibility for the management of CIAP is vested in the Secretary of the Interior; the Secretary delegated this authority and responsibility to this Agency up until September 30, 2011. In 2011, it was announced that FWS would take over administration of CIAP effective October 1, 2011, since the program aligns with the FWS conservation mission and similar grant programs run by FWS. The eligibility requirements for States, coastal political subdivisions, and fundable projects are expected to remain largely the same after the transfer.

The CIAP provides Federal grant funds derived from Federal offshore lease revenues to oil-producing states for conservation, protection, or restoration of coastal areas. This includes wetlands; mitigation of damage to fish, wildlife, or natural resources; planning assistance and the administrative costs of complying with these objectives; implementation of a federally approved marine, coastal, or comprehensive conservation management plan; and mitigation of the impact of OCS activities through the funding of onshore infrastructure projects and public service needs. Under Section 384 of the Energy Policy Act of 2005, the Secretary of the Interior was directed to disburse $250 million for each of the fiscal years (FY) 2007 through 2010 to eligible OCS oil- and gas-producing States and coastal political subdivisions.

Eligible CIAP States	Eligible CIAP Coastal Political Subdivisions
Alabama	Baldwin and Mobile Counties
Alaska	Municipality of Anchorage and Bristol Bay, Kenai Peninsula, Kodiak Island, Lake and Peninsula, Matanuska-Susitna, North Slope, and Northwest Arctic Boroughs
California	Alameda, Contra Costa, Los Angeles, Marin, Monterey, Napa, Orange, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, and Ventura Counties
Louisiana	Assumption, Calcasieu, Cameron, Iberia, Jefferson, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, and Vermilion Parishes
Mississippi	Hancock, Harrison, and Jackson Counties
Texas	Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Harris, Jackson, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Orange, Refugio, San Patricio, Victoria, and Willacy Counties

The Gulf Coast Ecosystem Restoration Task Force

The Gulf Coast Ecosystem Restoration Task Force was set up by Executive Order 13554 "Gulf Coast Ecosystem Restoration Task Force," which was signed by President Obama on October 5, 2010. The Task Force stated the Federal Government's desire to address long-standing ecological decline and to begin moving toward a more resilient Gulf Coast ecosystem, especially in the aftermath of the *Deepwater Horizon* explosion, oil spill, and response. The Executive Order expressed the Federal Government's commitment to help residents conserve and restore resilient and healthy GOM ecosystems that support and sustain the diverse economies, communities, and cultures of the region, and the important national missions carried out in the Gulf of Mexico.

The specific goals of the Task Force were to restore and conserve habitat, to restore water quality, to replenish and protect living coastal and marine resources, and to enhance community resilience (Gulf Coast Ecosystem Restoration Task Force, 2011). To support and enable these goals, the Task Force's role was to coordinate intergovernmental responsibilities, planning, and exchange of information so as to better implement ecosystem restoration and to facilitate appropriate accountability and support throughout the restoration process. The Executive Order directed Federal efforts to be efficiently integrated with those of local stakeholders and that particular focus should be toward innovative solutions for complex, large-scale restoration projects. The Gulf Coast Ecosystem Restoration Task Force was terminated within 60 days of the Gulf Coast Ecosystem Restoration Task Force commencing work, and Executive Order 13554 was revoked concurrent with the termination of the Task Force.

Natural Resource Damage Assessment Trustee Council

Executive Order 13554, which was signed on October 5, 2010, recognized the role of the Natural Resource Damage Trustee Council (Trustee Council) under the Oil Pollution Act and "designated trustees as provided in 33 U.S.C. 2706, with trusteeship over those natural resources injured, lost, or destroyed as a result of the *Deepwater Horizon* oil spill. Specifically, Executive Order 13554 recognized the importance of carefully coordinating the work of the Gulf Coast Restoration Task Force with the Trustee Council, whose members have statutory responsibility to assess natural resource damages from the *Deepwater Horizon* oil spill, to restore trust resources, and seek compensation for lost use of those trust resources" (The White House, 2012).

Gulf Coast Ecosystem Restoration Council

In September 2012, an Executive Order was released affirming the Federal Government's Gulf Coast ecosystem restoration efforts in light of the recent passage of the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act). The RESTORE Act established a mechanism for providing funding to the Gulf region to restore ecosystems and rebuild local economies damaged by the *Deepwater Horizon* oil spill. Additionally, the RESTORE Act established the Gulf Restoration Council, an independent entity charged with developing a comprehensive plan for ecosystem restoration on the Gulf Coast (Comprehensive

Plan), as well as any future revisions to the Comprehensive Plan. This Council replaced the Gulf Coast Ecosystem Restoration Task Force within 60 days of its inception.

Among its other duties, the Gulf Restoration Council is tasked with identifying projects and programs aimed at restoring and protecting the natural resources and ecosystems of the Gulf Coast region, which are to be funded from a portion of the Trust Fund; establishing such other advisory committees as may be necessary to assist the Gulf Restoration Council, including a scientific advisory committee and a committee to advise the Gulf Restoration Council on public policy issues; gathering information relevant to Gulf Coast restoration, including through research, modeling, and monitoring; and providing an annual report to the Congress on implementation progress. Consistent with the RESTORE Act, the Comprehensive Plan developed by the Gulf Restoration Council will include provisions necessary to fully incorporate the strategy, projects, and programs recommended by the Task Force (The White House, 2012).

3.3.5. Natural Events and Processes

3.3.5.1. Physical Oceanography

Physical oceanographic processes in the GOM that contribute to the distribution of spilled oil include the Loop Current, Loop Current eddies, and whirlpool-like features underneath the Loop Current and Loop Current eddies that interact with the bottom. In the region of an EPA proposed action, there is a <5 to ~30 percent chance of the watermass being associated with the Loop Current (Vukovich, 2007). In the GOM, infrequently observed processes include a limited number of high-speed current events, at times approaching 100 cm/sec (39 in/sec). These events were observed at depths exceeding 1,500 m (4,921 ft) in the northern GOM (Hamilton and Lugo-Fernandez, 2001; Hamilton et al., 2003) and as very high-speed currents in the upper portions of the water column observed in deep water by several oil and gas operators. All of these processes are further described in **Appendix A.2**. Generally, current speed in the deep GOM has been observed to decrease with depth. Mean deep flow around the edges of the GOM circulates in a counterclockwise direction, as observed at ~2,000 m (6,562 ft) (Sturges et al., 2004) and at ~900 m (2,953 ft) (Weatherly, 2004).

Mean seasonal circulation patterns of inner-shelf and outer-shelf currents on the Louisiana-Texas continental shelf, the northeastern GOM shelf, and the West Florida shelf are described in **Appendix A.2**. These currents are primarily wind-driven and are also influenced by riverine outflow. Cold water from deeper off-shelf regions moves onto and off the continental shelf by cross-shelf flow associated with upwelling and downwelling processes in some locations (Collard and Lugo-Fernandez, 1999). Wind events such as tropical cyclones (especially hurricanes), extratropical cyclones, and cold-air outbreaks can result in extreme waves and cause currents with speeds of 100-150 cm/s (39-59 in/s) over continental shelves. These extreme events would likely cause oil to be transported farther into coastal habitats, such as up onto beaches and into marshes.

Currents at depth in deep waters of the GOM will strongly impact the transport and fate of oil spills in these waters, including the evolution of subsurface plumes. With relevance to this topic, several reports on circulation of the Gulf's deep waters have recently been completed. The main findings from such studies are as follows: (1) the deep Gulf can be approximated as a two-layer system with an upper layer about 800- to 1,000-m (2,625- to 3,281-ft) thick that is dominated by the Loop Current and associated clockwise whirlpools (Welsh et al., 2009; Inoue et al., 2008); (2) the lower layer below ~1,000 m (3,281 ft) has near uniform currents (Cox et al., 2010; Welsh et al., 2009; Inoue et al., 2008); (3) the coupling between these two layers is generally absent, but it seems that motions of the layer interface are needed to transmit the energy from the Loop Current and eddies downward (Cox et al., 2010; Welsh et al., 2009; Inoue et al., 2008; Donohue et al., 2008); (4) there is a wealth of secondary whirlpools with smaller diameters (50-100 km; 31-62 mi) that affect the exchange between the shelf and deepwater, and these smaller whirlpools interact with the larger Loop Current eddies (Donohue et al., 2008); and (5) the ocean's response to tropical storms and hurricanes is similar to that reported previously, but a new mode was found to transport the hurricane's energy downward related to the sea-level rise near the storm's eye (Welsh et al., 2009; Cole and DiMarco, 2010).

Caribbean Sea waters colliding with the Yucatan Peninsula turn northward and enter the Yucatan Channel as a strong flow called the Yucatan Current. This current exhibits two basic arrangements inside the Gulf of Mexico. First, the Yucatan Current enters the Gulf and turns immediately eastward, exiting the Gulf towards the Atlantic Ocean via the Florida Straits to become the Gulf Stream. The second arrangement consists of a northward penetration of the Yucatan Current into the Gulf reaching to 26º-28º N. latitudes, then curls clockwise turning south, and exiting via the Florida Straits into the Atlantic Ocean to become, again, the Gulf Stream. The stream inside the Gulf is called the Loop Current. The Loop Current transports warm and salty water year round into the GOM at a rate of 25-30 million cubic meters per second, and it is the main energy source for oceanographic processes inside the Gulf. At its climatic northern position, the Loop Current becomes unstable, breaks, and sheds a large (200- to 400-km diameter; 124- to 248-mi diameter) clockwise whirlpool that travels southwestwards at speeds of 4-8 km/day (2-5 mi/day). The southwest trip of Loop Current eddies continues until colliding with the Texas and Mexico continental slope in the western GOM, where they disintegrate. This sequence connects the eastern Gulf with the western Gulf, which otherwise appear disconnected.

For a more complete and detailed discussion of physical oceanography, refer to Chapter 3.3.4.3 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

3.3.5.2. Hurricanes

Climatic cycles in tropical latitudes typically last 20-30 years, or even longer (USDOC, NOAA, 2005). As a result, the Atlantic experiences alternating periods of above-normal or below-normal hurricane seasons. There is a two- to three-fold increase in hurricane activity during eras of above-normal activity. The hurricane activity from 1995 to 2007 is representative of an era of above-normal hurricane activity (Elsner et al., 2008, page 1210).

Eighteen hurricanes made landfall in the Gulf of Mexico during the 1995-2012 hurricane seasons, disrupting OCS oil and gas activity in the Gulf of Mexico (**Table 3-29**). Half of these hurricanes reached a maximum strength of Category 1 or 2 while in the CPA or WPA; the other half were powerful hurricanes reaching maximum strengths of Category 4 or 5. The current era of heightened Atlantic hurricane activity began in 1995; therefore, the Gulf of Mexico could expect to see a continuation of above-normal hurricane activity during the first decade to half of the 40-year analysis period and below-normal activity during the remaining half to three-quarters of the 40-year analysis period.

Hurricanes Ivan, Katrina, Rita, Gustav, and Ike caused extensive damage to OCS platforms, topside facilities, and pipeline systems (**Tables 3-30**). During Hurricanes Ivan, Katrina, and Rita, 9 jack-up rigs and 19 moored rigs were either toppled or torn from their mooring systems. Sixty platforms were destroyed as a result of Hurricanes Gustav and Ike in 2008; 31 platforms had extensive damage, and 93 platforms had moderate damage (USDOI, MMS, 2008). The number of destroyed platforms by Hurricanes Gustav and Ike exceeds the number destroyed by Hurricane Katrina. On August 28, 2012, Hurricane Isaac made landfall in southeastern Louisiana as a Category 1 hurricane. No moderate or extensive damage was reported to offshore oil or gas infrastructure in the Gulf of Mexico; however, Hurricane Isaac did result in the suspension of small amounts of tarballs and some oil from sediments (Mulagabal et al., 2013). Refer to **Appendix A.3** for statistics for Hurricanes Gustav and Ike in 2008 and to **Chapter 3.2.3** for additional details for pipeline failures caused by hurricanes.

CHAPTER 4

DESCRIPTION OF THE ENVIRONMENT AND IMPACT ANALYSIS

4. DESCRIPTION OF THE ENVIRONMENT AND IMPACT ANALYSIS

Chapter 4 describes the environment that would potentially be affected by an EPA proposed action or the alternative. Resource by resource, this chapter also describes the potential impacts caused by an EPA proposed action or alternative. This EIS was prepared with consideration of the potential changes to the baseline conditions of the physical, biological, and socioeconomic resources that may have occurred as a result of the *Deepwater Horizon* explosion, oil spill, and response. The environmental resources include sensitive coastal environments, offshore benthic resources, marine mammals, sea turtles, coastal and marine birds, endangered and threatened species, fisheries, and socioeconomic issues such as recreation, tourism, and employment.

It must be understood that this EIS analyzes the proposed actions and alternative for the proposed EPA lease sales. This EIS will assist decisionmakers in making informed, future decisions regarding the approval of operations, as well as leasing. Pursuant to the OCSLA's staged leasing process, for each lease sale proposed in the final Five-Year Program, BOEM makes individual decisions on whether and how to proceed with a lease sale. After completion of this EIS, BOEM will make a decision on proposed EPA Lease Sale 225. An additional NEPA review (e.g., a determination of NEPA adequacy, an EA or, if determined necessary, a supplemental EIS) will be conducted in the year prior to proposed EPA Lease Sale 226 to address any relevant significant new information. Informal and formal consultation with other Federal agencies, the affected States, and the public will be carried out to assist in the determination of whether or not the information and analyses in this EIS are still valid. Specifically, information requests will be issued soliciting input on proposed EPA Lease Sale 226. This is not an EIS on the *Deepwater Horizon* explosion, oil spill, and response, although information on this event is being analyzed as it applies to resources in the EPA.

This EIS for proposed EPA Lease Sales 225 and 226 uses information contained in three previous environmental impact statements. This EIS tiers from the *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Programmatic Environmental Impact Statement* (Five-Year Program EIS) (USDOI, BOEM, 2012b) and, due to the close proximity of the proposed EPA lease sale area to the CPA, incorporates by reference all of the relevant material published in the EIS's that were prepared for the nearby or adjacent CPA and WPA: *Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247, Final Environmental Impact Statement* (2012-2017 WPA/CPA Multisale EIS) (USDOI, BOEM, 2012c) and *Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014; Western Planning Area Lease Sale 233; Central Planning Area Lease Sale 231, Draft Supplemental Environmental Impact Statement* (WPA 233/CPA 231 Supplemental EIS) (USDOI, BOEM, 2012d).

Although for its NEPA analyses in other planning areas BOEM typically analyzes alternatives that defer blocks based on the proximity or presence of biologically sensitive features or for other programmatic reasons, BOEM has determined that such alternatives are not reasonable in the EPA as there are no known blocks to exclude due to proximity to or presence of biologically sensitive features and due to the fact that the EPA proposed action area is such a small area for leasing. Scoping did not identify any other reasonable alternatives (refer to **Chapter 2.2.3.2**, "Issues Considered but Not Analyzed," for additional information on those alternatives). And finally, other viable alternatives such as the deferral of blocks or the delay of a proposed EPA lease sale would essentially result in the same impacts as the No Action alternative, and therefore, do not need to be evaluated as separate and distinct alternatives.

4.1. PROPOSED EASTERN PLANNING AREA LEASE SALES 225 AND 226

The first proposed EPA lease sale under the 2012-2017 Five-Year Program is EPA Lease Sale 225, which is tentatively scheduled to be held in early 2014. The second proposed EPA lease sale under the 2012-2017 Five-Year Program is proposed EPA Lease Sale 226, which is tentatively scheduled to be held in early 2016. The proposed EPA lease sale area is approximately 657,905 ac and includes those blocks previously included in the EPA Lease Sale 224 Area and a triangular-shaped area south of this area bordered by the CPA boundary on the west and the Military Mission Line (86º41′ W. longitude) on the east. The area is south of eastern Alabama and western Florida; the nearest point of land is 125 mi (201 km) northwest in Louisiana (**Figure 1-1**). As of August 2013, approximately 465,200 ac of the proposed EPA lease sale area are currently unleased. An EPA proposed action would offer for lease all unleased blocks within the proposed EPA lease sale area for oil and gas operations (**Figure 1-1**).

Although the leasing of portions of the EPA (subareas or blocks) can be deferred during a Five-Year Program, DOI is conservative throughout the NEPA process and includes the total area within the Gulf of Mexico for analysis.

Chapter 4 presents the baseline data for the physical, biological, and socioeconomic resources that would potentially be affected by an EPA proposed action (a single lease sale) or the alternative, and it presents analyses of the potential impacts of routine events, accidental events, and cumulative impacts on these resources. Baseline data are considered in the assessment of impacts from a proposed EPA lease sale on these resources.

The *Deepwater Horizon* explosion and oil spill off the Louisiana coast resulted in the largest oil spill in U.S. history. An event such as this has the potential to adversely affect multiple resources over a large area. The level of adverse effect depends on many factors, including the sensitivity of the resource as well as the sensitivity of the environment in which the resource is located. All effects may not initially be seen and some could take years to fully develop. The analyses of impacts from the *Deepwater Horizon* explosion, oil spill, and response on the physical, biological, and socioeconomic resources below are based on post-*Deepwater Horizon* explosion, oil spill, and response credible scientific information that was publicly available at the time this document was prepared and were applied using accepted methodologies. BOEM will continue to monitor these resources for effects caused by the *Deepwater Horizon* explosion, oil spill, and response.

Chapter 3.2.1 provides a summary of the information on accidental spills that could result from all operations conducted under the OCS Program, as well as information on the number and sizes of spills from non-OCS sources. The number of spills ≥1,000 bbl and <1,000 bbl estimated to occur as a result of an EPA proposed action is provided in **Table 3-10**. The mean number of spills ≥1,000 bbl estimated for an EPA proposed action is <1 spill. Spill rates for several spill-size categories are provided in **Table 3-10**. The probabilities of a spill ≥1,000 bbl occurring and contacting modeled environmental resources are described in **Chapter 3.2.1.7** and are shown on **Figures 3-7 through 3-23**. For additional information on accidental spills that could result from all operations conducted under the OCS Program, as well as information on the number and sizes of spills from non-OCS sources, refer to **Chapter 3.2.1**.

The potential impacts of a low-probability, catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, such as the one that resulted from the *Deepwater Horizon* explosion, to the physical, biological, and socioeconomic resources and conditions are addressed in the "Catastrophic Spill Event Analysis" (**Appendix B**). The reader is referred to **Appendix B** for the analysis of potential effects of a catastrophic event that is not reasonably expected and not part of an EPA proposed action for each resource.

The cumulative analyses below consider impacts to physical, biological, and socioeconomic resources that may result from the incremental impact of a proposed EPA lease sale when added to all past, present, and reasonably foreseeable future human activities, including non-OCS activities, as well as all OCS oil and gas program activities (OCS Program). A summary of the environmental impacts of the cumulative case for the Gulf of Mexico resources are found in the individual resource analyses in **Chapter 4.1.1**.

Non-OCS activities include, but are not limited to, import tankering; State oil and gas activity; recreational, commercial, and military vessel traffic; offshore liquefied natural gas activity; recreational and commercial fishing; onshore development; and natural processes. The OCS Program scenario includes all activities that are projected to occur from past, proposed, and future lease sales during the 40-year analysis period (2012-2051). This includes projected activity from lease sales that have been held but for which exploration or development has not yet begun or is continuing.

Analytical Approach

The analyses of potential effects to the wide variety of physical, environmental, and socioeconomic resources in the vast area of the GOM and adjacent coastal areas is very complex. Specialized education, experience, and technical knowledge are required, as well as familiarity with the numerous impact-producing factors associated with oil and gas activities and other activities that can cause cumulative impacts in the area. Knowledge and practical working experience of major environmental laws and regulations such as NEPA, the Clean Water Act, CAA, CZMA, ESA, Marine Mammal Protection Act, Magnuson-Stevens Fishery Conservation and Management Act, and others are also required.

In order to accomplish this task, BOEM has assembled a multidisciplinary staff with many years of collective experience. The vast majority of this staff has advanced degrees with a high level of knowledge related to the particular resources discussed in this chapter. This staff prepares the input to BOEM's lease sale EIS's, a variety of subsequent postlease NEPA reviews, and are also involved with ESA, EFH, and CZMA consultations. In addition, this same staff is also directly involved with the development of studies conducted by BOEM's Environmental Studies Program. The results of these studies feed directly into our NEPA analyses.

For this EIS, a set of assumptions and a scenario were developed, and impact-producing factors that could occur from routine oil and gas activities, as well as accidental events, are described. This information is discussed in detail in **Chapter 3**. Using this information, the multidisciplinary staff described above applies their knowledge and experience to conduct their analyses of the potential effects of an EPA proposed action.

The conclusions developed by BOEM's subject-matter experts regarding the potential effects of an EPA proposed action for most resources are necessarily qualitative in nature; however, they are based on the expert opinion and judgment of the highly trained subject-matter experts. This staff approaches this effort in good faith utilizing credible scientific information including, but not limited to, information available since the *Macondo* spill and applied it using accepted methodologies. Where relevant information on reasonably foreseeable significant adverse impacts is incomplete or unavailable, the need for the information was evaluated to determine if it was essential to a reasoned choice among the alternatives and, if so, was either acquired or in the event it was impossible or exorbitant to acquire the information, accepted scientific methodologies were applied in its place. This approach is described in the next subsection on "Incomplete or Unavailable Information."

Over the years, a suite of lease stipulations and mitigation measures has been developed to eliminate or ameliorate potential environmental effects, where implemented. In many instances, these were developed in coordination with other natural resource agencies such as NMFS and FWS. It must also be emphasized that, in arriving at the overall conclusions for certain environmental resources (e.g., coastal and marine birds, fisheries, and wetlands), the conclusions are not based on impacts to individuals, small groups of animals, or small areas of habitat but on impacts to the resources/populations as a whole.

BOEM has made conscientious efforts to comply with the spirit and intent of NEPA, to avoid being arbitrary and capricious in its analyses of potential environmental effects, and to use adaptive management to respond to new developments related to the OCS Program.

Incomplete or Unavailable Information

In the following analyses of physical, environmental, and socioeconomic resources, there are references to incomplete or unavailable information, particularly in relation to the *Deepwater Horizon* explosion, oil spill, and response. BOEM's subject-matter experts for each resource used what scientifically credible information was publicly available at the time this EIS was written, and acquired, when possible, new information. This new information is included in the description of the affected environment and impact analyses throughout **Chapter 4.1.1**. Where necessary, BOEM's subject-matter experts extrapolated from existing or new information, using accepted methodologies, to make reasoned estimates and developed conclusions regarding the current EPA baseline for resource categories and expected impacts from an EPA proposed action given any baseline changes.

The most notable incomplete or unavailable information relates to the *Deepwater Horizon* explosion, oil spill, and response in the CPA and EPA. Credible scientific data regarding the potential short-term and long-term impacts from the *Deepwater Horizon* explosion, oil spill, and response on the EPA, CPA, and WPA resources are becoming available but remain incomplete at this time, and it could be many years before this information becomes available via the Natural Resource Damage Assessment (NRDA) process, BOEM's Environmental Studies Program, and numerous studies by academia. Nonetheless, BOEM's subject-matter experts acquired and used newly available, scientifically credible information, determined that other additional information was not available absent exorbitant expenditures or could not be obtained regardless of cost in a timely manner, and where gaps remained, exercised their best professional judgment to extrapolate baseline conditions and impact analyses using accepted methodologies based on credible information.

It is important to note that, barring another catastrophic oil spill, which is a low-probability accidental event not part of an EPA proposed action, the adverse impacts associated with a proposed EPA lease sale are small, even in light of the *Deepwater Horizon* explosion, oil spill, and response. This is because of BOEM's lease sale stipulations and mitigations, site-specific mitigations that become conditions of plan or permit approval at the postlease stage, and mitigations required by other State and Federal agencies. Lease sale stipulations may include the Protected Species Stipulation, the Military Areas Stipulation, the Evacuation Stipulation, and the Coordination Stipulation. Site-specific postlease mitigations may include buffer zones and avoidance criteria to protect sensitive resources such as areas of live bottoms, topographic features, chemosynthetic communities, deepwater corals, and historic shipwrecks. Mitigations may also be required by other agencies (i.e., the U.S. Army Corps of Engineers and State CZM agencies) to reduce or avoid impacts from OCS activities, e.g., boring under beach shorelines and the rerouting of pipelines to reduce or eliminate impacts from OCS pipelines that make landfall.

For the following resources, BOEM's subject-matter experts determined that there is incomplete or unavailable information that is relevant to reasonably foreseeable significant adverse impacts; however, it is not essential to a reasoned choice among alternatives for the reasons described in the following chapters.

- Air Quality (**Chapter 4.1.1.1**)
- Water Quality (Coastal Waters and Offshore Waters, **Chapters 4.1.1.2.1 and 4.1.1.2.2,** respectively)
- Coastal Barrier Beaches and Associated Dunes (**Chapter 4.1.1.3**)
- Wetlands (**Chapter 4.1.1.4**)
- *Sargassum* Communities (**Chapter 4.1.1.8**)
- Chemosynthetic Deepwater Benthic Communities (**Chapter 4.1.1.9)**
- Nonchemosynthetic Deepwater Benthic Communities (**Chapter 4.1.1.10)**
- Soft Bottom Benthic Communities (**Chapter 4.1.1.11**)
- Beach Mice (**Chapter 4.1.1.15**)
- Commercial Fisheries (**Chapter 4.1.1.18**)
- Recreational Fishing (**Chapter 4.1.1.19**)
- Recreational Resources (**Chapter 4.1.1.20**)
- Archaeological Resources (Historic and Prehistoric, **Chapters 4.1.1.21.1 and 4.1.1.21.2**, respectively)
- Human Resources and Land Use (Land Use and Coastal Infrastructure, Demographics, and Economic Factors; **Chapters 4.1.1.22.1, 4.1.1.22.2, and 4.1.1.22.3**, respectively)
- Species Considered due to U.S. Fish and Wildlife Service Concerns (**Chapter 4.1.1.23)**

For the following resources, BOEM's subject-matter experts determined that there is incomplete or unavailable information that is relevant to reasonably foreseeable significant adverse impacts and may be essential to a reasoned choice among alternatives, for the reasons described in the chapters identified below. BOEM's subject-matter experts determined that, in many instances, the cost of obtaining the information was exorbitant or that, regardless of cost, it could not be obtained within the timeframe contemplated by this NEPA analysis. In place of the incomplete or unavailable information, BOEM's subject-matter experts used what scientifically credible information was available and applied it using accepted scientific methodologies.

- Seagrass Communities (**Chapter 4.1.1.5**)

- Live Bottoms (Pinnacle Trend and Low Relief, **Chapters 4.1.1.6.1 and 4.1.1.6.2**, respectively)
- Topographic Features (**Chapter 4.1.1.7**)
- Marine Mammals (**Chapter 4.1.1.12**)
- Sea Turtles (**Chapter 4.1.1.13**)
- Diamondback Terrapins (**Chapter 4.1.1.14**)
- Coastal and Marine Birds (**Chapter 4.1.1.16**)
- Fish Resources and Essential Fish Habitat (**Chapter 4.1.1.17**)
- Human Resources and Land Uses (Environmental Justice, **Chapter 4.1.1.22.4**)

This chapter has thoroughly examined the existing credible scientific evidence that is relevant to evaluating the reasonably foreseeable significant adverse impacts of an EPA proposed action on the human environment. BOEM's subject-matter experts that prepared this EIS conducted a diligent search for pertinent information, and BOEM's evaluation of such impacts is based upon theoretical approaches or research methods generally accepted in the scientific community. All reasonably foreseeable impacts were considered, including impacts that could have catastrophic consequences, even if their probability of occurrence is low, not reasonably expected and not part of an EPA proposed action. Throughout this chapter, where information was incomplete or unavailable, BOEM complied with its obligations under NEPA to determine if the information was relevant to reasonably foreseeable significant adverse impacts; if so, whether it was essential to a reasoned choice among alternatives; and, if it is essential, whether it can be obtained and whether the cost of obtaining the information is exorbitant, as well as whether generally accepted scientific methodologies can be applied in its place (40 CFR § 1502.22).

4.1.1. Alternative A—The Proposed Action

4.1.1.1. Air Quality

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for air quality can be found in Chapter 4.2.1.1 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.1 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.1 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.1 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for air quality regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for air quality presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for air quality presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and are hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on air quality, and various Internet and publicly available sources were examined to determine any recent information regarding air quality. Sources investigated included, but were not limited to, journals and scientific articles, Google, Google Scholar, and several USEPA websites. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding air quality since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS that would impact the conclusions herein.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, there is incomplete or unavailable information regarding air quality and potential air impacts. Although final summary information and reports on air quality impacts from the *Deepwater Horizon* explosion, oil spill, and response may be forthcoming, USEPA, NOAA, and other agencies obtained and released to the public a large number of air quality measurements indicating that air impacts tended to be minor and below USEPA's health-based standards. As there are no continuing sources of air pollution related to the *Deepwater Horizon* explosion, oil spill, and response, BOEM would not expect any additional measurements or information to alter the conclusions from currently existing data. In addition, as noted below and in **Appendix G**, there are a number of competing methods and available models for estimating and tracking potential air emissions and impacts. Each of these methods and models has inherent limitations, particularly with regard to the offshore environment in which an EPA proposed action would take place. In acknowledgement of these limitations, BOEM's subject-matter experts, using their best professional judgment and experience, have developed conservative assumptions and modeling parameters so as to ensure that the impact conclusions herein are reasonable and not underestimated. As such, although there is incomplete or unavailable information on air quality impacts at this time that may be relevant to reasonably foreseeable adverse impacts, this information is not essential to a reasoned choice among alternatives.

The full analyses of the potential impacts of routine activities and accidental events associated with an EPA proposed action and a proposed action's incremental contribution to the cumulative impacts are presented in this EIS. A brief summary of potential impacts follows. Emissions of pollutants into the atmosphere from the routine activities associated with an EPA proposed action are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, emission heights, emission rates, and the distance of these emissions from the coastline. The impacts of the OCS emissions on the onshore air quality are below the USEPA Significance Impact Levels (SIL's), below BOEM Significance Levels, and are well below the National Ambient Air Quality Standards (NAAQS). While regulations are in place to reduce the risk of impacts from hydrogen sulfide (H_2S), which occurs naturally in crude oil and is listed as a hazardous air pollutant (HAP), and while no H_2S-related deaths have occurred on the OCS, accidents involving high concentrations of H_2S could result in deaths as well as environmental damage. Additionally, HAP's such as benzene may be released during an accidental event, as it is a constituent of oil. These emissions from routine activities and accidental events associated with an EPA proposed action are not expected to have concentrations that would change onshore air quality classifications or affect compliance with the NAAQS.

4.1.1.1.1. Description of the Affected Environment

The Clean Air Act of 1970 (CAA) established the NAAQS; the primary standards are to protect public health and the secondary standards are to protect public welfare, such as visibility, or to protect vegetation. The current NAAQS are shown in **Table 4-1**. The Clean Air Act Amendments of 1990 (CAAA) established classification designations based on regional monitored levels of ambient air quality. These designations impose mandated timetables and other requirements necessary for attaining and maintaining healthful air quality in the U.S. based on the seriousness of the regional air quality problem. However, Federal OCS waters' classification designation is unclassified. The OCS areas are not classified because there is no regulatory provision for any classification in the CAA for waters outside of the boundaries of State waters. Only areas within State boundaries are to be classified as either attainment, nonattainment, or unclassifiable.

Prevention of Significant Deterioration (PSD) Class I air quality areas, designated under the Clean Air Act, are afforded the greatest degree of air quality protection and are protected by stringent air quality standards that allow for very little deterioration of their air quality. The PSD maximum allowable pollutant increase for Class I areas are as follows: 1-hour nitrogen dioxide (NO_2) increment that has yet to be determined and 2.5 micrograms/cubic meter ($\mu g/m^3$) annual increment for NO_2; 1-hour sulfur dioxide (SO_2) increment has yet to be determined, 25 $\mu g/m^3$ 3-hour increment, 5 $\mu g/m^3$ 24-hour increment, and 2 $\mu g/m^3$ annual increment for SO_2; and 8 $\mu g/m^3$ 24-hour increment and 4 $\mu g/m^3$ annual increment for PM_{10} (particulate matter smaller than 10 microns in size). The EPA includes the

Chassahowitzka National Wildlife Refuge, the Saints Marks Wilderness Area, and the Bradwell Bay Wilderness Area, south of Florida, which are designated as PSD Class I areas. The FWS and NPS have responsibility for protecting wildlife, vegetation, visibility, and other sensitive resources called air-quality-related values in this area. The FWS has expressed concern that the SO_2 increments for the Chassahowitzka Wilderness Area have been exceeded. In addressing the FWS concern, FWS and the Florida Department of Environmental Protection are cooperating in a modeling study to determine the status of the increment. If it is exceeded, Florida will evaluate remedial action options, including requiring additional pollution reductions on certain facilities. However, an EPA proposed action takes place outside of the Eastern Planning Area's PSD Class I areas and should not contribute to the exceedance of the increment. Therefore, BOEM's subject-matter experts believe an EPA proposed action should not significantly affect the Class I areas.

Under the Clean Air Act, USEPA is periodically required to review and, as appropriate, modify the criteria based on the latest scientific knowledge. The current NAAQS address six pollutants: carbon monoxide (CO), lead, nitrogen dioxide (NO_2), particulate matter (PM), ozone (O_3) and sulfur dioxide (SO_2) (**Table 4-1**). Particulate material is presented as two categories according to size. Coarse particulate matter is in the size range equal to or less than 10 μm (PM_{10}), and fine particulate matter is less than 2.5 μm in size ($PM_{2.5}$).

Effective December 17, 2006, USEPA revoked the annual PM_{10} standard and revised the 24-hour $PM_{2.5}$ from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. In early 2008, USEPA promulgated a new, more restrictive NAAQS 8-hour O_3 standard of 0.075 parts per million (ppm).

The USEPA also issued revisions to other NAAQS standards during 2010. Effective April 23, 2010, USEPA revised the NO_2 NAAQS standard to a new 1-hour standard of 100 parts per billion (ppb) (0.100 ppm); however, the annual NO_2 NAAQS was retained. Effective August 23, 2010, USEPA established a NAAQS for 1-hour average SO_2 of 75 ppb (0.075 ppm). In addition to the 1-hour SO_2 standard, USEPA revoked the 24-hour and annual primary SO_2 NAAQS. Most recently, effective December 14, 2012, USEPA lowered the $PM_{2.5}$ annual standard to 12 $\mu g/m^3$.

Attainment Status (Classification Designations)

A designation is the term USEPA uses to describe the air quality in a given area for any of six common air pollutants known as criteria pollutants. After USEPA establishes or revises a primary and/or secondary NAAQS, the Clean Air Act requires USEPA to designate areas as "attainment" (meeting standard), "nonattainment" (not meeting standard), or "unclassifiable" (insufficient data) after monitoring data is collected by State, local, and tribal governments. Once nonattainment designations take effect, the State and local governments have 3 years to develop implementation plans outlining how areas will attain and maintain the standards by reducing air pollutant emissions.

The CAAA established classification designations based on regional monitored levels of ambient air quality. These designations impose mandated timetables and other requirements necessary for attaining and maintaining healthful air quality in the U.S. based on the seriousness of the regional air quality problem.

Air quality depends on multiple variables—the location and quantity of emissions, dispersion rates, distances from receptors, and local meteorology. Meteorological conditions and topography may confine, disperse, or distribute air pollutants in a variety of ways.

When measured concentrations of regulated pollutants are below or equal to standards established by the NAAQS, an area may be designated as an attainment area for a regulated pollutant. When measured concentrations of regulated pollutants exceed standards established by the NAAQS, an area may be designated as a nonattainment area for a regulated pollutant. The number of exceedances and the concentrations determine the nonattainment classification of an area. In the CAAA, there are five classifications of nonattainment status—marginal, moderate, serious, severe, and extreme.

The Federal OCS waters' designation is unclassified. The OCS areas are not classified because there is no regulatory provision for any classification in the CAA for waters outside of the boundaries of State waters. Only areas within State boundaries are to be classified as either attainment, nonattainment, or unclassifiable.

The OCS oil and gas operations west of 87.5^{o} W. longitude fall under BOEM's jurisdiction for purposes of the Clean Air Act. The OCS waters east of 87.5^{o} W. longitude are under the jurisdiction of USEPA. The proposed EPA lease sale area falls east of 87.5^{o} W. longitude, where jurisdiction is assigned to USEPA. **Figure 4-1** presents the air quality status in the Gulf Coast States as of 2010. All air-quality nonattainment areas reported in **Figure 4-1** represent ozone nonattainment for coastal and inland counties and parishes. In May 2008, the new 8-hour ozone standard NAAQS of 0.075 ppm was promulgated. Currently, the air quality status for onshore ozone formation in the EPA is in attainment.

Jurisdiction

The CAA, which was last amended in 1990, requires USEPA to set the NAAQS (40 CFR part 50) for pollutants considered harmful to public health and the environment. The USEPA has set NAAQS for six principal pollutants, which are called "criteria" pollutants. These pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution (listed as $PM_{2.5}$ and PM_{10}), and sulfur dioxide.

The NAAQS were developed to protect the public health and welfare while allowing for an adequate margin of safety. Primary NAAQS protect the public health including sensitive subpopulations such as infants and the elderly. Secondary NAAQS standards protect public welfare such as the prevention of aquatic acidification, plant leaf damage, or visibility impairment. Due to the fact that OCS oil and gas activities do not cause exceedances of the NAAQS, are below BOEM's maximum allowable increases, and are below the U.S. Environmental Protection Agency SIL's, for NEPA evaluation purposes, it is reasonable to presume that concentrations of emissions from offshore activities will have minimal impacts to onshore air quality.

The OCSLA requires the Secretary of the Interior to promulgate and administer regulations for compliance with the NAAQS to the extent that the authorized activities significantly affect the air quality of any state.

BOEM-regulated pollutants include carbon monoxide, suspended particulates, sulfur dioxide, nitrogen oxides, and volatile organic compounds. The original NAAQS particulate standard was for TSP, which BOEM adopted. This standard has been replaced with PM_{10} and $PM_{2.5}$ (particulate matter equal to or below 10 µm and equal to or below 2.5µm in size) because these specific size classifications better define the size range that has greatest environmental impact. BOEM's regulations continue to include TSP; however, for purposes of this NEPA analysis, BOEM determined levels of PM_{10} and $PM_{2.5}$ so that the data are compatible with USEPA data for the sake of comparison. This is one example of where USEPA's regulations and BOEM's regulations are different. Similarly, BOEM's regulations still employ 3-hour, 24-hour, and annual standards while the NAAQS have 1-hour standards to limit pollutant spikes that are not detectable when concentrations are averaged over a longer time period. BOEM has included both types of particulate designations in **Appendix G**.

On the Outer Continental Shelf in the Gulf of Mexico west of 87.5° W. longitude, the provisions regarding air quality for OCS oil and gas activities are implemented through regulations established by BOEM at 30 CFR part 550 subpart C. BOEM's regulations require a review of air quality emissions to determine if the projected emissions from a facility result in onshore ambient air concentrations above BOEM's significance levels and to identify appropriate emissions controls to mitigate potential onshore air quality degradation. Emissions data for new or modified onshore facilities directly associated with proposed OCS activities are required to be included in development plans submitted to BOEM so that affected States can determine potential air quality impacts on its air quality.

On the OCS in the Gulf of Mexico east of 87.5° W. longitude, the provisions of the CAA are implemented through regulations established by USEPA at 40 CFR part 55. These regulations require that sources within 25 mi (40 km) of a State's seaward boundary comply with the applicable regulations of the corresponding onshore area, generally a state. Areas beyond 25 mi (40 km) of the State's seaward boundary are subject to Federal requirements including the requirements for construction and operating permits and equipment-specific performance standards. Pursuant to the Federal OCS regulations, OCS facilities go through a case-by-case review process to ensure they are in compliance with the CAA and would not cause or contribute to a violation of a NAAQS.

The proposed EPA lease sale area falls east of 87.5° W. longitude, where jurisdiction for air quality-related OCS oil and gas activities, among others, is assigned to USEPA. Operators with actions that affect air quality in this area must comply with USEPA's air quality regulations and submit air permit applications to USEPA for approval.

Emission Inventories

BOEM coordinates certain air-pollution control activities with USEPA. Thus, there will be a continuing need for emission inventories and modeling in the future. The following is a summary of new information available in the past few years. This Agency has completed three air emissions inventory studies for calendar years 2000 (Wilson et al., 2004), 2005 (Wilson et al., 2007), and 2008 (Wilson et al., 2010). These studies estimated emissions for all OCS oil and gas production-related sources in the Gulf of Mexico, including non-platform sources, as well as non-OCS oil/gas-related emissions. The inventories included CO, nitrogen oxides (NO_x), SO_2, PM_{10}, $PM_{2.5}$, and volatile organic compounds (VOC's), as well as greenhouse gases—carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Another emission inventory study is underway for the year 2011. These emissions inventories will be used in air quality modeling to determine the potential impacts of offshore sources to onshore areas.

The emission data used for the EPA proposed action modeling analysis can be found in **Table G-1**. The calculations relied on the *Year 2008 Gulfwide Emission Inventory Study* (Wilson et al., 2010) and Billings et al. (official communication, 2012) because they are the most recent inventory studies of emissions in the GOM. In addition, BOEM's subject-matter experts believe that the information in the 2008 report remains accurate and most likely conservative because, even with a small increase in activities in the EPA with an EPA proposed action, potential emission-producing factors relating to OCS oil and gas activities are expected to remain constant or even decrease over the 40-year analysis period, as described in **Chapter 3** of this EIS and in Chapter 3 of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. For example, drilling and the use of drilling rigs (which are one of the primary emissions-producing activities related to the OCS oil and gas program) remain relatively constant or are even expected to decrease due to the availability of rigs and the continuing emphasis on more focused drilling.

Greenhouse Gas Reporting

In response to the FY 2008 Consolidated Appropriations Act, USEPA issued 40 CFR part 98, which requires reporting of greenhouse gas emissions. Subpart W of the Greenhouse Gas Reporting Rule requires petroleum and natural gas facilities that emit 25,000 metric tons or more of CO_2 equivalents per year to report emissions from equipment leaks and venting. On average, the amount of CO_2 emissions from a typical well site is about 237-439 tons per year. Subpart C of the Green House Gas Reporting Rule requires operators to report greenhouse gas emissions from general stationary fuel combustion sources to USEPA. At this point, this is just a reporting requirement; there are no specific NAAQS or emission limitations for greenhouse gases.

BOEM has included in **Appendix G** modeled estimates for certain greenhouse gases that may be directly emitted during OCS oil and gas activities. At this time, the greenhouse gas emissions related to OCS oil and gas activities are a very small percentage of national emissions, and it would be impossible to tease out the impacts from this small incremental addition from global climate change impacts attributable to all other global sources.

General Conformity Regulations

New General Conformity regulations were promulgated on March 24, 2010 (USEPA, 2011b). The purpose of the General Conformity Rule is to ensure that Federal activities do not cause or contribute to a new violation of the NAAQS, ensure that actions do not cause additional or worsen existing violations of or contribute to new violations of the NAAQS, and ensure that attainment of the NAAQS is not delayed. This regulation applies to emissions within nonattainment areas and maintenance areas and to areas within 25 mi (40 km) of the State's seaward boundary.

4.1.1.1.2. Impacts of Routine Events

Background/Introduction

The following routine activities associated with an EPA proposed action would potentially affect air quality: platform construction and emplacement; platform operations; drilling activities; flaring; seismic-survey and support-vessel operations; pipeline laying and burial operations; evaporation of volatile petroleum hydrocarbons during transfers; and fugitive emissions. The impact analysis is based on four parameters—emission rates, surface winds, atmospheric stability, and the mixing height. BOEM conducts a review of the impacts of each EP and DOCD to onshore air quality during the postlease plans review process (**Chapter 1.5**). Operators submit their projected maximum emissions in order to obtain plan approval. The projected emissions are compared with exemption thresholds. If the emissions exceed the exemption thresholds, Offshore and Coastal Dispersion Model (OCD) modeling is performed. The operator can choose to customize their submittal by using actual fuel use rather than the BOEM-provided default factors or by submitting manufacturer's emissions specifications. They may also reduce emissions by spacing out the activity over time or selecting a different rig.

Routine activities result in pollutant emissions. Emissions of air pollutants would occur during exploration, development, and production activities. The profile of typical emissions for exploration and development drilling activities shows that emissions of NO_x are the most prevalent pollutant of concern. Emissions during exploration are higher than emissions during development due to power requirements for drilling a deeper hole. During drilling, engines are used to power the drill. Combustion of fuel (e.g., natural gas or diesel) to run the engines generates the NAAQS criteria pollutants CO, NO_x, $PM_{2.5}$, PM_{10}, and SO_2. Additional amounts of NAAQS criteria pollutants are generated by the vessels that transport equipment, workers, and supplies to and from the drill sites. More information about the pollutants that are generated by specific equipment and activities is available in the *2008 Gulfwide Emissions Inventory Study* (Wilson et al., 2010).

Atmospheric emissions will also arise from the operation of the vessels required to install, maintain, or replace sections of pipelines. Pipelines require occasional maintenance and repair. Product from oil platforms is generally transported to shore via pipeline. New pipelines are constantly being laid, linking new platforms to shore or increasing the capacity of the existing network.

Pollutants emitted during routine production activities may be combustion products related to burning fuel to power pumps or VOC's, which escape from the produced hydrocarbon. The well may produce a mixture of gas, condensate and water, or oil and water. This mixture must be separated and treated before it enters an oil or gas pipeline for transport to shore. A glycol dehydrator is a piece of platform equipment that is used to remove the final traces of water from the gas before it is piped to shore. During the dehydration process the water moves from the gas into the glycol. The glycol is then regenerated. The VOC's are released from the glycol during pressure reductions (flashing) and the regeneration process. Throughout the production platform, cold vents are installed to receive exhaust streams from various miscellaneous sources as well as from amine units, dehydrators, loading operations, or storage tanks.

The VOC's are precursor pollutants involved in a complex photochemical reaction with NO_x in the atmosphere to produce ozone. The primary sources of VOC's result from venting and evaporative losses that occur during the processing and transporting of natural gas and petroleum products. Some VOC's are also listed as HAP's. The most common HAP's in oil production and exploration activities are benzene, toluene, xylene, and ethyl benzene. The potential impacts that may result from HAP's include irritation of the skin, eyes, and respiratory tract; dizziness; nausea; and neurological effects. Long-term exposure to benzene may cause blood, reproductive and developmental disorders and cancer.

Fugitive emissions are gases that leak or intermittently escape from pressurized equipment. These leaks are a major source of VOC emissions on the platform. As with drilling, NAAQS criteria pollutants are generated by any vessels and helicopters that transport equipment, workers, and supplies to and from the production platform. Greater detail regarding these sources is available in Wilson et al. (2010).

Flaring is the burning of natural gas from a specially designed boom. Flaring systems are also used to vent gas during well testing or during repair/installation of production equipment. The BSEE operating regulations provide for some limited volume, short-duration flaring or venting of some natural gas volumes upon approval by BSEE. These operations may occur for short periods of time (typically 2-14 days) as part of unloading/testing operations that are necessary to remove potentially damaging completion fluids from the wellbore, to provide sufficient reservoir data for the operator to evaluate a reservoir and development options, and in emergency situations. The potential impacts from these accidental events are discussed in **Chapter 4.1.1.1.3**.

The concentration of the H_2S occurring naturally in crude oil varies substantially from formation to formation and even varies to some degree within the same reservoir. The natural gas in deepwater reservoirs has been mainly sweet (i.e., low in sulfur content), but the oil averages between 1 and 4 percent sulfur content by weight. By far, most of the documented production of sour gas (i.e., high sulfur content) lies within 150 km (93 mi) of the Breton Wilderness Area.

Flaring of gas containing H_2S (sour gas) is of concern because it could significantly impact nearby areas, particularly when considering the short-duration, averaging periods (1 and 24 hours) for SO_2. The contribution of flaring to SO_2 is regulated in 30 CFR part 250 subpart K. Although the proposed EPA lease sale location is within USEPA's jurisdiction for air quality issues, BSEE has jurisdiction over flaring during OCS oil and gas activities.

The SO_x levels from routine flaring are evaluated as part of the postlease plans review process. Emergency requests to vent or flare gas or burn oil are made when a well test occurs, when equipment is going to be upgrading, or when a pipeline is going to be repaired and there is no other pipeline to divert the gas or oil. When emergency flaring is required, the operator requests permission from BSEE. The BSEE refers the request to BOEM. The amount of SO_2 generated is dependent upon the sulfur concentration, rate of flaring, and the presence and functioning of a sulfur recovery unit. BOEM compares the estimated SO_x to a threshold exemption level based on the distance to shore. If the projected maximum pounds per hour SO_x emission level will exceed the threshold, BOEM informs the operator of the rate that they must not exceed. The operator may install an amine unit temporarily in order to flare at a higher rate. Routine and emergency flaring that is a normal part of an EPA proposed action is not expected to result in SO_x levels that impact onshore levels, because of the low activity levels resulting in a minimal need to flare in the EPA.

The BSEE and BOEM recently issued a final rule (30 CFR § 250.490 and 30 CFR § 550.215, respectively [*Federal Register*, 2011a]) governing requirements for preventing H_2S releases, detecting and monitoring H_2S and SO_2, protecting personnel, providing warning systems and signage, and establishing requirements for H_2S flaring and venting.

The combustion of liquid hydrocarbon fuel is the primary source of sulfur oxides (SO_x), when considering the annual averaging period; however, impacts from high-rate well cleanup operations can generate significant SO_2 emissions. To prevent inadvertently exceeding established criteria for SO_2 for the 1-hour and 24-hour averaging periods, all incinerating events involving H_2S or liquid hydrocarbons containing sulfur are reported to BSEE and are evaluated individually for compliance with safety and flaring requirements. The lessees must not flare or vent oil well gas for more than 48 continuous hours unless BSEE's Regional Supervisor approves (30 CFR § 250.1160).

Platform emission rates for the Gulf of Mexico region were obtained from the 2008 emission inventory of OCS sources (Wilson et al., 2010). This compilation was based on information from a survey of 3,304 platforms from 103 companies. Since these responses included all the major oil and gas production facilities, they were deemed representative of the type of emissions to be associated with an individual platform. The NO_x and VOC's are the primary pollutants of concern since both are considered to be precursors to ozone. Emission factors for other activities such as support vessels, helicopters, tankers, and loading and transit operations were taken from the OCS emission inventory (Wilson et al., 2010). There are 3-29 wells anticipated to be drilled over the 40-year analysis period (**Table 3-2**).

Once pollutants are released into the atmosphere, atmospheric transport and dispersion processes begin circulating the emissions. Transport processes are carried out by the prevailing wind circulation. During summer, the wind regime in the EPA is predominantly onshore during daytime hours at mean speeds of 3-5 m/sec (6.7-11.2 mph). Average winter winds are predominantly offshore at speeds of 4-8 m/sec (8.9-17.9 mph) (**Appendix A.3**). Although, for the summer months, the wind regime in the EPA is predominantly onshore during the day, OCS activities would not be expected to impact air pollutant levels in Louisiana because any pollutants emitted would be dispersed and recirculated prior to reaching shore. The majority of OCS Program-related emissions occur offshore anywhere from the State/Federal waters boundary to 200 mi (322 km) offshore, which limits the potential for emissions to result in impacts onshore.

Dispersion depends on emission height, atmospheric stability, mixing height, exhaust gas temperature and velocity, and wind speed. For emissions within the atmospheric boundary layer, the vertical heat flux, which includes effects from wind speed and atmospheric stability (via air-sea temperature differences), is a good indicator of turbulence available for dispersion (Lyons and Scott, 1990). Heat flux calculations in the EPA (Florida A&M University, 1988) indicate an upward flux year-round, being highest during winter and lowest in summer.

The annual CO_2 emissions in the WPA and CPA are estimated at 0.34 and 1.3 million tons, respectively. The CO_2 emissions attributable to the WPA and CPA are estimated to be about 0.005 percent of total global CO_2 emissions annually. However, the annual CO_2 emissions attributable to the EPA are expected to be substantially less than the estimates given for the WPA and CPA, given the small size of the proposed EPA lease sale area and the expected level of activities to result from an EPA proposed action. The U.S. CO_2 emissions in 2008 were estimated to be 7.1 billion metric tons CO_2 equivalents. In 2010, total U.S. greenhouse gas emissions were 6.8 billion metric tons CO_2 equivalent. Total U.S. emissions have increased by 10.5 percent from 1990 to 2010, and emissions increased from 2009 to 2010 by 3.2 percent (213.5 teragrams CO_2 equivalent). The CO_2 equivalent emissions from total offshore sources (including non-OCS sources) are 0.45 percent of the total U.S. Green House Gases Inventory using 2008 numbers. The CO_2 equivalent emission from specifically OCS oil and gas sources is 0.4 percent of the U.S. Green House Gas Inventory.

The amount of CO_2 emissions from a typical well site on average is about 237-439 tons per year. This is well below the reporting thresholds under the Green House Gas Reporting Rule. Given these emissions estimates, greenhouse gas emissions attributable to the EPA would not be expected to contribute significantly to the global warming or climate change.

Every source on the OCS generates $PM_{2.5}$ and PM_{10} as the result of burning marine and diesel fuels. In order of greatest to least amount of $PM_{2.5}$ and PM_{10} emissions are support vessels, drilling rigs, platforms, helicopters, and survey vessels. An estimate of PM from the major sources on a platform is provided in Wilson et al. (2010). The diesel engines and natural gas engines on the platform comprise about 80 percent of the total PM that is generated on the platform.

Proposed Action Analysis

The proposed EPA lease sale area falls east of 87.5^{o} W. longitude, where air quality regulatory jurisdiction is assigned to USEPA. Operators with actions that affect air quality in this area must comply with USEPA's air quality regulations and submit air permit applications to USEPA for approval. Although the proposed EPA lease sale area is under the jurisdiction of USEPA for air quality matters, BOEM nevertheless is conducting a NEPA analysis of its EPA proposed action. BOEM's regulations may differ from USEPA's regulations on air quality; however, BOEM compared the modeled impacts of an EPA proposed action with the U.S. Environmental Protection Agency SIL's for the ease of reference in evaluating impacts (refer to **Table G-5**). A more detailed explanation of an EPA proposed action analysis can be found in **Appendix G**.

There are many factors that BOEM evaluates to determine the potential impact occurring from offshore air emissions. These include estimates for likely emission sources, likely emission locations, emission rates, timeframes, and the likelihood of transport by wind resulting in contact to specified environmental features. BOEM used data gathered during recent OCS emission inventories, along with a scenario or estimates of future production, to evaluate the potential effects of emissions. The scenario provides (1) the set of assumptions for and estimates of future activities, (2) the rationale for the scenario assumptions and estimates, and (3) the type, frequency, and quantity of emissions from offshore sources associated with an EPA proposed action.

BOEM determined projected emissions resulting from the activities on the lease based on known emissions from various equipment such as diesel engines and generators, and the level of offshore activity projected in the 2012-2017 WPA/CPA Multisale EIS. BOEM then used a numerical model to calculate the concentration of five pollutants (NO_x, SO_x, $PM_{2.5}$, PM_{10}, and CO) at the receptor. Inputs to the model include the location of the emission source and the receptor, the aforementioned emissions, and source parameters such as source height and source stack gas temperature, and a 5-year history of meteorological conditions. The latter two parameters influence the dispersion of the pollutant as it is carried from the source to the receptor. The model output is the concentration of the pollutant at the onshore receptor location at specified time intervals. A description of the numerical model, called the Offshore Coastal Dispersion Model (OCD), and its results are summarized in **Appendix G**. One of the limitations of the OCD model is that it is unable to directly model contributions to ambient ozone. To address this limitation, BOEM examined available studies on OCS oil and gas activities' contribution to onshore ozone levels, as described in **Appendix G**. These studies confirm that OCS oil and gas activities are likely to only have a minimal impact on onshore ozone.

The OCD modeling was performed for the EPA Class I and Class II Areas; with the hypothetical EPA sources located in De Soto Canyon Block 548. De Soto Canyon Block 548 is approximately 125 mi (201 km) from the closest shoreline and 134 mi (216 km) from the Breton National Wilderness Areas, a Class I area. Since the Breton National Wilderness Area is the nearest Class I area to the selected EPA sources, Class I modeling was performed at this location. Other Class I areas include Chassahowitzka

Wilderness Area, St. Marks National Wildlife Refuge, and Bradwell Bay Wilderness, all located in Florida approximately 376.4 mi, 180 mi, and 181 mi (607 km, 290 km, and 291 km), respectively, from the selected sources. However, these areas were not included in the model, as the nearest Class I area to the selected sources was chosen to model. All the emissions from the year with the highest activity were placed in one location rather than distributed across the proposed EPA lease sale area. The modeling scenarios are presented in **Table G-3**.

BOEM calculated scenario-specific emissions based on the *Year 2008 Gulfwide Emission Inventory Study* (Wilson et al., 2010) and Billings et al. (official communication, 2012). To provide a conservative estimate, BOEM assumed a high range of activity emissions during the year, with the greatest amount of activity (e.g., drilling, platform, and pipeline installation) out of the 40-year life of the lease. All of the scenario-predicted emissions were then modeled at one location in the EPA. Even with all the emissions being attributed to a single point (which would not be the case in reality and thus provides a conservative estimate of impacts), the EPA emissions have minimal impacts to onshore air quality. The EPA emissions are below the U.S. Environmental Protection Agency SIL's, BOEM's Significance Levels, and BOEM's maximum allowable increase for the scenario. Methodology, emissions, and modeling results are discussed further in **Appendix G**. As shown in **Appendix G**, emissions of pollutants into the atmosphere from the activities associated with the OCS Program are estimated to have minimal effects on onshore air quality because of the prevailing atmospheric conditions, emission rates and mixing heights, and the resulting pollutant concentrations. Given that these very conservative estimates of emissions were modeled and still below both agencies' regulatory thresholds, BOEM believes that the potential onshore impacts related to emissions from OCS oil and gas activities that may result from an EPA proposed action will not be significant.

BOEM is in progress of a comprehensive assessment of numerical methods (including variety of sensitivity analysis, comparison of emission inventories and evaluation of emission scenarios) using USEPA-approved models, which will help us to support our scientific statements in future EIS's. This modeling assessment will be helpful when considering that modern air quality models are still in development and need to be evaluated before they are widely used for realistic estimations of pollutant concentrations over offshore and coastal environments. However, this assessment will take time and potentially years, and there will always be some limitations in the application of models. For this reason, BOEM is using the OCD model as it is appropriate for the offshore environment, unlike most other USEPA-approved models. BOEM's subject-matter experts also used their professional judgment in developing and modeling parameters to ensure the results were conservative.

Summary and Conclusion

Emissions of pollutants into the atmosphere from the routine activities associated with an EPA proposed action are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, emission heights, emission rates, and the distance of these emissions from the coastline. BOEM compared the modeled impacts of the proposed action with the U.S. Environmental Protection Agency SIL's, since the U.S. Environmental Protection Agency SIL's appear to be more appropriate target values for significant impact assessment. The ambient concentrations of pollutants due to emissions from proposed-action activities in the EPA are below the U.S. Environmental Protection Agency SIL's, BOEM Significance Levels, and are well below the NAAQS. As indicated in **Appendix G**, an EPA proposed action would have only a small effect on ozone levels in ozone nonattainment areas and would not interfere with the States' schedule for compliance with the NAAQS. The OCD modeling results show that increases in onshore annual average concentrations of NO_x, SO_x, and PM_{10} are estimated to be less than the maximum increases allowed in the PSD Class II areas. The 1-hour NO_2 modeling performed by operators as part of the postlease approval process indicates concentrations less than the maximum increase allowed.

4.1.1.1.3. Impacts of Accidental Events

Background/Introduction

The accidental release of hydrocarbons related to an EPA proposed action would result in the emission of air pollutants. The OCS accidents would include the release of oil, condensate, or natural gas or chemicals used offshore or pollutants from the burning of these products. The air pollutants include criteria NAAQS pollutants, volatile and semi-volatile organic compounds, hydrogen sulfide, and methane. These pollutants are discussed in **Chapter 4.1.1.1.2** above. If a fire were associated with the accidental event, it would produce a broad array of pollutants, including all NAAQS-regulated primary pollutants, including NO_2, CO, SO_x, VOC, PM_{10}, and $PM_{2.5}$. The discussion below addresses a 2,200-bbl spill. In the spill size category of ≥1,000 bbl, the estimated median spill size based on historical data is 2,200 bbl (**Table 3-10**).

A catastrophic event is a high-volume, long-duration oil spill or a "spill of national significance" that is not reasonably expected and not part of an EPA proposed action. An analysis of the impact of a catastrophic spill is included in **Appendix B**. Many Federal and State agencies and companies participate in response to a catastrophic event such as the *Deepwater Horizon* explosion, oil spill, and response. Air quality onshore and on-water was monitored by the Occupational Safety and Health Administration, USCG, and the responsible party to ensure a safe work environment. For response workers, coastal community air quality was monitored by USEPA and State environmental agencies. The results from these efforts are available on *Deepwater Horizon* explosion, oil spill, and response websites such as http://www.epa.gov/bpspill/air.html.

Proposed Action Analysis

The accidental release of hydrocarbons or chemicals from an EPA proposed action would cause the emission of air pollutants. Some of these pollutants are precursors to ozone, which is formed by complex photochemical reactions in the atmosphere. Accidents, such as oil spills and blowouts, are a source of emissions related to OCS operations. Typical emissions from OCS accidents consist of hydrocarbons; only fires produce a broad array of pollutants, including all NAAQS-regulated primary pollutants. The criteria pollutants considered here are NO_2, CO, SO_x, VOC, PM_{10}, and $PM_{2.5}$.

NAAQS Pollutants

Some of the NAAQS pollutants, the VOC's and NO_x, are precursors to ozone, which is formed by complex photochemical reactions in the atmosphere. Human exposure to ground-level ozone exposure causes a variety of health problems, including airway irritation, aggravation of asthma, and increased susceptibility to respiratory illnesses. Ozone levels could increase, especially if the oil spill were to occur on a hot, sunny day with sufficient concentrations of NO_x present in the lower atmosphere. An accidental spill would possibly have a temporary localized adverse effect due to NAAQS pollutant concentrations. Due to the distance from shore and an assumed accidental spill size of 2,200 bbl, an oil spill would not affect onshore ozone concentrations.

The VOC emissions from the evaporation of spilled oil can contribute to the formation of particulate matter ($PM_{2.5}$). In-situ burning also generates particulate matter. Particulate matter can cause adverse human respiratory effects and can also result in a reduction of atmospheric visibility or haze.

Hydrocarbons

Oil is a mixture of many different chemical compounds, some of which are hazardous to human health. Toxic chemicals can cause headache or eye irritation. Benzene can cause cancer at high levels and long exposures. The benzene, ethylbenzene, toluene, and xylene (BTEX fraction) of oil is light and volatilizes into air. The BTEX level is commonly measured to provide an indication of the level of air quality. During an accidental spill, the levels of BTEX in the immediate area could exceed safe levels. In hazardous conditions, the Occupational Safety and Health Administration and USCG regulations require workers to use breathing protection. An accidental spill would possibly result in temporary localized elevated levels of hydrocarbons. Due to the distance to shore and an assumed accidental spill size of 2,200 bbl, an accidental spill would not result in elevated onshore BTEX concentrations. An analysis of the impact of a catastrophic spill, of far greater size, which is not reasonably expected and not part of an EPA proposed action, is included in **Appendix B**.

H_2S

The presence of H_2S within formation fluids occurs sporadically throughout the Gulf of Mexico OCS and may be released during an accident. There has been some evidence that petroleum from deep water contains significant amounts of sulfur. The H_2S concentrations in the OCS vary from as low as a fraction of a ppm to as high as 650,000 ppm. Hydrogen sulfide can cause acute symptoms, including headaches, nausea, and breathing problems. During an accidental event, H_2S concentrations could be high enough in the immediate area to be life threatening. The BSEE's regulations (30 CFR § 250.490(a)(1)) and the clarifying Hydrogen Sulfide NTL (NTL 2009-G31) require a Contingency Plan as well as sensors and alarms to alert and protect workers from H_2S releases.

In-situ Burning

In-situ burning of a spill results in emissions of NO_2, SO_2, CO, and PM_{10}, and would generate a plume of black smoke. Fingas et al. (1995) describes the results of a monitoring program of a burn experiment at sea. The program involved extensive ambient measurements during two experiments in which approximately 300 bbl of crude oil were burned. It found that, during the burn, CO, SO_2, and NO_2 were measured only at background levels and were frequently below detection levels. Ambient levels of VOC were high within about 100 m (328 ft) of the fire but were significantly lower than those associated with a nonburning spill. Measured concentrations of PAH's were low. It appeared that a major portion of these compounds was consumed in the burn. In measurements taken from the NOAA WP-3D aircraft during the *Deepwater Horizon* explosion, lofted plumes from the controlled burns rose above the marine boundary layer of 2,000 ft (610 m) (Ravishankara and Goldman, 2010).

McGrattan et al. (1995) modeled smoke plumes associated with in-situ burning (which is the type of particulate matter measured). The results showed that the surface concentrations of particulate matter did not exceed the health criterion of 150 $\mu g/m^3$ in 24 hours beyond about 5 km (3 mi) downwind of an in-situ burn. This is quite conservative as this health standard is based on a 24-hour average concentration rather than a 1-hour average concentration. This appears to be supported by field experiments conducted off of Newfoundland and in Alaska. In summary, the impacts from in-situ burning are temporary. Pollutant concentrations would be expected to be within the NAAQS. The air quality impacts from in-situ burning would therefore be minor.

Dioxins and furans are a family of extremely persistent chlorinated compounds that magnify in the food chain. During an in-situ burn, the conditions exist (i.e., incomplete hydrocarbon combustion and the presence of chlorides in seawater) where dioxins and furans could potentially form. Measurements of dioxins and furans during the *Deepwater Horizon* explosion's in-situ burning were made (Aurell and Gullett, 2010). The estimated levels of dioxins and furans produced by the in-situ burns were similar to those from residential woodstove fires and slightly lower than those from forest fires, according to USEPA researchers (Schaum et al., 2010) and, thus, concerns about eventual dioxin bioaccumulation in seafood were alleviated.

Flaring

Flaring may be conducted to manage excess natural gas during an accidental event such as damage to a pipeline that transports the gas to shore. For the *Deepwater Horizon* explosion, a flare that burned both oil and gas was employed. Flaring would result in the release of NO_x emissions from the flare. The SO_2 emissions would be dependent on the sulfur content of the crude oil.

Particulate matter from the flare would also affect visibility. In-situ burning and flaring are temporary efforts to limit environmental impact during an accidental spill. The appropriate agencies will monitor for worker safety. Pollutant concentrations onshore would be expected to be within the NAAQS and not to have onshore impacts.

Dispersants

Dispersants may be applied to break up surface and subsurface oil following an accidental spill. In surface application, aircraft fly over the spill, similar to crop dusting on land, and spray dispersants on the visible oil. Dispersant usage is usually reserved for offshore locations. There is the possibility that the dispersant mist can drift from the site of application to a location where workers or the community is exposed by both skin contact and inhalation. Following the *Deepwater Horizon* explosion and oil spill, USEPA provided the TAGA bus, a mobile laboratory, to perform instantaneous analysis of air in coastal communities. Two ingredients in the COREXIT dispersant were measured. Very low levels of these two ingredients were identified. Due to the distance to shore from the proposed lease sale area and a probable accidental spill size of 2,200 bbl (**Table 3-10**), it is unlikely that dispersants used in response to a spill within the proposed EPA lease sale area would be carried to onshore areas.

Odors

An accidental spill could result in odors (USEPA, 2010a). The low levels of pollutants may cause temporary eye, nose, or throat irritation, nausea, or headaches, but the doses are not thought to be high enough to cause long-term harm (USEPA, 2010a). Due to the distance to shore and an assumed accidental spill size of 2,200 bbl, it is unlikely that applied dispersants would drift to onshore areas.

It is expected that the accidental event or hazardous air pollutants will have a minimum effect on the onshore air quality. This document does not address hazardous air pollutants offshore other than H_2S, which is not required by BOEM. The effects of the BP oil spill on the onshore air quality are as yet uncertain.

Summary and Conclusion

Accidental events associated with an EPA proposed action that could impact air quality include spills of oil, natural gas, condensate, and refined hydrocarbons; H_2S release; fire; and releases of NAAQS air pollutants (i.e., SO_x, NO_x, VOC's, CO, PM_{10}, and $PM_{2.5}$). Response activities that could impact air quality include in-situ burning, the use of flares to burn gas and oil, and the use of dispersants applied from aircraft. Accidents involving high concentrations of H_2S could result in deaths as well as environmental damage. Other emissions of pollutants into the atmosphere from accidental events as a result of an EPA proposed action are not projected to have significant impacts on onshore air quality because of the prevailing atmospheric conditions, emissions height, emission rates, and the distance of these emissions from the coastline. These emissions are not expected to have concentrations that would change onshore air quality classifications. The impacts of accidental events are not expected to have significant impacts on onshore air quality. The impacts from catastrophic events, which are not reasonably expected and not part of an EPA proposed action, are still uncertain.

Overall, since loss of well-control events and blowouts are rare events and of short duration, potential impacts to air quality are not expected to be significant, except in the rare case of a catastrophic event, which is not reasonably expected and not part of an EPA proposed action. The summary of vast amounts of data collected and additional studies will provide more information in the future.

4.1.1.1.4. Cumulative Impacts

Background/Introduction

An impact analysis for cumulative impacts in the EPA is described in this section. This cumulative analysis considers OCS and non-OCS activities that could occur and adversely affect onshore air quality from OCS sources during the 40-year analysis period.

The activities in the cumulative scenario that could potentially impact onshore air quality considered here are the OCS oil- and gas-related impacts (i.e., an EPA proposed action, the OCS Program, accidental releases from an oil spill, accidental releases from hydrogen sulfide, a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action) and the non-OCS oil- and gas-related impacts (i.e., onshore non-OCS activities, State oil and gas programs, and natural events [e.g., hurricanes]).

OCS Oil- and Gas-Related Impacts

Emissions contributing to air quality degradation come from many sources. The NAAQS list is made up of the most common air pollutants, including ozone, particulate matter, NO_x, and SO_x. Air pollutants on the NAAQS are commonly referred to as criteria pollutants because they are ubiquitous. Although these pollutants can all occur naturally, elevated levels are usually the result of anthropogenic activities.

The activities for the OCS Program include the drilling of exploration, delineation, and development wells; platform installation; and service-vessel trips, flaring, and fugitive emissions. Emissions of pollutants into the atmosphere from activities associated with the OCS Program are not projected to have significant effects on onshore air quality because of the prevailing atmospheric conditions, emission rates and heights, and the resulting pollutant concentrations. Onshore impacts on air quality from emissions from OCS activities are estimated to be within PSD Class II allowable increments. The modeling results indicate that the cumulative impacts to a PSD Class I Area are well within the PSD Class I allowable increment (Wheeler et al., 2008). (Refer to **Chapter 4.1.1.1.2** for additional information on the potential impacts of routine events.)

A spill could result in the loss of crude oil, crude oil with a mixture of natural gas, or refined fuel. Air quality could be affected by the additional response vessel traffic, volatilization of components of the oil, and natural gas if released. Impacts from individual spills would be localized and temporary. (Refer to **Chapter 4.1.1.1.3** for additional information on the potential impacts of accidental events.)

The safety issues related to an accidental release of hydrogen sulfide include the following: irritation, injury, and lethality from leaks; exposure to sulfur oxides produced by flaring; equipment and pipeline corrosion; and outgassing and volatilization from spilled oil.

In a catastrophic spill, oil may be burned to prevent it from entering sensitive habitats. The USEPA released two peer-reviewed reports concerning dioxins emitted during the controlled burns of oil during the *Deepwater Horizon* explosion, oil spill, and response (Aurell and Gullett, 2010; Schaum et al., 2010). Dioxins is a category that describes a group of hundreds of potentially cancer-causing chemicals that can be formed during combustion or burning. The reports found that, while small amounts of dioxins were created by the burns, the levels that workers and residents would have been exposed to were below USEPA's levels of concern. (Refer to **Appendix B.3.1.1** for additional information on the potential impacts of a catastrophic event.)

Non-OCS Oil- and Gas-Related Impacts

State oil and gas programs onshore, in territorial seas, and in coastal waters also generate emissions that affect onshore air quality. These emissions are regulated by State agencies and/or USEPA. Reductions in emissions have been achieved through the use of low sulfur fuels, catalytic reduction, and other efforts, and as a result, constitute minor impacts to onshore air quality.

Major onshore emission sources from non-OCS activities include power generation, industrial processing, manufacturing, refineries, commercial and home heating, naturally occurring forest fires, and motor vehicles. Two other NAAQS pollutants, CO and lead, are not associated with offshore oil and gas activity so they are not discussed below as cumulative impacts relative to an EPA proposed action and are not useful for purposes of NEPA.

Of the NAAQS of concern, ozone pollution is mainly a daytime problem during the summer months. Strong sunlight and hot weather causes ground-level ozone to form in harmful concentrations in the air. Ozone is not emitted directly into the air. Ozone is a secondary pollutant formed in the presence of sunlight from the reaction of VOC's and NO_x. These pollutants are found in emissions from such varied sources as follows: vehicles such as automobiles, trucks, buses, aircraft, and locomotives; construction equipment; lawn and garden equipment; sources that combust fuel, such as large industries and utilities; small industries such as gas stations and print shops; and consumer products, including some paints and cleaners, among many others. In addition, biogenic, or natural emissions from trees and plants, are a source of VOC's.

The concentration of ozone in the air is determined not only by the amounts of ozone precursor chemicals, but also by weather and climate factors. Intense sunlight, warm temperatures, stagnant high-pressure weather systems, and low wind speeds cause ozone to accumulate in harmful amounts.

Ozone precursors, NO_x and VOC's, are shown to have more ozone-emitting sources present onshore. According to USEPA, automobiles and other mobile sources contribute about half of the NO_x that is emitted. According to NOAA, power plants emit about one-quarter of the total U.S. human-made contribution of NO_x to the atmosphere. All other sources of NO_x emissions, combined, account for one-quarter of the United States' totals.

Shore-based sources of $PM_{2.5}$ include all types of combustion activities related to both human activities and naturally occurring sources. Sources range from large and highly regulated industrial sources down to sources related to activities of an individual such as trash burning. Some of the most cited additional sources include fuel burning associated with motor vehicles, power plants, and wood burning, and certain industrial processes.

Fine particulate matter can also form when gases from burning fuels react with sunlight and water vapor. These can result from fuel combustion in motor vehicles, at power plants, and in other industrial processes. Sources of coarse particles, PM_{10} , include crushing or grinding operations, and dust from paved or unpaved roads.

Sources of SOx include all types of activities ranging from large, highly regulated industrial sources, down to sources related to individual human activities such as outdoor grilling. Fossil fuels contain varying amounts of sulfur. Over 65 percent of the SO_x released to the air comes from electric utilities that burn coal. Some additional commonly cited sources of SO_x include pulp and paper mills, petroleum refining, and nonferrous smelters. Fuel burning associated with motor vehicle usage in is another source.

Sources of NO_x include all types of activities ranging from large, highly regulated industrial sources down to sources related to the activities of individual people, for example, the use of personal water craft (e.g., jet skis). Some of the most common anthropogenic sources of NO_x include motor vehicles, electric utilities, and other industrial commercial and residential sources that burn fuels. Because NO_x is a highly reactive chemical, it can contribute to ozone formation in the presence of VOC's in the presence of heat and sunlight.

The effects of hurricanes on the offshore infrastructure are mainly due to damage to the offshore infrastructure and pipelines by a hurricane, which may result in an oil spill. The emissions from the oil spill and repair activities are expected to have minimal effects on onshore air quality.

Other major factors influencing coastal environments, such as sand borrowing and transportation in State territorial waters, also generate emissions that can affect air quality. These emissions are regulated by State agencies and/or USEPA. Reductions have been achieved through the use of low sulfur fuels and catalytic reduction and other efforts, and as a result, constitute minor impacts to onshore air quality.

Summary and Conclusion

Emissions of pollutants into the atmosphere from activities associated with the OCS Program are not projected to have significant effects on onshore air quality because of the prevailing atmospheric conditions, emission rates and heights, and the resulting pollutant concentrations. Ozone precursors, NO_x and VOC's, are shown to have more ozone-emitting sources present onshore. Onshore impacts on air quality from emissions from OCS activities are estimated to be within PSD Class II allowable increments. The modeling results indicate that the cumulative impacts to a PSD Class I Area are well within the PSD Class I allowable increment (Wheeler et al., 2008).

Ozone levels are on a declining trend because of air-pollution control measures that have been implemented by the States. This downward trend is expected to continue as a result of local as well as nationwide, air-pollution control efforts.

The Gulf Coast has significant visibility impairment from anthropogenic emission sources. Area visibility is expected to improve somewhat as a result of regional and national programs to reduce emissions.

Based on the discussion above and modeled impacts in **Appendix G**, the incremental contribution of an EPA proposed action to the cumulative impacts is not significant. The incremental contribution of an EPA proposed action to the cumulative impacts would likewise not significantly affect coastal nonattainment areas. The cumulative contribution to visibility impairment from an EPA proposed action would also not be significant.

4.1.1.2. Water Quality

4.1.1.2.1. Coastal Waters

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for coastal water quality can be found in Chapter 4.2.1.2.1 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.2.1 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.2.1 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.2.1 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for coastal water quality regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for coastal water quality presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below no new significant information was discovered that would alter the impact conclusions for coastal water quality presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on water quality, and various Internet and publicly available sources were examined to determine any recent information regarding water quality. Sources investigated included, but were not limited to, journals and scientific articles, Google, Google Scholar, several USEPA websites, the Gulf of Mexico Sea Grant Programs website, the Coastal Response Research at the University of New Hampshire website, and the NOAA Central Library *Deepwater Horizon*: A Preliminary Bibliography of Published Research and Expert Commentary website. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding water quality since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, it is currently impossible to estimate precisely the long-term impacts that the spill resulting from the *Deepwater Horizon* explosion will have on coastal water quality. Various monitoring efforts and environmental studies are underway. More time is needed to fully assess the impacts of the *Deepwater Horizon* explosion, oil spill, and response. Although response efforts decreased the fraction of oil remaining in Gulf waters and reduced the amount of oil contacting the coastline, oil still remains in the environment (USDOC, NOAA, 2011a and 2011c; OSAT-2, 2011). As such, there remains some incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on coastal water quality. Much of this information relates to the *Deepwater Horizon* explosion, oil spill, and response and is continuing to be collected and developed through the NRDA process. These data collection and research projects may be years from completion. Few data or conclusions have been released to the public to date. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In light of this incomplete and unavailable information, BOEM's subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology. Given the amount and scope of available direct data on sediments and water quality that have been released, as described above, BOEM believes that this incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.1.1.2.1.1. Description of the Affected Environment

The Gulf of Mexico is the ninth largest waterbody in the world (USDOC, NOAA, 2008a). The description of the physical oceanography of the Gulf of Mexico is described in **Chapter 3.3.5.1 and Appendix A.2**. The United States' portion of the Gulf of Mexico region follows the coastline of five states from the southern tip of Texas moving eastward through Louisiana, Mississippi, Alabama, and ending in the Florida Keys (**Figure 4-2**). The combined coastline of these states totals over 47,000 mi (75,639 km) (when including the shores of all barrier islands, wetlands, inland bays, and inland bodies of water) (USDOC, NOAA, 2008a). The Gulf's coastal areas contain half the wetlands in the United States (USDOC, NOAA, 2008a). Wetlands are discussed in further detail in the **Chapter 4.1.1.4**. According to USEPA (2008b), the Gulf Coast's coastal area comprises over 750 bays, estuaries, and sub-estuary systems that are associated with larger estuaries. Gulf Coast estuaries and wetlands provide important spawning, nursery, and feeding areas for a wide array of fish and wildlife as well as being the home for a wide range of indigenous flora and fauna (USEPA, 2008b). The coastal waters of the Gulf Coast are an extremely productive natural system (USEPA, 2008b), which is also important to the Gulf Coast economy as the major commercial fishing ports in the region yield over 1.2 billion pounds of seafood on an annual basis (USDOC, NOAA, 2008a). The natural resources of the Gulf of Mexico are also important for tourism and recreation.

Over 150 rivers empty out of North America into the Gulf of Mexico (Gore, 1992, page 127). The river deltas emptying into the Gulf bring freshwater and sediment into coastal waters (Gore, 1992, pages 127-131), which affects the water quality of the receiving waters. Rivers carry excess nutrients downstream (e.g., nitrogen and phosphorus), as well as other possible inputs such as contaminants from industrial wastewater discharge, downstream; this effect is cumulative as the river reaches an estuary (Gore, 1992, pages 280 and 291). Overenrichment of nutrients may lead to eutrophication that can eventually cause algal blooms and fish kills (Gore, 1992, page 280) (refer to below for more information on nutrient enrichment and its effects; also refer to the wetlands and seagrasses discussions in **Chapters 4.1.1.4 and 4.1.1.5**, respectively). The emptying of rivers into the GOM is part of the hydrologic cycle or water cycle (USDOI, GS, 2010a). Understanding this cycle not only explains the movement of water on Earth but also how water quality might be affected by both natural and anthropogenic sources. The water cycle may introduce chemical and physical factors that alter the condition of the natural water, such as the addition of waterborne pollutants, or the addition of warmer water, into the GOM through waterbodies emptying into the GOM, runoff, groundwater discharge, or precipitation. Water quality in coastal waters of the northern Gulf of Mexico is highly influenced by seasonality. Seasonality influences salinity, dissolved oxygen, nutrient content, temperature, pH and Eh, pathogens, turbidity, metals, and organic compounds. Salinity in open water near the coast may vary between 29 and 32 practical salinity units (psu) during fall and winter, but it may decline to 20 psu during spring and summer due to increased runoff (USDOI, MMS, 2000a) (practical salinity units [psu] are similar to parts per thousand [ppt], but not identical).

The priority water quality issues identified by the Gulf of Mexico Alliance are as follows: (1) reducing the risk of exposure to disease-causing pathogens; (2) minimizing the occurrence and effects of harmful algal blooms; (3) identifying the sources of mercury in Gulf seafood; and (4) improving the monitoring of Gulf water resources (Gulf of Mexico Alliance, 2012). In addition to water quality itself, nutrients and nutrient impacts are also a priority issue for the organization.

The leading source of contaminants that impair coastal water quality is urban runoff. Urban runoff can include suspended solids, heavy metals and pesticides, oil and grease, nutrients, and organic matter. Urban runoff increases with population growth, and the Gulf Coast region has experienced a 109 percent population growth since 1970, with an additional expected 15 percent increase expected by 2020 (USDOC, NOAA, 2011b). Other pollutant source categories include (1) agricultural runoff, (2) municipal point sources, (3) industrial sources, (4) hydromodification (e.g., dredging), and (5) vessel sources (e.g., shipping, fishing, and recreational boating).

The National Research Council (NRC, 2003, Table I-4, page 237) estimated that, on average, approximately 26,324 bbl of oil per year entered Gulf waters from petrochemical and oil refinery industries in Louisiana and Texas. Further, NRC (2003) calculated an estimate for oil and grease loads from all land-based sources per unit of urban land area for rivers entering the sea. Based on the size of its watershed, the Mississippi River introduced approximately 3,680,938 bbl of oil and grease per year from land-based sources (NRC, 2003, Table I-9, page 242) into the waters of the Gulf of Mexico.

Since the marine environment is a dynamic system, sediment quality and water quality can affect each other. For example, a contaminant may react with the mineral particles in the sediment and be removed from the water column (e.g., adsorption). Thus, under appropriate conditions, sediments can serve as sinks for contaminants such as metals, nutrients, or organic compounds. However, if sediments are (re)suspended (e.g., due to dredging or a storm event), the resuspension can lead to a temporary redox flux, including a localized and temporal release of any formally sorbed metals as well as nutrient recycling (Caetano et al., 2003; Fanning et al., 1982).

The overall coastal condition of the Gulf Coast was evaluated from 2001 to 2002 by USEPA and was rated as fair to poor (USEPA, 2008b). Specifically, water quality was rated as fair while sediment quality and the coastal habitat index (a rating of wetlands habitat loss), both of which affect water quality, were rated as poor. The USEPA also conducted similar evaluations from 1990 to 1996 (USEPA, 2001) and again from 1997 to 2000 (USEPA, 2005). Water quality was poor overall in the first Coastal Condition Report, but it increased to fair overall in the latter reports. Conversely, sediment quality was generally fair in the first two reports and decreased to poor in the last report. The Barataria/Terrebonne Estuary, near Port Fourchon, which is a common service base, was ranked fair in terms of water quality (USEPA, 2007b) and was assessed as having moderately high eutrophic conditions by NOAA (Bricker et al., 2007). The NOAA examined additional Gulf Coast estuary systems near the CPA and, of those with sufficient data, the Mississippi/Atchafalaya Plume and Perdido Bay had high overall eutrophic conditions, Barataria

Bay had moderate high overall eutrophic conditions, Breton/Chandeleur Sound and Lake Pontchartrain were ranked as having moderate overall eutrophic conditions, the Mississippi River had moderately low overall eutrophic conditions, and Mississippi Sound and Lake Borgne had overall low eutrophic conditions (Bricker et al., 2007). Of those with sufficient data in the EPA, Suwannee River and Choctawhatchee Bay had low eutrophic conditions; Pensacola Bay had moderately low eutrophic conditions; and Apalachicola Bay, Florida Bay, and Charlotte Harbor had moderate eutrophic conditions. However, at the time of the assessment, conditions were expected to worsen in the future at Charlotte Harbor. Rookery Bay, Sarasota Bay, and Tampa Bay had moderately high eutrophic conditions, while North Ten Thousand Islands and Perdido Bay had high eutrophic conditions. The confidence of the eutrophication assessments varied.

The condition of the Gulf Coast was altered by the *Deepwater Horizon* explosion and oil spill. The Government estimated that approximately 4.9 million barrels of oil were released during the event (Oil Spill Commission, 2011b) and 1.84 million gallons of dispersant were used to breakup and dilute the oil subsea at the wellhead and on the surface (Oil Spill Commission, 2011c). As well, the corresponding emission of methane from the wellhead during the event was estimated between 9.14×10^9 and 1.25×10^{10} moles (Kessler et al., 2011). Independent analysis of chemical measurements derived an average environmental release rate for hydrocarbons of $(10.1 \pm 2.0) \times 10^6$ kilograms/day (kg/d), which confirmed the official average leak rate of $(10.2 \pm 1.0) \times 10^6$ kg/d (Ryerson et al., 2011a). In coastal waters, the maximum extent of surface water and shoreline oiling stretched from roughly the Louisiana-Texas border to Apalachicola, Florida (Oil Spill Commission, 2011b, Figure 7.1). As well, a subsurface oil and gas plume was discovered in deep waters between ~1,100 and 1,300 m (3,609 and 4,265 ft) (e.g., Diercks et al., 2010). Based on in-situ fluorescence and oxygen measurements (likely indicators of concentration and biodegradation, respectively), the subsurface plume traveled to the northeast of the wellhead and much farther to the southwest, reaching as far west as approximately -93.0° (e.g., Kessler et al., 2011; refer to supporting online material).

In general, coastal water quality would potentially not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic, hydromodification (e.g., dredging, berm building, etc.), and the addition of dispersants and methanol to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree. Fortunately, over time, natural processes can physically, chemically, and biologically degrade oil (NRC, 2003). The physical processes involved include evaporation, emulsification, and dissolution; the primary chemical and biological degradation processes include photooxidation and biodegradation (i.e., microbial oxidation).

The oil that entered the Gulf of Mexico from the *Deepwater Horizon* explosion is a South Louisiana sweet crude oil (i.e., it is low in sulfur) (USDOC, NOAA, 2010b). The oil is fairly high in alkanes (organic compounds containing only carbon and hydrogen and single bonds; sometimes called paraffin or aliphatic compounds) (USDOC, NOAA, 2010b). Because alkanes are simple hydrocarbons, these oils are likely to undergo biodegradation more easily (USDOC, NOAA, 2010b). Weathering of crude can occur within the first 24-48 hours with up to a 40 percent weight loss within 7 days (English, 2010). Also, this oil is less toxic than other crude oils in general because this oil is lower in PAH's than many crude oils. Studies indicate that the oil contained approximately 3.9 percent PAH's by weight, which results in an estimated release of 2.1×10^{10} grams of PAH's (Reddy et al., 2011; Reddy, official communication, 2012).

The *Deepwater Horizon* explosion released natural gas into the water column in addition to oil. Methane is the primary component of natural gas (Maina, 2005). Limited research is available for the biogeochemistry of hydrocarbon gases in the marine environment (Patin, 1999, page 233). Theoretically, methane could stay in the marine environment for long periods of time (Patin, 1999, page 237), as methane is highly soluble in seawater at the high pressures and cold temperatures found in deepwater environments (NRC, 2003, page 108). Methane diffusing through the water column would likely be oxidized in the aerobic zone and would rarely reach the air-water interface (Mechalas, 1974, page 23). During the *Deepwater Horizon* oil spill and gas release, methane and oxygen distributions were measured at 207 stations throughout the affected region (Kessler et al., 2011). Based on these measurements, it was concluded that, within ~120 days from the onset of release, $\sim 3.0 \times 10^{10}$ to 3.9×10^{10} moles of oxygen were respired, primarily by methanotrophs, and left behind a residual microbial community containing methanotrophic bacteria. The researchers further suggested that a vigorous deepwater bacterial bloom respired nearly all the released methane within this time and that by analogy, large-scale releases of methane from hydrate in the deep ocean are likely to be met by a similarly rapid methanotrophic response. Unfortunately, little is known about methane toxicity in the marine environment, but there is concern as to how methane in the water column might affect fish.

Extensive water and sediment sampling was performed in coastal waters during the *Deepwater Horizon* oil spill and response. Water and sediment samples were collected in the nearshore zone at multiple sites from Texas to Florida for quantitative analysis of oil and oil-related compounds, dispersants, or by-products (OSAT, 2010). The nearshore sampling plan was designed to determine if the spill had contaminated the sediments and water column with oil-related products and/or dispersant-related chemicals. A total of 6,090 water samples were considered for comparison with USEPA's human health benchmarks. None of the samples exceeded USEPA's benchmark for human health (child swimmer scenario). A total of 6,909 water and sediment samples were considered for comparison with USEPA's aquatic life benchmarks. Of these samples, a total of 41 nearshore water benchmark exceedances were observed throughout the event. Based on oil fingerprinting, 13 of these samples were of indeterminate origin, 19 were considered not consistent with Mississippi Canyon Block 252 oil, and 9 were deemed consistent with Mississippi Canyon Block 252 oil. Only a small subset of the analyzed samples targeted areas of observed surface oil, such as samples collected during the Dispersant Environmental Effects Project. A total of 24 nearshore sediment benchmark exceedances were observed throughout the event. As with water, fewer sediment benchmark exceedances were observed in USEPA Region 6 (Texas and Louisiana) than in USEPA Region 4 (Alabama, Mississippi, and Florida). Of the total sediment exceedances, 9 samples were of indeterminate origin, 11 were considered not consistent with Mississippi Canyon Block 252 oil, and 4 were consistent with Mississippi Canyon Block 252 oil. Notably, no water or sediment benchmark exceedances in the nearshore measured after August 3 (the last overflight observation of surface oil) were consistent with Mississippi Canyon Block 252 oil.

A study of coastal waters sampled for bioavailable PAH's in Grand Isle, Louisiana; Gulfport, Mississippi; Gulf Shores, Alabama; and Gulf Breeze, Florida, using passive sampling devices. The study began sampling prior to any shoreline oiling on May 10, 2010, and continued for over a year. After the oil spill, bioavailable PAH levels were statistically significantly higher than pre-spill levels; however, the PAH levels at all locations had returned to pre-spill levels by March 2011 (Allan et al., 2012). Elevated PAH concentrations were observed again at the Alabama sampling location in summer 2011. The authors of this study suggested that this increase may be due to resuspension of contaminated sediments or continued nearshore cleanup activities. Increased inputs from other sources and/or climatic factors could not be ruled out (Allan et al., 2012).

Recent reports found that Hurricane Isaac unearthed oil from the *Deepwater Horizon* explosion and oil spill that was likely buried along the coast; the oil was discovered mostly as tarballs in several locations, including Elmer's Island and Grand Isle, Louisiana, as well as possible locations along the Mississippi and Alabama coasts (Burdeau and Reeves, 2012). Testing at Louisiana State University also confirmed a match to *Macondo* well oil with samples collected from Barataria Bay and the Bay Jimmy area as well as from the Fort Morgan area in Alabama (Overton, official communication, 2012).

One standard tool used in response to spilled oil on water is dispersants. The purpose of chemical dispersants is to facilitate the movement of oil into the water column in order to encourage weathering and biological breakdown of the oil (i.e., biodegradation) (NRC, 2005; Australian Maritime Safety Authority, 2010). If the oil moves into the water column and is not on the surface of the water, it is less likely to reach sensitive shore areas (USEPA, 2010b). Since sea birds are often on the surface of the water or in shore areas, dispersants are also considered to be very effective in reducing the exposure of sea birds to oil (Australian Maritime Safety Authority, 2010). In addition to dispersion being enhanced by artificial processes, oil may also be dispersed through natural processes. For instance, microbial metabolism of crude oil results in the dispersion of oil (Bartha and Atlas, 1983). Oil dispersion, as a spill-response strategy, has both positive and negative effects. The positive effect is that the oil, once dispersed, is more available to be degraded. The negative effect is that the oil, once dispersed, is more available to microorganisms and temporarily increases the toxicity (Bartha and Atlas, 1983). The toxicity of dispersed oil in the environment depends on many factors, including the effectiveness of the dispersion, temperature, salinity, the degree of weathering, type of dispersant, and degree of light penetration in the water column (NRC, 2005). The toxicity of dispersed oil is primarily due to the toxic components of the oil itself (Australian Maritime Safety Authority, 2010).

COREXIT 9500 and 9527 were used in response to the *Deepwater Horizon* explosion and oil spill (USEPA, 2010b). The components of these dispersants are identical with the exception of the base solvent; COREXIT 9527 has an organic solvent as a base (McDonald et al., 1984; USEPA, 2010b). Dispersants used in the 1960's were quite toxic, but more recently developed dispersants such as COREXIT are considerably less toxic (Doe and Wells, 1978; Leahy and Colwell, 1990). Lindstrom and Braddock (2002) found that environmental use of COREXIT 9500 could result in either increases or decreases in the toxicity of residual oil through selective microbial mineralization of hydrocarbons. In fact, reviews of studies have found that the general effectiveness of dispersants in enhancing biodegradation of crude oil and individual hydrocarbons is highly variable and depends on several factors, including the chemical formulation of the dispersant, its concentration, and the dispersant/oil application ratio (Boehm, 1983). A recent study assessed the impacts of COREXIT EC9500A, which was widely deployed during the *Deepwater Horizon* oil spill , on microbial communities from a beach impacted by the spill (Hamdan and Fulmer, 2011). In cultured laboratory samples spiked with dispersant, the findings suggest that hydrocarbon-degrading bacteria could be impacted by very high dispersant concentrations (>1 milligram/liter [mg/L]), with potential implications for the capacity of the environment to bioremediate spills. However, in the case of the *Deepwater Horizon* oil spill, there was evidence that the dispersants worked in dispersing oil at the wellhead (USDOC, NOAA, 2010c; USEPA, 2010b). COREXIT 9527 has been shown to greatly increase volatile liquid hydrocarbons incorporation into water, as well as to accelerate the process in experiments compared with observations where no dispersant was used (McDonald et al., 1984). In fact, dispersants used during the *Deepwater Horizon* oil spill have been noted to reduce the volatile organic compounds that can be a workplace issue for response workers on ships near the site (Coastal Response Research Center et al., 2012).

During the *Deepwater Horizon* explosion, oil spill, and response, sediment and water samples collected in the nearshore zone were analyzed for a number of dispersant-related chemicals, including, but not limited to dipropylene glycol n-butyl ether (DPnB), propylene glycol, and dioctylsulfosuccinate. Between May 13 and October 20, 2010, there were 4,850 water and 412 sediment samples collected in the nearshore zone (OSAT, 2010). None of the concentrations of dispersant-related chemicals found in water samples collected during the response exceeded USEPA's benchmarks. Only 66 samples (60 water and 6 sediment) had detectable levels of dispersant-related chemicals. The DPnB was the most common detectable dispersant-compound and was found in 57 of the 60 water samples; however, concentrations never exceeded 3 micrograms/liter (μg/L) (cf. USEPA screening level 1 mg/L). The presence of dispersant-related chemicals in water occurred all along the Gulf Coast; however, a majority of the nearshore detections were encountered around Louisiana. Propylene glycol was the only dispersant-related chemical detected in the sediments. Unfortunately, no benchmark for dispersant indicator compounds in sediment exists; thus, the significance of these concentrations is unknown. . It should also be noted that hypoxic conditions in the subsurface plume were not reached during the *Deepwater Horizon* explosion and oil spill (e.g., OSAT, 2010).

It is currently impossible to estimate precisely the long-term impacts that the spill resulting from the *Deepwater Horizon* explosion will have on coastal water quality. Various monitoring efforts and environmental studies are underway. More time is needed to fully assess the impacts of the *Deepwater Horizon* explosion, oil spill, and response. Although response efforts decreased the fraction of oil remaining in Gulf waters and reduced the amount of oil contacting the coastline, oil still remains in the environment (USDOC, NOAA, 2011a and 2011c; OSAT-2, 2011). As such, there remains some incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on coastal water quality. Much of this information relates to the *Deepwater Horizon* explosion, oil spill, and response and is continuing to be collected and developed through the NRDA process. These data collection and research projects may be years from completion. Few data or conclusions have been released to the public to date. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In light of this incomplete and unavailable information, BOEM's subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology. Given the amount and scope of available direct data on sediments and water quality that have been released, as described above, BOEM believes that this incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.1.1.2.1.2. Impacts of Routine Events

Background/Introduction

The scenario information related to an EPA proposed action is presented in **Table 3-2**. The routine activities associated with an EPA proposed action that would impact water quality include the following:

- discharges during drilling of exploration and development wells;
- structure installation and removal;
- discharges during production;
- installation of pipelines;
- workovers of wells,
- maintenance dredging of existing navigational canals;
- service-vessel discharges; and
- nonpoint-source runoff from platforms and OCS Program-related vessels.

Proposed Action Analysis

Sediment disturbance and turbidity may result from nearshore pipeline installation or maintenance dredging. The installation of pipelines can increase the local total suspended solids in the water. The adverse effect on water quality would be temporary and localized. For the nearshore sections of OCS pipelines, COE and State permits for constructing pipelines would require that turbidity impacts be mitigated through the use of turbidity screens and other turbidity reduction or confinement equipment. No new navigation channels are expected to be dredged as a result of an EPA proposed action, but an EPA proposed action would contribute to maintenance dredging of existing navigation canals. Maintenance dredging would temporarily increase turbidity levels in the vicinity of the dredging and disposal of materials.

In coastal waters, the water quality would be impacted by the discharges from the service vessels in port. Service-vessel round trips projected for an EPA proposed action are 144-17,000 roundtrips over the 40-year life of an EPA proposed action (**Table 3-2**). Based on current service-base usage, it is assumed the majority of these trips would occur in Louisiana’s coastal waters. The types of discharges and regulations are discussed in **Chapter 3.1.1.4**. Most discharges are treated or otherwise managed prior to release. In coastal waters, bilge and ballast water may be discharged with an oil content of 15 ppm or less (33 CFR § 151.10). The discharges would affect the water quality locally. However, regulations are becoming more stringent. The USCG Ballast Water Management Program became mandatory for some vessels in 2004 (33 CFR part 151 subparts C and D) (USDHS, CG, 2012b). The goal of the program was designed to prevent the introduction of nonindigenous (invasive) species that would affect local water quality. The USCG is increasing its regulations on ballast water management by establishing a standard for the allowable concentration of living organisms in ballast water discharged from ships in waters of the U.S and by establishing an approval process for ballast water management systems. The final rule on the Ballast Water Discharge Standard was published on March 23, 2012, in the *Federal Register* and became effective on June 21, 2012 (USDHS, CG, 2012b). The final Vessel General Permit (VGP), issued by USEPA, became effective on December 19, 2008, and was an addition to already existing NPDES permit requirements. The permit increased the NPDES regulations so that discharges incidental to the normal operation of vessels operating as a means of transportation were no longer excluded unless exempted by Congressional legislation. The 2013 draft VGP would continue to regulate 26 specific discharge categories that were contained in the 2008 VGP, and it is more stringent because the permit contains numeric ballast water discharge limits for most vessels and more stringent effluent limits for oil to sea interfaces and exhaust gas scrubber washwater (USEPA, 2011c). The draft Small Vessel General Permit (sVGP), if finalized, would authorize discharges incidental to the normal operation of nonmilitary and non-recreational vessels less than 79 feet in length (USEPA, 2011c). At this time, a Congressional moratorium exempts all incidental discharges, with the exception of ballast water, from commercial fishing vessels and nonrecreational, nonmilitary vessels less than 79 ft (24 m) in length. However, the Congressional moratorium expires on December 18, 2013, at which time the VGP would provide coverage for those vessels (USEPA, 2011c).

Up to one new gas processing facility is projected as a result of an EPA proposed action, though construction of a new facility is not considered likely. In addition, an EPA proposed action would contribute to the use of existing onshore facilities in Louisiana, Mississippi, Alabama, and possibly Texas. These supporting onshore facilities would discharge into local wastewater treatment plants and waterways during routine operations. The types of onshore facilities are discussed in **Chapter 3.1.2.2.1**. All point-source discharges are regulated by USEPA, the Federal agency responsible for coastal water quality, or the USEPA-authorized State agency. The U.S. Environmental Protection Agency's NPDES storm-water effluent limitation guidelines control storm-water discharges from support facilities. Indirect impacts could occur from nonpoint-source runoff, such as rainfall, which has drained from infrastructure (e.g., a public road or parking lot) and may contribute hydrocarbons, trace-metal pollutants, and suspended sediments. These indirect impacts would be minimal, as long as existing regulations are followed, and difficult to discern from other sources.

Summary and Conclusion

The primary impacting sources to water quality in coastal waters are point-source and storm-water discharges from support facilities, vessel discharges, and nonpoint-source runoff. These activities are not only highly regulated but also localized and temporary in nature. The impacts to coastal water quality from routine activities associated with an EPA proposed action should be minimal because of the distance to shore of most routine activities, USEPA's regulations that restrict discharges, and few, if any, new pipeline landfalls or onshore facilities to be constructed.

4.1.1.2.1.3. Impacts of Accidental Events

Background/Introduction

Accidental events associated with an EPA proposed action that could impact coastal water quality include spills of oil and refined hydrocarbons, releases of natural gas, usage of chemical dispersants in oil spill response, spills of chemicals or drilling fluids, loss of well control, collisions, or other malfunctions that would result in such spills. **Chapter 3.2** discusses the accidental events that could result from the impact-producing factors and scenario, with particular attention given to the risk of oil spills, response to such oil spills, loss of well control, pipeline failures, vessel collisions, and chemical and drilling fluid spills. A brief summary is presented here. The impacts of rare, catastrophic spills, which are not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**.

Proposed Action Analysis

Oil Spills and Natural Gas and Condensate Releases

Water quality is altered and degraded by oil spills through the increase of petroleum hydrocarbons and their various transformation/degradation products in the water. The extent of impact from a spill depends on the behavior and fate of oil in the water column (e.g., the movement of oil and the rate and nature of weathering), which, in turn, depends on oceanographic and meteorological conditions at the time (**Appendices A.2 and A.3**), as well as human-induced actions for minimizing spill impacts (e.g., the use of chemical dispersants, in-situ burning, and containment booms/skimmers). Crude oils are not a single chemical, but instead are complex mixtures with varied compositions. The various components of the crude oil behave differently in water. Thus, the behavior of the oil and the risk that the oil poses to natural resources depends on the composition of the specific oil encountered (Michel, 1992). Generally, oils can be divided into three groups of compounds with (1) light-weight, (2) medium-weight, and (3) heavy-weight components. **Chapter 3.2.1** further describes the characteristics of OCS oil and discusses oil spills. Generally, the lighter ends of the oil are more water soluble and would contribute to acute toxicity. As the spill weathers, the aromatic components at the water's surface are more likely to exit the water through evaporation. The heavier fractions are less water soluble and would partition to organic matter. This fraction is more likely to persist in sediments and would contribute to longer-term impacts, depending on variability in physical processes (such as storms), weathering, and biodegradation.

In addition to oil, natural gas may also be explored for or produced in the GOM. Wells and sidetracks (smaller wells drilled as auxiliaries off main wells) may produce a mixture of both oil and natural gas. Condensate is a liquid hydrocarbon phase that generally occurs in association with natural gas. The quality and quantity of components in natural gas vary widely by the field, reservoir, or location from which the natural gas is produced. Although there is not a "typical" makeup of natural gas, it is primarily composed of methane (Maina, 2005). Thus, if natural gas were to leak into the environment, methane may be released to the environment. Methane, like oil, is a carbon source, and its introduction into the marine environment could result in lowering dissolved oxygen levels due to microbial degradation. For example, the *Deepwater Horizon* explosion resulted in the emission of an estimated 9.14×10^9 to 1.29×10^{10} moles of methane from the wellhead (Kessler et al., 2011; Valentine et al., 2010), with maximum subsurface methane concentrations of 183-315 micrometers measured in May/June 2010 (Valentine et al., 2010; Joye et al., 2011). This methane release corresponded to a measurable decrease in oxygen in the subsurface plume due to respiration by a community of methanotrophic bacteria; however, hypoxic conditions were never reached (OSAT, 2010). Note that methane released from the *Deepwater Horizon* explosion was generally confined to the subsurface, with minimal amounts reaching the atmosphere (Kessler et al., 2011; Ryerson et al., 2011b). Unfortunately, little is directly known about the toxicity of natural gas and its components in the marine environment, such as may have been associated with the *Deepwater Horizon* explosion, but there is noted a concern as to how methane in the water column might affect fish (**Chapter 4.1.1.17**).

The National Academy of Sciences (NRC, 2003), Patin (1999), and Boesch and Rabalais (1987) have reviewed the fate and effects of spilled oil and, to a lesser degree, natural gas releases. **Chapter 3.2.1.6** presents the risk of coastal spills associated with an EPA proposed action. Spills in coastal waters could occur at storage or processing facilities supporting the OCS oil and gas industry or from the transportation of OCS-produced oil through State offshore waters and along navigation channels, rivers, and through coastal bays. For coastal spills, two additional factors that must be considered are the shallowness of the area the spill is in and the proximity to shore. Spills in coastal waters are more likely to be in shallow waters than offshore spills. Spills near the shore are less likely to be diluted since the volume of water in shallow waters is less than in deep waters. Furthermore, spills are more likely to contact land as there is less distance from the spill to land and less time for the oil to weather before it reaches the shore. Since oil does not mix with water and is usually less dense, most of the oil forms a slick at the surface. Small droplets in the water may adhere to suspended sediment and be removed from the water column. Oil may also penetrate sand on the beach or be trapped in wetlands, where it can be re-released into the water sometime after the initial spill, such as due to resuspension during storm events.

Oil-Spill Response and Chemical Dispersants

In the case of an accidental event, it is likely that response efforts would reduce the amount of oil. **Chapter 3.2.1.8** provides a further discussion of oil-spill-response considerations. Coastal water quality would not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic, hydromodification (e.g., dredging, berm building, boom deployment, etc.), and the addition of dispersants and methanol to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree.

One standard tool used in response to spilled oil on water is dispersants. Dispersants are not preauthorized for use in coastal areas (NRC, 2005), but it is possible that the use of dispersants in offshore spills may have effects on coastal environments. The purpose of chemical dispersants is to facilitate the movement of oil into the water column in order to encourage weathering and biological breakdown of the oil (i.e., biodegradation) (NRC, 2005; Australian Maritime Safety Authority, 2010).

A large volume of chemical dispersants was applied during the *Deepwater Horizon* explosion and oil spill, equaling 1.84 million gallons of dispersant used to breakup and dilute the oil subsea at the wellhead and on the surface (Oil Spill Commission, 2011c). The dispersant formulation used was the COREXIT® series. While dispersants were not used in the nearshore sampling zone as part of the response, there were concerns that dispersant-related chemicals could be transported into the nearshore zone. Sediment and water samples collected in the nearshore zone were analyzed for a number of dispersant-related chemicals, including, but not limited to DPnB, propylene glycol, and dioctylsulfosuccinate. Between

May 13 and October 20, 2010, there were 4,850 water and 412 sediment samples collected in the nearshore zone (OSAT, 2010). None of the concentrations of dispersant-related chemicals found in water samples collected during the response exceeded USEPA's benchmarks. Only 66 samples (60 water and 6 sediment) had detectable levels of dispersant-related chemicals. The DPnB was the most common detectable dispersant-compound and was found in 57 of the 60 water samples; however, concentrations never exceeded 3 μg/L (cf. USEPA screening level 1 mg/L). Propylene glycol was the only dispersant-related chemical detected in the sediments. Unfortunately, no benchmark for dispersant-indicator compounds in sediment exists; thus, the significance of these concentrations is unknown.

Lindstrom and Braddock (2002) found that environmental use of COREXIT 9500 could result in either increases or decreases in the toxicity of residual oil through selective microbial mineralization of hydrocarbons. In fact, reviews of studies have found that the general effectiveness of dispersants in enhancing biodegradation of crude oil and individual hydrocarbons is highly variable and depends on several factors, including the chemical formulation of the dispersant, its concentration, and the dispersant/oil application ratio (Boehm, 1983). A recent study assessed the impacts of COREXIT EC9500A, which was widely deployed during the *Deepwater Horizon* oil spill, on microbial communities from a beach impacted by the spill (Hamdan and Fulmer, 2011). In cultured laboratory samples spiked with dispersant, the findings suggest that hydrocarbon-degrading bacteria could be impacted by very high dispersant concentrations (>1 mg/L), with potential implications for the capacity of the environment to bioremediate spills. However, other recent studies have found that dispersing crude oil with COREXIT 9500 lead to increased biodegradation of the oil under surface seawater (Zahed et al., 2011) and deepwater simulated (Baelum et al., 2012) laboratory studies. There was evidence that the dispersants worked in dispersing oil at the wellhead in the case of the *Deepwater Horizon* oil spill (USDOC, NOAA, 2010c; USEPA, 2010b).

If the oil moves from the surface into the water column through dispersion, it is less likely to reach sensitive shore areas (USEPA, 2010b). The toxicity of dispersed oil in the environment depends on many factors, including the effectiveness of the dispersion, temperature, salinity, the degree of weathering, type of dispersant, and degree of light penetration in the water column (NRC, 2005). The toxicity of dispersed oil is primarily due to the toxic components of the oil itself (Australian Maritime Safety Authority, 2010).

Fortunately, over time, natural processes can physically, chemically, and biologically degrade oil (NRC, 2003). The physical processes involved include evaporation, adsorption, emulsification, and dissolution; the primary chemical and biological degradation processes include photooxidation and biodegradation (i.e., microbial oxidation).

Chemical Spills

A study of chemical spills from OCS activities determined that accidental releases of zinc bromide and ammonium chloride could potentially impact the marine environment (Boehm et al., 2001). Both of these chemicals are used for well treatment or completion and are not in continuous use; thus, the risk of a spill is small. Most other chemicals are either relatively nontoxic or used in such small quantities that a spill would not result in measurable impacts. Zinc bromide is of particular concern because of the toxic nature of zinc. Close to the release point of an ammonium chloride spill, the ammonia concentrations could exceed toxic levels.

Pipeline Failures

A pipeline failure would result in the release of crude oil, condensate, or natural gas; the impacts of which are discussed above. Pipeline failures are discussed in more detail in the **Chapter 3.2.3**.

Fuel Oil Spills from Collisions

A collision may result in the spillage of crude oil, refined products such as diesel, or chemicals. Crude oil and chemicals are discussed in the preceding paragraphs. Diesel is the type of refined hydrocarbon spilled most frequently as the result of a collision. Minimal impacts result from a spill since diesel is light and will evaporate, naturally disperse, and/or biodegrade within a few days (USDOC, NOAA, 2012a). A collision could result in the release of up to the entire contents of the fuel tanks. Since collisions occur infrequently, the potential impacts to coastal water quality are not expected to be significant.

Summary and Conclusion

Accidental events associated with an EPA proposed action that could impact coastal water quality include spills of oil and refined hydrocarbons, releases of natural gas and condensate, usage of chemical dispersants in oil-spill response, and spills of chemicals or drilling fluids. The loss of well control, pipeline failures, collisions, or other malfunctions could also result in such spills. Although response efforts may decrease the amount of oil in the environment, the response efforts may also impact the environment through, for example, increased vessel traffic, hydromodification, and application of dispersants. Natural degradation processes would also decrease the amount of spilled oil over time. For coastal spills, two additional factors that must be considered are the shallowness of the area and the proximity of the spill to shore. Over time, natural processes can physically, chemically, and biologically degrade oil. Chemicals used in the oil and gas industry are not a significant risk in the event of a spill because they are either nontoxic, are used in minor quantities, or are only used on a noncontinuous basis. Spills from collisions are not expected to be significant because collisions occur infrequently.

4.1.1.2.1.4. Cumulative Impacts

Background/Introduction

Activities in the cumulative scenario that could impact coastal water quality generally include the broad categories of an EPA proposed action and the OCS Program, State oil and gas activity, the activities of other Federal agencies (including the military), natural events or processes, and activities related to the direct or indirect use of land and waterways by the human population (e.g., urbanization, agricultural practices, coastal industry, and municipal wastes). Many of these categories would cause some of the same specific impacts (e.g., vessel traffic would occur for all of those categories except natural processes).

OCS Oil- and Gas-Related Impacts

The OCS oil- and gas-related impacts include erosion and runoff, sediment disturbance and turbidity, vessel discharges, and accidental releases of oil, gas, or chemicals. Further discussion on these impacts is described below.

Erosion and runoff from nonpoint sources degrade water quality. Nonpoint-source runoff from onshore support facilities could result from OCS-related activities; however as discussed below, OCS activities are not the leading source of contaminants that impair coastal water quality. The leading source of contaminants that impair coastal water quality is urban runoff.

Sediment disturbance and turbidity may result from nearshore pipeline installation, maintenance dredging, and disposal of dredge materials. These impacts generally degrade water quality locally and are not expected to last for long periods of time.

Since the marine environment is a dynamic system, sediment quality and water quality can affect each other. For example, a contaminant may react with the mineral particles in the sediment and be removed from the water column (e.g., adsorption). Thus, under appropriate conditions, sediments can serve as sinks for contaminants such as metals, nutrients, or organic compounds. However, if sediments are (re)suspended (e.g., due to dredging or a storm event), the resuspension can lead to a temporary shift in water quality, including a localized and temporal release of any formally sorbed metals as well as nutrient recycling (Caetano et al., 2003; Fanning et al., 1982). Additionally, sediment disturbances from a hurricane may also lead to any buried coastal oil being released, as was seen by the deposition of *Deepwater Horizon* tarballs on some beaches after Hurricane Isaac (Burdeau and Reeves, 2012; Overton, official communication, 2012).

Vessel discharges can degrade water quality. Vessels may be service vessels supporting a proposed action or OCS-related activities. Fortunately, for many types of vessels, most discharges are treated or otherwise managed prior to release through regulations administered by USCG and/or USEPA, and many regulations are becoming more stringent. The USCG Ballast Water Management Program became mandatory for some vessels in 2004 (33 CFR part 151 subparts C and D) (USDHS, CG, 2012b). The goal of the program was designed to prevent the introduction of nonindigenous (invasive) species that would affect local water quality. The USCG is increasing its regulations on ballast water management by establishing a standard for the allowable concentration of living organisms in ballast water discharged from ships in waters of the U.S and by establishing an approval process for ballast water management systems. The final rule was published on March 23, 2012, in the *Federal Register* and became effective on June 21, 2012 (USDHS, CG, 2012b). The final Vessel General Permit (VGP), which was issued by USEPA, became effective on December 19, 2008, and was an addition to already existing NPDES permit requirements. The permit strengthened the NPDES regulations so that discharges incidental to the normal operation of vessels operating as a means of transportation were no longer excluded unless exempted by Congressional legislation. The 2013 draft VGP would continue to regulate 26 specific discharge categories that were contained in the 2008 VGP, and it is more stringent because the permit contains numeric ballast water discharge limits for most vessels and more stringent effluent limits for oil-to-sea interfaces and exhaust gas scrubber washwater (USEPA, 2011c). The draft Small Vessel General Permit (sVGP), if finalized, would authorize discharges incidental to the normal operation of nonmilitary and nonrecreational vessels less than 79 ft (24 m) in length (USEPA, 2011c). These regulations should minimize the cumulative impacts of vessel activities.

Accidental releases of oil, gas, or chemicals would degrade water quality during and after the spill until either the spill is cleaned up or natural processes degrade or disperse the spill. These accidental releases could be a result of an EPA proposed action or ongoing OCS activity. The impacts of rare, catastrophic spills, which are not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**. A catastrophic spill event, which is not reasonably expected and not part of an EPA proposed action, would not be expected to occur in coastal waters, but a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, in offshore waters could affect coastal waters. For example, the oil spill resulting from the *Deepwater Horizon* explosion impacted coastal waters and sediments in Louisiana, Mississippi, Alabama, and Florida. The extent of impact from a spill depends on the release location and the behavior and fate of oil in the water column (e.g., the movement of oil and the rate and nature of weathering), which, in turn, depends on oceanographic and meteorological conditions at the time (**Appendices A.2 and A.3**). The effect on coastal water quality from spills estimated to occur from an EPA proposed action are expected to be minimal relative to the cumulative effects from hydrocarbon inputs from other sources such as river outflow, industrial discharges, and bilge water releases, as discussed in the National Research Council's report *Oil in the Sea* (NRC, 2003).

A major hurricane can result in a greater number of coastal oil and chemical spill events with increased spill volume and oil-spill-response times. In the case of an accidental event, it is likely that response efforts would reduce the amount of oil. **Chapter 3.2.1.8** provides further discussion of oil-spill-response considerations. Coastal water quality would not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic, hydromodification (e.g., dredging, berm building, boom deployment, etc.) and the addition of dispersants and methanol to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree.

Non-OCS Oil- and Gas-Related Impacts

Activities not related to an EPA proposed action or the OCS Program that may impact coastal waters include State oil and gas activities, the activities of other Federal agencies (including the military), natural events or processes, and activities related to the direct or indirect use of land and waterways by the human population. These activities may result in erosion and runoff, sediment disturbance and turbidity, vessel discharges, and accidental releases of oil, gas, or chemicals. Further discussion on these impacts is described below.

Water quality in coastal waters of the northern Gulf of Mexico is highly influenced by season. Seasonality influences salinity and dissolved oxygen, nutrient content, temperature, pH and Eh, pathogens, turbidity, metals, and organic compounds. Furthermore, as noted above, it is also important to consider sediment quality as sediment quality can affect water quality.

Erosion and runoff from nonpoint sources degrade water quality. Nonpoint-source runoff could result from State oil and gas activities and other industries and coastal development. The leading source of contaminants that impair coastal water quality is urban runoff. Urban runoff can include suspended solids, heavy metals and pesticides, oil and grease, nutrients, and organic matter. Urban runoff increases with population growth, and the Gulf Coast region has experienced a 109 percent population growth since 1970, with an additional expected 15 percent increase by 2020 (USDOC, NOAA, 2011b). The National

Research Council (2003, Table I-4, page 237) estimated that, on average, approximately 26,324 bbl of oil per year entered Gulf waters from petrochemical and oil refinery industries in Louisiana and Texas. **Chapter 3.1.1.7** discusses the various sources of petroleum hydrocarbons that can enter the Gulf of Mexico in further detail. The natural emptying of rivers into the GOM as part of the water cycle may introduce chemical and physical factors that alter the condition of the natural water through both natural and anthropogenic sources, such as the addition of waterborne pollutants and inflowing waters of different temperature, as well as inputs to the GOM from groundwater discharge and precipitation. The Mississippi River introduced approximately 3,680,938 bbl of oil and grease per year from land-based sources (NRC, 2003, Table I-9, page 242) into the waters of the Gulf. Nutrients carried in waters of the Mississippi River contribute to seasonal formation of the hypoxic zone on the Louisiana-Texas shelf. The USEPA proposed the first set of nutrient standards in 2010 for the State of Florida. However, the effective date on those standards was postponed so USEPA could review proposed criteria from the State of Florida (USEPA, 2012). The proposed water quality standards would set a series of numeric nutrient (nitrogen and phosphorus) limitations for Florida's lakes, rivers, streams, springs, and canals; future standards are expected for Florida's estuaries and coastal waters. The USEPA has regulatory programs designed to protect the waters that enter the Gulf, including the regulation of point-source discharges. The USEPA has authorized the Gulf Coast States to administer the State NPDES programs.

Sediment disturbance and turbidity may result from nearshore pipeline installation, maintenance dredging, disposal of dredge materials, sand borrowing, sediment deposition from rivers, and hurricanes. Turbidity is also influenced by the season. These impacts may be the result of State oil and gas activities, the activities of other Federal agencies, and natural processes. Dredging projects related to restoration or flood prevention measures may be directed by the Federal Government for the benefit of growing coastal populations. The COE and State permits would require that the turbidity impacts due to pipeline installation be mitigated by using turbidity screens and other turbidity reduction or confinement equipment. These impacts generally degrade water quality locally and are not expected to last for long periods of time.

Vessel discharges can degrade water quality. Vessels may be service vessels supporting State oil and gas activities. However, the vessels may also be vessels used for shipping, fishing, military activities, or recreational boating. Fortunately, for many types of vessels, most discharges are treated or otherwise managed prior to release through regulations administered by USCG and/or USEPA, and many regulations such as the USCG Ballast Water Management Program and the U.S. Environmental Protection Agency's VGP and sVGP are becoming more stringent as discussed in further detail above. At this time, a Congressional moratorium exempts all incidental discharges, with the exception of ballast water, from commercial fishing vessels and nonrecreational, nonmilitary vessels less than 79 ft (24 m) in length. However, the Congressional moratorium expires on December 18, 2013, at which time the sVGP would provide coverage for those vessels (USEPA, 2011c). These regulations should minimize the cumulative impacts of vessel activities.

Accidental releases of oil, gas, or chemicals would degrade water quality during and after the spill until either the spill is cleaned up or natural processes degrade or disperse the spill. These accidental releases could be a result of State oil and gas activity, the transport of commodities to ports, and/or coastal industries. The extent of impact from a spill depends on the release location and the behavior and fate of oil in the water column (e.g., the movement of oil and the rate and nature of weathering), which, in turn, depends on oceanographic and meteorological conditions at the time.

A major hurricane can result in a greater number of coastal oil and chemical spill events with increased spill volume and oil-spill-response times. In the case of an accidental event, it is likely that response efforts would reduce the amount of oil. Coastal water quality would not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic, hydromodification (e.g., dredging, berm building, boom deployment, etc.), and the addition of dispersants and methanol to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree.

Summary and Conclusion

Water quality in coastal waters would be impacted by sediment disturbance and suspension (i.e., turbidity), vessel discharges, erosion, runoff from nonpoint-source pollutants (including river inflows), seasonal influences, and accidental events. These impacts may be a result of an EPA proposed action and the OCS Program, State oil and gas activity, the activities of other Federal agencies (including the military), natural events or processes, or activities related to the direct or indirect use of land and waterways by the human population (e.g., urbanization, agricultural practices, coastal industry, and municipal wastes). The impacts resulting from an EPA proposed action are a small addition to the cumulative impacts on the coastal waters of the Gulf of Mexico because non-OCS activities, including vessel traffic, erosion, and nonpoint source runoff, are cumulatively responsible for a majority of coastal water impacts. Increased turbidity and discharge from an EPA proposed action would be temporary in nature and minimized by regulations and mitigation. Since a catastrophic OCS Program-related accident would be rare, not reasonably expected, not part of an EPA proposed action, and not expected to occur in coastal waters, the impact of accidental spills is expected to be small. The incremental contribution of the routine activities and accidental events associated with a proposed action to the cumulative impacts on coastal water quality is not expected to be significant for the reasons identified above.

4.1.1.2.2. Offshore Waters

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for offshore water quality can be found in Chapter 4.2.1.2.2 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.2.2 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.2.2 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.2.2 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for offshore water quality regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for offshore water quality presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below no new significant information was discovered that would alter the impact conclusions for offshore water quality presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on water quality, and various Internet and publicly available sources were examined to determine any recent information regarding water quality. Sources investigated included, but were not limited to, journals and scientific articles, Google, Google Scholar, several USEPA websites, the Gulf of Mexico Sea Grant Programs website, the Coastal Response Research at the University of New Hampshire website, and the NOAA Central Library *Deepwater Horizon*: A Preliminary Bibliography of Published Research and Expert Commentary website. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding water quality since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, it is currently impossible to estimate precisely the long-term impacts that the *Deepwater Horizon* oil spill will have on offshore water quality. The *Deepwater Horizon* explosion and oil spill occurred in offshore waters and was of considerable magnitude. Various monitoring efforts and environmental studies are underway. Although response efforts decreased the fraction of oil remaining in Gulf waters and reduced the amount of oil contacting the coastline, oil still remains in the offshore environment, albeit at levels that were considered not actionable by USCG (OSAT, 2010). As such, there is incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on offshore water quality. This information includes data and analyses that may be forthcoming after the *Deepwater Horizon* explosion, oil spill, and response, and is continuing to be collected and developed through the NRDA process.

These data collection and research projects may be years from completion. Few data or conclusions have been released to the public to date. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In light of this incomplete and unavailable information, BOEM's subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology. Given the data samples that are available regarding water quality and sediments after the *Deepwater Horizon* explosion, oil spill, and response, as described in this section, BOEM believes that this incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.1.1.2.2.1. Description of the Affected Environment

The Gulf of Mexico is the ninth largest waterbody in the world (USDOC, NOAA, 2008a). Over 150 rivers empty out of North America into the Gulf of Mexico (Gore, 1992, page 127). The majority of this input is accounted for by the two largest United States' deltas, the Mississippi River Delta and the 5-river Mobile Bay System (Gore, 1992, page 127). The river deltas emptying into the Gulf bring freshwater and sediment into coastal waters (Gore, 1992, pages 127-131), which affects the water quality of receiving waters. Rivers carry excess nutrients (e.g., nitrogen and phosphorus), as well as other possible inputs such as contaminants from industrial wastewater discharge, downstream; this effect is cumulative as the river reaches an estuary (Gore, 1992, pages 280 and 291). The emptying of rivers into the GOM is part of the hydrologic cycle or water cycle (USDOI, GS, 2010a). Understanding this cycle not only explains the movement of water on Earth but also how water quality might be affected by both natural and anthropogenic sources. The water cycle may introduce components into the GOM through waterbodies emptying into the GOM, runoff, groundwater discharge, or precipitation. Water quality can be affected by not only chemical processes but also by physical and biological processes. For example, the water quality of the Gulf of Mexico is influenced by the physical oceanography of the Gulf of Mexico, which is described in **Chapter 3.3.5.1 and Appendix A.2**. Besides nutrients, water quality is generally gauged by measuring a series of parameters commonly including, but not limited to, temperature, salinity, dissolved oxygen, pH, Eh, pathogens, and turbidity. Water quality may also examine possible pollutants such as metals and organic compounds.

The water offshore of the Gulf's coasts can be divided into two regions: shallow (<1,000 ft; 305 m) and deep water (>1,000 ft; 305 m). Waters on the continental shelf (0-200 m; 0-656 ft) and slope (200-2,000 m; 656-6,562 ft) are heavily influenced by the Mississippi and Atchafalaya Rivers, the primary sources of freshwater, sediment, nutrients, and pollutants from a huge drainage basin encompassing 55 percent of the continental U.S. (Murray, 1998). The presence or extent of a nepheloid layer, a body of suspended sediment at the sea bottom (Kennet, 1982, page 524), affects water quality on the shelf and slope. Deep waters east of the Mississippi River are affected by the Loop Current and associated warm-core (anticyclonic) eddies, which consist of clear, low-nutrient water (Muller-Karger et al., 2001). These anticyclonic eddies can entrain and transport high turbidity shelf waters farther offshore over deep Gulf waters. Cold-core cyclonic eddies (counterclockwise rotating) also form at the edge of the Loop Current and are associated with upwelling and nutrient-rich, high-productivity waters. More details on the physical oceanography of the Gulf of Mexico are available in **Chapter 3.3.5.1 and Appendix A.2**.

Seawater generally averages pH 8 at the surface due to marine systems being buffered by carbonates and bicarbonates. However, in the open waters of the Gulf of Mexico, pH ranges from approximately 8.1 to 8.3 at the surface (Gore, 1992, page 87). The pH decreases to approximately 7.9 at a depth of 700 m (2,297 ft), and in deeper waters, it increases again to approximately 8.0 (Gore, 1992, page 87).

The salinity at the sea surface in the offshore central Gulf of Mexico is generally 36 ppt (Gore, 1992, page 81). Lower salinities are characteristic nearshore where freshwater from the rivers mix with Gulf waters. For example, salinity can decrease to less than 25 ppt near inlets due to riverine inputs (Gore, 1992, page 81). Salinity also varies seasonally. For example, salinity in open water near the coast may vary between 29 and 32 psu during fall and winter but decline to 20 psu during spring and summer due to increased runoff (USDOI, MMS, 2000a).

Temperatures in the Gulf of Mexico vary seasonally. The average summer surface temperature is approximately 29 ºC (84 ºF) (Gore, 1992, page 79). In winter, temperature in the northern Gulf is 19 ºC (65 ºF), and in the southern portion of the Gulf, it is about 24 ºC (75 ºF) (Gore, 1992, page 79). However, temperatures may dip lower during cold fronts. In winter, seawater is well mixed vertically (Gore, 1992, page 80). At other times, sea-surface temperatures can vary from temperatures at depth. In the summer, warm water may be found from the surface down to a certain depth known as the thermocline. Below this depth, the temperature becomes cooler and therefore the water becomes denser (Gore, 1992, page 79-80). In the Gulf, the thermocline may be found anywhere from just below the surface to 160 ft (50 m) deep. Seawater also gets colder in deep water. Below 1,000 m (about 3,300 ft), temperatures are the coldest in the Gulf at <4.4 ºC (40 ºF).

Dissolved oxygen enters the upper waters (~100-200 m; 328-656 ft) of the Gulf of Mexico through the atmosphere and photosynthesis (Jochens et al., 2005). In deep waters, dissolved oxygen is introduced through the transport and mixing of oxygen-rich watermasses into the Gulf of Mexico from the Caribbean Sea through the Yucatan Channel (Jochens et al., 2005). The Gulf of Mexico does not have watermass formation to replenish the deep oxygen concentrations (Jochens et al., 2005). Thus, the deep circulation of the Gulf of Mexico and its related mixing are the mechanisms that replenish the deep oxygen (Jochens et al., 2005). Oxidation of organic matter is the major oxygen sink in the Gulf of Mexico (Jochens et al., 2005). The Gulf of Mexico has an oxygen minimum zone, which is generally located from 300 to 700 m (984 to 2,297 ft) (Jochens et al., 2005).

Though the largest zone of hypoxia in the United States is the zone on the Louisiana-Texas shelf, separate zones of hypoxia have been discovered in other shelf regions such as a recent dead zone that stretched from the Chandeleur Sound off Louisiana's coast to Alabama's Dauphin Island and possibly beyond (McConnaughey, 2012). However, the article notes that hypoxia off of Florida's coast is not likely due to the geology and currents in the area.

The priority, water quality issues identified by the Gulf of Mexico Alliance are as follows: (1) reducing the risk of exposure to disease-causing pathogens; (2) minimizing the occurrence and effects of harmful algal blooms; (3) identifying the sources of mercury in Gulf seafood; and (4) improving the monitoring of Gulf water resources (Gulf of Mexico Alliance, 2012). In addition to water quality itself, nutrients and nutrient impacts are also a regional priority issue for the organization (Gulf of Mexico Alliance, 2012).

As with coastal waters, water and sediments on the shelf and slope are greatly affected by runoff. Runoff may include any number of pollutants such as nutrients, pesticides and other organic chemicals, and metals. The National Research Council (2003, Table I-4, page 237) estimated that, on average, approximately 26,324 bbl of oil per year entered Gulf waters from petrochemical and oil refinery industries in Louisiana and Texas. The Mississippi River introduced approximately 3,680,938 bbl of oil and grease per year from land-based sources (NRC, 2003, Table I-9, page 242) into the waters of the Gulf of Mexico. Offshore waters, especially deeper waters, are more directly affected by natural seeps that are located in offshore waters of the Gulf of Mexico. Hydrocarbons enter the Gulf of Mexico through natural seeps in the Gulf of Mexico at a rate of approximately 980,392 bbl per year (a range of approximately 560,224-1,400,560 bbl per year) (NRC, 2003, page 191). Hydrocarbons from natural seeps are considered to be the highest contributor of petroleum hydrocarbons to the marine environment (NRC, 2003, page 33). Produced water (formation water) is the largest waste stream by volume from the oil and gas industry that enters Gulf waters. Produced water is commonly treated to separate free oil and is either injected back into the reservoir or discharged overboard according to NPDES permit limits. The NRC has estimated the quantity of oil in produced water entering the Gulf per year to be 473,000 bbl (NRC, 2003, page 200, Table D-8). These numbers were generated from converting the units reported in the noted reference and do not imply any level of significance.

Since the marine environment is a dynamic system, sediment quality and water quality can affect each other. For example, a contaminant may react with the mineral particles in the sediment and be removed from the water column (e.g., adsorption). Thus, under appropriate conditions, sediments can serve as sinks for contaminants such as metals, nutrients, or organic compounds. However, if sediments are (re)suspended (e.g., due to dredging or a storm event), the resuspension can lead to a temporary redox flux, including a localized and temporal release of any formally sorbed metals as well as nutrient recycling (Caetano et al., 2003; Fanning et al., 1982). However, resuspension events are less likely in deepwater environments. Deepwater sediments, with the exception of barium concentrations in the vicinity of previous drilling, do not appear to contain elevated levels of metal contaminants (USDOI, MMS, 1997 and 2000a). The western Gulf has lower levels of total organic carbon and hydrocarbons in sediment, particularly those from terrestrial sources, than the central Gulf (Gallaway and Kennicutt, 1988). Reported total hydrocarbons, including biogenically derived (e.g., from biological sources), in sediments collected from the Gulf slope range from 5 to 86 nanograms/gram (Kennicutt et al., 1987).

Hydrocarbons in sediments have been determined to influence biological communities of the Gulf slope, even when present in trace amounts (Gallaway and Kennicutt, 1988).

A 3-year, environmental baseline study conducted from 1974 to 1977 in the eastern GOM resulted in an overview of the Mississippi, Alabama, and Florida (MAFLA) OCS environment to 200 m (656 ft) (State University System of Florida, Institute of Oceanography, 1977; Dames & Moore, Inc., 1979). Analysis of water, sediments, and biota for hydrocarbons indicated that the MAFLA area is relatively pristine, with some influence of anthropogenic and petrogenic hydrocarbons from river sources. Analysis of trace metal contamination for the trace metals analyzed (barium, cadmium, chromium, copper, iron, lead, nickel, vanadium, and zinc) also indicated no contamination. A decade later, the continental shelf off Mississippi and Alabama was revisited (Brooks, 1991). Bottom sediments were analyzed for high-molecular-weight hydrocarbons and heavy metals. High-molecular-weight hydrocarbons can come from natural petroleum seeps at the seafloor or recent biological production as well as input from anthropogenic sources. In the case of the Mississippi-Alabama shelf, the source of petroleum hydrocarbons and terrestrial plant material is the Mississippi River. Higher levels of hydrocarbons were observed in the late spring, which coincides with increased river influx. The sediments, however, are washed away later in the year, as evidenced by low hydrocarbon values in winter months. Contamination from trace metals was not observed (Brooks, 1991).

Several studies have addressed offshore water and sediment quality in deep waters. Water at depths >1,400 m (4,593 ft) is relatively homogeneous with respect to temperature, salinity, and oxygen (Nowlin, 1972; Pequegnat, 1983; Gallaway et al., 1988; Jochens et al., 2005). Limited analyses of trace metals and hydrocarbons for the water column and sediments exist (Trefry, 1981; Gallaway et al., 1988). Continental Shelf Associates, Inc. (CSA) completed an Agency-funded field study of four drilling sites located in water depths of 1,033-1,125 m (3,389-3,691 ft) (CSA, 2006). The sampling design called for before and after exploratory or development drilling and captured the drilling-related changes that occur in sediments and sediment pore water. Chemical impacts of drilling were detected at all four sites. Impacts noted within the near-field zone included elevated barium, SBF, total organic carbon concentrations, and low sediment oxygen levels. At the Viosca Knoll Block 916 site, the closest drilling activity had occurred 1.4 mi (2.3 km) north-northwest and 2 years prior to the study; no drilling had ever been performed at the Viosca Knoll Block 916 site. The site was located at a water depth of 1,125 m (3,691 ft) and 70 mi (120 km) from the mouth of the Mississippi River. At this relatively pristine location, mean concentrations of sediment barium increased by ~30-fold at near-field stations following exploratory drilling (from 0.108% to 3.32%). As well, mean concentrations of sediment mercury and total PAH's increased in the near-field from 71 to 90 nanograms/gram and 232 to 279 nanograms/gram, respectively. At this site, sediment cadmium concentrations did not change significantly following exploratory drilling.

The condition of offshore waters of the Gulf of Mexico was altered by the *Deepwater Horizon* explosion and oil spill. The Government estimated that approximately 4.9 million barrels of oil were released during the event (Oil Spill Commission, 2011b) and that 1.84 million gallons of dispersant were used subsea at the wellhead and on the surface (Oil Spill Commission, 2011c). As well, the corresponding emission of methane from the wellhead during the event was estimated between 9.14×10^9 and 1.25×10^{10} moles (Kessler et al., 2011). Independent analysis of chemical measurements derived an average environmental release rate for hydrocarbons of $(10.1\pm 2.0) \times 10^6$ kg/d, which confirmed the official average leak rate of $(10.2 \pm 1.0) \times 10^6$ kg/d (Ryerson et al., 2011a). In shelf waters, surface water oiling stretched from a maximum westward extent at roughly the Louisiana-Texas border to an eastward extent around Apalachicola, Florida (Oil Spill Commission, 2011b, Figure 7.1). Surface oiling was also observed stretching southward from the spill site, farther over deep waters, as oil was advected by cyclones at the northern edge of the Loop Current (e.g., USDOC, NOAA, 2010c). To date, oil from the *Deepwater Horizon* explosion has not been identified as having entered the Loop Current. A subsurface oil and gas plume was discovered in deep waters between ~1,100 and 1,300 m (3,609 and 4,265 ft) (e.g., Diercks et al., 2010). Based on in-situ fluorescence and oxygen measurements (likely indicators of oil concentration and biodegradation, respectively), the subsurface plume traveled to the northeast of the wellhead and much farther to the southwest, reaching as far west as approximately -93.0° (e.g., Kessler et al., 2011; refer to supporting online material).

Offshore water quality would not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic, hydromodification, and the addition of dispersants, methanol, and water-based drilling mud to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree. Fortunately, over time, natural processes can physically, chemically, and biologically degrade oil (NRC, 2003). The physical processes involved include evaporation, emulsification, and dissolution; the primary chemical and biological degradation processes include photooxidation and biodegradation (i.e., microbial oxidation). Studies of the surface slick found that, despite being nutrient-limited as noted by no evidence of an increase in microbial biomass, microbial respiration within the oil slick was enhanced by almost a factor of five (Edwards et al., 2011). The study concluded that the microbial community in the Gulf of Mexico supported remarkable rates of oil respiration despite a lack of dissolved nutrients (e.g., phosphorus) (Edwards et al., 2011).

The oil that entered the Gulf of Mexico from the *Deepwater Horizon* explosion is a South Louisiana sweet crude oil (i.e., it is low in sulfur) (USDOC, NOAA, 2010b). The oil is fairly high in alkanes (organic compounds containing only carbon and hydrogen and single bonds, sometimes called paraffin or aliphatic compounds) (USDOC, NOAA, 2010b). Because alkanes are simple hydrocarbons, these oils are likely to undergo biodegradation more easily (USDOC, NOAA, 2010b). Weathering of crude can occur within the first 24-48 hours with up to a 40 percent weight loss within 7 days (English, 2010). Also, this oil is less toxic than other crude oils in general because this oil is lower in PAH’s than many crude oils. Studies indicate that the oil contained approximately 3.9 percent PAH’s by weight, which results in an estimated release of 2.1×10^{10} grams of PAH’s (Reddy et al., 2011; Reddy, official communication, 2012).

The *Deepwater Horizon* explosion released natural gas into the water column in addition to oil. Methane is the primary component of natural gas (Maina, 2005). Limited research is available for the biogeochemistry of hydrocarbon gases in the marine environment (Patin, 1999, page 233). Theoretically, methane could stay in the marine environment for long periods of time (Patin, 1999, page 237) as methane is highly soluble in sea water at the high pressures and cold temperatures found in deepwater environments (NRC, 2003, page 108). Methane diffusing through the water column would likely be oxidized in the aerobic zone and would rarely reach the air-water interface (Mechalas, 1974, page 23). During the *Deepwater Horizon* explosion and oil spill, methane and oxygen distributions were measured at 207 stations throughout the affected region (Kessler et al., 2011). Based on these measurements, it was concluded that, within ~120 days from the onset of release, $\sim 3.0 \times 10^{10}$ to 3.9×10^{10} moles of oxygen were respired, primarily by methanotrophs, and left behind a residual microbial community containing methanotrophic bacteria. The researchers further suggested that a vigorous deepwater bacterial bloom respired nearly all the released methane within this time and that, by analogy, large-scale releases of methane from hydrate in the deep ocean are likely to be met by a similarly rapid methanotrophic response. However, lively debate continues over these findings (Joye et al., 2011; Kessler et al., 2011). Unfortunately, little is directly known about methane toxicity in the marine environment, but in light of plumes identified with the *Deepwater Horizon* explosion, there is concern as to how methane in the water column might affect fish (**Chapter 4.1.1.17)**.

As in coastal waters, extensive water and sediment sampling was performed in offshore waters by the response to the *Deepwater Horizon* explosion and oil spill (OSAT, 2010). Note that the following is a synthesis of data from the offshore (shelf) and deepwater sampling zones in the OSAT report, separated by the 200-m (656-ft) isobath. Approximately 700 water and 250 sediment samples collected in shelf waters from May through October 2010 were analyzed in the OSAT report. Chronic and acute aquatic life ratios were calculated for all samples in which PAH compounds were analyzed. Six water samples in shelf waters exceeded USEPA’s chronic aquatic life benchmark, and one of these exceeded the acute aquatic life benchmark during May-June 2010. No shelf water samples exceeded the benchmark after August 3, 2010. In shelf sediment samples, none of the samples exceeded USEPA’s chronic aquatic life benchmark. In the deepwater sampling zone, water and sediment samples were collected by a number of vessels (NOAA, BP contract, and academic) operating both in the vicinity of the wellhead and in the far field. Approximately 4,000 water and sediment samples from the deepwater zone were analyzed in the OSAT report. In the deepwater zone, there was a total of 70 exceedances of aquatic life benchmarks for PAH’s in water and 7 exceedances in sediment. Chronic exceedances in water samples in deepwater potentially associated with Mississippi Canyon Block 252 oil were constrained to within approximately 70 km (43 mi) of the wellhead and to approximately two depths (the near-surface and the subsurface between ~1,100 and 1,300 m [3,609 and 4,265 ft]). Quantitative results indicate that deposits of drilling mud-entrained oil remained near the wellhead. Seven sediment samples within 3 km (2 mi) of the wellhead collected since August 3, 2010, exceeded aquatic life benchmarks for PAH's, with oil concentrations of 2,000-5,000 ppm.

One tool that was used in response to the oil leaking into the Gulf of Mexico from the *Deepwater Horizon* explosion was dispersants. The purpose of chemical dispersants is to facilitate the movement of oil into the water column in order to encourage weathering and biological breakdown of the oil (i.e., biodegradation) (NRC, 2005; Australian Maritime Safety Authority, 2010). If the oil moves into the water column and is not on the surface of the water, it is less likely to reach sensitive shore areas (USEPA, 2010b). In addition to dispersion being enhanced by artificial processes, oil may also be dispersed through natural processes. For example, microbial metabolism of crude oil results in the dispersion of oil (Bartha and Atlas, 1983). Dispersion has both positive and negative effects. The positive effect is that the oil, once dispersed, may be more available to be degraded (however, we note that contrary findings for beached oil were presented by Hamdan and Fulmer, 2011). The negative effect is that the oil, once dispersed, is more available to microorganisms and temporarily increases the toxicity (Bartha and Atlas, 1983). Toxicity of dispersed oil in the environment would depend on many factors, including the effectiveness of the dispersion, temperature, salinity, the degree of weathering, type of dispersant, and the degree of light penetration in the water column (NRC, 2005). The toxicity of dispersed oil is primarily due to the toxic components of the oil itself (Australian Maritime Safety Authority, 2010).

COREXIT 9500 and 9527 were used in the response to the *Deepwater Horizon* explosion and oil spill (USEPA, 2010b). The components of these dispersants are identical, with the exception of the base solvent; COREXIT 9527 has an organic solvent as a base (McDonald et al., 1984; USEPA, 2010b). Dispersants used in the 1960's were quite toxic, but more recently developed dispersants such as COREXIT are considerably less toxic (Doe and Wells, 1978; Leahy and Colwell, 1990). Lindstrom and Braddock (2002) found that environmental use of COREXIT 9500 could result in either increases or decreases in the toxicity of residual oil through selective microbial mineralization of hydrocarbons. In fact, reviews of studies have found that the general effectiveness of dispersants in enhancing biodegradation of crude oil and individual hydrocarbons is highly variable and depends on several factors, including the chemical formulation of the dispersant, its concentration, and the dispersant/oil application ratio (Boehm, 1983). However, there was evidence that the dispersants worked in the case of the *Deepwater Horizon* explosion and oil spill, and response (USDOC, NOAA, 2010c; USEPA, 2010b). COREXIT 9527 has been shown to greatly increase volatile liquid hydrocarbons' incorporation into water as well as to accelerate the process in experiments compared with if no dispersant was used (McDonald et al., 1984). In fact, dispersants used during the *Deepwater Horizon* oil spill were noted to reduce the volatile organic compounds, which can be a workplace issue for response workers on ships near the site (White House Press Briefing, 2010). Since the amount of dispersants used in the *Deepwater Horizon* oil spill is unprecedented and since this is the first time dispersants have been applied in deep waters, continual monitoring and evaluation of their use is imperative (White House Press Briefing, 2010). Note, however, that hypoxic conditions were not reached during the *Deepwater Horizon* explosion and oil spill in the subsurface plume (e.g., OSAT, 2010).

The amounts of dispersant sprayed at the surface and injected at the wellhead were 1,072,514 gallons and 771,272 gallons, respectively (USDHS, CG, 2010). The fate of this dispersant remains under study. As part of the *Deepwater Horizon* oil spill response, the OSAT (2010) report analyzed results from water and sediment samples analyzed for dispersant-related chemicals collected from June through October 2010. Deepwater samples were analyzed for the dispersant-related chemicals 2-butoxyethanol, DPnB, and propylene glycol. Screening levels exist for dispersant compounds in water only. The dispersant-related chemical measured predominantly in the deepwater zone was DPnB, with a benchmark for DPnB in water of 1,000 μg/L (1 ppm). Of the 4,114 total water samples that were analyzed for dispersants in deep water, 353 samples contained measurable amounts of DPnB. The range in detected DPnB concentrations was 0.0170-113.4 μg/L (mean 4.3 μg/L), with all samples significantly below the chronic screening level. Peaks in DPnB detections were observed in two distinct layers, at the surface and in the subsurface (1,100-1,300 m; 3,609-4,265 ft) similar to distributions of exceedances of the aquatic life benchmark for PAH's. Of 440 shelf water samples analyzed, there were no exceedances of dispersant-related benchmarks for individual compounds. Approximately half of these samples did have detections of dispersant-related chemicals. In shelf sediment samples, there was only one detection of a dispersant-related chemical out of 243 samples. The anionic surfactant, dioctyl sodium sulfosucinate (DOSS), is a component of both COREXIT formulations. Studies of the deep water during and after the flow of the oil had ceased showed that DOSS, used as a tracer of the polar components of the two COREXIT formulations, was selectively associated with the oil and gas phases in the deepwater plume and did not intermingle with surface dispersant applications (Kujawinski et al., 2011). It is possible that biodegradation or sedimentation contributed to the decrease of DOSS concentrations over time; however, dilution is believed to be the primary process affecting the concentration of DOSS (Kujawinski et al., 2011).

Dissolved oxygen levels are a concern with any release of a carbon source, such as oil and natural gas, and became a particular concern during the *Deepwater Horizon* oil spill and gas release, since dispersants were used in deep waters for the first time. Thus, USEPA required monitoring protocols in order to use subsea dispersants (USDOC, NOAA, 2010c). In areas where plumes of dispersed oil were previously found, dissolved oxygen levels decreased by about 20 percent from long-term average values in the GOM; however, scientists reported that these levels stabilized and were not low enough to be considered hypoxic (USDOC, NOAA, 2010d). The drop in oxygen, which did not continue over time, has been attributed to microbial degradation of the oil. Studies during the spill indicated that bacteria were degrading hydrocarbons from both gas and oil in the subsurface plume, with degradation rates varying based on time and location (Camilli et al., 2010; Hazen et al., 2010; Valentine et al., 2010). Over time, as the oil continued to degrade and diffuse, hypoxia became less of a concern. In fact, the 2010 hypoxic zone could not be linked to the *Deepwater Horizon* explosion and oil spill in either a positive or a negative manner (LUMCON, 2010).

During the *Deepwater Horizon* oil spill, one of the earlier attempts to stop the oil from leaking from the well was a procedure called a "top kill." The top kill involved using a top kill mud mix that was primarily composed of barite, the heavy mineral used for its mass to hold pressure in the well string, as well as small amounts of other components for hydrate control (Boland, official communication, 2011). This top kill mud mix was really not a "drilling" mud at all, oil-based or water-based, because there was no reason to have lubricating or other qualities needed for drilling as it was simply for weighting to try to contain the blowout. This procedure was not successful and resulted in the release of some mud mix used for this operation. However, BOEM research has shown that drilling mud discharges do not move very far, even when discharged at the surface (CSA, 2006). As such, any contamination from drilling mud, even when used in spill response, would not be expected to be widespread.

It is currently impossible to estimate precisely the long-term impacts that the spill from the *Deepwater Horizon* explosion will have on offshore water quality. The *Deepwater Horizon* explosion and oil spill occurred in offshore waters and was of considerable magnitude. Various monitoring efforts and environmental studies are underway. Although response efforts decreased the fraction of oil remaining in Gulf waters and reduced the amount of oil contacting the coastline, oil still remains in the offshore environment, albeit at levels that were considered not actionable by USCG (OSAT, 2010). As such, there is incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on offshore water quality. This information includes data and analyses that may be forthcoming after the *Deepwater Horizon* explosion, oil spill, and response and is continuing to be collected and developed through the NRDA process. These data collection and research projects may be years from completion. Few data or conclusions have been released to the public to date. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In light of this incomplete and unavailable information, BOEM's subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology. Given the data samples that are available regarding water quality and sediments after the *Deepwater Horizon* explosion, oil spill, and response, as described in this section, BOEM believes that this incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.1.1.2.2.2. Impacts of Routine Events

Background/Introduction

The scenario information related to an EPA proposed action is presented in **Table 3-2**. The routine activities associated with an EPA proposed action that would impact water quality include the following:

- discharges during drilling of exploration and development wells;

- structure installation and removal;
- discharges during production;
- installation of pipelines;
- workovers of wells,
- maintenance dredging of existing navigational canals;
- service-vessel discharges; and
- nonpoint-source runoff.

Proposed Action Analysis

The USEPA regulates discharges associated with offshore oil and gas exploration, development, and production activities on the OCS under the Clean Water Act's NPDES program. Regulated wastes include drilling muds, drill cuttings, produced water, production solids such as produced sand, well treatment fluids, well completion fluids, well workover fluids, sanitary wastes, domestic wastes, and miscellaneous wastes. The USEPA Region 4 issues individual and general permits covering facilities that discharge in water depths seaward of 200 m (656 ft) occurring offshore the coasts of Alabama and Florida. The western boundary of the coverage area is demarcated by Mobile and Viosca Knoll lease blocks located seaward of the boundary of the territorial seas from the coasts of Mississippi and Alabama. The USEPA Region 4's NPDES general permit (GEG460000) for offshore oil and gas activities in Federal waters in the eastern portion of the OCS of the Gulf of Mexico (off of the coast of Mississippi and eastward) was issued on March 15, 2010, and it expires on March 21, 2015 (USEPA, 2011a).

The bulk of waste materials produced by offshore oil and gas activities are produced water (formation water) and drilling muds and cuttings. All of these waste streams are regulated by USEPA through NPDES permits. Characteristics of drilling muds and cuttings, the impacts of discharge, and regulatory controls are discussed in greater detail in **Chapter 3.1.1.4.1**. An EPA proposed action is projected to result in the drilling of a total of 3-12 exploration and delineation wells and 0-17 development and production wells (**Table 3-2**). Muds are the weighted fluids used to lubricate the drill bit, and cuttings are the ground rock displaced from the well. Drilling muds generally consist of clays, barite, lignite, caustic soda (sodium hydroxide), lignosulfonates, and a base fluid such as freshwater, saltwater, mineral oil, diesel oil, or a synthetic oil (USDOI, BSEE, 2012b; NRC, 1983; USEPA, 2009b). However, the exact formulas are complex and vary. Three general types of drilling muds have been used during drilling operations: water-based drilling muds (WBM or WBF), oil-based drilling muds (OBM or OBF), and synthetic-based drilling muds (SBM or SBF). The WBM and WBM-wetted cuttings may be discharged. Historically, the industry has used primarily WBM because they are inexpensive. The OBM's are used to improve drilling performance in difficult situations, such as wells drilled in reactive shales, deep wells, and horizontal and extended-reach wells. The base fluid for OBM is typically diesel or mineral oil. Because these oils often contain toxic materials such as PAH's, the discharge of OBM or cuttings wetted with OBM is prohibited, and these muds are now rarely used in deepwater operations and are only occasionally used on the shelf. The SBM's were developed as a lower-toxicity alternative to OBM and have mostly replaced their use. The base fluid is a synthetic material, typically an olefin or ester, free of toxic PAH's. The discharge of SBM is prohibited and, due to cost, is generally recycled (USEPA, 2009b). However, SBM-wetted cuttings may be discharged after the majority of the SBM has been removed. Water-based muds and cuttings that are discharged increase turbidity in the water column and alter the sediment characteristics in the area where they settle (Neff, 2005). The SBF-wetted cuttings do not disperse as readily in water and descend in clumps to the seafloor (Neff et al., 2000). The SBF on the wetted cuttings gradually breaks down and may deplete the oxygen level at the sediment water interface as it degrades (Neff et al., 2000).

During production, produced water is brought up from the hydrocarbon-bearing strata along with the oil and gas that is generated. Characteristics of produced water, the impacts of discharge, and regulatory controls are discussed in greater detail in **Chapter 3.1.1.4.2**. The scenario for the EPA projects that 0-17 development and production wells would be drilled, of which 0-10 are expected to be producing oil wells and 0-4 are expected to be producing gas wells (**Table 3-2**). Greater volumes of produced water are associated with oil than with gas production. However, less than 3 percent of total U.S. produced water is generated from Federal offshore activities (Clark and Veil, 2009). Produced water may contain dissolved solids, metals, hydrocarbons, and naturally occurring radionuclides in higher concentrations than Gulf waters (Veil et al., 2004). Produced water may contain residuals from the treatment, completion, or workover compounds used, as well as additives used in the oil/water separation process (Veil et al., 2004). Produced water is treated to meet NPDES requirements before it is discharged. Discharge requirements include required dilution of the produced water. Additional chemical products are used to "workover," treat, or complete a well. These wastes are regulated by USEPA through the NPDES program as noted above. Characteristics of workover, treatment, and production chemicals; the impacts of discharge; and regulatory controls are discussed in greater detail in **Chapter 3.1.1.4.3**. Some examples of chemicals that might be used to "workover" or treat a well include, but are not limited to, brines used to protect a well, acids used to increase well production, and miscellaneous products used to separate water from oil, to prevent bacterial growth, or to eliminate scale formation or foaming (Boehm et al., 2001). Completion fluids consist of salt solutions, weighted brines, polymers, and various additives used to prevent damage to the wellbore during operations that prepare the drilled well for hydrocarbon production (USEPA, 2009b).

During structure installation and removal, impacts from anchoring, mooring, pipeline and flowline emplacement, and the placement of subsea production structures may occur. An EPA proposed action is projected to result in the installation of 0-1 structures and the removal of 0-1 structures (**Table 3-2**). An EPA proposed action is also projected to result in the installation of 0-82 km (~0-51 mi) of pipeline. Additional information on bottom-area disturbance is available in **Chapter 3.1.1.3.2.1**. More specifically, a description of the pipeline installation is provided in **Chapter 3.1.1.3.2**. Any disturbance of the seafloor would increase turbidity in the surrounding water, but the increased turbidity should be temporary and restricted to the area near the disturbance.

Service-vessel discharges include bilge and ballast water, and sanitary and domestic waste. An EPA proposed action is projected to result in 144-17,000 service-vessel round trips over the 40-year life of an EPA proposed action (**Table 3-2**). A marine sanitation device is required to treat sanitary waste generated on the service vessel so that surrounding water would not be impacted by possible bacteria or viruses in the waste (40 CFR part 140 and 33 CFR part 159). The discharge of treated sanitary waste would still contribute a small amount of nutrients to the water. A description of service-vessel operational wastes is provided in **Chapter 3.1.1.4.10**. Oil may contaminate bilge and, although less likely, ballast water. The regulations for the control of oil discharges are in 33 CFR § 151.10. The regulations state that bilge and ballast water may only be discharged with an oil content of less than 15 ppm. The discharges would affect the water quality locally. However, regulations regarding discharges from vessels are becoming increasingly stringent. The USCG Ballast Water Management Program became mandatory for some vessels in 2004 (33 CFR part 151 subparts C and D) (USDHS, CG, 2012b). The goal of the program was designed to prevent the introduction of nonindigenous (invasive) species that would affect local water quality. The USCG is increasing its regulations on ballast water management by establishing a standard for the allowable concentration of living organisms in ballast water discharged from ships in waters of the U.S and by establishing an approval process for ballast water management systems. The final rule was published on March 23, 2012, in the *Federal Register* and became effective on June 21, 2012 (USDHS, CG, 2012b). The final VGP, issued by USEPA, became effective on December 19, 2008, and was an addition to already existing NPDES permit requirements. The permit increased the NPDES regulations so that discharges incidental to the normal operation of vessels operating as a means of transportation were no longer excluded unless exempted by Congressional legislation. The 2013 draft VGP would continue to regulate 26 specific discharge categories that were contained in the 2008 VGP, and it is more stringent because the permit contains numeric ballast water discharge limits for most vessels and more stringent effluent limits for oil to sea interfaces and exhaust gas scrubber washwater (USEPA, 2011c). The draft sVGP, if finalized, would authorize discharges incidental to the normal operation of nonmilitary and nonrecreational vessels less than 79 ft (24 m) in length (USEPA, 2011c). At this time, a Congressional moratorium exempts all incidental discharges, with the exception of ballast water, from commercial fishing vessels and nonrecreational, nonmilitary vessels less than 79 ft (24 m) in length. However, the Congressional moratorium expires on December 18, 2013, at which time the sVGP would provide coverage for those vessels (USEPA, 2011c).

Summary and Conclusion

During exploration activities, the primary impacting sources to offshore water quality are discharges of drilling fluids and cuttings. During platform installation and removal activities, the primary impacting sources to water quality are sediment disturbance and temporarily increased turbidity. Impacting discharges during production activities are produced water and supply-vessel discharges. Regulations are in place to limit the toxicity of the discharge components, the levels of incidental contaminants in these discharges, and, in some cases, the discharge rates and discharge locations. Pipeline installation can also affect water quality by sediment disturbance and increased turbidity. Service-vessel discharges might include water with oil concentration of approximately 15 ppm as established by regulatory standards. Any disturbance of the seafloor would increase turbidity in the surrounding water, but the increased turbidity should be temporary and restricted to the area near the disturbance. There are multiple Federal regulations and permit requirements that would decrease the magnitude of these activities. Impacts to offshore waters from routine activities associated with an EPA proposed action should be minimal as long as regulatory requirements are followed.

4.1.1.2.2.3. Impacts of Accidental Events

Background/Introduction

Accidental events associated with an EPA proposed action that could impact offshore water quality include spills of oil and refined hydrocarbons, releases of natural gas, usage of chemical dispersants in oil spill response, spills of chemicals or drilling fluids, loss of well control, collisions, or other malfunctions that would result in such spills. **Chapter 3.2** discusses the accidental events that could result from the impact-producing factors and scenario, with particular attention given to the risk of oil spills, response to such oil spills, loss of well control, pipeline failures, vessel collisions, and chemical and drilling fluid spills. A brief summary is presented here. The impacts of rare, catastrophic spills, which are not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**.

Proposed Action Analysis

Oil Spills and Natural Gas and Condensate Releases

Water quality is altered and degraded by oil spills through the increase of petroleum hydrocarbons and their various transformation/degradation products in the water. Most of the oil spills that may occur as a result of an EPA proposed action are expected to be ≤1 bbl (**Table 3-10**). The extent of impact from a spill depends on the behavior and fate of oil in the water column (e.g., the movement of oil and the rate and nature of weathering), which, in turn, depends on oceanographic and meteorological conditions at the time (**Appendices A.2 and A.3**), as well as human-induced actions for minimizing spill impacts (e.g., use of chemical dispersants, in-situ burning, and containment booms/skimmers). Crude oils are not a single chemical, but instead are complex mixtures with varied compositions. The various components of crude oil behave differently in water. Thus, the behavior of the oil and the risk that the oil poses to natural resources depends on the composition of the specific oil encountered (Michel, 1992). Generally, oils can be divided into three groups of compounds with (1) light-weight, (2) medium-weight, and (3) heavy-weight components. **Chapter 3.2.1** further describes the characteristics of OCS oil and discusses oil spills. Generally, the lighter ends of the oil are more water soluble and would contribute to acute toxicity. As the spill weathers, the aromatic components at the water's surface are more likely to exit the water through evaporation. The heavier fractions are less water soluble and would partition to organic matter. This fraction is more likely to persist in sediments and would contribute to longer-term impacts.

In addition to oil, natural gas may also be explored for or produced in the GOM. Wells and sidetracks (smaller wells drilled as auxiliaries off main wells) may produce a mixture of both oil and natural gas. Condensate is a liquid hydrocarbon phase that generally occurs in association with natural gas. The quality and quantity of components in natural gas vary widely by the field, reservoir, or location from which the natural gas is produced. Although there is not a "typical" makeup of natural gas, it is primarily composed of methane. Thus, if natural gas were to leak into the environment, methane may be released to the environment. Methane, like oil, is a carbon source and its introduction into the marine environment could result in lowering dissolved oxygen levels due to increased microbial degradation. For example, the oil spill resulting from the *Deepwater Horizon* explosion resulted in the emission of an estimated 9.14 x 10^9 to 1.29 x 10^{10} moles of methane from the wellhead (Kessler et al., 2011; Valentine et al., 2010), with maximum subsurface methane concentrations of 183-315 micrometers measured in May/June 2010 (Valentine et al., 2010; Joye et al., 2011). This methane release corresponded to a measurable decrease in oxygen in the subsurface plume due to respiration by a community of methanotrophic bacteria; however, hypoxic conditions were never reached (OSAT, 2010). Note that methane released from the *Deepwater Horizon* explosion was generally confined to the subsurface, with minimal amounts reaching the atmosphere (Kessler et al., 2011; Ryerson et al., 2011b). Unfortunately, little is directly known about the toxicity of natural gas and its components in the marine environment, but in light of plumes identified with the *Deepwater Horizon* explosion and oil spill, there is concern as to how methane in the water column might affect fish (**Chapter 4.1.1.17**).

The National Academy of Sciences (NRC, 2003), Patin (1999), and Boesch and Rabalais (1987) have reviewed the fate and effects of spilled oil and, to a lesser degree, natural gas releases. **Chapter 3.2.1.6** presents the risk of offshore spills associated with an EPA proposed action. Oil spills at the water surface may result from a platform accident. Subsurface spills are more likely to occur from pipeline failure or a loss of well control. As noted above, the behavior of a spill depends on many things, including the characteristics of the oil being spilled as well as oceanographic and meteorological conditions. An experiment in the North Sea indicated that the majority of oil released during a deepwater blowout would quickly rise to the surface and form a slick (Johansen et al., 2003). In such a case, impacts from a deepwater oil spill would occur at the surface where the oil is likely to be mixed into the water and dispersed by wind and waves. The oil would undergo natural physical, chemical, and biological degradation processes including weathering. However, data and observations from the *Deepwater Horizon* explosion, oil spill, challenged the previously prevailing thought that most oil from a deepwater blowout would quickly rise to the surface. Measurable amounts of hydrocarbons (dispersed or otherwise) were detected in the water column as subsurface plumes and on the seafloor in the vicinity of the release (e.g., Diercks et al., 2010; OSAT, 2010). In the *Deepwater Horizon* oil spill subsurface plume, half-lives were estimated for petroleum hydrocarbons and n-alkanes on the order of 1 month and several days, respectively, indicating the impacts of various weathering processes (Reddy et al., 2011). After the *Ixtoc I* blowout in 1979, which was located 50 mi (80 km) offshore in the Bay of Campeche, Mexico, some subsurface oil also was observed dispersed within the water column (Boehm and Fiest, 1982); however, the scientific investigations were limited (Reible, 2010). The water quality of offshore waters would be affected by the dissolved components and oil droplets that are small enough that they do not rise to the surface or are mixed down by surface turbulence. In the case of subsurface oil plumes, it is important to remember that these plumes would be affected by subsurface currents, dilution, and natural physical, chemical, and biological degradation processes including weathering.

Oil-Spill Response and Chemical Dispersants

In the case of an accidental event, it is likely that response efforts would reduce the amount of oil. **Chapter 3.2.1.8** provides a further discussion of oil-spill-response considerations. Offshore water quality would not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic, boom deployment, and the addition of dispersants and methanol to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree.

Top kills use drilling muds, which are heavy due to the mineral component barite, in order to stop flow from a well. Top kill methods would typically involve the use of water-based drilling muds, which may be discharged to the ocean under normal operations as regulated by USEPA (USDOI, BSEE, 2012b). Depending on the success of the procedure, a portion of the mud could end up on the seafloor. Since drilling mud discharges do not move far from where they are released (CSA, 2006), any contamination from drilling mud would not be expected to be widespread (refer to the “Accidental Release of Drilling Fluids” below for more information.). During *Deepwater Horizon* oil spill, a water-based kill mud was used during multiple top kill procedures, which proved unsuccessful. The top kill mud composition was almost all barite, with small amounts of other components for hydrate control.

One standard tool used in response to spilled oil on water is dispersants. The purpose of chemical dispersants is to facilitate the movement of oil into the water column in order to encourage weathering and biological breakdown of the oil (i.e., biodegradation) (NRC, 2005; Australian Maritime Safety Authority, 2010).

A large volume of chemical dispersants was applied during the oil spill resulting from the *Deepwater Horizon* explosion, equaling 1.84 million gallons of dispersant used to breakup and dilute the oil subsea at the wellhead and on the surface (Oil Spill Commission, 2011c). The dispersant formulation used was the COREXIT® series. Sediment and water samples collected in the offshore and deepwater zones were analyzed for a number of dispersant-related chemicals, but predominantly DPnB (OSAT, 2010). Between mid-June and mid-October, a total of 4,916 water and sediment samples were collected in the offshore and deepwater zones. Peaks in DPnB detections were observed in two distinct layers in deep water, at the surface and in the subsurface (1,100-1,300 m; 3,609-4,265 ft), similar to distributions for PAH’s. A total of 554 offshore and deepwater samples (552 water and 2 sediment) had detectable levels of dispersant-related chemicals. However, none of the concentrations of dispersant-related chemicals found in water samples collected during the response exceeded USEPA’s benchmarks. Only a small subset of the analyzed samples targeted areas of observed surface oil, such as samples collected during the Dispersant Environmental Effects Project. Unfortunately, no benchmark for dispersant indicator compounds in sediment exists; thus, the significance of these concentrations is unknown. Concentrations of the dispersant DPnB in water samples collected during the response decreased significantly with time.

Further research is needed to assess the fate and toxicity of dispersants released in the deep subsurface. For example, benchmarks still need to be set by USEPA for chronic and acute toxicity levels of dispersant-related chemicals in sediments (USEPA, 2010b). Without such benchmarks, it is difficult to assess the impacts of these compounds on marine life in sediments. Using ultrahigh-resolution mass spectrometry and liquid chromatography with tandem mass spectrometry (LC/MS/MS), Kujawinski et al. (2011) showed that dioctylsulfosuccinate was sequestered in deepwater hydrocarbon plumes at 1,000- to 1,200-m (3,281-to 3,937-ft) water depths and persisted up to 300 km (186 mi) from the well, 64 days after deepwater dispersant applications ceased. Note that the concentrations they observed were below those tested in published toxicology assays (e.g., NRC, 2005). Based on observed concentrations, the researchers concluded that dioctylsulfosuccinate underwent negligible, or slow, rates of biodegradation in the affected waters. These preliminary findings point to the need for further dispersant degradation studies, as well as assessment of the fates and reactivities of the other dispersant-related compounds.

Reviews of studies have found that the general effectiveness of dispersants in enhancing biodegradation of crude oil and individual hydrocarbons is highly variable and depends on several factors, including the chemical formulation of the dispersant, its concentration, and the dispersant/oil application ratio (Boehm, 1983). Recent studies found that dispersing crude oil with COREXIT 9500 lead to increased biodegradation of the oil under deepwater simulated laboratory studies (Baelum et al., 2012). If the oil moves from the surface into the water column through dispersion, it is less likely to reach sensitive shore areas (USEPA, 2010b). The toxicity of dispersed oil in the environment depends on many factors, including the effectiveness of the dispersion, temperature, salinity, the degree of weathering, type of dispersant, and degree of light penetration in the water column (NRC, 2005). The toxicity of dispersed oil is primarily due to the toxic components of the oil itself (Australian Maritime Safety Authority, 2010).

In addition to response efforts, the natural environment can attenuate some oil. The Gulf of Mexico has numerous natural hydrocarbon seeps, as discussed in **Chapter 3.1.1.7**. Thus, the marine environment can be considered adapted to handling small amounts of oil released over time. Furthermore, over time, natural processes can physically, chemically, and biologically degrade oil (NRC, 2003). The physical processes involved include evaporation, adsorption, emulsification, and dissolution; the primary chemical and biological degradation processes include photooxidation and biodegradation (i.e., microbial oxidation).

Chemical Spills

A study of chemical spills from OCS activities determined that accidental releases of zinc bromide and ammonium chloride could potentially impact the marine environment (Boehm et al., 2001). Both of these chemicals are used for well treatment or completion and are not in continuous use; thus, the risk of a spill is small. Most other chemicals are either relatively nontoxic or used in such small quantities that a spill would not result in measurable impacts. Zinc bromide is of particular concern because of the toxic nature of zinc. Close to the release point of an ammonium chloride spill, the ammonia concentrations could exceed toxic levels.

Accidental Releases of Drilling Fluids

Drilling muds or fluids are the weighted fluids used to lubricate the drill bit. Drilling muds generally consist of clays, barite, lignite, caustic soda (sodium hydroxide), lignosulfonates, and a base fluid such as freshwater, saltwater, mineral oil, diesel oil, or a synthetic oil (USDOI, BSEE, 2012b; USEPA, 2009b); however, the exact formulas are complex and vary. The impacts of discharge and regulatory controls of drilling muds are discussed in **Chapter 3.1.1.4.1**. Three general types of drilling muds are used during drilling operations: predominantly water-based drilling muds (WBM or WBF) and synthetic-based drilling muds (SBM or SBF), and less frequently oil-based drilling muds (OBM or OBF). Accidental releases of drilling fluids would have similar effects as discharges. In general, Continental Shelf Associates, Inc.'s research has shown that drilling mud discharges do not move very far even when discharged at the surface (CSA, 2006); therefore, accidental releases of drilling muds are not expected to move very far either. The WBM's may be discharged, but those discharges are regulated by USEPA through NPDES permits. The WBM's that are discharged increase turbidity in the water column and alter the sediment characteristics in the area where they settle (Neff, 2005). The base mud for OBM is typically diesel or mineral oil. Because these oils often contain toxic materials such as PAH's, the discharge of OBM or cuttings wetted with OBM is prohibited. Thus, an accidental release of OBM's could decrease water and sediment quality locally. The SBM's were developed as an alternative to OBM and, thus, the use of OBM's has been decreasing. The base fluid is a synthetic material, typically an olefin or ester, free of toxic PAH's. Discharge of SBM itself is prohibited and, due to cost, is generally recycled (USEPA, 2009b). However, SBM-wetted cuttings may be discharged after the majority of the SBM has been removed. The SBF-wetted cuttings do not disperse as readily in water and descend in clumps to the seafloor (Neff et al., 2000). The SBF on the wetted cuttings gradually breaks down and may deplete the oxygen level at the sediment water interface as it degrades (Neff et al., 2000). An accidental release of SBF is expected to behave similarly with the SBF sinking to the seafloor adjacent to the release site and resulting in local anoxic conditions.

Pipeline Failures

A pipeline failure would result in the release of crude oil, condensate, or natural gas, the impacts of which are discussed above. Pipeline failures are discussed in more detail in **Chapter3.2.3**.

Fuel Oil Spills from Collisions

A collision may result in the spillage of crude oil, refined products such as diesel, or chemicals. Crude oil and chemicals are discussed in the preceding paragraphs. Diesel is the type of refined hydrocarbon spilled most frequently as the result of a collision. Minimal impacts result from a spill since diesel is light and will evaporate, naturally disperse, and/or biodegrade within a few hours to a few days (USDOC, NOAA, 2012a). Impacts can be more serious in the event that heavier oil is spilled. Heavy oil may submerge due to its inherent mass relative to that of the receiving water or as a function of its inherent mass plus sediment. An example of such a spill occurred on November 11, 2005, in the Gulf of Mexico when a double-hull tank barge collided with the submerged remains of a pipeline service platform that collapsed during Hurricane Rita. The barge was carrying approximately 119,793 bbl (5,031,306 gallons) of a blended mixture of low API gravity (4.5) slurry oil, and as a result of the incident, the bulk of the released oil sank to the bottom (USDOC, NOAA and ENTRIX, 2009). Since spills due to collisions occur infrequently (USDOI, BSEE, 2012c), the potential impacts to offshore water quality are not expected to be significant.

Loss of Well Control

A loss of well control is the uncontrolled flow of a reservoir fluid that may result in the release of gas, condensate, oil, drilling fluids, sand, or water. The impacts of the release of gas, condensate, oil, and drilling fluids are discussed above. A loss of well control includes events with no surface expression or impact on water quality and events with a release of oil or drilling fluids. A loss of well control event may also result in localized suspension of sediments, thus affecting water quality temporarily. Loss of well control is a broad term that includes very minor well-control incidents up to the most serious well-control incidents (**Appendix B**). Historically, most losses of well control have occurred during development drilling operations, but losses of well control can happen during exploratory drilling, production, well completions, or workover operations. Although losses of well control are an occasional occurrence during operations on the OCS, only a few of these incidents lead to condensate/crude oil spillage (USDOI, BOEMRE, 2011a). During the period 1971-2009, 41,514 wells were drilled on the OCS and 249 well control incidents occurred, 50 of which resulted in the spillage of condensate/crude oil. These spills ranged from minor to medium in size (<1 bbl to 450 bbl). The total spilled from these 50 incidents was 1,829 bbl or approximately 0.00001147 percent of the volume produced during this period. Blowouts are a loss of well control subset of more serious incidents, with a greater risk of oil spill or human injury. It is through the loss of well control that the volume and duration of a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, could occur, as was the case with the *Deepwater Horizon* explosion. From 1971 to 2010, one well control incident resulted in a spill volume of 1,000 bbl or more and that was the *Deepwater Horizon* explosion (USDOI, BOEMRE, 2011a). Although there is an extremely low probability of a catastrophic spill event, which is not reasonably expected and not part of an EPA proposed action, the impacts of such an event on water quality are addressed in **Appendix B**. Overall, since major losses of well control and blowouts are rare events, potential impacts to offshore water quality are not expected to be significant except in the rare case of a catastrophic event.

Summary and Conclusion

Accidental events associated with an EPA proposed action that could impact offshore water quality include spills of oil and refined hydrocarbons, releases of natural gas and condensate, usage of chemical dispersants in oil-spill response, spills of chemicals or drilling fluids, loss of well control, pipeline failures, collisions, or other malfunctions that would result in such spills. Spills from collisions are not expected to be significant because collisions occur infrequently. Overall, loss of well control events and blowouts are rare events and of short duration, so potential impacts to offshore water quality are not expected to be significant except in the rare case of a catastrophic event, which is not reasonably expected and not part of an EPA proposed action, (**Appendix B**). Although response efforts may decrease the amount of oil in the environment, the response efforts may also impact the environment through, for example, increased vessel traffic and application of dispersants. Natural physical, chemical, and biological processes would decrease the amount of spilled oil over time through dilution, weathering, and degradation of the oil (NRC, 2003). Chemicals used in the oil and gas industry are not a significant risk for a spill because they are either nontoxic, are used in minor quantities, or are only used on a noncontinuous basis. Although there is the potential for accidental events, an EPA proposed action would not significantly change the water quality of the Gulf of Mexico over a large spatial or temporal scale.

4.1.1.2.2.4. Cumulative Impacts

Background/Introduction

Activities in the cumulative scenario that could impact offshore water quality generally include the broad categories of an EPA proposed action and the OCS Program, the activities of other Federal agencies (including the military), natural events or processes, State oil and gas activity, and activities related to the direct or indirect use of land and waterways by the human population (e.g., urbanization, agricultural practices, coastal industry, and municipal wastes). Although some of these impacts are likely to affect coastal areas to a greater degree than offshore waters, coastal pollutants that are transported away from shore would also affect offshore environments. Many of these categories noted above would have some of the same specific impacts (e.g., vessel traffic would occur for all of these categories listed above except natural processes).

OCS Oil- and Gas-Related Impacts

The OCS oil- and gas-related impacts include erosion and runoff, sediment disturbance and turbidity, vessel discharges, discharges from exploration and production activities, and accidental releases of oil, gas or chemicals.

Erosion and runoff from nonpoint sources degrade water quality. Nonpoint-source runoff from onshore support facilities could result from OCS-related activities; however, as discussed below, runoff from OCS activities is not the leading source of contaminant runoff. The leading source of contaminants that impair coastal water quality is urban runoff. Although offshore waters would not be affected as strongly as coastal waters since contaminants would be more diluted by the time they reached offshore areas, in many cases this runoff would still contribute somewhat to the degradation of offshore waters.

Sediment disturbance and turbidity may result from pipeline installation, the installation and removal of platforms, and discharges of muds and cuttings from drilling operations. These impacts generally degrade water quality locally and are not expected to last for long time periods. Furthermore, discharges from drilling platforms are regulated by USEPA through the NPDES permit process; thus, effects from these discharges should be limited.

It should be noted that, since the marine environment is a dynamic system, sediment quality and water quality can affect each other. For example, a contaminant may react with the mineral particles in the sediment and be removed from the water column (e.g., adsorption). Thus, under appropriate conditions, sediments can serve as sinks for contaminants such as metals, nutrients, or organic compounds. However, if sediments are (re)suspended, the resuspension can lead to a temporary shift in water quality, including a localized and temporal release of any formally sorbed metals as well as nutrient recycling (Caetano et al., 2003; Fanning et al., 1982).

Vessel discharges can degrade water quality. Vessels may be service vessels supporting a proposed action or OCS-related activities. Fortunately, for many types of vessels, most discharges are treated or otherwise managed prior to release through regulations administered by USCG and/or USEPA, and many regulations are becoming more stringent. The USCG Ballast Water Management Program became mandatory for some vessels in 2004 (33 CFR part 151 subparts C and D) (USDHS, CG, 2012b). The goal of the program was designed to prevent the introduction of nonindigenous (invasive) species that would affect local water quality. The USCG is amending its regulations on ballast water management by establishing a standard for the allowable concentration of living organisms in ballast water discharged from ships in waters of the U.S and by establishing an approval process for ballast water management systems. The final rule was published on March 23, 2012, in the *Federal Register* and became effective on June 21, 2012 (USDHS, CG, 2012b). The final VGP, issued by USEPA, became effective on December 19, 2008, and was an addition to already existing NPDES permit requirements. The permit increased the NPDES regulations so that discharges incidental to the normal operation of vessels operating as a means of transportation were no longer excluded unless exempted by Congressional legislation. The 2013 draft VGP would continue to regulate 26 specific discharge categories that were contained in the 2008 VGP, and it is more stringent because the permit contains numeric ballast water discharge limits for most vessels and more stringent effluent limits for oil-to-sea interfaces and exhaust gas scrubber washwater (USEPA, 2011c). The draft sVGP, if finalized, would authorize discharges incidental to the normal operation of nonmilitary and nonrecreational vessels less than 79 ft (24 m) in length (USEPA, 2011c). These regulations should minimize the cumulative impacts of vessel activities.

Discharges from exploration and production activities can degrade water quality in offshore waters. The USEPA regulates discharges associated with offshore oil and gas exploration, development, and production activities on the OCS under the Clean Water Act's NPDES program. Regulated wastes include drilling fluids, drill cuttings, deck drainage, produced water, produced sand, well treatment fluids, well completion fluids, well workover fluids, sanitary wastes, domestic wastes, and miscellaneous wastes (USEPA, 2009b). The bulk of waste materials produced by offshore oil and gas activities are produced water (formation water) and drilling muds and cuttings. Produced water is the largest waste stream by volume from the oil and gas industry that enters Gulf waters. The NRC has estimated the quantity of oil in produced water entering the Gulf per year to be 11,905 bbl of oil contributed from 473,000,000 bbl of produced water, with a resulting oil and grease discharge of approximately 11,905 bbl per year (NRC, 2003, page 200, Table D-8). However, produced water is commonly treated to separate free oil and, as noted above, it is a regulated discharge. Since discharges from drilling and production platforms are regulated by USEPA through the NPDES permit process, the effects from these discharges should be limited. Accidental releases of oil, gas, or chemicals would degrade water quality during and after the spill until either the spill is cleaned up or natural processes degrade or disperse the spill. These accidental releases could be a result of an EPA proposed action or ongoing OCS activity. Actions taking place directly in offshore waters would generally have more significant impacts on offshore waters. The impacts of rare, catastrophic spills, which are not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**. The extent of impact from a spill depends on the location of release and the behavior and fate of oil in the water column (e.g., the movement of oil and the rate and nature of weathering), which, in turn, depends on oceanographic and meteorological conditions at the time (**Appendices A.2 and A.3**). **Chapter 4.1.1.2.2.3** contains more information on accidental releases.

A major hurricane can result in a greater number of spill events, with increased spill volume and oil-spill-response times. In the case of an accidental event, it is likely that response efforts would reduce the amount of oil. (Refer to **Chapter 3.2.1.8** for further discussion of oil-spill-response considerations.) Offshore water quality would not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic and the addition of dispersants and methanol to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree.

Non-OCS Oil-and-Gas-Related Impacts

Activities not related to an proposed action or the OCS Program that may impact coastal waters include State oil and gas activities, the activities of other Federal agencies (including the military), natural events or processes, and activities related to the direct or indirect use of land and waterways by the human population. These activities may result in erosion and runoff, sediment disturbance and turbidity, vessel discharges, natural releases of oil and gas (e.g., seeps) and accidental releases of oil, gas or chemicals. Further discussion on these impacts is described below.

Erosion and runoff from point and nonpoint sources degrade water quality. Nonpoint-source runoff from onshore support facilities could result from State oil and gas activities, other industries, and coastal development, as well as OCS-related activities. The leading source of contaminants that impair coastal water quality is urban runoff. Although offshore waters would not be affected as strongly as coastal waters since contaminants would be more diluted by the time they reached offshore areas, in many cases this runoff would still contribute somewhat to the degradation of offshore waters. Urban runoff can include suspended solids, heavy metals and pesticides, oil and grease, nutrients, and organic matter. Urban runoff increases with population growth, and the Gulf Coast region has experienced a 109 percent population growth since 1970, with an additional expected 15 percent increase by 2020 (USDOC, NOAA, 2011b). The National Research Council (2003, Table I-4, page 237) estimated that, on average, approximately 26,324 bbl of oil per year entered Gulf waters from petrochemical and oil refinery industries in Louisiana and Texas. **Chapter 3.1.1.7** discusses the various sources of petroleum hydrocarbons that can enter the Gulf of Mexico in further detail. The natural emptying of rivers into the GOM as part of the water cycle may introduce chemical and physical factors that alter the condition of the receiving waters. The Mississippi River introduced approximately 3,680,938 bbl of oil and grease per year from land-based sources (NRC, 2003, Table I-9, page 242) into the waters of the Gulf. Nutrients carried in waters of the Mississippi River contribute to seasonal formation of the hypoxic zone on the Louisiana-Texas shelf. The USEPA proposed the first set of nutrient standards in 2010 for the State of Florida. However, the effective date on those standards was postponed so USEPA could review proposed criteria from the State of Florida (USEPA, 2012). The proposed water quality standards would set a series of numeric nutrient (nitrogen and phosphorus) limitations for Florida's lakes, rivers, streams, springs, and canals; future standards are expected for Florida's estuaries and coastal waters. The USEPA also regulates point-source discharges. The USEPA has various regulatory programs designed to protect the waters that enter the Gulf. If these and other water quality programs and regulations continue to be administered and enforced, it is not expected that additional oil and gas activities would adversely impact the overall water quality of the region.

Sediment disturbance and turbidity may result from pipeline installation, the installation and removal of platforms, discharges of muds and cuttings from drilling operations, disposal of dredge materials, sand borrowing, sediment deposition from rivers, and hurricanes. Turbidity is also influenced by the season. These impacts may be the result of other Federal agencies, including the military and natural processes. State oil and gas activities may have some effect if they take place near offshore waters. Dredging projects related to restoration or flood prevention measures may be directed by the Federal Government for the benefit of growing coastal populations. These impacts generally degrade water quality locally and are not expected to last for long time periods. Furthermore, discharges from drilling platforms are regulated by USEPA through the NPDES permit process, including USEPA-authorized State programs; thus, effects from these discharges should be limited.

Vessel discharges can degrade water quality. Vessels may be service vessels supporting State oil and gas activities. However, the vessels may also be vessels used for shipping, fishing, military activities, or recreational boating. State oil and gas activities, fishing, and recreational boating would have fewer effects on offshore waters except for larger fishing operations and cruise lines, as smaller vessels tend to remain near shore. Fortunately, for many types of vessels, most discharges are treated or otherwise managed prior to release through regulations administered by USCG and/or USEPA, and many regulations such as the USCG Ballast Water Management Program and the USEPA VGP and sVGP are becoming more stringent as discussed in further detail above. At this time, a Congressional moratorium exempts all incidental discharges, with the exception of ballast water, from commercial fishing vessels and nonrecreational, nonmilitary vessels less than 79 ft (24 m) in length. However, the Congressional moratorium expires on December 18, 2013, at which time the sVGP would provide coverage for those vessels (USEPA, 2011c). These regulations should minimize the cumulative impacts of vessel activities.

Accidental releases of oil, gas, or chemicals would degrade water quality during and after the spill until either the spill is cleaned up or natural processes degrade or disperse the spill. These accidental releases could be a result of State oil and gas activity, the transport of commodities to ports, and/or coastal industries. Actions taking place directly in offshore waters would generally have more significant impacts on offshore waters. The extent of impact from a spill depends on the release location and the behavior and fate of oil in the water column (e.g., the movement of oil and the rate and nature of weathering), which, in turn, depends on oceanographic and meteorological conditions at the time.

A major hurricane can result in a greater number of spill events, with increased spill volume and oil-spill-response times. In the case of an accidental event, it is likely that response efforts would reduce the amount of oil. (Refer to **Chapter 3.2.1.8** for further discussion of oil-spill-response considerations.) Offshore water quality would not only be impacted by the oil, gas, and their respective components but also to some degree from cleanup and mitigation efforts. Increased vessel traffic and the addition of dispersants and methanol to the marine environment in an effort to contain, mitigate, or clean up the oil may also tax the environment to some degree.

Offshore waters, especially deeper waters, are more directly affected by natural seeps since the natural seeps in the Gulf of Mexico are located in offshore waters. Natural seeps are the result of natural processes. Hydrocarbons enter the Gulf of Mexico through natural seeps at a rate of approximately 980,392 bbl/year (a range of approximately 560,224-1,400,560 bbl/year) (NRC, 2003, page 191). Hydrocarbons from natural seeps are considered to be the highest contributor of petroleum hydrocarbons to the marine environment (NRC, 2003, page 33). However, studies have shown that benthic communities are often acclimated to these seeps and may even utilize them to some degree (NRC, 2003, references therein and page 33).

Summary and Conclusion

Water quality in offshore waters may be impacted by sediment disturbance and suspension (i.e., turbidity), vessel discharges, erosion and runoff of nonpoint-source pollutants (including river inflows), natural seeps, discharges from exploration and production activities, and accidental events. These impacts may be a result of an EPA proposed action and the OCS Program, the activities of other Federal agencies (including the military), private vessels, and natural events or processes. To a lesser degree, these impacts may also be a result of State oil and gas activity or activities or related to the direct or indirect use of land and waterways by the human population (e.g., urbanization, agricultural practices, coastal industry, and municipal wastes). Routine activities that increase turbidity and discharges are temporary in nature and are regulated; therefore, these activities would not have a lasting adverse impact on water quality. In the case of a large-scale spill event, degradation processes in both surface and subsurface waters would decrease the amount of spilled oil over time through natural processes that can physically, chemically, and biologically degrade oil (NRC, 2003). The impacts resulting from an EPA proposed action are a small addition to the cumulative impacts on the offshore waters of the Gulf, when compared with inputs from natural hydrocarbon inputs (seeps), coastal factors (such as erosion and runoff), and other non-OCS industrial discharges. The incremental contribution of the routine activities and accidental discharges associated with an EPA proposed action to the cumulative impacts on offshore water quality is not expected to be significant.

4.1.1.3. Coastal Barrier Beaches and Associated Dunes

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for coastal barrier beaches and associated dunes can be found in Chapter 4.2.1.3 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.3 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.3 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.3 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for coastal barrier beaches and associated dunes regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for coastal barrier beaches and associated dunes presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for coastal barrier beaches and associated dunes presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on coastal barrier beaches and associated dunes, and various Internet sources were examined to determine any recent information regarding coastal barrier beaches and associated dunes. Sources investigated include BOEM, the USGS National Wetlands Research Center, the USGS Gulf of Mexico Integrated Science Data Information Management System, Gulf of Mexico Alliance, State environmental agencies, USEPA, and coastal universities. Other websites from scientific publication databases (including Science Direct, Elsevier, CSA Illumina, and JSTOR) were checked for new information using general Internet searches based on major themes. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding coastal barrier beaches and associated dunes since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, BOEM acknowledges that there remains incomplete and unavailable information that may be relevant to reasonably foreseeable significant impacts on coastal barrier beaches and associated dunes. This incomplete or unavailable information includes potential data on the *Deepwater Horizon* explosion, oil spill, and response that may be forthcoming. As there is substantial information available since the *Deepwater Horizon* explosion, oil spill, and response, which is included in this EIS, the 2012-2017 WPA/CPA Multisale EIS, and the WPA 233/CPA 231 Supplemental EIS, BOEM believes that the incomplete or unavailable information regarding the effects of the *Deepwater Horizon* explosion, oil spill, and response on coastal barrier beaches and associated dunes would likely not be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and the WPA 233/CPA 231 Supplemental EIS. The bulk of this information is expected to be developed through the ongoing NRDA process. To date, relatively little raw data have been released publicly by the NRDA process, and it may be years before studies are completed and results are released. This information will certainly not be available within the timeframe contemplated by this NEPA analysis. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. BOEM's subject-matter experts have used what scientifically credible information is available in their analyses and applied it using accepted scientific methodology. Compared with the historic and ongoing threats to coastal barrier beaches and dunes, such as development threats, natural factors such as hurricanes, and channelization, any remaining effects of the *Deepwater Horizon* explosion, oil spill, and response on coastal barrier beaches and associated dunes is expected to be small.

4.1.1.3.1. Description of the Affected Environment

The Gulf of Mexico shorelines are usually sandy beaches that can be divided into several interrelated environments. Generally, beaches consist of a shoreface, foreshore, and backshore (Frey and Howard, 1969). The shoreface slopes downward and seaward from the low-tidal water line, under the water. The nonvegetated foreshore slopes up from the ocean to the beach berm-crest. The backshore is found between the beach berm-crest and the dunes, and it may be sparsely vegetated. The berm-crest and backshore may occasionally be absent due to storm activity.

The dune zone of a barrier landform can consist of a single low dune ridge, several parallel dune ridges, or a number of curving dune lines. Such dunes may be stabilized by vegetation, which can trap sediment. These elongated, narrow landforms are composed of wind-blown sand and other unconsolidated, predominantly coarse sediments. Barrier landform configurations continually change, accreting and eroding, in response to prevailing and changing environmental conditions.

The Mississippi Delta region comprises much of coastal Louisiana and adjacent Mississippi. It stretches from the Atchafalaya Bay to the Chandeleur Islands and includes the New Orleans metropolitan area. The Delta complex contains major river channels and levees, bayous, swamps, marshes, lakes, tidal flats and channels, barrier islands, and shallow sea environments. Most barrier shorelines of the Mississippi River Delta in Louisiana are transgressive and outline the seaward remains of a series of five abandoned deltas (Coleman et al., 1998). Barrier islands associated with the Mississippi Delta include the Chandeleur-Breton Island, Timbalier Island, and Isle Dernieres chains in Louisiana.

The barrier island chains in the northern GOM that extend from Atchafalaya Bay, Louisiana, to Mobile Bay, Alabama, are disintegrating rapidly as a result of combined physical processes involving sediment availability, sediment transport, and sea-level rise. Relative sea-level rise is to the combination of subsidence in wetlands and eustatic sea-level rise, which is from high levels of melting ice in response to global warming (Day et al., 1995; Meier et al., 2007). The cumulative areas and rates of landloss from these ephemeral features are to some extent expected because present physical conditions are different from those that existed when the islands first formed.

Florida has extensive beach habitat with multiple areas of barrier islands on its coast. The west coast of Florida has low to moderate energy levels affecting the beaches, which consist of mainly quartz sand (Tanner, 1960). The barrier islands are generally low and flat, without conspicuous dunes. This coast contains all barrier island and inlet types in a range of sizes and ages. Barriers include both wave-dominated and mixed-energy drumstick (thinner in the middle and thicker on the ends as result of the interactions of wind, waves, storms, and tides) island morphologies with lengths ranging from about 2 km (~1 mi) to more than 30 km (~18 mi) (Hine et al., 2001). The Big Bend Coast of Florida is different from the sandy coast around the rest of the upper west coast of Florida. It is an open-marine salt marsh dominated by black needle rush, *Juncus roemerianus* (Hine et al., 2001). This shoreline and its associated continental shelf have a very low gradient, which gently slopes out into the Gulf. This gradient helps lower the wave energy and modifies the waves to a wide profile and low average breaker height. The area also has a small tidal range. Together, these circumstances generally cause less sediment movement and allow seagrasses to flourish. Beaches found in the Big Bend area are composed of shelly sand that forms skeletal berm-crest shorelines.

Coastal landloss from shoreline change in west Florida is primarily associated with the erosion of sandy beaches and barrier islands, especially around inlets, while bays and lagoons tend to experience lower loss rates because the waterbodies are generally small or protected by erosion control structures (Morton et al., 2004). The average long-term erosion rate, from the 1800's through 2001, was estimated as -0.8 m/year, lower than other Gulf Coast States. This can be attributed to relatively low wave energy and frequent beach nourishment (Morton et al., 2004).

A study of critically eroded shorelines in Florida was conducted in 2011 (Florida Dept. of Environmental Protection, 2012). Such beaches were defined as a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. The study found that the Gulf Coast of Florida had critical erosion areas on 183.5 mi (295.3 km) of beach and 4.1 mi (6.6 km) of inlet. Noncritical erosion areas included 70.1 mi (112.8 km) of beach and 0.9 mi (1.4 km) of inlet. Annual updates of the list of erosion areas since the first in 1989 revealed a pattern of gradual increases for most years except for years of high tropical storm activity, after which greater erosion was noted. For example, after 2004, there was a 13.2 percent increase in the statewide total of erosion areas.

Hurricane Isaac made landfall on the Louisiana coast on August 28, 2012. Storm surge and superimposed waves inundated and overwashed the barrier islands that lie to the east of the Mississippi River, e.g., the Chandeleur Islands, Louisiana, and Dauphin Island, Alabama, both of which were severely impacted during Hurricane Katrina in 2005. During Hurricane Isaac, these islands suffered considerable changes, including the apparent destruction of remnants of the oil protection berm built on the Chandeleurs during the *Deepwater Horizon* oil spill and response (USDOI, GS, 2012).

Gulf Coast beaches were impacted by spilled oil from the *Deepwater Horizon* explosion, as described in the 2012-2017 WPA /CPA Multisale EIS. After Hurricane Isaac made landfall, oil that matched the fingerprint of the oil from the *Deepwater Horizon* explosion was found on Elmer's Island and Grand Isle, Louisiana (Overton, official communication, 2012). Tarballs collected on the Alabama coast after Hurricane Isaac appeared "remarkably similar" in composition and consistency to tar found on State beaches during and immediately after the *Deepwater Horizon* explosion (Hayworth, official communication, 2012). These observations suggest that oil and tar from the *Deepwater Horizon* explosion remain in the nearshore Gulf where they can be resuspended and deposited on barrier beaches by storms.

4.1.1.3.2. Impacts of Routine Events

This is a summary of the impacts of routine events on the coastal barrier beaches and associated dunes resource. For additional information on routine impacts to coastal barrier beaches and associated dunes, refer to Chapter 4.2.1.3.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.3 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Impacts to the general vegetation and physical aspects of coastal environments by routine activities resulting from an EPA proposed action are considered in detail in **Chapter 4.1.1.4.2**. This section considers impacts from routine activities to the physical shape and structure of barrier beaches and associated dunes. The primary impact-producing routine activities include navigation channel use (vessel traffic) and dredging, pipeline emplacements, and the use and construction of support infrastructure.

Proposed Action Analysis

Routine activities that could affect coastal barrier beaches and associated dunes are navigation channel use and dredging, pipeline emplacements, and construction or continued use of infrastructure in support of an EPA proposed action. Effects from routine activities are expected to be restricted to temporary and localized disturbances. Maintenance dredging of barrier inlets and bar channels is expected to occur, which, combined with channel jetties, causes minor and localized impacts on adjacent barrier beaches. Mitigating adverse impacts should be addressed in accordance with requirements set forth by the appropriate Federal and State permitting agencies. Because these impacts occur regardless of an EPA proposed action, a proposed action would account for a small percentage of these impacts from routine events. Also, strategic placement of dredged material from channel maintenance, channel deepening, and related actions can mitigate adverse impacts upon those localized areas.

There are 50 onshore services bases that the OCS Program activities currently utilize. An EPA proposed action is expected to impact only those ports that currently have facilities used by the oil and gas industry as offshore service bases. It is projected that there will be 0-1 pipeline landfalls and 0-1gas processing facilities constructed in support of an EPA proposed action. If there is a pipeline landfall or gas facility construction, then these activities are not expected to cause significant impacts to barrier beaches because of the use of nonintrusive installation methods and regulations. No new facilities are expected to be constructed as a result of an EPA proposed action.

The presence of drilling and production platforms visible from land, increased vessel and air traffic, and noise are aesthetic impacts usually associated with a proposed lease sale and routine events. The area where proposed EPA Lease Sales 225 and 226 would occur is 125 mi (201 km) from the shoreline and would not be of concern to business operators, local chambers of commerce, and organizations promoting tourism.

Summary and Conclusion

In conclusion, routine activities associated with an EPA proposed action are not expected to adversely alter barrier beach configurations much beyond existing, ongoing impacts in localized areas. This is because of the small amount of dredging, small probability of a pipeline landfall, and forecast for no new onshore facilities expected to result from the proposed action. If any such activities should occur, multiple Federal and State regulations would ensure decreased impacts to coastal habitats..

4.1.1.3.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events on the coastal barrier beaches and associated dunes resource. For additional information on the potential impacts of accidental events to coastal barrier beaches and associated dunes, refer to Chapter 4.2.1.3.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.3 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Impacts to the general vegetation and physical aspects of coastal environments by oil spills and cleanup response activities resulting from an EPA proposed action are considered in **Chapters 4.1.1.3.3, 4.1.1.4.3, and 4.1.1.5.3**. The types and sources of spills that may occur and their characteristics are described in **Chapter 3.1.2**. There is also a risk analysis of accidental events in **Chapter 3.2.1** provide the probability of an offshore spill ≥1,000 bbl occurring and contacting counties and parishes around the Gulf. A low-probability catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, is discussed in **Appendix B**. Potential impacts from oil spills to barrier islands seaward of the barrier-dune system are considered in this section, while potential impacts to barrier islands landward of the barrier-dune system are considered in the wetlands analysis (**Chapter 4.1.1.4.3**). Impacts to biological, recreational, and archaeological resources associated with beach and dune environments are described in the impact analysis sections for those specific resources.

Proposed Action Analysis

Due to the proximity of inshore spills to barrier islands and beaches, inshore spills pose the greatest threat. This is because of the concentration of oil, lack of weathering, and the fact that dispersants are not utilized in inshore waters due to the negative effects on the shallow-water coastal habitats. Such spills may result from either vessel collisions that release fuel and lubricants or from pipelines that rupture. The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past as long as the levels of energy-related industry, commercial, and recreational activities remain the same as estimated for the 2012-2017 WPA/CPA Multisale EIS. Therefore, the coastal waters of Texas, Louisiana, Mississippi, Alabama, and Florida will have a total of 20, 200, 30, 10, and 30 spills <1,000 bbl/year, respectively, from all sources (**Chapter 3.2.1.6**). When limited to just oil- and gas-related spill sources such as platforms, pipelines, MODU's, and support vessels, Louisiana, Texas, Mississippi, Alabama, and Florida will have totals of 130-170, 5-10, 3-5, ~2, and ~3 spills <1,000 bbl/year, respectively (**Chapter 3.2.1.6**). Louisiana and Texas are the states most likely to have a spill ≥1,000 bbl occur in coastal waters. The most likely cause is from platforms located in State waters. The highest resource estimate shows an 8 percent probability of one or more spills ≥1,000 bbl to occur from either a facility or pipeline associated with an EPA proposed action (**Table 3-21**). The effects from inshore oil spills depend on the geographic location, volume, and rate of the spill; type of oil; oil-slick characteristics; oceanic conditions and season at the time of the spill; and response and cleanup efforts. The effects could be changes in species diversity that could result in changes in forage areas for species using microfauna as a food base (Teal and Howarth, 1984).

Offshore-based crude oil would be lessened in toxicity when it reaches the coastal environments. This is due to the distance from shore, the weather, the time oil remains offshore, and the dispersant used. The probability of a spill contacting recreational beaches is <0.5 percent, and Louisiana is the only state with a parish (Plaquemines) that has the probability of a spill contacting State waters <0.5 percent (<0.5% to 1.0%) (**Figure 3-20**). Equipment and personnel used in cleanup efforts can generate the greatest direct impacts to the area, such as the disturbance of sands through foot traffic and mechanized cleanup equipment (e.g., sifters), dispersal of oil deeper into sands and sediments, and foot traffic in marshes impacting the distribution of oils and marsh vegetation. Close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts.

Should a spill other than a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, contact a barrier beach, oiling is expected to be light and sand removal during cleanup activities minimized. No significant long-term impacts to the physical shape and structure of barrier beaches and associated dunes are expected to occur as a result of an EPA proposed action. An EPA proposed action would not pose a significant increase in risk to barrier island or beach resources.

Summary and Conclusion

Due to the proximity of inshore spills to barrier islands and beaches, inshore spills pose the greatest threat. The effects could be changes in species diversity that could result in changes in forage areas for species using microfauna as a food base (Teal and Howarth, 1984). The probability of an offshore spill contacting recreational beaches is <0.5 percent. Equipment and personnel used in cleanup efforts can generate the greatest direct impacts to the area. No significant long-term impacts to the physical shape and structure of barrier beaches and associated dunes are expected to occur as a result of an EPA proposed action.

4.1.1.3.4. Cumulative Impacts

This is a summary of the cumulative impacts to the coastal barrier beaches and associated dunes resource. For additional information on cumulative impacts to coastal barrier beaches and associated dunes, refer to Chapter 4.2.1.3.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.3 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Coastal barrier beaches and associated dunes are vulnerable to many impacts ranging from dredging, pipeline emplacement, vessel traffic, and construction related to OCS activities (both CPA ongoing and proposed actions and an EPA proposed action) to oil spills and natural phenomena. While each of these activities can cause negative impacts to barrier beaches and associated dunes, an EPA proposed action would not increase the overall impacts.

OCS Oil- and Gas-Related Impacts

Continued navigation channel use and dredging, pipeline emplacements, and construction or continued use of infrastructure in support of an EPA proposed action could impact coastal habitats. However, these efforts would most probably be small in scale within the coastal areas of the EPA. Therefore, effects from these activities are expected to be restricted to temporary and localized disturbances.

Due to the proximity of inshore spills to barrier islands and beaches, inshore spills pose the greatest threat. Aging pipelines and infrastructure continue to be problematic, and the potential for spills could exist until they are replaced. Improperly abandoned wells can also have a potential to create spills, especially in the shallow State waters. The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past, and the majority of inshore spills are assumed to be small in scale and short in duration; therefore, impacts would be minor. The probability of an offshore spill contacting recreational beaches is <0.5 percent (**Figure 3-20**). Oil from most offshore spills, including a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action (more detail in **Appendix B**), is assumed to be weathered and normally treated offshore; therefore, most of the toxic components would have dissipated by the time it would contact coastal beaches. The cleanup impacts of these spills could result in short-term (up to 2 years) adjustment in beach profiles and configurations as a result of sand removal and disturbance during the cleanup operations. All cleanup efforts would be monitored to ensure the least amount of disturbance to the areas. The long-term stressors to barrier beach communities caused by the physical effects and chemical toxicity of an oil spill may lead to decreased primary production, plant dieback, and further erosion.

Non-OCS Oil- and Gas-Related Impacts

River channelization, sediment deprivation, tropical and extra-tropical storm activity, sea-level rise, and rapid submergence have resulted in severe and rapid erosion of most of the barrier and shoreline landforms along the Louisiana coast. The barrier system of coastal Mississippi, Alabama, and the Florida panhandle is also supported on a coastal barrier platform of sand. Beach stabilization projects, such as groins and jetties, are considered by coastal geomorphologists and engineers to accelerate coastal erosion. Beach nourishment projects have resulted in short-term stability or accretion in some areas (Morton et al., 2004). Beneficial use of maintenance dredged materials and other restoration techniques could be required to mitigate some of these impacts.

Coastal barrier beaches have experienced severe adverse cumulative impacts from natural processes and human activities. Natural processes are generally considered the major contributor to these impacts, whereas human activities cause both severe local impacts and the acceleration of natural processes that deteriorate coastal barriers. Human activities that have caused the greatest adverse impacts are river channelization and damming, coastal development, pipeline canals, navigation channel stabilization and maintenance, and beach stabilization structures. Deterioration of Gulf barrier beaches from these factors is expected to continue in the future. Federal, State (Louisiana), and parish governments have made efforts over the last 10 years to slow the landward retreat of Louisiana's Gulf shorelines. Frequent intense storms, a relative rise in sea level, and a deficit in the sediment budget are the principal natural causes of barrier island landloss. The most recent landloss accelerations are likely related to the increased storm activity since 1995. Although overwash channels do not commonly occur, the islands may be overwashed during strong storms.

Summary and Conclusion

An EPA proposed action is not expected to adversely alter barrier beach configurations significantly beyond existing, ongoing impacts in localized areas downdrift of artificially jettied and maintained channels. Strategic placement of dredged material from channel maintenance, channel deepening, and related actions could mitigate localized adverse impacts. Also, an EPA proposed action is not expected to increase the probabilities of oil spills beyond the current estimates. Thus, the incremental contribution of an EPA proposed action to the cumulative impacts on coastal barrier beaches and associated dunes is expected to be small.

4.1.1.4. Wetlands

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for wetlands can be found in Chapter 4.2.1.4 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.4 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapters 4.2.1.4 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.4 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for wetlands regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for wetlands presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for wetlands presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and are hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on wetlands, and various Internet sources were examined to determine any recent information regarding wetlands. Sources investigated include BOEM, the USGS National Wetlands Research Center, the USGS Gulf of Mexico Integrated Science Data Information Management System, Gulf of Mexico Alliance, State environmental agencies, USEPA, and coastal universities. Other websites from scientific publication databases (including Science Direct, Elsevier, CSA Illumina, and JSTOR) were checked for new information using general Internet searches based on major themes. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding wetlands since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, BOEM concludes that the unavailable or incomplete information identified in this EIS, the WPA 233/CPA 231 Supplemental EIS, and the 2012-2017 WPA/CPA Multisale EIS may be relevant to foreseeable significant adverse impacts to wetlands. Relevant data on the status of wetlands and marshes after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. The NRDA process is ongoing and, to date, much of the information collected as part of the process has not been fully analyzed, and conclusions have not been released to the public. It may be years before NRDA data and conclusions are available. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated by this NEPA analysis, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted methods and approaches. Nevertheless, BOEM believes that incomplete or unavailable information regarding the unknown effects of the *Deepwater Horizon* explosion, oil spill, and response is not essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Although there may still be incoming information, there is significant available data on shoreline oiling and the current status of wetlands and marshes from the SCAT and ERMA databases that have assisted BOEM's subject-matter experts in their analyses. Future incoming data are not expected to significantly alter these conclusions, and future impacts from these past events are not expected.

4.1.1.4.1. Description of the Affected Environment

The importance of coastal wetlands to the coastal environment has been well documented (Greb et al., 2006). One of the important functions of coastal marshes and barrier islands is as a front line of defense against storm surge. High organic productivity and efficient nutrient recycling are characteristic of coastal wetlands. These wetland corridors provide habitat for a great number and wide diversity of resident plants, invertebrates, fishes, reptiles, birds, and mammals. Marsh environments are particularly important nursery grounds for many economically important fish and shellfish juveniles (Castellanos and Rozas, 2001). The marsh edge, where marsh and open water come together, is particularly important for its higher productivity and greater concentrations of organisms (Baltz et al., 1993). Emergent plants produce the bulk of the energy that supports salt marsh-dependent animals.

In general, coastal wetland habitats occur as bands around waterways, often many miles in width. They are broad expanses of saline, brackish, and freshwater marshes; mud and sand flats; forested wetlands that consist of cypress-tupelo swamps; and mangrove and bottomland hardwood forests. Saline and brackish habitats support sharply delineated and segregated stands of single plant species. Fresh and low-salinity environments support more diverse and mixed communities of plants.

The Chenier Plain formed between Port Bolivar, Texas, and Atchafalaya Bay in Louisiana as a result of storms and tidal currents reworking and depositing the sediments of the Mississippi River and its delta over the past several thousand years. Brackish and intermediate salinity marshes are dominant in the estuarine areas of the Chenier Plain. They are tidal with wind-driven tides being more influential, and they occasionally inundate these areas. Further inland, freshwater wetlands are extensive in the Chenier Plain due to the abundant rainfall and runoff, coupled with a ridge system that retains freshwater and restricts the inflow of saline waters.

The Mississippi River Delta Complex forms a plain that is composed of a series of overlapping riverine deltas that have extended onto the continental shelf over the past ~6,000 years (Coleman et al., 1998). Wetlands on this deltaic plain are the most extensive of those within the northern Gulf of Mexico. Sparse stands of black mangrove are found in the highest salinity areas of the Barataria and Terrebonne

Basins. Extensive salt and brackish marshes are found throughout the southern half of the plain and east of the Mississippi River. Further inland, extensive intermediate and freshwater marshes occur.

Coastal Mississippi is currently predominantly salt-marsh habitat with little fresh marsh. Estuarine wetlands are the second most common wetlands in Mississippi and include coastal, estuarine, and fresh marshes; mud flats; and cypress-tupelo gum swamp (estuarine forested wetlands). The estuarine marshes around Mississippi Sound and associated bays occur in discontinuous bands. The most extensive wetland areas in Mississippi occur in the eastern Pearl River Delta near the Louisiana/Mississippi border and in the Pascagoula River Delta area near the Mississippi/Alabama border.

The coastal lowlands of Alabama have gently undulating to flat topography and basically follow the shoreline along the Gulf of Mexico and Mobile, Perdido, and Bon Secour Bays (O'Neil and Mettee, 1982). The ecological environments and geomorphology consist of features such as wetlands (e.g., tidal marsh), two large peninsulas, a delta, lagoons, islands, and bays. The presence of a high water table with a range of salinities gives rise to the abundance of various wetland habitat types that are found within Alabama's coastal area.

Florida's salt marshes are most abundant on central and northern coastlines (Mitsch and Gosselink, 2000). They are dominant along the Big Bend area of the Gulf Coast in low-energy shorelines, sands, lagoons, and bays. These marshes are similar to the ones located throughout the northern Gulf of Mexico. The mangrove swamps of Florida are concentrated along the southwest coast. Florida has three mangrove species (*Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*), whereas the rest of the northern Gulf of Mexico has one (*Avicennia germinans*). These mangrove species are less cold tolerant than the other coastal salt-marsh plants found in the northern Gulf of Mexico coast.

Florida wetlands, at one time estimated to encompass over 20 million ac, have been converted through draining, dredging, filling, erosion, etc., until by 1996, approximately 11.4 million ac remained (Dahl, 2005). Of this, 10 percent were estuarine and 90 percent were freshwater wetlands. Wetland loss rates in the State, as high as 72,000 ac per year from the mid-1950's to the mid-1970's, declined during the next decade to 23,700 ac per year. The loss rate dropped by 81 percent, to 5,000 ac per year between 1985 and 1996. This decline was due largely to increased regulation and elimination of incentives for wetland drainage. Public education, protection programs, and policies that promoted wetland restoration and creation also contributed (Dahl, 2005).

Florida's coastal zone contained approximately 21 percent of the estuarine and marine wetlands of the conterminous United States and 92 percent of estuarine shrub wetlands in 1996. Between 1985 and 1996, Florida's intertidal wetlands lost only 500 ac, less than 1 percent of the total (Dahl, 2005). Seventy-five percent of the estuarine shrub losses were due to some form of coastal development, including bridges, roads, and urban or suburban development. Seventy-one percent of the losses to estuarine shores were attributed to urban expansion along the coast.

4.1.1.4.2. Impacts of Routine Events

This is a summary of the potential impacts of routine events to wetlands. For additional information on the potential impacts of routine events to wetlands, refer to Chapter 4.2.1.4.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.4 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Impact-producing factors and scenarios for routine operations can be found in **Chapter 3.1**. In this section, consideration is given to impacts to coastal wetlands and marshes from routine activities associated with an EPA proposed action. The primary impact-producing factors include maintenance dredging; disposal of OCS-related wastes; and pipeline emplacement, construction, and maintenance.

Proposed Action Analysis

Routine activities include dredging, waste disposal, and trenching associated with pipeline emplacement and entrainment. It is expected that impacts from routine events in the EPA would be reduced or eliminated through mitigation, such as horizontal, directional (trenchless) drilling techniques to avoid damages to these sensitive wetland habitats. While an EPA proposed action would contribute to the continued need for maintenance dredging of existing navigation channels, a mature network of navigation channels already exists in the analysis area; therefore, no new navigation channel construction would be expected as a direct result of an EPA proposed action. Alternative dredged-material disposal methods can be used to maintain and create wetlands. BOEM's analyses indicate that there is an abundance of solid-waste capacity in the GOM region and, thus, it is highly unlikely that any new waste facilities would be constructed. Support-vessel operators servicing the OCS offshore oil and gas industry may still legally discharge oily bilge waters in coastal waters, but they must treat the bilge water to limit its oil content to 15 ppm prior to discharge in accordance with regulations. Ballast water also has to abide by international standards adopted by the Coast Guard and USEPA. The Clean Water Act prohibits the discharge of oil in harmful quantities that violate applicable water quality standards or that cause a visible sheen on the water. BOEM projects that 0-1 new gas processing facilities and 0-1 pipeline landfalls would result from an EPA proposed action. No new additional onshore facilities are expected to be constructed as a result of an EPA proposed action.

Summary and Conclusion

Overall, the impacts to wetlands from routine activities associated with an EPA proposed action are expected to be low because 0-1 pipeline landfalls are projected, 0-1 new gas processing facilities are expected, and the contribution from an EPA proposed action to the need for maintenance dredging would be minimal. Also, the mitigation measures required in most permits would further reduce all of these impacts.

4.1.1.4.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to wetlands. For additional information on the potential impacts of accidental events to wetlands, refer to Chapter 4.2.1.4.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.4 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

A risk analysis of accidental events associated with an EPA proposed action can be found in **Chapters 3.2.1.4 and 3.2.1.5**.

Background/Introduction

The main impact-producing factors that would affect wetlands are oil spills. With the reduced protection of the barrier islands lost due to hurricanes and anthropogenic factors, there is a greater potential for the oiling of coastal wetlands during an accidental event. Both coastal and offshore oil spills can be caused by large tropical cyclone events. In most cases, offshore spills, unless catastrophic in nature, which is not reasonably expected and not part of an EPA proposed action, (e.g., *Deepwater Horizon* oil spill), are not expected to significantly damage any wetlands along the Gulf Coast. Refer to **Appendix B** for an analysis of impacts from a low-probability catastrophic spill event, which is not reasonably expected and not part of an EPA proposed action. It must be noted that, even with offshore spills, the degree of coastal impact is a function of the source oil type, volume, and condition of the oil as it reaches shore, along with the season of the spill and the composition of the wetland plant community affected.

Proposed Action Analysis

Due to the proximity of inshore spills to wetlands and coastal habitats, inshore spills pose the greatest threat. This is because of the concentration of oil, lack of weathering, and the fact that dispersants are not utilized in inshore waters due to the negative effects on the shallow-water coastal habitats. Such spills may result from either vessel collisions that release fuel and lubricants or from pipelines that rupture. The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past, as long as the levels of energy-related industry, commercial, and recreational activities remain the same as estimated for the 2012-2017 WPA/CPA Multisale EIS. Therefore, the coastal waters of Texas, Louisiana, Mississippi, Alabama, and Florida will have a total of 20, 200, 30, 10, and 30 spills <1,000 bbl/year, respectively, from all sources (**Chapter 3.2.1.6**). When limited to just oil- and gas-related spill sources such as platforms, pipelines, MODU's, and support vessels, Texas, Louisiana, Mississippi, Alabama, and Florida will have totals of 5-10, 130-170, 3-5, ~2, and ~3 spills <1,000 bbl/year, respectively (**Chapter 3.2.1.6**).

Louisiana and Texas are the states most likely to have a spill ≥1,000 bbl occur in coastal waters. The most likely cause is from platforms located in State waters. However, the greatest threat from an oil spill to wetland habitat is from an inland spill as a result of a nearshore vessel accident or pipeline rupture, and the probability of occurrence of those types of spill is low. The highest resource estimate shows a probability of one or more spills ≥1,000 bbl to occur from either a facility or pipeline associated with an EPA proposed action is 8 percent (**Table 3-21)**.

Offshore oil spills resulting from an EPA proposed action would have a low probability of contacting and damaging any wetlands along the Gulf Coast, except in the case of a catastrophic event, which is not reasonably expected and not part of an EPA proposed action (**Appendix B**). This is because of the distance of the spill to the coast, the likely weathered condition of oil (through evaporation, dilution, and biodegradation) should it reach the coast, and because wetlands are generally protected by barrier islands, peninsulas, sand spits, and currents. Louisiana is the only state with a probability of a spill contacting State waters >0.5 percent (with a range of <0.5-1.0%) and shoreline (0-1%) and that is only for Plaquemines Parish (**Figures 3-8 and 3-9**).

The fringe wetlands in the northern Gulf of Mexico are in moderate- to high-energy environments; therefore, sediment transport and tidal stirring should reduce the chances for oil persisting in the event that these areas are oiled. While a resulting slick may cause minor impacts to wetland habitat and surrounding seagrass communities, the equipment, chemical treatments, and personnel used to clean up can generate the greatest impacts to the area. Associated foot traffic may work oil farther into the sediment than would otherwise occur. Close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. In addition, an assessment of the area covered, oil type, and plant composition of the wetland oiled should be made prior to choosing remediation treatment. These treatments could include mechanical and chemical techniques with onsite technicians. Overall, impacts to wetland habitats from an oil spill associated with activities related to an EPA proposed action would be expected to be low and temporary because of the nature of the system, regulations, and specific cleanup techniques.

Summary and Conclusion

Due to the proximity of inshore spills to wetlands and coastal habitats, inshore spills pose the greatest threat. Louisiana is the only state with a probability of an offshore spill contacting State waters. Fringe wetlands in the northern Gulf of Mexico are in moderate- to high-energy environments; therefore, sediment transport and tidal stirring should reduce the chances for oil persisting in the event that these areas are oiled. While a resulting slick may cause minor impacts to wetland habitat and surrounding seagrass communities, the equipment, chemical treatments, and personnel used to clean up can generate the greatest impacts to the area. Close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. Overall, impacts to wetland habitats from an oil spill associated with activities related to an EPA proposed action would be expected to be low and temporary because of the nature of the system, regulations, and specific cleanup techniques.

4.1.1.4.4. Cumulative Impacts

This is a summary of cumulative impacts to wetlands. For additional information on cumulative impacts to wetlands, refer to Chapter 4.2.1.4.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.4 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Wetlands are exposed to many events that could cause negative effects. These include pipeline emplacement, construction, dredging (from both CPA ongoing and proposed actions and an EPA proposed action), oil spills, coastal development, and natural phenomena.

OCS Oil- and Gas-Related Impacts

Any landloss associated with vessel traffic would be minimal because of the small increase in traffic caused by an EPA proposed action. An EPA proposed action would not require any channel maintenance; therefore, no additional wetland loss would result from dredged material disposal. The OCS wastes and drilling by-products would be delivered to existing disposal facilities approved by USEPA for handling these materials. Because of existing capacity, no additional expansion into wetland areas is expected.

The wetlands that are in the closest proximity with an EPA proposed action have a minimal probability for oil-spill contact. This reduced risk is due to the distance of the offshore facility to wetland sites, beach and barrier island topography, and product transportation through existing pipelines or pipeline corridors. Wetlands can also be at risk for offshore spills including a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action (more detail in **Appendix B**), but the risks are minimized by distance, time, sea conditions, weather conditions, and the implementation of a timely and appropriate spill-response effort. If any inland spills occur, they would likely be small and at inland service bases or other support facilities and generally located away from wetlands; therefore, the spills would not be expected to substantially affect wetlands. Impacts associated with an EPA proposed action are a minimal part of the overall OCS impacts.

Non-OCS Oil- and Gas-Related Impacts

Landloss would continue from subsidence and saltwater intrusion. Development pressures in the coastal regions of Louisiana, Mississippi, Alabama, and Florida have caused the destruction of large areas of wetlands. In coastal Louisiana, the most destructive developments have been the inland oil and gas industry projects, which have resulted in the dredging of huge numbers of access channels.

Agricultural, residential, and commercial developments have caused the most destruction of wetlands in Mississippi, Alabama, and Florida. In Florida, recreational and tourist developments have been particularly destructive. These trends are expected to continue. The cumulative effects of human and natural activities in the coastal area have severely degraded the deltaic processes and have shifted the coastal area from a condition of net land building to one of net landloss. Deltaic Louisiana is expected to continue to experience the greatest loss of wetland habitat. Wetland loss is also expected to continue in coastal Mississippi, Alabama, and Florida, but at slower rates.

Along with increased human activities, the recent increase in intensity and frequency of hurricanes in the Gulf (Stone et.al., 2004) has greatly impacted the system of protective barrier islands, beaches, and dunes and associated wetlands along the Gulf Coast. Intense storms typically erode all of the vegetation and soil from some areas of marsh, leaving behind a body of water, as seen with Hurricane Isaac. Based on the depths of storm-related scours, marsh type (i.e., fresh, intermediate, brackish, or saline), sediment supply, and drainage; possible recovery time for wetlands after storms can be determined. These storm events will continue to impact the Gulf of Mexico coast.

Summary and Conclusion

The impacts to wetlands from activities associated with an EPA proposed action are expected to be low because 0-1 pipeline landfalls are projected, 0-1 new gas processing facilities are expected, and the contribution from an EPA proposed action to the need for maintenance dredging would be minimal. The wetlands that would be associated with an EPA proposed action have a minimal probability for oil-spill contact. The cumulative effects of human and natural activities in the coastal area have severely degraded the deltaic processes and have shifted the coastal area from a condition of net land building to one of net landloss. The incremental contribution of an EPA proposed action to the cumulative impacts on coastal wetlands is expected to be small.

4.1.1.5. Seagrass Communities

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for seagrass communities can be found in Chapter 4.2.1.5 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.5 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.5 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.5 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for seagrass communities regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for seagrass communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for seagrass communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on seagrass communities, and various Internet sources were examined to determine any recent information regarding seagrass communities. Sources investigated include BOEM, USDOC/NOAA, the USGS National Wetlands Research Center, the USGS Gulf of Mexico Integrated Science Data Information Management System, Seagrass Watch, Gulf of Mexico Alliance, State environmental agencies, USEPA, and coastal universities. Other websites from scientific publication databases (including Science Direct, Elsevier, CSA Illumina, and JSTOR) were checked for new information using general Internet searches based on major themes. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding seagrass communities since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and despite the new information identified and provided below, there remains uncertainty regarding the impacts of the *Deepwater Horizon* explosion, oil spill, and response on submerged vegetation. At least for submerged vegetation in Louisiana, Mississippi, and Alabama, BOEM cannot definitively determine that the incomplete or unavailable information being developed through the NRDA process may be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Unavailable information on the effects to submerged vegetation from the *Deepwater Horizon* explosion, oil spill, and response (and thus changes to the submerged vegetation baseline in the affected environment) makes an understanding of the cumulative effects less clear. BOEM concludes that the unavailable information from these events may be relevant to foreseeable significant adverse impacts to submerged vegetation. Nevertheless, the ongoing research on submerged vegetation after the *Deepwater Horizon* explosion, oil spill, and response is being conducted through the NRDA process. Relevant data on the status of submerged vegetation beds after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated by this NEPA analysis, regardless of the cost or resources needed. In light of this incomplete and unavailable information, BOEM's subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology.

4.1.1.5.1. Description of the Affected Environment

According to the most recent and comprehensive data available, approximately 500,000 ha (1.25 million ac) of seagrass beds are estimated to exist in exposed, shallow coastal/nearshore waters and embayments of the Gulf of Mexico, and over 80 percent of these beds are in Florida Bay and Florida coastal waters (calculated from Handley et al., 2007). True seagrasses that occur in the Gulf of Mexico are *Halodule beaudettei* (formerly *Halodule wrightii;* shoal grass), *Halophila decipiens* (paddle grass), *Halophila engelmannii* (star grass), *Syringodium filiforme* (manatee grass), and *Thalassia testudinum* (turtle grass) (Short et al., 2001; Handley et al., 2007). Although it is not considered a true seagrass because it has hydroanemophilous pollination (pollen grains float) and can tolerate freshwater, *Ruppia maritima* (widgeon grass) is common in the brackish waters of the Gulf of Mexico (Zieman, 1982; Berns, 2003; Cho and May, 2008). Freshwater genera that are dominant in the northern Gulf of Mexico coastal waters are *Ceratophyllum*, *Najas*, *Potamogeton*, and *Vallisneria* (Castellanos and Rozas, 2001; Cho and May, 2008). In the northern Gulf of Mexico from south Texas to Mobile Bay, seagrasses occur in relatively small beds behind barrier islands in bays, lagoons, and coastal waters (**Figure 4-3**), while submerged aquatic vegetation occur in the upper freshwater regions of estuaries and rivers (Onuf, 1996; Castellanos and Rozas, 2001; Handley et al., 2007).

In Louisiana, submerged vegetation primarily consists of freshwater and low-salinity vegetation (submerged aquatic vegetation), and these beds are found in coastal waterbodies like Lake Pontchartrain, Biloxi Marsh, and the Barataria-Terrebonne estuary (Maiaro, 2007; Poirrier et al., 2010). Seagrass beds in Louisiana have low densities and are rare. The exceptions are the beds in the vicinity of the Chandeleur Island chain located between Louisiana and Mississippi (Poirrier, 2007).

Seagrass beds in Mississippi primarily occur in Mississippi Sound and are in the proximity of the Grand Bay National Estuarine Research Reserve, Buccaneer State Park, and the Gulf Island National Seashore islands of Cat, Ship, Horn, and Petit Bois (Moncreiff, 2007). After local extinctions of *T. testudinum* and *S. filiforme* from Hurricane Camille and recent increases in freshwater outflow from nearby watersheds, there has been an increase in *R. maritima* and a persistence of *H. beaudettei*, making them the predominant submerged vegetation communities along the Mississippi coast (Cho and May, 2008; Cho et al., 2009; Barry A. Vittor & Associates, Inc., 2009).

Barry A. Vittor & Associates, Inc. (2009) reported approximately 2,100 ha (5,250 ac) of freshwater and marine submerged vegetation in Alabama coastal waters. Freshwater communities are dominated by *Myriophyllum spicatum*, *Najas quadalupensis*, and *Vallisneria americana*, while *R. maritima* and *H. beaudettei* occur in marine waters. Alabama's submerged vegetation beds are similar to the coastal beds in Mississippi.

Most of the seagrass coverage in Florida is in south Florida and the higher-salinity estuarine regions in the Florida Panhandle, between Pensacola and Alligator Harbor, and the Big Bend area (Dawes et al., 2004; Carlson and Madley, 2007; Carlson et al., 2010). All of the seagrass species that occur in the northern Gulf of Mexico are present in Florida's waters. Many of the SAV genera are found in Florida's inland estuaries, bays, lagoons, and coastal rivers (Kraemer et al., 1999; Lores et al., 2000; Hoyer et al., 2004). An EPA proposed action is located in the De Soto Canyon and Walker Ridge leasing areas of the Gulf of Mexico, approximately 125 mi (201 km) south of the northern Gulf Coast. That is, an EPA proposed action is a considerable distance from the nearest seagrass communities.

4.1.1.5.2. Impacts of Routine Events

This is a summary of the potential impacts of routine events to seagrass communities. For additional information on the potential impacts of routine events to seagrass communities, refer to Chapter 4.2.1.5.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.5 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The routine events associated with OCS activities in the CPA that could adversely affect submerged vegetation communities include maintenance dredging, vessel traffic (e.g., propeller scars), and construction of pipelines and onshore facilities. Many of these activities would result in an increase of water turbidity that is detrimental to submerged vegetation health. Through avoidance and mitigation policies such as avoidance of the seagrass and vegetation communities or the use of turbidity curtains, these effects are generally localized, short term, and minor in nature. Existing and projected lengths of OCS-related dredging, pipelines, and vessel activities are described in detail in **Chapter 3.1**.

Proposed Action Analysis

Routine OCS activities in the EPA that may impact seagrasses include maintenance dredging, vessel traffic, and pipeline landfalls. These activities are not expected to significantly increase in occurrence and range in the near future. While an EPA proposed action would contribute to the continued need for maintenance dredging of existing navigation channels, a mature network of navigation channels already exists in the analysis area; therefore, no new navigation channel construction would be expected as a direct result of an EPA proposed action. Further, requirements of other Federal and State programs, such as avoidance of the seagrass and vegetation communities or the use of turbidity curtains, reduce the undesirable effects on submerged vegetation beds from dredging activities. Federal and State permit requirements should ensure pipeline routes avoid high-salinity beds and maintain water clarity and quality. Local programs decrease the occurrence of prop scarring in grass beds, and channels utilized by OCS vessels are generally away from exposed submerged vegetation beds. BOEM projects that 0-1 new gas processing facilities and 0-1 new pipeline landfalls will result from an EPA proposed action. No additional new onshore facilities beside the possible one gas processing facility are expected to be constructed, and existing waterways and ports will be used with an EPA proposed action.

Summary and Conclusion

Routine OCS activities in the EPA that may impact seagrasses include maintenance dredging, vessel traffic, and pipeline landfalls. These activities are not expected to significantly increase in occurrence and range in the near future. If they do occur, these activities should have minor effects on submerged vegetation. This is because of Federal and State requirements and implemented programs, along with the beneficial effects of natural flushing (e.g., from winds and currents). Any potential effects on submerged vegetation from routine activities in the EPA are expected to be localized and not significantly adverse.

4.1.1.5.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to seagrass communities. For additional information on the potential impacts of accidental events to seagrass communities, refer to Chapter 4.2.1.5.3 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.5 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

In Louisiana, submerged vegetation primarily consists of freshwater and low-salinity vegetation, but there are seagrass beds in the vicinity of the Chandeleur Island chain (Poirrier, 2007). Mississippi's seagrass beds primarily occur in Mississippi Sound and are in the proximity of the Gulf Island National Seashore islands (Moncreiff, 2007). Alabama's coast has submerged beds throughout the area. Most of the seagrass coverage in Florida is in south Florida and the higher-salinity estuarine regions in the Florida Panhandle, between Pensacola and Alligator Harbor, and the Big Bend area (Dawes et al., 2004; Carlson and Madley, 2007; Carlson et al., 2010). Accidental impact-producing factors from an EPA proposed action are discussed in **Chapter 3.2**, and a catastrophic event, which is not reasonably expected and not part of an EPA proposed action, is discussed in **Appendix B**. The section below discusses the possible impacts from these factors on seagrass communities.

Proposed Action Analysis

Due to the proximity of inshore spills to areas with submerged vegetation, inshore spills pose the greatest threat. This is because of the concentration of oil, lack of weathering, and the fact that dispersants are not utilized in inshore waters due to the negative effects on the shallow-water coastal habitats. Such spills may result from either vessel collisions that release fuel and lubricants or from pipelines that rupture. The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past as long as the levels of energy-related industry, commercial, and recreational activities remain the same as estimated for the 2012-2017 WPA/CPA Multisale EIS. Therefore, the coastal waters of Louisiana, Texas, Mississippi, Alabama, and Florida will have a total of 200, 20, 30, 10, and 30 spills/year <1,000 bbl, respectively, from all sources (**Chapter 3.2.1.6**). When limited to just oil- and gas-related spill sources such as platforms, pipelines, MODU's, and support vessels Louisiana, Texas, Mississippi, Alabama, and Florida will have totals of 130-170, 5-10, 3-5, ~2, and ~3 spills/year <1,000 bbl, respectively (**Chapter 3.2.1.6**). Louisiana and Texas are the states most likely to have a spill ≥1,000 bbl occur in coastal waters. The most likely cause is from platforms located in State waters. However, the greatest threat to inland, submerged vegetation communities would be from an inland spill resulting from a vessel accident or pipeline rupture, but the size of these types of spills is small and the duration short. The resulting slick may cause short-term and localized impacts to a submerged vegetation bed.

There is also the remote possibility of an offshore spill to such an extent that it could also affect submerged vegetation beds, and this would have similar effects to an inshore spill. Louisiana is the only state with a probability of a spill contacting State waters >0.5 percent (with a range of <0.5-1.0%) and shoreline (0-1%) and that is only for Plaquemines Parish (**Figures 3-8 and 3-9**). Louisiana's submerged vegetation is generally inshore and would not have contact with oil except for the beds behind the Chandeleur Islands. The large area of seagrass in Florida called the Big Bend has a <0.5 percent probability of a spill contacting the beds (**Figure 3-21**). These probabilities show that there is a small chance of an oil spill contacting submerged vegetation from an EPA proposed action.

Because prevention and cleanup measures can have negative effects on submerged vegetation, close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. The floating nature of nondispersed crude oil, the regional microtidal range, the dynamic climate with mild temperatures, and the amount of microorganisms that consume oil would alleviate prolonged effects on submerged vegetation communities. Also, safety and spill-prevention technologies are expected to continue to improve and would decrease the detrimental effects to submerged vegetation from an EPA proposed action.

The impacts to submerged vegetation from an accidental event related to an EPA proposed action are expected to be minimal. This is because of the distance of most activities from the submerged vegetation beds and because of the likelihood of an accidental event of size, location, and duration reaching submerged vegetation remains small.

Summary and Conclusion

The greatest threat to inland, submerged vegetation communities would be from an inland spill resulting from a vessel accident or pipeline rupture, but the size of these types of spills is small and the duration short. The resulting slick may cause short-term and localized impacts to a submerged vegetation bed. Because prevention and cleanup measures can have negative effects on submerged vegetation, close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts. Safety and spill-prevention technologies are expected to continue to improve and would decrease the detrimental effects to submerged vegetation from an EPA proposed action.

4.1.1.5.4. Cumulative Impacts

This is a summary of potential cumulative impacts to wetlands. For additional information on potential cumulative impacts to seagrass communities, refer to Chapter 4.2.1.5.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.5 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Of all of the activities in the cumulative scenario found in **Chapter 3.3**, dredging, oil spills/pipelines, hydrological changes, and storm events present the greatest threat of impacts to submerged vegetation communities.

OCS Oil- and Gas-Related Impacts

Specifically, activities related to the OCS Program will continue to affect submerged vegetation beds, and these activities include an EPA proposed action. An EPA proposed action would cause a minor incremental contribution to any ongoing impacts on submerged vegetation from dredging, pipeline installations, boat scarring, and oil spills. Because of Federal and State requirements and implemented programs, along with the beneficial effects of natural flushing (e.g., from winds and currents), any potential effects on submerged vegetation from dredging, pipelines, and boat scarring associated with an EPA proposed action are expected to be localized and not significantly adverse. The impacts to submerged vegetation from an accidental event related to an EPA proposed action are expected to be minimal. This is due to the distance of most activities from the submerged vegetation beds and because of the likelihood of an accidental event of size, location, and duration reaching submerged vegetation remains small. This also includes a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action (more detail can be found in **Appendix B**).

Non-OCS Oil- and Gas-Related Impacts

Many of man's activities have caused landloss either directly or indirectly by accelerating natural processes. Saltwater intrusion, as a result of river channelization and canal dredging, is a major cause of coastal habitat deterioration (including submerged vegetation communities) (Boesch et al., 1994). Large shifts in salinities can decrease both seagrass and SAV populations, which decreases their ecological function for juvenile fishes and invertebrates. Currently, there is a period of significant increased tropical cyclone activity in the Gulf of Mexico. These storms can remove or bury submerged beds and the barriers that protect these beds from storm surges. This could weaken the existing populations of local submerged vegetation. An EPA proposed action is not expected to significantly increase the effects from natural disturbances.

Summary and Conclusion

The current Federal and State mitigation policies, the small probability of an oil spill, and the natural flow regimes reduce the incremental contribution of stress from an EPA proposed action on submerged vegetation. The impact of an EPA proposed action remains minor compared with the cumulative effects of other factors, including dredging, hurricanes, and vessel traffic. This is a summary of the seagrass communities.

4.1.1.6. Live Bottoms

4.1.1.6.1. Live Bottoms (Pinnacle Trend)

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for live bottoms (Pinnacle Trend) can be found in Chapter 4.2.1.6.1 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.6.1 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.6.1 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.6.1 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for live bottoms (Pinnacle Trend) regarding an EPA proposed action, and they are hereby incorporated by reference.

BOEM has examined the analysis for live bottoms (Pinnacle Trend) presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for live bottoms (Pinnacle Trend) presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and incorporated by reference for proposed Lease Sales 225 and 226 in the EPA.

Further, a search was conducted for information published on live bottoms (Pinnacle Trend), and various Internet sources were examined to determine any recent information regarding live bottoms (Pinnacle Trend). A search of Internet information sources (the NOAA Gulf Spill Restoration Publications website; the ERMA Gulf Response website; the NOAA *Deepwater Horizon* Archive Publications and Factsheets; the Gulf of Mexico Sea Grant *Deepwater Horizon* Oil Spill Research and Monitoring Activities Database; the RestoreTheGulf.gov website; and the *Deepwater Horizon* Oil Spill Portal), as well as recently published journal articles was conducted to determine the availability of recent information on the Pinnacle Trend. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding live bottoms (Pinnacle Trend) since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, limited data are currently available on potential impacts of the *Deepwater Horizon* explosion, oil spill, and response on Pinnacle Trend features in the CPA. This incomplete or unavailable information may be relevant to reasonably foreseeable significant impacts to Pinnacle Trend features. BOEM has determined that this incomplete or unavailable information may be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Relevant data on the status of Pinnacle Trend features after the *Deepwater Horizon* explosion, oil spill, and response, however, may take years to acquire and analyze. Much of this data is being developed through the NRDA process, which is expected to take years to complete. Little data from the NRDA process have been made available to date. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated by this NEPA, regardless of the cost or resources needed. In the place of this incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

4.1.1.6.1.1. Description of the Affected Environment

The northeastern portion of the CPA exhibits a region of high topographic relief known as the "Pinnacle Trend" at the outer edge of the Mississippi-Alabama shelf between the Mississippi River and De Soto Canyon (**Figure 4-4**). The Pinnacle Trend spreads over a 103 x 26 km area (64 x 16 mi) in water depths of 60-200 m (200-650 ft). It includes pinnacles, flat-top reefs, patch reefs, reef-like mounds, and isobath parallel ridges (Sager et al., 1992; Brooks and Giammona, 1990; CSA, 1992).

The Pinnacle Trend features consist of both high-relief outcroppings at the edge of the Mississippi-Alabama Shelf and low-relief hard bottoms on the inner and middle shelf. The high-relief features are complex in shape and structure and provide varied zones of microhabitat for attached organisms and attract a large number of fish. Low-relief features include fields of small seafloor mounds that rise only a meter or two from the seafloor but provide hard surfaces for encrusting and attached epifauna. Both high- and low-relief features are relict features that developed prior to the most recent sea-level rise and do not support active reef-building activity (Thompson et al., 1999).

The Mississippi River outflow produces a gradient of sedimentation and water-column turbidity throughout the Pinnacle Trend that influences the organisms that live in the area (Gittings et al., 1992a; CSA and GERG, 2001). In addition, a nepheloid layer (heavy bottom turbidity layer), common in the western Gulf of Mexico, sometimes affects the Pinnacle Trend through the resuspension of bottom sediments (Weaver et al., 2002). For additional information on the Pinnacle Trend features, refer to Chapter 4.2.1.6.1.1 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

Pinnacle features are located on 74 OCS lease blocks in the northeastern CPA of the Gulf of Mexico. They are defined in this Agency's NTL 2009-G39, "Biologically-Sensitive Underwater Features and Areas," as "small, isolated, low to moderate relief carbonate reefal features or outcrops of unknown origin or hard substrates exposed by erosion that provide surface area for the growth of sessile invertebrates and attract large numbers of fish." BOEM has protected Pinnacle Trend features that support sensitive benthic communities through lease stipulations since 1974 and recommends oil and gas operators avoid contact with these features by providing a 100-ft (30-m) buffer zone as described in NTL 2009-G39. Protective measures were instituted based on the nature and sensitivity of Pinnacle habitats and their associated communities. These protections have developed into stipulations applied to OCS leases.

BOEM has examined the Pinnacle Trend as part of this EIS because, although it is distanced from the area of an EPA proposed action by 75 mi (120 km) (**Figure 4-4**) and would not be impacted by routine or small-scale accidental events, it could be impacted by a large or catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action. In addition, lease stipulations protect these features from routine activity impacts and help to distance the features from some accidental events, but oil from a large-scale spill event could possibly reach these habitats. Analyses of the potential impacts to the Pinnacle Trend features associated with an EPA proposed action are presented below in **Chapters**

4.1.1.6.1.2 (“Impacts of Routine Events”), **4.1.1.6.1.3** (“Impacts of Accidental Events”), **and 4.1.1.6.1.4** (“Cumulative Impacts”).

4.1.1.6.1.2. Impacts of Routine Events

This is a summary of the potential impacts of routine events to live bottoms (Pinnacle Trend). For additional information on oil and gas routine impacts and possible impacts to live bottoms (Pinnacle Trend), refer to Chapter 4.2.1.6.1.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.6.1 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The vast majority of the GOM seabed is comprised of soft sediments. Live bottom (Pinnacle Trend) features are located within 74 lease blocks in the northeastern portion of the CPA in water depths between 60 and 120 m (197 and 394 ft) in the Main Pass, Viosca Knoll, and Destin Dome lease areas. These Pinnacle Trend features, which sustain sensitive offshore habitats in the CPA, are listed and described in **Chapter 4.1.1.6.1.1**. The Pinnacle Trend is protected by BOEM from routine oil and gas activities with the Live Bottom (Pinnacle Trend) Stipulation, which has been included in appropriate leases since 1973. However, because an EPA proposed action will not include any of the 74 pinnacle stipulated blocks, the stipulation will not be applied to a lease resulting from an EPA proposed action. However, the closest portion of the Pinnacle Trend to the proposed EPA lease sale area is approximately 75 mi (120 km). Due to the distance of the Pinnacle Trend from the proposed EPA lease sale area (**Figure 4-4**), the Pinnacle features will not be affected by BOEM’s routine oil and gas activities.

Proposed Action Analysis

In addition to the physical distance of the Pinnacle Trend from an EPA proposed action, a proposed action is in water far deeper than the waters in which Pinnacle features are found. For an EPA proposed action, there will be no exploration or development wells in water depths <800 m (2625 ft) (**Table 3-2**), while the Pinnacle Trend is found on the continental shelf in water depths of 120 m (394 ft) or less. Therefore, all activity will take place deeper than the depth of growth on the Pinnacles. The depth of an EPA proposed action, along with the distance of a proposed action, eliminates potential effects of routine impacts on the Pinnacle Trend, including: anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal, which have the potential to disrupt and alter the environmental, commercial, recreational, and aesthetic values of these features.

The physical distance of the Pinnacle Trend from the proposed EPA lease sale area 64 nmi (≥120 km; 75 mi) and the depth of the proposed EPA lease sale area (≥800 m; 2,625 ft) will prevent damage to the habitat from routine oil and gas activities because most of these impacts occur within 1,000 m (3,281 ft) of a well. No anchor damage from vessels supporting structure emplacement will occur to Pinnacle features because there are no Pinnacle features in the proposed EPA lease sale area. The deposition of cuttings from the drilling of wells is heaviest closest to the well, and impacts to organisms have been reported 100-200 m (328-656 ft) from the well (Montagna and Harper, 1996; Kennicutt et al., 1996; Hart et al., 1989; Kennicutt, 1995; CSA, 2004b). In addition, the composition of muds is strictly regulated, and discharges of cuttings/muds are tested to ensure that toxicity levels are below the limits allowed by NPDES permits (USEPA, 2004, 2007a, and 2009b). The drilling muds that may remain in the water column are rapidly diluted and the measured concentration of drilling mud in the water at 1 m (3 ft) from the source was far below that which caused mortality to several species of coral in bioassays, although polyp retraction may occur at the concentrations of drilling mud measured in the water column 1 m (3 ft) from an outflow (Neff, 2005; Shinn et al., 1980; Hudson et al., 1982; Thompson et al., 1980; Raimondi et al., 1997). Produced waters released during operation are rapidly diluted and acute toxicity to organisms are generally only observed within proximity of the discharge point, while chronic effects were reported to 1,000 m (3,281 ft) from the discharge (Holdway, 2002; Burns et al., 1999; Gittings et al., 1992b). The Pinnacle features will not be affected by structure removal because of the distance of an EPA proposed action from the Pinnacles. The BSEE regulations require a small individual charge (normally 50 lb [27 kg] or less per well piling and per conductor jacket) and charges that are detonated 5 m (15 ft) below the mudline and at least 0.9 seconds apart (timing needed to prevent shock waves from becoming additive) (USDOI, MMS, 2005).

Summary and Conclusion

Based on the localized impacts of routine oil and gas activities, the distance of the Pinnacle Trend from the proposed EPA lease sale area, and the depth of the proposed EPA lease sale area in relation to the depth where Pinnacle features are found, no impacts from routine events are anticipated to occur to Pinnacle features in the CPA as a result of the proposed EPA activity. The Pinnacle Trend is approximately 64 nmi (≥120 km; 75 mi) from the proposed EPA lease sale area, which eliminates the potential effects of routine impacts that could affect these features, including anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal. Because the greatest impacts of routine oil and gas activity are reported close to the well and because the discharge of drilling muds, cuttings, and produced waters is strictly regulated by NPDES permits, routine discharges will not reach the Pinnacle Trend. In addition, BSEE's regulations protect Pinnacle features from structure removal by reducing shock impact.

4.1.1.6.1.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to live bottoms (Pinnacle Trend). For additional information on oil and gas accidental impacts and possible impacts to live bottoms (Pinnacle Trend), refer to Chapter 4.2.1.6.1.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.6.1 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The Pinnacle Trend features of the CPA that sustain sensitive offshore habitats are listed and described in **Chapter 4.1.1.6.1.1**. Disturbances resulting from an EPA proposed action, including oil spills and blowouts, have the potential to disrupt and alter the environmental, recreational, and aesthetic values of the Pinnacle Trend habitat. One form of protection for the Pinnacles is the Live Bottom (Pinnacle Trend) Stipulation, which was created to protect the Pinnacle features from routine impacts of drilling and production, and it has been applied to appropriate leases within Live Bottom (Pinnacle Trend) Stipulation Blocks since 1973. However, because the proposed EPA lease sale area is >64 nmi (≥120 km; 75 mi) from the Pinnacle Trend features and because the proposed EPA lease sale area is not within a Live Bottom (Pinnacle Trend) Stipulation block, the stipulation will not be applied to a lease resulting from an EPA proposed action. However, because of the distance of an EPA proposed action from the features, only large spills have the potential to reach the Pinnacle Trend features. Possible modes of exposure and impacts resulting to the organisms of the Pinnacle features from a large-scale spill are discussed below.

Proposed Action Analysis

Accidental releases of oil could occur as a result of an EPA proposed action. The probability of surface water oiling occurring as a result of an EPA proposed action was estimated by the Bureau of Ocean Energy Management's OSRA model for spills ≥1,000 bbl and ≥10,000 bbl. The mean number of offshore spills ≥1,000 bbl is estimated to be between 0 and 0.08 spills for an EPA proposed action, and the probability of one or more spills of the same size occurring is estimated to be between 0 and 8 percent (**Table 3-21**). The mean number of offshore spills ≥10,000 bbl is estimated to be fewer (between 0 and 0.02 spills for an EPA proposed action), and the probability of one or more spills of the same size occurring is estimated to be between 0 and 2 percent (**Table 3-22**).

The OSRA model estimated the combined probabilities of one or more hypothetical spills ≥1,000 bbl both occurring and contacting surface waters above particular features or in specific polygons delineated on the GOM as a result of an EPA proposed action. The OSRA model estimated probabilities of <0.5-1 percent after 10 and 30 days that a spill would occur and contact surface waters above the Pinnacle Trend, which is a Habitat Area of Particular Concern (HAPC) (**Figure 3-14**).

Oil released to the environment as a result of an accidental event may impact Pinnacle features in several ways. Oil may be physically mixed into the water column from the sea surface, be injected below the sea surface and travel with currents, be dispersed in the water column, or be adsorbed to sediment particles and sink to the seafloor. A brief description of the exposure routes is discussed below.

An oil spill that occurs at the sea surface would result in a majority of the oil remaining at the sea surface. Lighter compounds in the oil may evaporate, and some components of the oil may dissolve in the seawater. Evaporation allows the removal of the most toxic components of the oil, while dissolution may allow bioavailability of hydrocarbons to marine organisms for a brief period of time (Lewis and Aurand, 1997). Remnants of the oil may then emulsify with water or adsorb to sediment particles and fall to the seafloor.

The Pinnacle features in the CPA are found in water depths <120 m (394 ft). They represent a small fraction of the continental shelf area in the GOM. The fact that the Pinnacle Trend features are >64 nmi (≥120 km; 75 mi) from an EPA proposed action serves to limit the extent of damage from any given oil spill to the Pinnacle Trend features.

The depth below the sea surface to which the Pinnacle features rise (40 m [130 ft] or more below the sea surface) helps to protect them from surface oil spills because disturbance of the sea surface by storms can mix surface oil into the water column, but the effects are generally limited to the upper 10 m (33 ft), although modeling exercises have indicated that oil may reach a depth of 20 m (66 ft) (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002). Also, the low probabilities of oil reaching the surface waters above these features, based on the OSRA model, combined with the limited depth of the mixing of surface oil to the crests of these features, function to protect the Pinnacles.

A spill that occurs below the sea surface (i.e., at the rig, along the riser between the seafloor and sea surface, or through leak paths on the BOP/wellhead) would result in most of the released oil rising to the sea surface. All known reserves in the Gulf of Mexico have specific gravity characteristics that would preclude oil from sinking immediately after release at a blowout site. As discussed in **Chapter 3.2.1.4.4**, oil discharges that occur at the seafloor from a pipeline or loss of well control would rise in the water column, surfacing almost directly over the source location, thus not impacting sensitive benthic communities. If the oil is ejected under high pressure, oil droplets may become entrained in the water column (Boehm and Fiest, 1982; Adcroft et al., 2010). The upward movement of the oil may be reduced if methane mixed with the oil is dissolved into the water column, reducing the oil's buoyancy (Adcroft et al., 2010). The large oil droplets would rise to the sea surface, but the smaller droplets, formed by vigorous turbulence in the plume or the injection of dispersants, may remain neutrally buoyant in the water column, creating a subsurface plume (Adcroft et al., 2010; Joint Analysis Group, 2010). Dispersed oil in the water column begins to biodegrade and may flocculate with particulate matter, promoting sinking of the particles.

A subsurface spill or plume may impact sessile biota of Pinnacle features. Oil or dispersed oil may cause sublethal impacts to benthic organisms if a plume reaches these features. Impacts may include loss of habitat, biodiversity, and live coverage; change in community structure; and failed reproductive success. Oil adsorbed to sediments or sedimentation as a result of a blowout may impact benthic organisms. However, the distance of an EPA proposed action from Pinnacle Trend features would result in well-dispersed oil that has adsorbed to sediments and a light layer of deposition, if any, that would be removed by the normal self-cleaning processes of corals. Corals may use a combination of increased mucus production and ciliary action to rid themselves of oiled sediment (Bak and Elgershuizen, 1976).

Any impacts that may occur to benthic communities on Pinnacles as a result of a spill would depend on the type of spill, distance from the spill, relief of the biological feature, and surrounding physical characteristics of the environment (e.g., turbidity). Oil released during a large-scale accidental event may reach Pinnacle Trend features if it is able to travel the 64 nmi (≥120 km; 75 mi) or more to the features and reach the depth of the communities (40-120 m; 130-400 ft). Acute impacts to benthic organisms are not anticipated to occur due to the distance of the Pinnacle Trend from an EPA proposed action. Any impacts that may occur would be sublethal, although the great distance between an EPA proposed action and the Pinnacle Trend features may even eliminate impacts because the oil weathers and disperses over the distance.

Summary and Conclusion

As described above, the proposed EPA lease sale area is >64 nmi (≥120 km; 75 mi) from the Pinnacle Trend and because of the distance of an EPA proposed action from the features, only large spills have the potential to reach the Pinnacle Trend. Most of the oil released from a spill at depth would be expected to rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on Pinnacle features. The depth of the Pinnacle Trend would protect it from the physical mixing of oil into the water column. Small droplets of oil in the water column may attach to suspended particles in the water column, sink to the seafloor, and could possibly contact Pinnacle features (McAuliffe et al., 1975). The Pinnacle Trend features and their benthic communities that are exposed to subsea plumes, dispersed oil, or oil adsorbed to sediment particles may demonstrate reduced recruitment success, reduced growth, and reduced coral cover as a result of impaired recruitment.

4.1.1.6.1.4. Cumulative Impacts

This is a summary of the potential cumulative impacts to live bottoms (Pinnacle Trend). For additional information on oil and gas cumulative impacts and possible impacts to live bottoms (Pinnacle Trend), refer to Chapter 4.2.1.6.1.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.6.1 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The cumulative impact from routine oil and gas operations includes effects resulting from an EPA proposed action, as well as those resulting from past and future OCS oil and gas leasing. These operations include anchoring, structure emplacement, muds and cuttings discharge, effluent discharge, blowouts, and oil spills. Non-oil- and gas-related impacts including commercial fisheries, natural disturbances, anchoring by recreational boats, and other non-oil and gas commercial vessels, as well as spillage from import tankering, all have the potential to alter live bottoms of the Pinnacle Trend.

OCS Oil- and Gas-Related Impacts

Structure placement and anchor damage from support boats and ships, floating drilling units, and pipeline-laying vessels that disturb areas of the seafloor are considered the greatest OCS oil- and gas-related threat to Pinnacle live bottom areas. Organisms within the footprint of structures and anchors on the seafloor, as well as the areas where anchor chains sweep the seafloor, may be crushed or physically removed, and communities could be altered by the organism loss (Lissner et al., 1991; Dinsdale and Harriott, 2004). These activities, however, will not affect Pinnacle Trend features as a result of an EPA proposed action because the proposed EPA lease sale area is located at least 64 nmi (≥120 km; 75 mi) from the closest area of the Pinnacle Trend.

Discharges of drilling fluids and produced waters will not impact Pinnacle Trend features because of the distance between the proposed EPA lease sale area and the Pinnacle Trend (at least 64 nmi [≥120 km; 75 mi]). Discharges are controlled by USEPA through the NPDES discharge permit, which regulates the materials discharged and their concentrations. Drilling fluid plumes are rapidly dispersed on the OCS; approximately 90 percent of the material discharged in drilling a well (cuttings and drilling fluid) settles rapidly to the seafloor, while 10 percent forms a plume of fine mud that drifts in the water column (Neff, 2005). Impacts to benthic organisms from drill cuttings are localized to 100-200 m (328-656 ft) from a well (Montagna and Harper, 1996; Kennicutt et al., 1996). Produced waters are rapidly diluted in the water column upon release, and acute effects have only been reported in the mixing zone around the outfall (Gittings et al., 1992b; Smith et al., 1994; Burns et al., 1999; Holdway, 2002). Any fine material discharged from a well that is drifting in the water column will be well dispersed before it reaches the Pinnacle Trend.

Impacts on the Pinnacle Trend features could occur as a result of oil- and gas-related spills or spills from import tankering. Due to dilution and physical mixing depths of surface oil paired with the depths of the crests of the Pinnacle features (40 m; 130 ft or greater), discharges should not reach Pinnacle features in sufficient concentrations to cause impacts. Tanker accidents would result in surface oil spills, which generally do not mix below a depth of 10-20 m (33-66 ft) (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002), which should protect most Pinnacle features, very few of which rise to within 40 m (130 ft) of the sea surface. Any dispersed surface oil from a tanker spill that may reach the benthic communities of Pinnacle features in the Gulf of Mexico would be expected to be at very low concentrations (<1 ppm) (McAuliffe et al., 1981a and 1981b; Lewis and Aurand, 1997). Laboratory studies and field observations of coral larval and adult stages have shown resistance to such concentrations (Lewis, 1971; Elgershuizen and De Kruijf, 1976; Knap, 1987; Wyers et al., 1986; Cohen et al., 1977; Jackson et al., 1989; Guzmán et al., 1991), while other studies show that similar concentrations can harm larval or embryonic life stages of other benthic organisms (Fucik et al., 1995;

Suchanek, 1993; Beiras and Saco-Álvarez, 2006; Byrne, 1989). Any dispersed or physically mixed oil in the water column that comes in contact with corals, however, may evoke short-term negative responses by the organisms, such as reduced feeding or altered behavior (Wyers et al., 1986; Cook and Knap, 1983; Dodge et al., 1984).

It is unlikely that a blowout could impact the biota of the Pinnacle Tend features due to the distance of the features from the proposed EPA lease sale area (64 nmi; 120 km; 75 mi) and the depth of the proposed activity, which is much deeper than the Pinnacle Trend features. Most of the oil from a seafloor blowout would rise to the surface, but some of it may be entrained in the water column as a subsea plume. Because the depth of the proposed EPA lease sale area (800 m; 2,625 ft) is much deeper than the crests of the Pinnacle features (40 m; 130 ft) and because oil mixed into the water column is moved by water currents that do not generally travel toward shore, subsea oil should not move up onto the continental shelf toward the Pinnacle features (Pond and Pickard, 1983; Inoue et al., 2008). Oil at the sea surface would behave the same as a surface oil spill (refer to the above paragraph). Oil in a subsea plume could be carried toward the Pinnacle Trend, although the oil would become diluted in the water column as it travels. The resulting level of impact, if any, depends on the concentration of the oil when it contacts the habitat. The farther the Pinnacle feature is from the blowout, the more dispersed the oil and sediment would become, reducing the possible impacts. Also, because currents are anticipated to sweep around the larger Pinnacle features instead of over them, subsea oil should be directed away from the larger features, reducing the possibility of physical oiling or deposition of oiled sediment (Rezak et al., 1983; McGrail, 1982). In the unlikely event that oil was to contact the Pinnacle features, the impacts may include loss of habitat, biodiversity, and live coverage; change in community structure; and failed reproductive success. In the highly unlikely event that oil from a subsurface spill could reach the peaks of Pinnacle features in lethal concentrations, the recovery of this area could take in excess of 10 years (Fucik et al., 1984).

In the case of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, oil would have a fairly low probability of impacting Pinnacle features because the bottom-disturbing activities of oil and gas activities are distanced from the Pinnacle features within Live Bottom (Pinnacle Trend) Stipulation blocks, as described in NTL 2009-G39, and because BOEM conducts a case-by-case review of all plans to ensure that activities do not impact these seafloor features. In addition, Live Bottom (Pinnacle Trend) Stipulation blocks will not be leased as part of this proposed EPA lease sale, creating farther distance between oil and gas activities and Pinnacle features. Also, Pinnacle features are protected by the limited depth of mixing of surface oil compared with the depth of the Pinnacle features, currents sweeping around larger features, and the weathering and dispersion of oil that would occur with distance from the source as it travels toward the features. Refer to **Appendix B** for more details on the impacts of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action.

Non-OCS Oil- and Gas-Related Impacts

Severe and permanent physical damage may occur to Pinnacle features and the associated live bottoms as a result of non-oil and gas activities. It is assumed those biota associated with the Pinnacle Trend are well-adapted to natural disturbances such as turbidity and storms; however, human disturbance could cause severe damage to live bottom biota, possibly leading to changes of physical integrity, species diversity, or biological productivity. If such events were to occur, recovery to pre-impact conditions could take as much as 10 years (Fucik et al., 1984).

Natural events such as storms, extreme weather, and fluctuations of environmental conditions (e.g., nutrient pulses, low dissolved oxygen levels, seawater temperature minima, and seasonal algal blooms) may impact live bottom communities. Because of the depth of the Pinnacle Trend environment, waves seldom have a direct influence. During severe storms, such as hurricanes, large waves may reach deep enough to stir bottom sediments (Brooks, 1991; CSA, 1992). These forces are not expected to be strong enough to cause direct physical damage to organisms living on the features. Rather, currents are created by the wave action that can resuspend sediments to produce added turbidity and sedimentation (Brooks, 1991; CSA, 1992). The animals in this region are well-adapted to the effects common to this frequently turbid environment (Gittings et al., 1992a).

Recreational boating, fishing, and import tankering may severely impact Pinnacle communities. Ships anchoring near major shipping fairways, on occasion, may impact sensitive areas located near these fairways. Numerous fishermen also take advantage of the resources of the region and may anchor at

Pinnacle features to fish. Much of the fishing on these habitats uses bottom fishing gear that may damage benthic organisms or may snag on the reefs and be lost. Such gear, particularly lines of varying thickness, can cut into the tissues of many benthic organisms during storm movement of bottom waters.

Damage resulting from commercial fishing, especially bottom trawling, may have a severe impact on hard-bottom benthic communities. Bottom trawling in the Gulf of Mexico primarily targets shrimp from nearshore waters to depths of approximately 90 m (300 ft) (NRC, 2002). Although trawlers would not target areas with pinnacles as fishing ground and since pinnacles may tangle with gear, accidental instances of trawling may occur near or over pinnacles, resulting in community damage. Reports indicate that bottom trawling activity on hard-bottom substrates can overturn boulders and destroy epifaunal organisms (Freese et al., 1999). Large emergent sponges and anthozoans may be particularly vulnerable to trawling activity, as these organisms grow above the substrate and can be caught and removed by trawling activity (Freese et al., 1999). Recovery rates of corals and coralline algae may take decades to centuries and depend on the extent of the impact, frequency of disturbance, other natural changes that occur to the habitat, and the organism's life history (NRC, 2002).

Summary and Conclusion

Overall, the incremental contribution of an EPA proposed action to the cumulative impact is negligible when compared with non-oil and gas impacts. Activities causing mechanical disturbance represent the greatest threat to the Pinnacle Trend features. With respect to OCS oil- and gas-related activities, this would, however, be prevented by the distance of the proposed EPA lease sale area from the Pinnacle Trend. Routine impacts of oil and gas activity include anchoring of vessels, structure emplacement, and operational discharges (drilling muds and cuttings, and produced waters), none of which will impact the Pinnacle features because of their distance from the proposed EPA lease sale area and USEPA discharge regulations. It is highly unlikely that blowouts and oil spills would impact Pinnacle features due to the distance of the proposed EPA lease sale area from Pinnacle features, which would allow for dispersion of oil. In addition, the depth of the proposed activity is much deeper than the depth of the Pinnacle features, which would prevent deep oil plumes from rising to the crests of the pinnacles.

Non-oil and gas activities that may occur in the vicinity of the pinnacle communities include recreational boating and fishing, import tankering, fishing and trawling, and natural events such as extreme weather conditions and extreme fluctuations of environmental conditions. These activities could cause damage to the pinnacle communities. Ships using fairways in the vicinity of pinnacles anchor in the general area of pinnacles on occasion, and numerous fishermen take advantage of the resources of regional bottoms. These activities could lead to instances of severe and permanent physical damage to individual formations. During severe storms, such as hurricanes, large waves may reach deep enough to stir bottom sediments (Brooks, 1991; CSA, 1992). Because of the depth of the Pinnacle Trend area, these forces are not expected to be strong enough to cause direct physical damage to organisms living on the reefs.

4.1.1.6.2. Live Bottoms (Low Relief)

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the routine events, accidental events, and cumulative impacts for live bottoms (low relief) can be found in Chapter 4.2.1.6.2 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.6.2 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.6.2 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.6.2 of the 2012-2017 WPA/CPA Supplemental EIS would be equally applicable for live bottoms (low relief) regarding the EPA proposed action, and they are hereby incorporated by reference.

BOEM has examined the analysis for live bottoms (low relief) presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for live bottoms (low relief) presented in the CPA chapters of the

2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS,, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on live bottoms (low relief), and various Internet sources were examined to determine any recent information regarding live bottoms (low relief). A search of Internet information sources (the NOAA Gulf Spill Restoration Publications website; the ERMA Gulf Response website; the NOAA *Deepwater Horizon* Archive Publications and Factsheets; the Gulf of Mexico Sea Grant *Deepwater Horizon* Oil Spill Research and Monitoring Activities Database; the RestoreTheGulf.gov website; and the *Deepwater Horizon* Oil Spill Portal), as well as recently published journal articles was conducted to determine the availability of recent information on live bottoms (low relief). Any new significant information that was discovered since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS is included in this EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, limited data are currently available on the potential impacts of the *Deepwater Horizon* explosion, oil spill, and response on live bottom (low-relief) features in the CPA. This incomplete or unavailable information may be relevant to reasonably foreseeable significant impacts to live bottom (low-relief) features. BOEM has determined that this incomplete or unavailable information may be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Relevant data on the status of live bottom (low-relief) features after the *Deepwater Horizon* explosion, oil spill, and response, however, may take years to acquire and analyze. Much of this data is being developed through the NRDA process, which is expected to take years to complete. Little data from the NRDA process have been made available to date. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated by this NEPA analysis, regardless of the cost or resources needed. In the place of this incomplete or unavailable information, as noted above, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

4.1.1.6.2.1. Description of the Affected Environment

Live bottoms of various types are present throughout the EPA in many locations on the West Florida Shelf, as well as on the nearby Mississippi-Alabama Shelf in the CPA (**Figure 4-4**). BOEM protects biological resources of live bottom areas, which are located in Federal waters of 100 m (328 ft) or less in the EPA and in a small northeastern portion of the CPA, from potential offshore oil and gas activities by designating blocks in these areas as "Live Bottom (Low Relief) Stipulation blocks" and attaching stipulations to leases within these blocks. In addition, there are areas of high-relief, live bottom features that are located within or very near the BOEM-protected Live Bottom (Low Relief) Stipulation blocks. None of the blocks with live bottom habitat are offered for lease under an EPA proposed action, and the area open for lease is in water much deeper than the live bottom stipulated blocks that BOEM protects. Because there are no Live Bottom (Low Relief) Stipulation blocks in the proposed EPA lease sale area, the Live Bottom (Low Relief) Stipulation will not be applied to any leases within the proposed EPA lease sale area. In addition, because the areas designated by BOEM as capable of supporting live bottom habitats in both the EPA and CPA are not within the proposed EPA lease sale area and are distanced from an EPA proposed action by 130 km (80 mi) or more, they would not be impacted by routine oil and gas activities; however, these areas could be impacted by accidental events related to the proposed activity. Therefore, an analysis of possible impacts is being included in this EIS.

Live bottom (low relief) habitats are defined by BOEM as "seagrass communities, areas that contain biological assemblages consisting of sessile invertebrates living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; and areas where a hard substrate and vertical relief may favor the accumulation of turtles, fish, or other fauna" (NTL 2009-G39). Sessile invertebrates may include sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals. Many of the low-relief live bottoms are flat and ephemeral. There are also some permanent areas of hard bottom that have a higher relief, including The Madison-Swanson Marine Reserve, The Florida Middle Ground; Pulley Ridge, The Steamboat Lumps Special Management Area, and The Sticky Ground

Mounds. All of these higher relief areas are distanced from the proposed EPA lease sale area by at least 130 km (80 mi) or more. All live bottoms are protected from routine offshore oil and gas activities by environmental reviews of plans and pipeline routes in the areas of proposed activity. BOEM's biologists review areas of proposed activities for potential sites of live bottom habitat that may overlap with planned seafloor impacts. The live bottom habitats are protected by prohibiting bottom-disturbing activity that could affect them.

Ecology of Inner- and Middle-Shelf Live Bottoms of the West Florida Shelf

A majority of live bottom (low-relief) habitat in the GOM is found on the West Florida Shelf. BOEM has designated blocks on the West Florida Shelf out to a 100-m (328-ft) depth as Live Bottom (Low Relief) Stipulation blocks because live bottom communities are widely scattered across the area (**Figure 4-4**). The shelf is a relatively flat table of carbonate (karst limestone) that is largely covered with sheets of carbonate sands. In many places, the sand moves around due to seasonal storms, forming ephemeral (temporary) patches of sand interspersed with exposed hard bottom. Various species of sessile (attached) reef fauna and flora grow on the exposed hard grounds. Some species such as sea whips and other gorgonians are tall enough to survive sand movement and accretion. Surveys on the southwest Florida Shelf revealed that the biotic cover on the live bottom patches is generally low and that the patches tend to be dominated by either algae or encrusting invertebrates (Woodward-Clyde Consultants and CSA, 1983). Dominant algal species include green algae (*Halimeda* spp., *Anadyomene menziesii*, *Caulerpa* spp., and Chlorophycophyta), coralline algae (Cryptonemiales and *Peyssonnelia simulans*), brown algae (Phaeophycophyta), and red algae (Rhodophycophyta). Dominant epifauna include sponges (Porifera, Calcarea, *Placospongia melobesoides*, and *Geodia* spp.), Hydrozoa, and hard coral (*Agaricia* spp.) (Woodward-Clyde Consultants and CSA, 1983).

In addition to the widely distributed, flat hard-bottom areas, there are also permanent areas of hard bottom that have greater relief. Three areas are NMFS-designated HAPC's on the West Florida Shelf: The Madison-Swanson Marine Reserve; The Florida Middle Ground; and Pulley Ridge. Other higher relief live bottom areas, including the Steamboat Lumps Special Management Area and the Sticky Ground Mounds, are also important habitats on the West Florida Shelf. The above-named, live bottom habitats are relic reef formations that were "drowned" with sea-level rise. Many of the formations have deep reef communities with sponges, sea fans, black corals, scattered *Oculina* corals, echinoderms, and crabs. Habitats with formations that are closer to the water surface have some hermatypic (reef-building) corals.

Madison-Swanson Marine Reserve

The Madison-Swanson Marine Reserve is 65 km (40 mi) southwest off Cape San Blas, Florida, in waters 60-140 m (200-460 ft) deep (**Figure 4-4**). It covers approximately 400 km^2 (155 mi^2) and consists of relic reef formations (Puglise and Kelty, 2007; Hine and Locker, 2008). The reef has outcrops of 1- to 3-m (3- to 10-ft) relief with a ridge of 15-m (50-ft) relief and a series of pinnacles about 9 m (30 ft) high. It supports a deep reef community with sponges, sea fans, black corals, scattered *Oculina* corals, echinoderms, and crabs. It is federally protected as a grouper spawning site (Puglise and Kelty, 2007). This habitat is the closest of the high-relief live bottoms at 130 km (80 mi) from the proposed EPA lease sale area.

Steamboat Lumps Marine Reserve

The Steamboat Lumps Marine Reserve is 161 km (100 mi) south-southeast of Cape San Blas, Florida, in waters 60-140 m (200-460 ft) deep (**Figure 4-4**). It covers approximately 357 km^2 (138 mi^2) and consists of relic reef formations (Puglise and Kelty, 2007; Hine and Locker, 2008). The reserve has a series of five broad terraces pockmarked with depressions. It supports a deep reef community with sponges, sea fans, black corals, scattered *Oculina* corals, echinoderms, and crabs. It is federally protected as a grouper spawning site (Puglise and Kelty, 2007). This Special Management Area is located 200 km (125 mi) from the proposed EPA lease sale area.

Florida Middle Grounds

Amongst the most studied hard-bottom features of the West Florida Shelf in terms of live cover and relief are the outcroppings of the Florida Middle Grounds. The crests of the Florida Middle Grounds outcroppings support hard and soft corals, molluscs, crustaceans, echinoderms, sponges, polychaetes, algae, and fish (Hopkins et al., 1977). Jaap and Hallock (1991) found the Florida Middle Ground to be the most diverse habitat of the West Florida Shelf. It is the northernmost location of reef-forming corals in the United States (Puglise and Kelty, 2007).

The Florida Middle Grounds is a series of outcroppings located 138 km (86 mi) south of Apalachee Bay and 150 km (93 mi) northwest of Tarpon Springs (**Figure 4-4**). They spread over a 35 km (21 mi) long and 11 km (7 mi) wide area, oriented north-south along its length. The outcroppings rise from a 40-m (131-ft) deep seafloor to within 23 m (75 ft) of the sea surface. The outcroppings are populated by tropical reef organisms, including live and dead corals, invertebrates, and fish (Grimm and Hopkins, 1977). The Florida Middle Grounds coral structure is primarily composed of fire coral (*Millepora alcicornis*). Reef fauna also includes hydroids, anemones, hard corals (15 species), soft corals (13 species), molluscs (75 species), crustaceans (56 species), echinoderms (23 species), polychaetes (41 species), sponges, ahermatypic corals, hydrozoans, and fishes (170 species) (Hopkins et al., 1977; Mallinson et al., 1998 and 2006; Coleman et al., 2009). This community differs from the coral reef habitat of the Flower Garden Banks in the WPA because soft coral species have been found here that do not exist at the Flower Garden Banks. In addition, the Florida Middle Grounds is not considered a true coral reef because the hermatypic corals are not abundant enough to build a coral reef by accretion.

Sticky Ground Mounds

The Sticky Ground Mounds is a trend of seafloor mounds located approximately 185 km (115 mi) west of Tampa Bay, Florida (**Figure 4-4**). They occur in water depths of 120-130 m (390-425 ft). The Sticky Ground Mounds are uniformly dispersed mounds of about 20 m (65 ft) in diameter with 10 m (33 ft) of relief. They are thought to be relic drowned reefs, similar to the Pinnacle Trend features (Locker, official communication, 2008). The Sticky Ground Mounds may have originated from gas seeps (Hine and Locker, 2008). The Sticky Ground Mounds are located 235 km (146 mi) from the proposed EPA lease sale area.

Pulley Ridge

The Pulley Ridge area consists of a series of submerged linear ridges that likely represent a former low sea-level shoreline. Pulley Ridge is found in water depths of 60-110 m (200-360 ft) (Cash et al., 2010), trends in a north-south direction, and stretches approximately 300 km (200 mi) in the western part of the shelf off southwest Florida (**Figure 4-4**). It ranges about 5-15 km (3-9 mi) wide (Cash et al., 2010; Jaap and Halley, 2008) and typically has about 10 m (33 ft) of relief. The southern 30 km (18.75 mi) of the reef is colonized by a robust reef community dominated by hermatypic (reef-building) stony corals, coralline red algae, and green algae (Halley et al., 2004; Jarrett et al., 2002). The most common corals are the lettuce corals (*Leptoseris cucullata* and *Agaricia* spp.) (Jaap and Halley, 2008), and the reef exhibits 10-60 percent coral cover (Culter et al., 2006).

The bathymetry in the 70- to 90-m (230- to 295-ft) depth range is irregular, and numerous ledges, holes, and depressions are seen on the seafloor (CSA, 1988 and 1990). Where the coral reef is not prevalent, Pulley Ridge is capped by coralline algal growths (algal nodules and algal pavements), which provide additional hard substrate for sessile epifauna even where the underlying rock is not exposed (CSA, 1990). Coralline algae appear to produce as much carbonate sediment as the stony corals; algal nodule and cobble zones are prevalent in deeper waters around much of the Ridge below 80 m (260 ft) (Halley et al., 2004). Pulley Ridge is located 307 km (191 mi) from the proposed EPA lease sale area.

Florida Reef Tract

The portion of the Florida Reef Tract that extends into the GOM includes the Florida Keys, Tortugas National Park, and the Tortugas Ecological Reserve (North and South). The entire reef tract stretches from Miami to the Dry Tortugas and is 220 mi (354 km) long (Puglise and Kelty, 2007). There are four types of live bottom habitat in the reef tract: hard bottom; patch reef; offshore shallow reefs; and offshore deep reefs (Donahue et al., 2008). Many of the nearshore low-relief hard bottoms are located in water depths less than 3 m (10 ft) that are dominated by octocorals (Chiappone and Sullivan, 1994). The most abundant species found in these communities are algae (*Laurencia intricata* and *Halimeda opuntia*), sponges (*Dysidea etheria*, *Aplysina fulva*, and *Chondrilla nucula*), stony corals (*Millepora alcicornis*, *Siderastrea radians*, *Porites porites*, *Solenastrea bournoni*, *Solenastrea hyades*, *Favia fragum*, and *Oculina diffusa*), and octocorals (*Eunicea palmeri*, *Pseudoplexaura flagelloas*, *Briareum asbestinum*, *Pterogorgia anceps*, and *Pseudopterogorgia americana*) (Chiappone and Sullivan, 1994). The shallow reef community structure is controlled by the natural influences of temperature and sedimentation and by the anthropogenic influence of dredge and fill (Chiappone and Sullivan, 1994). Species richness in all of the reef habitats has been declining over the past 15 years (Donahue et al., 2008). The Dry Tortugas historically supported large populations of *Acropora cervicornis*, which have now substantially declined (Donahue et al., 2008). Hurricanes, tropical storms, and disease, as well as anthropogenic influences such as coastal development, runoff, and ship groundings, have led to the decline in coral populations in the reef tract (Donahue et al., 2008). The closest portion of the Florida Reef Tract to the proposed EPA lease sale area is approximately 500 km (311 mi).

Ecology of Inner- and Middle-Shelf Live Bottoms of the Mississippi-Alabama Shelf

Nearshore hard-bottom areas are located on the Mississippi-Alabama Shelf in 18-40 m (60-130 ft) of water (**Figure 4-4**). A fine-grained quartz sand sheet covers most of the Mississippi-Alabama Shelf; however, numerous hard bottoms that are formed of sedimentary rock occur in the CPA off the Mississippi River Delta and seaward of the Chandeleur Islands (Schroeder, 2000). Sediments across the area east of the Mississippi River transition from the silt/clay of the Delta to quartzose riverine sands of the eastern rivers to the carbonate Florida platform characterized by carbonate sands and generally clear waters (east of De Soto Canyon). Low-relief, hard-bottom features are located on the inner and middle Mississippi-Alabama Shelf. These features include isolated low-relief, reef-like structures; rubble fields; low-relief flat rocks (e.g., 6 m long and 60 cm thick; 20 ft long and 2 ft thick); limestone ledges (e.g., 4 m [13 ft] high); rocky outcrops off Mobile Bay (18- to 40-m [59- to 131-ft] depth range; 5 m wide and 2 m high; 16 ft wide and 7 ft high); and clustered reefs (e.g., tens of meters across and 3 m [10 ft] high) (Schroeder et al., 1988; Schroeder, 2000). Hard-bottom features on the Mississippi-Alabama-Florida Shelf typically provide reef habitat for tropical organisms, including sessile epifauna (soft corals, nonreef-building hard corals, sponges, bryozoans, crinoids) and fish; these areas are typically of low relief (<1 m; 3 ft) (Thompson et al., 1999). There are some higher relief features near the De Soto Canyon and Destin Dome. None of these areas are closer to the proposed EPA lease sale area than 130 km (80 mi).

Inner-Shelf Live Bottoms West of De Soto Canyon

Live cover on hard bottoms of the inner part of the Mississippi-Alabama Shelf is mainly restricted by turbidity and sedimentation caused by the Mississippi runoff and by waves and currents that mobilize sediments off the seafloor. Inner- and middle-shelf features include rubble fields, low-relief flat rocks (e.g., 6 m long and 60 cm thick; 20 ft long and 24 in thick), outcrops (e.g., 5 m wide and 2 m high; 16 ft wide and 7 ft high), limestone ledges (e.g., 4 m [13 ft] high), and clustered reefs (e.g., tens of meters across and 3 m [10 ft] high) (Schroeder, 2000). The epifauna that colonize these hard bottoms are probably ephemeral because of their intermittent exposure to sand scouring and cycles of exposure burial during winter storms and tropical storms (Schroeder, 2000).

In deeper waters, live cover is more stable as it is removed from the inner-shelf sand scouring and burial caused by storms. Live cover in deep water may, however, be impacted by periodic turbidity associated with nepheloid (turbid water) layers (Gittings et al., 1992a). The environmental conditions at the shelf edge are, however, not suitable for reef-building by corals. Carbonate depositing organisms are mainly limited to coralline algae species (Gittings et al., 1992a). The gorgonians *Leptogorgia virgulata* and *Lophogorgia hebes* are the most frequently encountered encrusting organisms amongst inner- and mid-shelf hard bottoms. Other biotic cover, not as common as soft corals, consists of hydroids and bryozoans (Schroeder et al., 1988 and 1989).

Four types of rock formations that form the hard-bottom areas are described by Schroeder et al. (1988).

- massive to nodular sideritic sandstones and mudstones, which are scattered on the central and western portions of the shelf;
- slabby-aragonite-cemented coquina and sandstone rubble associated with storm-related ridges of shell and sand on the central shelf;
- dolomitic sandstone in small irregular outcrops; and
- calcite cemented algal calcirudite occurring in reef-like knobs on the southeastern shelf.

Schroeder et al. (1988 and 1989) described four live bottom areas west of De Soto Canyon: Southeast Bank, Southwest Rock, Big Rock/Trysler Grounds, and features at the 17 Fathom Hole. The soft corals *Leptogorgia virgulata* and *Lophogorgia hebes* were the most frequently encountered encrusting organisms amongst inner- and mid-shelf hard bottoms. Other biotic cover, not as common as soft corals, was made of hydroids and bryozoans (Schroeder et al., 1988 and 1989).

- The Southeast Bank is a rock rubble field site in 21-27 m (69-87 ft) of water, bearing encrusting epifauna (mostly the gorgonians *Leptogorgia virgulata* and *Lophogorgia hebes*).
- The Southwest Rock area is made of two rocks that are 10 m (33 ft) apart. The larger of the two is 7-9 m (23-30 ft) wide and 1-1.5 m (3-5 ft) high. The smaller rock is 1.5-3.5 m (5-11 ft) wide, but it is almost level with the surrounding rubble substrate.
- The Big Rock/Trysler Grounds are 5 m (16 ft) tall mound-like structures of rock rubble found in 30-35 m (98-115 ft) of water.
- The features at the 17 Fathom Hole are reef-like and mound-like. One reef-like feature is 100 m (328 ft) long, 35 m (115 ft) wide, and 2 m (7 ft) high. A mound-like feature is made of rock rubble, covers a 300 m^2 (3,228 ft^2) area, and rises 2 m (7 ft) above the seafloor.

Brooks (1991) found shallow-water hard bottoms off Mobile Bay that support living algae communities. The 40-Fathom Isobath area is located 24 km (15 mi) northeast of the Pinnacle Trend area (the Pinnacle Trend area is described in **Chapter 4.1.1.6.1.1**) in water depths of approximately 75 m (245 ft). This area consists of topographic features with up to 9 m (30 ft) of relief that are mound-like, pinnacle-like, or ridge-like in form (Schroeder et al., 1988 and 1989).

Live Bottoms at the Head of De Soto Canyon

Shipp and Hopkins (1978) found a hard-bottom area of large, rectangular limestone blocks rising up to 10 m (33 ft) off the seafloor near the head of De Soto Canyon in 55 m (180 ft) of water. Live cover included sponges, nonreef-building hard coral (*Oculina diffusa*), soft corals (*Lophogorgia cardinalis* and *L. hebes*), and an antipatharian (*Antipathes* sp.). A diverse and abundant tropical fish community was associated with the hard bottom. Benson et al. (1997) found another important hard-bottom community, the "DeSoto Canyon Rim Feature," on the western edge of the canyon head, 45 km (28 mi) northeast of the Pinnacle Trend area. This feature is a 12-km (7.5-mi) ridge composed of sandstone. Hard bottoms to the north of the De Soto Canyon appear to represent a series of drowned/submerged barrier islands and shelf-edge deltas (Gardner et al., 2007).

Live Bottoms in the Destin Dome

Photodocumentation studies of Destin Dome have revealed five hard-bottom habitats in the area (USDOI, MMS, 1999b; Thompson et al., 1999). Hard-bottom habitats found include the following:

- A high-relief ridge formation running through Destin Dome Blocks 55, 56, 57, and 99 (1-8 m [3-36 ft] tall, approximately 10 km [6 km] long, 229-m [751-ft] maximum width, and a depth range of 52-61 m [-200 ft]);
- A discontinuous, variable, high-relief, hard-bottom trend oriented southwest-northeast running through Destin Dome Blocks 99 and 100 (8 m [26 ft] tall on the southern portion and <1 m [3 ft] in the eastern portion of the feature, approximately 7.5 km [5 mi] long, and a depth range of 61-76 m [200-259 ft]);
- Low-relief (<2 m [7 ft] tall), scattered, discontinuous, tier-like rock formations with numerous ledges and crevices located between 32 and 38 m (105 and 125 ft) in Destin Dome Blocks 51 and 52 and the surrounding area to the northeast of the unit;
- Deepwater, low-relief (<2 m [7 ft] tall), sparse rock outcrops located in Destin Dome Block 57 within the 76- to 104-m (249- to 341-ft) depth range, interspersed by a sand-covered hard bottom along the slope edge; and
- Small, discontinuous, low-relief (<2 m [7 ft] tall), "Hammock-like" rock outcrops surrounded by sand from 61 to 79 m [200 to 259 ft] in the eastern edge of Destin Dome Blocks 15 and 16.

Sessile organisms found in this area include ahermatypic (non-reef building) corals, echinoderms, gastropods, decapods, holothurians, and calcareous algae (Science Applications International Corporation, 1997). High-relief ridge formations are dominated by sponges, soft corals, calcareous algae, arrow crabs, bryozoans, sea stars, urchins, and sea basses. Variable and low-relief hard bottoms are dominated by bryozoans, soft corals, black corals, sponges, hydroids, and sea basses. Deepwater low-relief hard bottoms are dominated by paramuricid soft corals, black corals, bryozoans, arrow crabs, seastars, and short bigeye (Thompson et al., 1999).

Recent Invasive Species Concerns for Live Bottoms

Two exotic species that may be of concern for live bottom habitats have invaded the Gulf of Mexico: the orange cup coral (*Tubastraea coccinea*) and the lionfish (*Pterois volitans/miles*). Invasive species are organisms that are not native to the local environment and have the potential to outcompete native species. *Tubastraea coccinea*, which is reported on many oil and gas platforms in the northern Gulf of Mexico, has been reported on several artificial reefs off the Florida coast (Fenner and Banks, 2004). It was first reported in the southeastern GOM in 1977, western GOM in 1985, off Texas in the northwestern GOM in 1991, and off Louisiana in the northern GOM in 1994 dispersing with currents along the continental shelf (Fenner and Banks, 2004). It is considered to have "invaded" the GOM by 2001 and believed to have been introduced on hulls of ships used for artificial reefs (Fenner and Banks, 2004). It has also been found on several natural banks in the GOM, including the Flower Garden Banks (Hickerson et al., 2008; Fenner and Banks, 2004). *Tubastraea coccinea* has been reported to settle on vertical faces and the underside of substrates (Glynn et al., 2008; Vermeij, 2006) and may become the dominant benthic organism once it has established in an area because it can utilize many substrate types and reproduce year round (Creed and De Paula, 2007; Glynn et al., 2008). The lionfish was reported off the coasts of Florida, Alabama, and Louisiana in 2010 (USDOI, GS, 2010b). Reports of this species began in 2006 in Florida, but the species was confirmed in the northern Gulf of Mexico in 2010 (Schofield, 2009; USDOI, GS, 2010b). It has also recently been reported in the southern Gulf of Mexico (Aguilar-Perera and Tuz-Sulub, 2010). Specific sightings were noted at several artificial reefs and oil and gas platforms in the CPA (USDOI, GS, 2010b).

Threatened, Endangered, and Proposed Candidate Species

Elkhorn coral (*Acropora palmata*) and staghorn coral (*Acropora cervicornis*) were listed as "threatened" in 2006 and are protected under the Endangered Species Act (ESA). They have been documented in patch reefs off the Florida Keys and Florida reef tract (GMFMC, 2005; USDOC, NOAA, 2011d). The Florida patch reefs are one of four NMFS-designated critical habitats for elkhorn and staghorn corals (USDOC, NOAA, 2011d).

In 2009, a petition was submitted to NOAA Fisheries by the Center for Biological Diversity to list 82 additional species of coral under the ESA (USDOC, NOAA, 2012b). Those 82 "candidate species" were reviewed by NOAA Fisheries. In April 2012, NOAA Fisheries completed a Status Review Report and a draft Management Report of the candidate species of corals and on December 7, 2012, the Proposed Listing Determinations for 82 Reef-Building Coral Species and Proposed Reclassification of *Acropora palmata* and *Acropora cervicornis* from Threatened to Endangered was published in the *Federal Register* (*Federal Register*, 2012b). The species proposed for listing as endangered that are found on live bottoms in the EPA include the following: *Montastraea annularis*, *Montastraea faveolata*, *Montastraea franksi*, and *Dendrogyra cylindrus*. Two other species that are found on live bottoms in the EPA that are proposed for listing as threatened are *Agaricia lamarcki* and *Dichocoenia stokesii*. In addition, *Acropora palmata* and *Acropora cervicornis* are proposed to be upgraded from threatened to endangered. If these proposed species are listed, BOEM would consult with NOAA Fisheries under ESA Section 7 if an action may affect the listed species or designated critical habitat, as it currently does for other listed species.

Essential Fish Habitat

The NMFS has designated essential fish habitat (EFH) for coral species within the Florida Middle Grounds, southwest tip of the Florida reef tract, and in predominantly patchy hard bottom offshore of Florida (from approximately Crystal River south to the Keys). These areas are managed under fishery management plans (FMP) (USDOC, NMFS, 2010). The EFH is defined as "**waters**—aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; **substrate**—sediment, hard bottom, structures underlying the waters, and associated biological communities; **necessary**—the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and **spawning, breeding, feeding, or growth to maturity**—stages representing a species' full life cycle" (USDOC, NMFS, 2010). Groups of coral protected under the Coral and Coral Reef FMP include octocorals, fire corals, stinging corals, stony corals, black corals, and deepwater corals (GMFMC and SAFMC, 1982). The EFH for coral in the Gulf of Mexico is designated for all life stages. The Magnuson-Stevens Fishery Conservation and Management Act requires Federal agencies to consult with NMFS on actions that are to be federally permitted, funded, or undertaken that may have an adverse effect on EFH. Adverse effects are defined as "any impact that reduces quality and/or quantity of EFH. . . [and] may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction of species' fecundity), site-specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions" (USDOC, NMFS, 2010). BOEM is in the process of consulting with NMFS on proposed projects that may adversely affect EFH.

Habitat Areas of Particular Concern

The NOAA has designated Habitat Areas of Particular Concern (HAPC's) within designated EFH areas. The HAPC areas have been created to focus and prioritize conservation efforts for federally managed fish species. Areas designated as hard-bottom HAPC's in the EPA are Florida Middle Grounds, Madison-Swanson Marine Reserve, Tortugas North and South Ecological Reserves, and Pulley Ridge (Dale and Santos, 2006; GMFMC, 2005). The currently listed threatened species (possibly updated to endangered) of elkhorn and staghorn coral are found in patch reefs off the Florida Keys and Florida reef tract, which are one of four NMFS-designated critical habitats for these corals (GMFMC, 2005; USDOC, NOAA, 2011d).

4.1.1.6.2.2. Impacts of Routine Events

This is a summary of the potential impacts of routine events to live bottom, low-relief features. For additional information on routine impacts to live bottom low-relief features, refer to Chapter 4.2.1.6.2.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.6.2 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The vast majority of the GOM seabed is comprised of soft sediments. Live bottom (low-relief) features of various types are located throughout the EPA in many locations on the West Florida Shelf, as well as on the nearby Mississippi-Alabama Shelf in the CPA. These live bottom, low-relief features, which sustain sensitive offshore habitats in the EPA and CPA, are described in **Chapter 4.1.1.6.2.1**. Live bottom features are protected by BOEM from routine oil and gas activities with the Live Bottom (Low Relief) Stipulation, which has been applied to appropriate leases since 1973. However, because the proposed EPA lease sale area will not include any of the live bottom (low-relief) stipulated blocks, the stipulation will not be applied to a lease resulting from an EPA proposed action. The closest portion of the BOEM-protected, Live Bottom (Low Relief) Stipulation blocks (which are considered the "live bottom [low relief]" habitat areas for this discussion) to an EPA proposed action is approximately 70 nmi (130 km; 80 mi). Due to the distance of the areas that may support live bottom habitats from an EPA proposed action (**Figure 4-4**), the live bottom features will not be affected by BOEM's routine oil and gas activities.

Proposed Action Analysis

In addition to the physical distance of the live bottom, low-relief areas from an EPA proposed action, the proposed EPA lease sale area is in water deeper than the waters in which live bottom, low-relief features are found and protected. For an EPA proposed action, there will be no exploration or development wells in water depths <800 m (2,625 ft) (**Table 3-2**), while the live bottom, low-relief habitats are most abundant on the continental shelf in waters 100 m (328 ft) or less. Therefore, all activity will take place deeper than the depth of growth on the live bottoms. The depth of the proposed EPA lease sale area, along with the distance from the proposed EPA lease sale area, eliminates the potential effects of routine impacts on the live bottom, low-relief habitats, including anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal, which have the potential to disrupt and alter the environmental, commercial, recreational, and aesthetic values of these features.

The physical distance of the live bottom, low-relief habitats from an EPA proposed action (≥70 nmi; 130 km; 80 mi) and depth of an EPA proposed action (≥800 m, 2,625 ft) will prevent damage to the habitat from routine oil and gas activities because most of these impacts occur within 1,000 m (3,281 ft) of a well. No anchor damage from vessels supporting structure emplacement will occur to live bottom features because there are no live bottom, low-relief features in the proposed EPA lease sale area. The deposition of cuttings from the drilling of wells is heaviest closest to the well, and impacts to organisms have been reported 100-200 m (328-656 ft) from the well (Montagna and Harper, 1996; Kennicutt et al., 1996; Hart et al., 1989; Kennicutt, 1995; CSA, 2004b). In addition, the composition of muds is strictly regulated, and discharges of cuttings/muds are tested to ensure that toxicity levels are below the limits allowed by NPDES permits (USEPA, 2004, 2007a, and 2009b). Drilling muds that may remain in the water column are rapidly diluted, and the measured concentration of drilling mud in the water at 1 m (3 ft) from the source was far below that which caused mortality to several species of coral in bioassays (Neff, 2005, Shinn et al., 1980; Hudson et al., 1982; Thompson et al., 1980; Raimondi et al., 1997). Produced waters released during operation are rapidly diluted, and acute toxicity to organisms are generally only observed within proximity of the discharge point, while chronic effects were reported to 1,000 m (3,281 ft) from the discharge (Holdway, 2002; Burns et al., 1999; Gittings et al., 1992b). The live bottom, low-relief features will not be affected by structure removal because of the distance of the proposed EPA lease sale area from these features. In addition, BSEE's regulations require a small individual charge (normally 50 lb [27 kg] or less per well piling and per conductor jacket) and charges that are detonated 5 m (15 ft) below the mudline and at least 0.9 seconds apart (timing needed to prevent shock waves from becoming additive) (USDOI, MMS, 2005).

Summary and Conclusion

Based on the localized impacts of routine oil and gas activities, the distance of the live bottom, low-relief features from the proposed EPA lease sale area, and the depth of the proposed EPA lease sale area in relation to the depth where live bottom features are found, no impacts from routine events are anticipated to occur to live bottom, low-relief features in the EPA or CPA as a result of proposed EPA activity. The closest Live Bottom (Low Relief) Stipulation block is approximately 70 nmi (130 km; 80 mi) from the proposed EPA lease sale area, which eliminates the potential effects of routine impacts that could affect live bottom, low-relief features including anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal. Because the greatest impacts of routine oil and gas activity are reported close to the well and because the discharge of drilling muds, cuttings, and produced waters is strictly regulated by NPDES, permits routine discharges will not reach the live bottom features. In addition, BSEE's regulations protect live bottoms from structure removal by reducing shock impact.

4.1.1.6.2.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to live bottom, low-relief features. For additional information on potential impacts of accidental events to live bottom, low-relief features, refer to Chapter 4.2.1.6.2.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.6.2 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The live bottom (low-relief) features of the EPA and the CPA that sustain sensitive offshore habitats are listed and described in **Chapter 4.1.1.6.2.1**. Disturbances resulting from an EPA proposed action, including oil spills and blowouts, have the potential to disrupt and alter the environmental, recreational, and aesthetic values of the live bottom habitats. One form of protection for the live bottoms is the Live Bottom (Low Relief) Stipulation, which was created to protect the live bottom features from routine impacts of drilling and production, and it has been applied to appropriate leases within Live Bottom (Low Relief) Stipulation blocks since 1973. However, because the proposed EPA lease sale area is greater than 70 nmi (130 km; 80 mi) from the closest Live Bottom (Low Relief) Stipulation, the stipulation will not be applied to a lease resulting from an EPA proposed action. Because of the distance of EPA proposed action from the features, only large spills have the potential to reach the live bottom (low-relief) features. Possible modes of exposure and impacts resulting to the organisms of the live bottom features from a large-scale spill are discussed below.

Proposed Action Analysis

Accidental releases of oil could occur as a result of an EPA proposed action. The probability of surface water oiling occurring as a result of an EPA proposed action was estimated by the Bureau of Ocean Energy Management's OSRA model for spills ≥1,000 bbl and ≥10,000 bbl. The mean number of offshore spills ≥1,000 bbl is estimated to be between 0 and 0.08 spills for an EPA proposed action, and the probability of one or more spills of the same size occurring is estimated to be between 0 and 8 percent (**Table 3-21**). The mean number of offshore spills ≥10,000 bbl is estimated to be fewer (between 0 and 0.02 spills for an EPA proposed action), and the probability of one or more spills of the same size occurring is estimated to be between 0 and 2 percent (**Table 3-22**).

The OSRA model estimated the combined probabilities of one or more hypothetical spills ≥1,000 bbl occurring and contacting surface waters above particular features or in specific polygons delineated on the GOM as a result of an EPA proposed action. The OSRA model estimated a <0.5 percent probability that the surface waters above the Live Bottom (Low Relief) Stipulation blocks would be oiled within 10 days of a spill, except for the few blocks in the CPA south of Mobile Bay that had a 1 percent probability (**Figure 3-16**). The OSRA model estimated a <0.5 percent probability that the surface waters above the Live Bottom (Low Relief) Stipulation blocks between the shoreline and 20-m (66 ft) depth, as well as the stipulation blocks in waters >20 m (66 ft) off the southern portion of Florida (polygon S10), would be oiled within 30 days of a spill (**Figure 3-17**). The surface waters of the Live Bottom (Low Relief) Stipulation blocks off the northern half of Florida in waters >20 m (66 ft) had a 1 percent probability of oiling within 30 days (polygons S8 and S9), and the few blocks in the CPA, south of Mobile Bay, in waters >20 m (66 ft) (polygon S7) had a 2 percent probability. When the OSRA model focused on HAPC's in the EPA (Madison-Swanson Marine Reserve, Steamboat Lumps Special Management Area, the Florida Middle Ground, Pulley Ridge, Tortugas North and South Ecological Reserves, the Dry Tortugas, and the Florida Keys National Marine Sanctuary), there was a <0.5 percent probability that there could be oiling of the surface waters above these features within both 10 and 30 days of a spill event (**Figure 3-14**).

Oil released to the environment as a result of an accidental event may impact live bottom (low-relief) features in several ways. Oil may be physically mixed into the water column from the sea surface, be injected below the sea surface and travel with currents, be dispersed in the water column, or be adsorbed to sediment particles and sink to the seafloor. A brief description of the exposure routes is discussed below.

An oil spill that occurs at the sea surface would result in a majority of the oil remaining at the sea surface. Lighter compounds in the oil may evaporate, and some components of the oil may dissolve in the seawater. Evaporation allows the removal of the most toxic components of the oil, while dissolution may allow bioavailability of hydrocarbons to marine organisms for a brief period of time (Lewis and Aurand, 1997). Remnants of the oil may then emulsify with water or adsorb to sediment particles and fall to the seafloor.

The live bottom (low-relief) features in the EPA and CPA are found in water depths <100 m (328 ft). They represent a small fraction of the continental shelf area in the GOM, as they are patchy and sometimes ephemeral (temporary). The fact that the Live Bottom (Low Relief) Stipulation blocks are >70 nmi (130 km; 80 mi) from an EPA proposed action serves to limit the extent of damage from any given oil spill to the live bottom features.

The depth below the sea surface to which the live bottom (low-relief) features rise helps to protect them from surface oil spills. Disturbance of the sea surface by storms can mix surface oil into the water column, but the effects are generally limited to the upper 10 m (33 ft). Modeling exercises have indicated that oil may reach a depth of 20 m (66 ft). Yet at this depth, the spilled oil would be at concentrations several orders of magnitude lower than the amount shown to have an effect on marine organisms (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002). Therefore, the depth of offshore live bottom features below the sea surface should protect them from the physical mixing of surface oil below the sea surface. Features in water depths shallower than 10 m (33 ft) would be more susceptible to oil impacts. However, nearshore low-relief, live bottom habitats are not located in lease blocks of an EPA proposed action, distancing them from potential activities. The low probabilities of oil reaching the surface waters above these features, based on the OSRA model, combined with the limited depth of the mixing of surface oil versus depths to the crests of these features, function to protect the live bottom (low-relief) features.

A spill that occurs below the sea surface (i.e., at the rig, along the riser between the seafloor and sea surface, or through leak paths on the BOP/wellhead) would result in most of the released oil rising to the sea surface. All known reserves in the Gulf of Mexico have specific gravity characteristics that would preclude oil from sinking immediately after release at a blowout site. As discussed in **Chapter 3.2.1.4.4**, oil discharges that occur at the seafloor from a pipeline or loss of well control would rise in the water column, surfacing almost directly over the source location, thus not impacting sensitive benthic communities. If the oil is ejected under high pressure, oil droplets may become entrained in the water column (Boehm and Fiest, 1982; Adcroft et al., 2010). The upward movement of the oil may be reduced if methane mixed with the oil is dissolved into the water column, reducing the oil's buoyancy (Adcroft et al., 2010). The large oil droplets would rise to the sea surface, but the smaller droplets, formed by vigorous turbulence in the plume or the injection of dispersants, may remain neutrally buoyant in the water column, creating a subsurface plume (Adcroft et al., 2010; Joint Analysis Group, 2010). Dispersed oil in the water column begins to biodegrade and may flocculate with particulate matter, promoting sinking of the particles.

A subsurface spill or plume may impact sessile biota of live bottom features. Oil or dispersed oil may cause sublethal impacts to benthic organisms if a plume reaches these features. Impacts may include loss of habitat, biodiversity, and live coverage; change in community structure; and failed reproductive success. Oil adsorbed to sediments or sedimentation as a result of a blowout may impact benthic organisms. However, the distance of the proposed EPA lease sale area from live bottom (low-relief) features would result in well dispersed oil that has adsorbed to sediments and a light layer of deposition, if any, that would be removed by the normal self-cleaning processes of corals.

Any impacts that may occur to benthic communities on live bottom (low-relief) features as a result of a spill would depend on the type of spill, distance from the spill, relief of the biological feature, and surrounding physical characteristics of the environment (e.g., turbidity). Oil released during a large-scale accidental event may reach Live Bottom (Low Relief) Stipulation blocks if it is able to travel the 70 nmi

(130 km; 80 mi) or more to the features. Acute impacts to benthic organisms are not anticipated to occur due to the distance of the live bottoms from the proposed EPA lease sale area. Any impacts that may occur would be sublethal, although the great distance between an EPA proposed action and the live bottom (low-relief) features may even eliminate these impacts because the oil weathers and disperses over the distance.

Summary and Conclusion

As described above, the proposed EPA lease sale area is 130 km (80 mi) from the closest live bottom feature, and because of the distance of an EPA proposed action from the features, only large spills would be expected to have the potential to reach the live bottom features. Most of the oil released from a spill at depth would rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on live bottom features. Deeper live bottoms may be protected from the mixing depth of oil into the water column, but shallower features may be oiled if oil mixes into the water column. Small droplets of oil in the water column may attach to suspended particles in the water column, sink to the seafloor, and could possibly contact live bottom (low-relief) features, (McAuliffe et al., 1975). The live bottom features and their benthic communities that are exposed to subsea plumes, dispersed oil, or oil adsorbed to sediment particles may demonstrate reduced recruitment success, reduced growth, and reduced coral cover as a result of impaired recruitment.

4.2.1.6.2.4. Cumulative Impacts

This is a summary of the potential cumulative impacts to live bottom, low-relief features. For additional information on potential cumulative impacts to live bottom, low-relief features, refer to Chapter 4.2.1.6.2.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.6.2 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The cumulative impact from routine oil and gas operations includes effects resulting from an EPA proposed action, as well as those resulting from past and future OCS oil and gas leasing. These operations include anchoring, structure emplacement, muds and cuttings discharge, effluent discharge, blowouts, and oil spills. Non-oil- and gas-related impacts including commercial fisheries, natural disturbances, anchoring by recreational boats, and other non-oil and gas commercial vessels, as well as spillage from import tankering, all have the potential to alter live bottoms on low-relief habitat.

OCS Oil- and Gas-Related Impacts

Structure placement and anchor damage from support boats and ships, floating drilling units, and pipeline-laying vessels that disturb areas of the seafloor are considered the greatest OCS oil- and gas-related threat to live bottom, low-relief areas. Organisms within the footprint of structures and anchors on the seafloor, as well as the areas where anchor chains sweep the seafloor, may be crushed or physically removed and communities could be altered by the organism loss (Lissner et al., 1991; Dinsdale and Harriott, 2004). These activities, however, will not affect live bottom habitats as a result of an EPA proposed action because the proposed EPA lease sale area is located at least 70 nmi (130 km; 80 mi) from the closest area of the live bottom, low-relief stipulation blocks.

Discharges of drilling fluids and produced waters will not impact live bottom, low-relief features because of the distance between the proposed EPA lease sale area and the live bottom features (at least 70 nmi [130 km; 80 mi] to the nearest Live Bottom (Low Relief) Stipulation block). Discharges are controlled by USEPA through the NPDES discharge permit, which regulates the materials discharged and their concentrations. Drilling fluid plumes are rapidly dispersed on the OCS; approximately 90 percent of the material discharged in drilling a well (cuttings and drilling fluid) settles rapidly to the seafloor, while 10 percent forms a plume of fine mud that drifts in the water column (Neff, 2005). Impacts to benthic organisms from drill cuttings are localized to 100-200 m (328-656 ft) from a well (Montagna and Harper, 1996; Kennicutt et al., 1996). Produced waters are rapidly diluted in the water column upon release, and acute effects have only been reported in the mixing zone around the outfall (Gittings et al., 1992b; Smith et al., 1994; Burns et al., 1999; Holdway, 2002). Any fine material discharged from a well that is drifting in the water column will be well dispersed before it reaches the live bottom, low-relief features of the EPA.

Impacts on the live bottom features could occur as a result of oil- and gas-related spills or spills from import tankering or a surface spill. Disturbance of the sea surface by storms can mix surface oil 10-20 m (33-66 ft) into the water column (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002). This may result in direct oil contact for shallow, nearshore live bottom communities. Direct oiling may result in lethal impacts to organisms or sublethal responses such as reduced feeding (Lewis, 1971; Cohen et al., 1977; Reimer, 1975), tissue damage (Peters et al., 1981; Reimer, 1975), decreased reproductive ability (Loya and Rinkevich, 1979; Rinkevich and Loya, 1977; Cohen et al., 1977; Guzmán and Holst, 1993), reduced photosynthesis (Cook and Knap, 1983; Rinkevich and Loya, 1983; Loya and Rinkevich, 1979; Peters et al., 1981), incorporation of petroleum hydrocarbons into their tissue (Burns and Knap, 1989; Knap et al., 1982; Kennedy et al., 1992; Cohen et al., 1977), and reduced community resilience (Jackson et al., 1989; Loya, 1976).

Live bottom (low-relief) communities farther offshore (out to 100 m [328 ft] deep) would be protected from direct physical oil contact due to their depth below the water's surface and oil's limited depth of mixing. Any dispersed surface oil from a tanker or rig spill that may reach the benthic communities of low-relief features in the Gulf of Mexico at a depth >10 m (33 ft) would be expected to be at very low concentrations (<1 ppm) (McAuliffe et al., 1981a and 1981b; Lewis and Aurand, 1997). Laboratory studies and field observations of coral larval and adult stages have shown resistance to such concentrations (Lewis, 1971; Elgershuizen and De Kruijf, 1976; Knap, 1987; Wyers et al., 1986; Cohen et al., 1977; Jackson et al., 1989; Guzmán et al., 1991), while other studies show that similar concentrations can harm larval or embryonic life stages of other benthic organisms (Fucik et al., 1995; Suchanek, 1993; Beiras and Saco-Álvarez, 2006; Byrne, 1989). Any dispersed or physically mixed oil in the water column that comes in contact with corals, however, may evoke short-term negative responses by the organisms, such as reduced feeding and photosynthesis or altered behavior (Wyers et al., 1986; Cook and Knap, 1983; Dodge et al., 1984).

It is unlikely that a blowout could impact the biota of the live bottom, low-relief features due to the distance of the features from the proposed EPA lease sale area (at least 70 nmi [130 km; 80 mi] to the nearest Live Bottom (Low Relief) Stipulation block) and the depth of the proposed activity (800 m; 2,625 ft), which is much deeper than the live bottom features. Most of the oil from a seafloor blowout would rise to the surface, but some of it may be entrained in the water column as a subsea plume. However, because oil mixed into the water column is moved by water currents, which do not generally travel toward shore, subsea oil should not move up onto the continental shelf toward the live bottom, low-relief features (Pond and Pickard, 1983; Inoue et al., 2008). Oil at the sea surface would behave the same as a surface oil spill (refer to the above paragraphs). Oil in a subsea plume could be carried toward the live bottom, low-relief features, although the oil would become diluted in the water column as it travels. The resulting level of impact, if any, depends on the concentration of the oil when it contacts the habitat. The farther the live bottom feature is from the blowout, the more dispersed the oil would become, reducing the possible impacts. In the unlikely event that oil was to contact the live bottom features, the impacts may include loss of habitat, biodiversity, and live coverage; change in community structure; and failed reproductive success. In the highly unlikely event that oil from a subsurface spill could reach a live bottom area in lethal concentrations, the recovery of this area could take in excess of 10 years (Fucik et al., 1984).

A catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, would have a fairly low probability of impacting live bottom features because the bottom-disturbing activities of oil and gas activities are distanced from live bottom features within the Live Bottom (Low Relief) Stipulation blocks, as described in NTL 2009-G39, and because BOEM conducts a case-by-case review of all plans to ensure that activities do not impact these seafloor features. In addition, the Live Bottom (Low Relief) Stipulation blocks will not be leased as part of this proposed EPA lease sale, creating farther distance between oil and gas activities and live bottoms. Also, live bottom features are protected by the limited depth of mixing of surface oil compared with the depth of the live bottom features, currents sweeping around larger features, and the weathering and dispersion of oil that would occur with distance from the source as it travels toward the features. Low-relief features could have impacts from a blowout as their relief would not divert currents and the locations of these features are not all known, so accidental anchor impacts may result in breakage of the features and possibly destruction. These low-relief features, however, would be protected by the distances of current oil and gas activities, which would lead to well dispersed oil before it reaches the features. Refer to **Appendix B** for more details on the impacts of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action.

Non-OCS Oil- and Gas-Related Impacts

Severe and permanent physical damage may occur to low-relief features and the associated live bottoms as a result of non-oil and gas activities. It is assumed those biota associated with the low-relief features are well adapted to natural disturbances such as turbidity and storms because they are situated in fairly shallow water; however, human disturbance could cause severe damage to live bottom biota, possibly leading to changes of physical integrity, species diversity, or biological productivity. If such events were to occur, recovery to pre-impact conditions could take as much as 10 years (Fucik et al., 1984).

Natural events such as storms, extreme weather, and fluctuations of environmental conditions (e.g., nutrient pulses, low dissolved oxygen levels, seawater temperature minima, and seasonal algal blooms) may impact live bottom communities. Live bottom (low-relief) communities occur from the shoreline to 100 m (328 ft) of water and, because many of these features are located in shallow water, storm events may damage these environments. Currents are created by wave action that can resuspend sediments to produce added turbidity and sedimentation (Brooks, 1991; CSA, 1992). Storms can physically affect shallow-bottom environments, causing an increase in sedimentation, burial of organisms by sediment, a rapid change in salinity or dissolved oxygen levels, storm surge scouring, remobilization of contaminants in the sediment, and abrasion and clogging of gills as a result of turbidity (Engle et al., 2008). Storms have also been shown to uproot benthic organisms from the sediment (Dobbs and Vozarik, 1983), and breakage or detachment may occur as a result of storm activity (Yoshioka and Yoshioka, 1987). Such impacts may be devastating to a benthic community.

Hypoxic conditions of inconsistent intensities and ranges also occur annually in a band that stretches along the Louisiana-Texas shelf each summer (Rabalais et al., 2002). The dissolved oxygen levels of bottom waters in the Gulf of Mexico hypoxic zone are <2 ppm during part of the summer season. Such low concentrations are lethal to many benthic organisms and may result in the loss of some benthic populations. Although this is mainly a character of the Louisiana-Texas shelf, its effect could reach some live bottom (low-relief) communities in the northeast portion of the CPA.

Recreational boating, fishing, and import tankering may severely impact local areas of live bottom communities. Ships anchoring near major shipping fairways of the EPA may occasionally impact sensitive areas located near these fairways. Recreational and commercial fishermen also take advantage of the relatively shallow and easily accessible resources of the region and anchor at live bottom locations to fish. Much of the fishing on these habitats uses bottom fishing gear that may damage benthic organisms or may snag on the reefs and be lost. Such gear, particularly lines of varying thickness, can cut into the tissues of many benthic organisms during storm movement of bottom waters.

Damage resulting from commercial fishing, especially bottom trawling, may have a severe impact on hard-bottom benthic communities. Bottom trawling in the Gulf of Mexico primarily targets shrimp from nearshore waters to depths of approximately 90 m (300 ft) (NRC, 2002). Although trawlers would not select areas with sharp relief as fishing ground, since rocky areas may entangle gear, many live bottom areas have little or no relief and may be targeted by trawlers. Reports indicate that bottom trawling activity on hard-bottom substrates can overturn boulders and destroy epifaunal organisms (Freese et al., 1999). Large emergent sponges and anthozoans may be particularly vulnerable to trawling activity, as these organisms grow above the substrate and can be caught and removed by trawling activity (Freese et al., 1999). Recovery rates of corals and coralline algae may take decades and depend on the extent of the impact, frequency of disturbance, other natural changes that occur to the habitat, and the organism's life history (NRC, 2002).

Summary and Conclusion

Overall, the incremental contribution of an EPA proposed action to the cumulative impact is negligible when compared with non-oil and gas impacts. Activities causing mechanical disturbance represent the greatest threat to the live bottom, low-relief features. With respect to OCS oil-and gas-related activities, this would, however, be prevented by the distance of the proposed EPA lease sale area from the features. Possible impacts from routine activities of OCS oil and gas operations include anchoring, structure emplacement and removal, pipeline emplacement, drilling discharges, and discharges of produced waters. In addition, accidental subsea oil spills or blowouts associated with OCS oil and gas activities can cause damage to low-relief, hard-bottom communities. Impacts from these factors should be minimized based on BOEM's policy and case-by-case review of proposed OCS oil and gas activity and the fact that live bottom (low-relief) blocks are not currently offered for lease. The physical distance between any routine OCS oil and gas activity and accidental spill from live bottom areas would minimize any possible impacts from the activity. The impact to the live bottom resource as a whole is expected to be minimal because of the distance of any OCS oil- and gas-related activity from these habitats.

Non-oil and gas activities that may occur in the vicinity of the low-relief, hard-bottom communities include boating and fishing, import tankering, fishing and trawling, and natural events such as extreme weather conditions and extreme fluctuations of environmental conditions. These activities could cause damage to the low-relief, hard-bottom communities. Occasionally, ships using fairways in the vicinity of communities anchor in the general area of live bottoms, and commercial and recreational fishermen take advantage of the relatively shallow and easily accessible resources of regional hard bottoms. These activities could lead to instances of severe and permanent physical damage. During severe storms, such as hurricanes, large waves may reach deep enough to stir bottom sediments, which could cause severe mechanical damage to organisms, including abrasion from suspended sand, bruising and crushing from tumbling rocks, and complete removal of organisms (Brooks, 1991; CSA, 1992). Yearly hypoxic events may affect portions of live bottom benthic populations in the northeast part of the Gulf of Mexico (Rabalais et al., 2002).

4.1.1.7. Topographic Features

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for topographic features can be found in Chapter 4.2.1.7 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.7 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.7 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.7 of the 2012-2017 WPA/CPA Supplemental EIS would be equally applicable for topographic features regarding an EPA proposed action, and they are hereby incorporated by reference.

BOEM has examined the analysis for topographic features presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for topographic features presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on topographic features, and various Internet sources were examined to determine any recent information regarding topographic features. A search of Internet information sources (the NOAA Gulf Spill Restoration Publications website; the ERMA Gulf Response website; the NOAA *Deepwater Horizon* Archive Publications and Factsheets; the Gulf of Mexico Sea Grant *Deepwater Horizon* Oil Spill Research and Monitoring Activities Database; the RestoreTheGulf.gov website; and the *Deepwater Horizon* Oil Spill Portal), as well as recently published journal articles was conducted to determine the availability of recent information on the topographic features. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding topographic features since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, limited data are currently available on potential impacts of the *Deepwater Horizon* explosion, oil spill, and response on the topographic features. This incomplete or unavailable information may be relevant to reasonably foreseeable significant impacts to topographic features. Relevant data on the status of topographic features after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze. Much of this data is being developed through the NRDA process, which may take years to complete. Little data from the NRDA process have been made available to date. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated by this NEPA analysis, regardless of the cost or resources needed. BOEM has determined that this incomplete or unavailable information may be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. In the place of this incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

4.1.1.7.1. Description of the Affected Environment

Topographic features are hard-bottom habitats and are rare compared with the ubiquitous soft bottoms in the GOM (Parker et al., 1983). They are typically upthrusts of rock due to uplift (salt diapirs) by underlying layers of salt deep under the seafloor. These topographic highs, or subsea banks, provide an island of hard substrate in a virtual ocean of soft bottoms. Wherever rock protrudes up into the water column, reef organisms may thrive. The type of organisms inhabiting a reef is determined by environmental conditions. Major factors are the amount of light and sedimentation and the temperature. If conditions are very good, a coral reef is established. True coral reefs are only found at the East and West Flower Garden Banks (in the WPA), a small area of McGrail Bank (in the CPA), and part of Pulley Ridge (in the EPA). Other banks support reef communities with varying degrees of diversity, depending on environmental conditions, but many are too deep in the water (causing too dark of an environment) or have too much sedimentation for hermatypic (reef-building) corals to thrive in numbers adequate to build a coral reef. However, these deeper reefs have thriving communities that include some stony corals as well as gorgonians, black corals, soft corals, sponges, urchins, crabs, many other invertebrates, macroalgae, calcareous algae, and a healthy fish community. For additional information on topographic features, refer to Chapters 4.1.1.6.1 and 4.2.1.7.1 of the 2012-2017 WPA/CPA Multisale EIS, which are hereby incorporated by reference.

There are 37 protected topographic features in the GOM: 21 in the WPA and 16 in the CPA, all of which are distanced 250 km (155 mi) or more from an EPA proposed action (**Figure 4-5**). This Agency has created No Activity Zones around the 37 major topographic features in order to protect these habitats from disruption due to oil and gas activities. A No Activity Zone is a protective perimeter associated with a specific depth contour that is drawn around each feature; no contact with the seafloor is allowed, including the placement of structures, drilling rigs, pipelines, anchoring, and cables. These No Activity Zones are areas protected by BOEM's policy. In addition, based on EFH programmatic consultation with NMFS, NTL 2009-G39 also recommends that drilling would not occur within 152 m (500 ft) of a No Activity Zone of a topographic feature (NTL 2009-G39). Any construction within the buffer would require project-specific EFH consultation with NMFS, which could extend the time necessary to complete BOEM's review of the project application. There are additional zones (1,000-Meter Zone, 1-Mile Zone, 3-Mile Zone, and the 4-Mile Zone) surrounding most topographic features with restrictions on the discharge of drill cuttings. All 37 banks have the No Activity Zone and may have up to two of the other zones. Details of the restrictions are described in this Agency's NTL 2009-G39. The Biological Stipulation Map Package (http://www.boem.gov/uploadedFiles/topo_features_package.pdf) includes drawings of each bank with associated protection zones. Some habitats in the EPA are similar to the protected topographic features and would receive similar protection measures if leasing occurred near them. Refer to **Chapter 4.1.1.6.2** for a description of the live bottom habitats in the EPA.

BOEM has examined the topographic features as part of this EIS because, although they are distanced from the area of an EPA proposed action and would not be impacted by routine or small-scale accidental events, they could be impacted by a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action. In addition, lease stipulations protect these features from routine activity impacts and help to distance the features from some accidental events, but oil from a large-scale spill event could possibly reach these habitats. Analyses of the potential impacts to topographic features associated with an EPA proposed action are presented in **Chapters 4.1.1.7.2** ("Impacts of Routine Events")**, 4.1.1.7.3** ("Impacts of Accidental Events")**, and 4.1.1.7.4** ("Cumulative Impacts").

4.1.1.7.2. Impacts of Routine Events

This is a summary of the potential impacts of routine events to topographic features. For additional information on the potential impacts of routine events to topographic features, refer to Chapter 4.2.1.7.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.7 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The vast majority of the GOM seabed is comprised of soft sediments. Topographic features formed on hard-bottom substrate are interspersed along the continental shelf above the soft sediment. These topographic features, which sustain sensitive offshore habitats in the WPA and CPA, are described in **Chapter 4.1.1.7.1**. The topographic features are protected by BOEM from routine oil and gas activities with the Topographic Features Stipulation, which has been applied to appropriate leases since 1973. But, because the proposed EPA lease sale area will not include any BOEM protected topographic features, the stipulation will not be applied to a lease resulting from an EPA proposed action. However, the closest protected topographic feature to the proposed EPA lease sale area is Sackett Bank, which lies in the CPA south of the Mississippi River Southwest Pass. This bank is approximately 250 km (150 mi) from the proposed EPA lease sale area. Due to the distance of the protected topographic features from the proposed lease sale area (**Figure 4-5**), the topographic features will not be affected by routine oil and gas activities.

Proposed Action Analysis

In addition to the physical distance of the topographic features from the proposed EPA lease sale area, the proposed lease sale area is in water far deeper than the waters in which topographic features are found. For an EPA proposed action, there will be no exploration or development wells in water <800 m (2,625 ft) (**Table 3-2**), while the majority of the topographic features are found on the continental shelf in water depths of 200 m (656 ft) or less. Therefore, all activity will take place far deeper than the depth of growth on the topographic features. The depth of the proposed EPA lease sale area, along with the distance of the proposed lease sale area, eliminates the potential effects of routine impacts that could affect topographic features, including anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal, which have the potential to disrupt and alter the environmental, commercial, recreational, and aesthetic values of topographic features.

The physical distance of the topographic features from the proposed EPA lease sale area (≥250 km; 155 mi) and depth of the proposed lease sale area (≥800 m; 2,625 ft) will prevent damage to the habitat from routine oil and gas activities because most of these impacts occur within 1,000 m (3,281 ft) of a well. No anchor damage from vessels supporting structure emplacement will occur to topographic features because there are no topographic features in the proposed lease sale area. The deposition of cuttings from the drilling of wells is heaviest closest to the well, and impacts to organisms have been reported 100-200 m (328-656 ft) from the well (Montagna and Harper, 1996; Kennicutt et al., 1996; Hart et al., 1989; Kennicutt, 1995; CSA, 2004b). In addition, the composition of muds is strictly regulated, and discharges of cuttings/muds are tested to ensure that toxicity levels are below the limits allowed by NPDES permits (USEPA, 2004, 2007a, and 2009b). Drilling muds that may remain in the water column are rapidly diluted and the measured concentration of drilling mud in the water at 1 m (3 ft) from the source was far below that which caused mortality to several species of coral in bioassays, although polyp retraction may occur at the concentrations of drilling mud measured in the water column 1m (3 ft) from an outflow (Neff, 2005, Shinn et al., 1980; Hudson et al., 1982; Thompson et al., 1980; Raimondi et al., 1997). Produced waters released during operation are rapidly diluted, and acute toxicity to organisms are generally only observed within proximity of the discharge point, while chronic effects were reported to 1,000 m (3,281 ft) from the discharge (Holdway, 2002; Burns et al., 1999; Gittings et al., 1992b). The topographic features will not be affected by structure removal because of the distance of the proposed EPA lease sale area from the topographic features and BSEE’s regulations, which require a small individual charge (normally 50 lb [27 kg] or less per well piling and per conductor jacket) and that charges are detonated 5 m (15 ft) below the mudline and at least 0.9 seconds apart (timing needed to prevent shock waves from becoming additive) (USDOI, MMS, 2005).

Summary and Conclusion

Based on the localized impacts of routine oil and gas activities, the distance of the topographic features from the proposed EPA lease sale area, and the depth of the proposed lease sale area in relation to the depth where topographic features are found, no impacts from routine events are anticipated to occur to topographic features in the GOM as a result of an proposed EPA action. The closest topographic feature is approximately 250 km (150 mi) from the proposed EPA lease sale area, which eliminates the potential effects of routine impacts that could affect topographic features, including anchoring, infrastructure emplacement, drilling-effluent and produced-water discharges, and infrastructure removal. Because the greatest impacts of routine oil and gas activity are reported close to the well and because discharge of drilling muds, cuttings, and produced waters is strictly regulated by NPDES permits, routine discharges will not reach the topographic features. In addition, BSEE's regulations protect topographic features from structure removal by reducing shock impact.

4.1.1.7.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to topographic features. For additional information on the potential impacts of accidental events to topographic features, refer to Chapter 4.2.1.7.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.7 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The topographic features of the CPA and WPA that sustain sensitive offshore habitats are listed and described in **Chapter 4.1.1.7.1**. Disturbances resulting from an EPA proposed action, including oil spills and blowouts, have the potential to disrupt and alter the environmental, commercial, recreational, and aesthetic values of topographic features of the CPA and WPA. One form of protection for topographic features is the Topographic Features Stipulation, which was created to protect topographic features from routine impacts of drilling and production; it has been applied to appropriate leases within Topographic Features Stipulation blocks since 1973. However, because there are no Topographic Feature Stipulation blocks in the proposed EPA lease sale area and because the proposed lease sale area is >250 km (155 mi) from the closest topographic feature, the stipulation will not be applied to a lease resulting from an EPA proposed action. Because of the distance of an EPA proposed action from the features, only large spills have the potential to reach the topographic features. Possible modes of exposure and impacts resulting to the organisms of topographic features from a large-scale spill are discussed below.

Proposed Action Analysis

Accidental releases of oil could occur as a result of an EPA proposed action. The probability of surface water oiling occurring as a result of an EPA proposed action was estimated by the Bureau of Ocean Energy Management's OSRA model for spills ≥1,000 bbl and ≥10,000 bbl. The mean number of offshore spills ≥1,000 bbl is estimated to be between 0 and 0.08 spills for an EPA proposed action, and the probability of one or more spills of the same size occurring is estimated to be between 0 and 8 percent (**Table 3-21**). The mean number of offshore spills ≥10,000 bbl is estimated to be fewer (between 0 and 0.02 spills for an EPA proposed action), and the probability of one or more spills of the same size occurring is estimated to be between 0 and 2 percent (**Table 3-22**).

The OSRA model estimated combined probabilities of one or more hypothetical spills ≥1,000 bbl occurring and contacting surface waters above particular features or in specific polygons delineated on the GOM as a result of an EPA proposed action. The OSRA model estimated probabilities of <0.5 percent after 10 and 30 days that a spill would contact surface waters above any BOEM-protected topographic feature in the GOM (**Figure 3-15**). The probabilities of oil contacting the surface water above HAPC's in the GOM, including Sonnier Bank, Stetson Bank, and the East and West Flower Garden Banks, as a result of an EPA proposed action is also <0.5 percent within 10 and 30 days following a spill (**Figure 3-14**).

Oil released to the environment as a result of an accidental event may impact topographic features in several ways. Oil may be physically mixed into the water column from the sea surface, be injected below the sea surface and travel with currents, be dispersed in the water column, or be adsorbed to sediment particles and sink to the seafloor. A brief description of the exposure routes is discussed below; for additional information on accidental impacts to topographic features, refer to Chapters 4.1.1.6.3 and 4.2.1.7.3 of the 2012-2017 WPA/CPA Multisale EIS, which are hereby incorporated by reference.

An oil spill that occurs at the sea surface would result in a majority of the oil remaining at the sea surface. Lighter compounds in the oil may evaporate, and some components of the oil may dissolve in the seawater. Evaporation allows the removal of the most toxic components of the oil, while dissolution may allow bioavailability of hydrocarbons to marine organisms for a brief period of time (Lewis and Aurand, 1997). Remnants of the oil may then emulsify with water or adsorb to sediment particles and fall to the seafloor.

All of the topographic features in the WPA and CPA are found in water depths <200 m (656 ft). They represent a small fraction of the continental shelf area in the GOM. The fact that the topographic features are widely dispersed and that the closest topographic feature (Sackett Bank) to the proposed EPA lease sale area is >250 km (155 mi) serves to limit the extent of damage from any given oil spill to the topographic features.

The depth below the sea surface to which many topographic features rise helps to protect them from surface oil spills. Any oil that might be driven to the depth of active coral growth (15 m; 49 ft) or deeper would probably be at concentrations low enough to result in a limited impact to these features. The peaks of most of the topographic features are over 20 m (66 ft) below the sea surface, the depth to which surface oil spills can generally be mixed into the water column by storms (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002). Also, the low probabilities of oil reaching the surface waters above these banks, based on the OSRA model, combined with the limited depth of the mixing of surface oil compared with the depth of the crests of these features, function to protect these features.

A spill that occurs below the sea surface (i.e., at the rig, along the riser between the seafloor and sea surface, or through leak paths on the BOP/wellhead) would result in most of the released oil rising to the sea surface. All known reserves in the GOM have specific gravity characteristics that would preclude oil from sinking immediately after release at a blowout site. As discussed in **Chapter 3.2.1.4.4**, oil discharges that occur at the seafloor from a pipeline or loss of well control would rise in the water column, surfacing almost directly over the source location, thus not impacting sensitive benthic communities. If the oil is ejected under high pressure, oil droplets may become entrained in the water column (Boehm and Fiest, 1982; Adcroft et al., 2010). The upward movement of the oil may be reduced if methane mixed with the oil is dissolved into the water column, reducing the oil's buoyancy (Adcroft et al., 2010). The large oil droplets would rise to the sea surface, but the smaller droplets, formed by vigorous turbulence in the plume or the injection of dispersants, may remain neutrally buoyant in the water column, creating a subsurface plume (Adcroft et al., 2010; Joint Analysis Group, 2010). Dispersed oil in the water column begins to biodegrade and may flocculate with particulate matter, promoting sinking of the particles.

A subsurface spill or plume may impact sessile biota of topographic features. Oil or dispersed oil may cause sublethal impacts to benthic organisms if a plume reaches these features. Impacts may include loss of habitat, biodiversity, and live coverage; change in community structure; and failed reproductive success. Oil adsorbed to sediments or sedimentation as a result of a blowout may impact benthic organisms. However, the distance of the proposed EPA lease sale area from topographic features would result in well dispersed oil that has adsorbed to sediments and a light layer of deposition, if any, that would be removed by the normal self-cleaning processes of corals.

Any impacts that may occur to benthic communities on topographic features as a result of a spill would depend on the type of spill, distance from the spill, relief of the biological feature, and surrounding physical characteristics of the environment (e.g., turbidity). Oil released during a large-scale accidental event may reach topographic features if it is able to travel the 250 km (155 mi) or more to the features. Acute impacts to benthic organisms are not anticipated to occur due to the distance of the topographic features from the proposed EPA lease sale area. Any impacts that may occur would be sublethal, although the great distance between the proposed lease sale area and the topographic features may even eliminate these impacts because the oil weathers and disperses over the distance.

Summary and Conclusion

As described above, the proposed EPA lease sale area is >250 km (155 mi) from the closest topographic feature and, because of the distance of an EPA proposed action from the features, only large spills have the potential to reach the topographic features. Most of the oil released from a spill at depth would rise to the sea surface and therefore reduce the amount of oil that may directly contact communities on topographic features. The depth of active coral growth would protect them from the physical mixing of oil into the water column. Small droplets of oil in the water column could possibly attach to suspended particles in the water column, sink to the seafloor, and contact topographic features, (McAuliffe et al., 1975). Topographic features and their benthic communities that are exposed to subsea plumes, dispersed oil, or oil adsorbed to sediment particles may demonstrate reduced recruitment success, reduced growth, and reduced coral cover as a result of impaired recruitment.

4.1.1.7.4. Cumulative Impacts

This is a summary of the potential cumulative impacts to topographic features. For additional information on the potential cumulative impacts to topographic features, refer to Chapter 4.2.1.7.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.7 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The cumulative impact from routine oil and gas operations includes effects resulting from an EPA proposed action, as well as those resulting from past and future OCS oil and gas leasing. These operations include anchoring, structure emplacement, muds and cuttings discharge, effluent discharge, blowouts, oil spills, and structure removal. Potential non-OCS oil- and gas-related factors include vessel anchoring, treasure-hunting activities, import tankering, heavy storms and hurricanes, the collapse of the tops of the topographic features due to dissolution of the underlying salt structure, commercial fishing, and recreational scuba diving.

OCS Oil- and Gas-Related Impacts

Mechanical damage, including anchoring, is considered to be a catastrophic threat to the biota of topographic features. Detrimental impacts would result if oil and gas operators anchored pipeline barges, drilling rigs, and service vessels or if they placed structures on topographic features (Rezak and Bright, 1979; Rezak et al., 1983). These activities will not occur to topographic features as a result of an EPA proposed action because the proposed EPA lease sale area is located 250 km (155 mi) from the closest topographic feature and because oil and gas activities are prohibited from physically impacting topographic features.

Discharges of drilling fluids and produced waters related to an EPA proposed action will likewise not be expected to impact topographic features because the proposed EPA lease sale area is at least 135 nmi (250 km; 155 mi) from the closest topographic feature. Discharges are regulated by USEPA through the NPDES discharge permit, which regulates the materials discharged and their concentrations. Drilling fluid plumes are rapidly dispersed on the OCS; approximately 90 percent of the material discharged in drilling a well (cuttings and drilling fluid) settles rapidly to the seafloor, while 10 percent forms a plume of fine mud that drifts in the water column (Neff, 2005). Impacts to benthic organisms from drill cuttings are localized to 100-200 m (328-656 ft) from a well (Montagna and Harper, 1996; Kennicutt et al., 1996). Produced waters are rapidly diluted in the water column upon release, and acute effects have only been reported in the mixing zone around the outfall (Gittings et al., 1992b; Smith et al., 1994; Burns et al., 1999; Holdway, 2002). Any fine material discharged from a well that is drifting in the water column will be well dispersed before it reaches the topographic features.

Impacts on the topographic features could occur as a result of oil- and gas-related spills or spills from import tankering. Due to dilution and physical mixing depths of surface oil paired with the depths of the crests of the topographic features, discharges should not reach topographic features in sufficient concentrations to cause impacts. Tanker accidents could result in surface oil spills, which generally do not mix below a depth of 10-20 m (33-66 ft) (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002), which should protect most topographic features, very few of which rise to within 15 m (50 ft) of the sea surface. Any dispersed surface oil from a tanker spill that may reach the benthic communities of topographic features in the Gulf of Mexico would be expected to be at very low concentrations (<1 ppm) (McAuliffe et al., 1981a and 1981b; Lewis and Aurand, 1997). Laboratory studies and field observations of coral larval and adult stages have shown resistance to such concentrations (Lewis, 1971; Elgershuizen and De Kruijf, 1976; Knap, 1987; Wyers et al., 1986; Cohen et al., 1977; Jackson et al., 1989; Guzmán et al., 1991), while other studies show that similar concentrations can harm larval or embryonic life stages of other benthic organisms (Fucik et al., 1995; Suchanek, 1993; Beiras and Saco-Álvarez, 2006; Byrne, 1989). Any dispersed or physically mixed oil in the water column that comes in contact with corals, however, may evoke short-term negative responses by the organisms, such as reduced feeding and photosynthesis or altered behavior (Wyers et al., 1986; Cook and Knap, 1983; Dodge et al., 1984).

It is unlikely that a blowout could impact the biota of the topographic features due to the distance of the features from the proposed EPA lease sale area (135 nmi; 250 km; 155 mi) and the depth of the proposed activity (800 m; 2,625 ft), which is much deeper than the zone of active coral growth. Most of the oil from a seafloor blowout would rise to the surface, but some of it may be entrained in the water column as a subsea plume. However, because oil mixed into the water column is moved by water currents, which do not generally travel toward shore, subsea oil should not move up onto the continental shelf toward the topographic features (Pond and Pickard, 1983; Inoue et al., 2008). Oil at the sea surface would behave the same as a surface oil spill (refer to the above paragraph). Oil in a subsea plume could be carried toward a topographic feature, although the oil would become diluted in the water column as it travels. The resulting level of impact, if any, depends on the concentration of the oil when it contacts the habitat. The farther the topographic feature is from the blowout, the more dispersed the oil and sediment would become, reducing the possible impacts. Also, because currents sweep around topographic features instead of over them, subsea oil should be directed away from the more sensitive communities on the upper levels of topographic features (Rezak et al., 1983; McGrail, 1982). In the unlikely event that oil was to contact the topographic features, the impacts may include loss of habitat, biodiversity, and live coverage; change in community structure; and failed reproductive success. In the highly unlikely event that oil from a subsurface spill could reach the peaks of topographic features in lethal concentrations, the recovery of this area could take in excess of 10 years (Fucik et al., 1984).

A catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, would have a low probability of impacting topographic features because of the distancing requirements included in leases, as described in NTL 2009-G39, of oil and gas activities from topographic features, the depth of mixing of surface oil compared with the depth of the active growing zone, currents that sweep around the topographic features, and the weathering and dispersion of oil that would occur with distance from the source as it travels toward the features. Refer to **Appendix B** for greater detail on the impacts of a catastrophic spill, which are not reasonably expected and not part of an EPA proposed action.

Non-OCS Oil- and Gas-Related Impacts

Topographic features may be impacted by activities other than those related to oil and gas including fishing, recreational scuba diving, treasure hunting, and anchoring vessels on or near these features. Many of the topographic features are found near established shipping fairways and are well-known fishing areas. Also, several of the shallower topographic features are frequently visited by scuba divers aboard recreational vessels (Hickerson et al., 2008). Anchoring at a topographic feature by a vessel involved in any of these activities could damage the biota. The degree of damage would depend on the size of the anchor and chain (Lissner et al., 1991). Anchor damages incurred by benthic organisms may take more than 10 years to recover, depending on the extent of the damage (Fucik et al., 1984; Rogers and Garrison, 2001).

The use of explosives in treasure-hunting operations has become a concern on topographic features; several large holes and damage have occurred on Bright Bank and treasure hunters have damaged the bank as recently as 2001 (Schmahl and Hickerson, 2006). The blasting of Bright Bank by treasure hunters has resulted in the loss of extensive live coral cover (Schmahl and Hickerson, 2006). The recovery from such destructive activity may take in excess of 10 years (Fucik et al., 1984; Rogers and Garrison, 2001), and it may never recover in some areas because the substrate itself has been destroyed. Recovery of the system to pre-interference conditions would depend on the type and extent of damage incurred by individual structures.

Impacts from natural occurrences such as hurricanes occasionally result in damage to the biota of the topographic features. Hurricanes can alter community structure on topographic features, such as a reduction in live cover, disappearance of some species, alterations in fish populations, and increased algal cover (Robbart et al., 2009; Kraus et al., 2006 and 2007). Another possible natural impact to the banks would be the dissolution of the underlying salt structure, leading to collapse of the reef (Seni and Jackson, 1983). However, dissolution of these salt structures is unlikely.

Depending on the levels of fishing pressure exerted, fishing activities that occur at the topographic features may impact local fish populations, and fishing gear may damage benthic communities. The collecting activities by scuba divers on shallow topographic features may have an adverse impact on the local biota. Anchoring during recreational and fishing activities, however, would be the source of the majority of severe impacts incurred by the topographic features.

Summary and Conclusion

Overall, the incremental contribution of an EPA proposed action to the cumulative impact is negligible when compared with non-OCS oil- and gas-related impacts. Activities causing mechanical disturbance represent the greatest threat to the topographic features. With respect to OCS oil- and gas-related activities for an EPA proposed action, this would, however, be prevented by the distance of the proposed EPA lease sale area from the topographic features. Routine impacts of oil and gas activity include anchoring of vessels, structure emplacement, and operational discharges (drilling muds and cuttings, and produced waters), none of which will impact the topographic features because of their distance from the proposed EPA lease sale area and USEPA's discharge regulations. It is highly unlikely that blowouts and oil spills would impact topographic features due to the distance of the proposed EPA lease sale area from topographic features, which would allow for dispersion of oil. In addition, the depth of the proposed activity is much deeper than the depth of the zone of active coral growth on topographic features, which would prevent deep oil plumes from rising to the crests of topographic features.

Non-OCS oil- and gas-related activities could mechanically disrupt the bottom (such as anchoring and treasure-hunting activities). Natural events such as hurricanes or the collapse of the tops of the topographic features (through dissolution of the underlying salt structure) could cause severe impacts. The collapsing of topographic features from geologic events is unlikely and would impact a single feature. Impacts from scuba diving, fishing, and private boat anchoring could have detrimental effects on topographic features and could have long recovery periods.

4.1.1.8. *Sargassum* Communities

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. Detailed description of the affected environment, routine events, accidental events, and cumulative impacts for *Sargassum* communities can be found in Chapter 4.2.1.8 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.8 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.8 of the 2012-2017 WPA/CPA Multisale and Chapter 4.2.1.8 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for *Sargassum* communities regarding an EPA proposed action, and they are hereby incorporated by reference.

BOEM has examined the analysis for *Sargassum* communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for *Sargassum* communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on *Sargassum* communities, and various Internet sources were examined to determine any recent information *Sargassum* communities. Sources that include scientific journals, published information from universities and research institutes, and governmental resource agencies were checked for new information. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and

WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding *Sargassum* communities since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, there remains incomplete or unavailable information on the effects of the *Deepwater Horizon* explosion, oil spill, and response on *Sargassum* that may be relevant to reasonably foreseeable significant adverse impacts. What scientifically credible information is available has been applied by BOEM's subject-matter experts using accepted scientific methodologies. Samples and results developed as part of the NRDA process have not been released and there is no timeline for this information becoming available. Nevertheless, BOEM has determined that this incomplete or unavailable information is not essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, including because *Sargassum* is widely distributed throughout the Gulf and the yearly cycle of replenishment for *Sargassum* indicates that impacts from the *Deepwater Horizon* explosion, oil spill, and response would be significantly reduced or eliminated within a year or two.

4.1.1.8.1. Description of the Affected Environment

Pelagic *Sargassum* algae is broadly distributed in surface waters throughout the Gulf of Mexico. The pelagic complex in the GOM is mainly comprised of *Sargassum natans* and *S. fluitans* (Lee and Moser, 1998; Stoner, 1983; Littler and Littler, 2000). This floating algae forms a unique and complex habitat (**Figure 4-6**) that is home to numerous endemic species (occurring only there), is utilized by a variety of species in their juvenile stages, and is frequently visited by itinerant pelagic species. Endemic and juvenile animals find both shelter and food among the algae. Itinerant visitors often come for temporary shelter or as predators on those sheltering. *Sargassum* mats support a diverse assemblage of marine organisms including micro- and macro-epiphytes (plants that grow on plants) (Carpenter and Cox, 1974; Coston-Clements et al., 1991), fungi (Winge, 1923), more than 100 species of invertebrates (Coston-Clements et al., 1991), over 100 species of fish (Dooley, 1972; Stoner, 1983), four species of sea turtles (Carr, 1987; Manzella et al., 2001), and various marine birds (Lee and Moser, 1998). *Sargassum* serves as nurseries, sanctuaries, and forage grounds for both commercially and recreationally exploited species. Certain flying fish lay eggs in the floating mats, and other fish use it as nursery grounds (Adams, 1960; Bortone et al., 1977; Dooley, 1972). Sea turtles have been seen using the protective mats for passive migration as hatchlings (Carr and Meylan, 1980). In addition, numerous seabird species utilize *Sargassum* habitat in foraging (Moser and Lee, 2012).

In recent years, scientists have applied new techniques to *Sargassum* studies by using satellite imagery to delineate and track the distribution of *Sargassum* mats. These studies have shown a remarkable pattern of annual growth of *Sargassum* in the GOM and a subsequent drift of the algae to the western Atlantic via the Gulf Stream current (Gower et al., 2006, Gower and King, 2008). An increased interest in *Sargassum* by scientists has been seen since the *Deepwater Horizon* explosion, oil spill, and response in 2010. A few new study efforts are directed toward analysis of the status of *Sargassum* habitat, but no results are available at the time of this EIS.

Little difference is seen between the characteristics of *Sargassum* mats in the EPA versus the CPA. The Loop Current of the Gulf Stream reaches into the EPA and the eastern part of the CPA (**Figure 4-7**). So, the major difference would be that the Loop Current would have a greater effect on the proposed EPA lease sale area than in the adjacent CPA.

4.1.1.8.2. Impacts of Routine Events

This is a summary of the potential impacts of routine events on *Sargassum* communities. For additional information on the potential impacts of routine events on *Sargassum* communities, refer to Chapter 4.2.1.8.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.8 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Impact-producing factors associated with routine events for an EPA proposed action that could affect *Sargassum* in the EPA may include the following: (1) drilling discharges (muds and cuttings);

(2) produced water and well treatment chemicals; (3) operational discharges (deck drainage, sanitary and domestic water, and bilge and ballast water); and (4) physical disturbance from vessel traffic and the presence of exploration and production structures (i.e., rigs, platforms, and MODU's).

Drilling activities differ from other routine activities in the use of drilling muds and the discharge of drill cuttings. Modern drilling muds are typically synthetic-based muds or water-based fluids. Synthetic muds are more costly than water-based muds and are routinely recycled rather than released. Water-based muds are relatively benign and are discharged in place. Oil-based drilling fluids are rarely used and when they are used, both the drilling muds and cuttings are captured and brought to shore. The USEPA regulates the composition of drilling muds to limit toxic components permitted for use. Some muds are released during initial spudding of the well (the first segment of the well, before the outer casing is installed); however, this release of drilling muds is at the seafloor. Since the muds are heavier than sea water, the muds and cuttings from the spudding process generally settle to the seafloor within about 100 m (328 ft) of the well site (CSA, 2006). Therefore, this release at the seafloor would not affect the pelagic *Sargassum* community, which floats on and near the sea surface.

Drill cuttings are typically discharged from the drill platform (on or near the sea surface) during drilling. Drill cuttings are heavier than sea water and, when released at the sea surface, generally sink to the seafloor less than 1,000 m (3,281 ft) from the well site (CSA, 2006). Cuttings can contain some concentrations of naturally occurring substances that are toxic, e.g., arsenic, cadmium, mercury, other heavy metals, and hydrocarbons (Neff, 2005). Hydrogen sulfide is also produced from some wells. In addition, some amount of drilling muds is included with the cuttings discharges, as the recycling process is not 100 percent efficient. However, the composition of muds is strictly regulated, and discharges of cuttings/muds are tested to ensure that toxicity levels are below the limits allowed by NPDES permits (USEPA, 2004, 2007a, and 2009b). Refer to **Chapter 3.1.1.4** for detailed information on drilling discharges.

Proposed Action Analysis

The routine discharge of drill cuttings and muds is expected to have little effect on *Sargassum* communities. There are three factors that support this conclusion. First, as highlighted above, muds and cuttings are heavier than sea water, so they would sink relatively rapidly. This means that the *Sargassum*, at or near the sea surface near the discharge point, would only be exposed to contact with discharges for a short time. The *Sargassum* would be traveling laterally with the surface water current; at the same time, the muds and cuttings would be rapidly sinking toward the seafloor. Second, the toxicity of muds and cuttings is limited by applicable regulations, so the effects can be expected to be low if *Sargassum* is contacted. Third, discharges affect only a localized area of the sea surface. An EPA proposed action is estimated to result in up to 67 wells drilled, affecting only a very small portion of the EPA. Though *Sargassum* occurs in most of the northern GOM, it is not abundant, or even present, in all waters at all times. Therefore, only a small portion of pelagic *Sargassum* in the GOM would come in contact with drill cuttings and muds, and any contact would be brief.

Produced waters may have an effect on *Sargassum* communities. Water is often a component of the fluid extracted from a well in offshore oil and gas operations. Produced water is more prevalent with oil than with gas extraction. The water is typically separated from the product on a platform and discharged at the sea surface. Produced waters usually have high salinity, high organic carbon, and low dissolved oxygen. Produced water may contain dissolved solids in higher concentrations than Gulf waters, including metals, hydrocarbons, and naturally occurring radionuclides (Veil et al., 2004). Produced waters are rapidly diluted and impacts are generally only observed within close proximity of the discharge point (Gittings et al., 1992b). Possibly toxic concentrations of produced water were reported 20 m (66 ft) from the discharge in both the sediment and the water column where elevated levels of hydrocarbons, lead, and barium occurred, but no impacts to marine organisms or sediment contamination were reported beyond 100 m (328 ft) of the discharge (Neff and Sauer, 1991; Trefry et al., 1995). These characteristics could make the produced waters toxic to some organisms in the *Sargassum* community, particularly crustaceans and suspension feeders (e.g., bryozoa). However, the produced waters are required to meet toxicity limits defined by NPDES permits and would further diffuse through the water mass, reducing concentrations of any toxic component (USEPA, 2004, 2007a, and 2009b). The *Sargassum* algae itself has a waxy coating and would be unlikely to be affected by possible short-term exposure. Refer to **Chapter 3.1.1.4** for detailed information on produced-water discharges.

Platform and service-vessel operational discharges may have an effect on water quality, indirectly affecting *Sargassum* in the immediate area of activity. Since the distribution of *Sargassum* is ubiquitous in the northern GOM, at least some small portions of it will come in contact with operational discharges. However, considering the ratio of the affected area (immediately surrounding the activity) to the entire planning area, and even larger area inhabited by *Sargassum*, it is clear that only a small percent of the total *Sargassum* population will contact operational discharges.

Vessel traffic and the presence of production structures may act as temporary barriers and obstacles for free-floating *Sargassum*. Stationary platforms and their associated fouling communities may snag pelagic *Sargassum* as it passes. In the event that *Sargassum* is caught in the propellers of vessels associated with an EPA proposed action, repairable damage may occur to the *Sargassum*.

Further research would enhance our knowledge of the effects, if any, of muds, cuttings, operational discharges, and physical impingement on *Sargassum* and its associated communities. *Sargassum* may have the capacity to absorb chemical substances, which may indirectly affect the health of the *Sargassum* and/or associated organisms. The likelihood that *Sargassum* would contact routine discharges or impinge on ships or stationary platforms is high. However, only a small part of the total population would be exposed to these types of contact, contact would be only for a short time, and concentrations would be low (within permit limits). Given the ratio of *Sargassum* habitat to the surface area of the proposed activities, it is unlikely that an EPA proposed action will have any lasting effects on *Sargassum* and its associated community.

Little difference is seen between the characteristics of *Sargassum* mats in the EPA versus the CPA. The Loop Current of the Gulf Stream reaches into the EPA and the eastern part of the CPA (**Figure 4-7**). So, the major difference would be that the Loop Current would have a greater effect on the proposed EPA lease sale area than in the adjacent CPA.

Summary and Conclusion

Sargassum, as pelagic algae, is a widely distributed resource that is found throughout the GOM and northwest Atlantic. Considering its ubiquitous distribution and occurrence in the upper water column near the sea surface, at least some small portions of it will contact routine discharges from oil and gas operations. All types of discharges including drill muds and cuttings, produced water, and operational discharges (e.g., deck runoff, bilge water, sanitary effluent, etc.) would contact small portions of *Sargassum* algae. However, the quantity and volume of these discharges within the EPA proposed lease sale area is relatively small compared with the pelagic waters of the EPA. Therefore, although discharges would contact *Sargassum*, they would only contact a very small portion of the *Sargassum* population. Likewise, impingement effects by service vessels and working platforms and drillships would contact only a very small portion of the *Sargassum* population. The impacts to *Sargassum* that are associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community as a whole. The *Sargassum* community lives in pelagic waters with generally high water quality and would be resilient to the minor effects predicted. It has a yearly cycle that promotes quick recovery from impacts. No measurable impacts are expected to the overall population of the *Sargassum* community.

4.1.1.8.3. Impacts of Accidental Events

This is a summary of the potential impacts of routine events on *Sargassum* communities. For additional information on potential impact of routine events on *Sargassum* communities, refer to Chapter 4.2.1.8.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.8 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Impact-producing factors associated with accidental events for an EPA proposed action that could affect *Sargassum* and its associated communities include (1) surface oil and fuel spills and underwater well blowouts, (2) spill-response activities, and (3) chemical spills. These impacting factors would have varied effects depending on the intensity of the spill and the presence of *Sargassum* in the area of the spill.

Oil spills are the major accidental event of concern to the *Sargassum* community. Accidental releases of oil could occur as a result of an EPA proposed action. The probability of one or more offshore spills ≥1,000 bbl occurring as a result of an EPA proposed lease sale is estimated to be between 0 and 8% (**Table 3-21**). The probability of one or more offshore spills ≥10,000 bbl occurring as a result of an EPA proposed lease sale is estimated to be between 0 and 2 percent (**Table 3-22**). The OSRA model estimated the combined probabilities of one or more hypothetical spills ≥1,000 bbl occurring and contacting surface waters in specific areas as a result of an EPA proposed action. **Figure 3-16** shows the probability of sea surface oiling within 10 days, and **Figure 3-17** shows the probability of oiling within 30 days. Sea surface oiling is most likely near the proposed EPA lease sale area and pipeline route but, even so, the maximum probability of oiling closest to the activity during the 40-year period is only 5 percent.

Proposed Action Analysis

Oil on the sea surface has the potential to negatively impact *Sargassum* communities. All known oil reserves in the Gulf of Mexico have specific gravity measures that are lighter than water, meaning that released oil would rise to the sea surface (also refer to **Chapter 3.2.1.4.4**). An oil spill that occurs at the sea surface would result in a majority of the oil remaining at the sea surface. Lighter compounds in the oil may evaporate, and some components of the oil may dissolve in the seawater. Evaporation allows the removal of the most toxic components of the oil, while dissolution may allow bioavailability of hydrocarbons to marine organisms for a brief period of time (Lewis and Aurand, 1997). Remnants of the oil may then emulsify with water or adsorb to sediment particles and fall to the seafloor. The emulsion continues to float on the sea surface and would be carried by wind and currents, likely coinciding with at least some of the *Sargassum* community. Disturbance of the sea surface by storms can mix surface oil into the water column, but the effects are generally limited to the upper 10 m (33 ft), the same space shared by the *Sargassum* community (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002).

When dispersants are applied to oil, its behavior is modified, causing the oil to mix with water, where its contact with *Sargassum* may be temporarily increased in the upper few meters of the water column. Data from other studies on dispersant usage on surface plumes indicate that a majority of the dispersed oil remained in the top 10 m (33 ft) of the water column, with 60 percent of the oil in the top 2 m (6 ft) (McAuliffe et al., 1981a). Field studies on dispersants have indicated that dispersed surface oil may be between 20 and 50 ppm at 1-5 m (3-16 ft) from the water's surface (McAuliffe et al., 1981a; Lewis and Aurand, 1997). McAuliffe et al. (1981a) reported dispersed oil concentrations between 1 and 3 ppm at 9 m (30 ft) below the sea surface at 1 hour after treatment with dispersant. Lewis and Aurand (1997) reported dispersed oil concentrations <1 ppm at 10 m (33 ft) below the sea surface. As time passes, the oil would begin to adhere to particles in the water column, form clumps, sink toward the seafloor, and biodegrade (ITOPF, 2002; Kingston et al., 1995).

The effects of oil contact with *Sargassum* communities would vary depending on the severity of exposure. *Sargassum* that contacts concentrated oil that coats the algae would likely succumb to the effects, die, and sink to the seafloor; associated organisms would suffer the same fate. *Sargassum* exposed to oil in lower concentrations may suffer sublethal effects. *Sargassum* that survives contact with a spill may exhibit levels of hydrocarbons, toxins, and chemicals that are concentrated up to four times that found in the adjacent uncontaminated waters (Burns and Teal, 1973). The effects of concentrated toxins on the macroalgae itself are undefined. Exposure may result in the loss of associated organisms such as attached epifauna that use the algae as a substrate and other organisms that utilize the community as habitat, including sea turtles, juvenile fish, and various invertebrates. Pelagic organisms feeding on the community may suffer sublethal effects that could reduce health and reproduction.

A large spill could affect a sizable portion of the *Sargassum* population (refer to **Appendix B** for discussion of catastrophic spills, which are not reasonably expected and not part of an EPA proposed action). Since *Sargassum* is ubiquitous in the northern GOM, the portion of the population affected by surface oil would be similar to the portion of the surface waters in the GOM that are oiled. Spill and cleanup efforts could contribute to negative impacts on *Sargassum*. The number of vessels working to clean a spill can increase physical damage to the *Sargassum* community, especially in the immediate vicinity of the spill. Direct effects of dispersant on the *Sargassum* community are unknown, but dispersants are known to be toxic to some invertebrates. Dispersants may increase short-term contact of oil with *Sargassum* and may have some inherent toxic properties, but their use can prevent the formation of persistent emulsions and promote diffusion of oil resulting in biodegradation, clumping, and sinking.

Chemical spills are typically small (a few gallons to a few barrels of product) and are unlikely to produce any measurable impact on *Sargassum* communities. Due to the ubiquitous nature of *Sargassum* over most of the GOM, such spills are negligible to the overall population.

Summary and Conclusion

Pelagic *Sargassum* algae occur seasonally as a patchy resource in almost every part of the northern GOM, resulting in a wide distribution over a very large area. Considering its ubiquitous distribution and occurrence in the upper water column near the sea surface, potential accidental spills from oil and gas operations would be expected to contact localized portions of the *Sargassum* community. All types of spills (including surface oil and fuel spills), underwater well blowouts, and chemical spills would contact *Sargassum* algae. The quantity and volume of most of these spills would be relatively small compared with the pelagic waters of the GOM. Therefore, most spills would only contact a very small portion of the *Sargassum* population. The impacts to *Sargassum* that are associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community unless a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, occurs. In the case of a very large spill, the *Sargassum* algae community could suffer severe impacts to a sizable portion of the population in the northern GOM. The *Sargassum* community lives in pelagic waters with generally high water quality and is expected to show good resilience to the predicted effects of spills. It has a yearly growth cycle that promotes quick recovery from impacts and that would be expected to restore typical population levels in 1-2 growing seasons. Because of the patchy and ephemeral nature of *Sargassum*, accidental impacts associated with an EPA proposed action are expected to have only minor effects to a small portion of the *Sargassum* community as a whole.

4.1.1.8.4. Cumulative Impacts

This is a summary of the potential cumulative impacts to *Sargassum* communities. For additional information on the potential cumulative impacts to *Sargassum* communities, refer to Chapter 4.2.1.8.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.8 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

OCS Oil-and Gas-Related Impacts

Pelagic *Sargassum* floats at the surface in oceanic waters and is carried by surface currents across the GOM. Both vessel passage and stationary structures can have minor physical impacts on *Sargassum*. Vessels transiting the GOM pass through *Sargassum* mats, producing slight impacts to the *Sargassum* community by their passage. None of these would have more than minor localized effects to the mats transited. Oil and gas structures can impede the movement of *Sargassum* mats and may entrap small quantities of the algae. This is expected to be a minor impact with no consequences to the overall *Sargassum* community.

The discharge of drill cuttings with small quantities of associated drilling muds from oil and gas drilling can result in impacts to *Sargassum* and the associated communities. Most cuttings from well drilling are discharged from the drill platform at the sea surface. This creates an area of high turbidity in the vicinity of drill operations. The bulk of cuttings discharged at the sea surface sink to the seafloor within 500 m (1,640 ft) of the source. Fine components of the plume may travel farther but are dispersed in the water column and are distributed widely at low concentrations (CSA, 2004b; NRC, 1983). Any exposure of *Sargassum* to discharges would be short-term exposure to discharges that are limited by NPDES regulations. These effects would be localized to a small portion of the total *Sargassum* population and represent a negligible amount of the incremental impact to *Sargassum* communities.

Effluents from marine vessels of all types and from oil and gas platforms and drill ships can affect *Sargassum*. Runoff water from the decks of ships and platforms may contain small quantities of oil, metals, and other contaminants. Larger vessels and offshore platforms discharge effluents from sanitary facilities (gray water). They also circulate seawater to cool the ships' engines, electric generators, and other machines. The cooling water discharge may be up to 11°C (20°F) warmer than the surrounding seawater (USDHS, CG, and USDOT, MARAD, 2003; Patrick et al., 1993). This temperature difference can accumulate in the vicinity of the discharge. For ships, this would only occur when the vessel is stationary, as in port. For oil and gas platforms, drill ships, and offshore LNG terminals, localized warming of the water could occur (Emery et al., 1997; USDHS, CG, and USDOT, MARAD, 2003). However, the warm water is rapidly diluted, mixing to background temperature levels within 100 m (328 ft) of the source (USDHS, CG, and USDOT, MARAD, 2003). Effects from gray water, deck runoff, and cooling water are only notable for stationary locations. Produced waters from stationary locations are rapidly diluted and impacts are only observed within 100 m (328 ft) of the discharge point (Neff and Sauer, 1991; Trefry et al., 1995; Gittings et al., 1992b). Effluent discharges are also limited by NPDES regulations. The effects are localized, with only brief contact to passing *Sargassum* before dilution to background levels. These effects would comprise a negligible portion of the overall cumulative impact to *Sargassum* communities.

Accidental spills of oil and other chemicals could affect *Sargassum* and its community wherever they contact the algae. Small spills would have a limited local effect on a small portion of the *Sargassum* community. Short-term exposure of passing *Sargassum* to high concentrations of oil and chemicals could result in death and the sinking of algae and organisms contacted. The size of the overall effect on *Sargassum* would depend on the size of the spill and the success of spill-response efforts. A catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* oil spill could have noticeable impacts to the overall *Sargassum* community. These impacts could destroy a sizable portion of *Sargassum* habitat wherever the surface slick of oil travels. The effects could reduce the supply of algae transiting from the GOM to the Atlantic. This effect, although large, would contact only a portion of the algae in the region of the spill. *Sargassum* algae are a widespread habitat with patchy distribution across the northern GOM and the western Atlantic. Due to the vegetative production of *Sargassum* algae, the community would likely recover within 1-2 seasons (1-2 years). The probability of occurrence of a catastrophic spill is very low and is not reasonably expected and not part of an EPA proposed action (refer to **Appendix B**, “Catastrophic Spill Event Analysis,” for more detail on a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action). If such a spill does occur, it would account for a sizable portion of the cumulative impact that affects *Sargassum*, although even such an impact would affect only a portion of the *Sargassum* in the region of its occurrence.

Non-OCS Oil-and-Gas-Related Impacts

Hurricanes are major natural sources of impacts that affect the *Sargassum* community by disrupting *Sargassum* and its associated community. The violent surface turbulence caused by these storms would dislocate many of the organisms living on and in the *Sargassum*. Some of the organisms (those that cannot swim or swim only weakly) such as nudibranchs (sea slugs), shrimp, *Sargassum* fish (*Histrio histrio*), and pipefish (*Syngnathus* spp.) would become separated from the algae. Without cover, many would fall prey to fish after a storm; others may sink to the seafloor and die. Some epifauna, such as hydroids, living on the algae may suffer physical damage or be broken off. In addition, hurricanes drive large quantities of *Sargassum* toward shore, into coastal waters having less conducive conditions for *Sargassum* and even stranding large quantities on shore. Other factors that can damage *Sargassum* communities include land based runoff carrying pollutants and causing anoxic conditions, especially in nearshore areas.

The OCS activities that affect *Sargassum* include turbulence from boat wakes, although these disturbances would be small compared with large storms in the Gulf. It is, therefore, likely that OCS activities have a minimum effect on the *Sargassum* community.

Summary and Conclusion

Because of the ephemeral nature of *Sargassum* communities, many activities associated with an EPA proposed action would have a localized and short-term effect. *Sargassum* occurs seasonally in almost every part of the northern GOM, resulting in a wide distribution over a very large area. However, its occurrence is patchy, drifting in floating mats that are occasionally impinged on ships and on oil and gas structures. This large, scattered, patchy distribution results in only a small portion of the total population contacting ships, structures, or drilling discharges. Contact with drilling discharges and discharges of effluent from ships’ operations also results in only short-term, localized effects. Because discharges are highly regulated to limit toxicity and because they would continue to be diluted in the GOM waters, concentrations of any toxic components related to an EPA proposed action would be limited. In the event that a low-probability catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, would occur, *Sargassum* and its associated inhabitants in that area are expected to suffer mortality (refer to **Appendix B**, "Catastrophic Spill Event Analysis," for more detail on a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action). However, *Sargassum* resilience is good and recovery is expected within 1-2 growing seasons. The incremental contribution of an EPA proposed action to the overall cumulative impacts on *Sargassum* communities that would result from the OCS Program, when compared with environmental factors (such as hurricanes and coastal water quality), and non-OCS-related activities (such as non-OCS vessel traffic and commercial shipping), are expected to be minimal.

4.1.1.9. Chemosynthetic Deepwater Benthic Communities

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for chemosynthetic deepwater benthic communities can be found in Chapter 4.2.1.9 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.9 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.9 of the 2012-2017 WPA/CPA Multisale and Chapter 4.2.1.9 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for chemosynthetic communities regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for chemosynthetic communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for chemosynthetic communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on chemosynthetic communities, and various Internet sources were examined to determine any recent information regarding chemosynthetic communities. Sources investigated include the NOAA Ocean Exploration website, the Gulf of Mexico Alliance, USEPA, USGS, and coastal universities. Other websites from scientific publication databases (including Science Direct, Elsevier, CSA Illumina, and JSTOR) were checked for new information using general Internet searches based on major themes. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding chemosynthetic communities since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, studies and data are continuing to be developed in response to the *Deepwater Horizon* explosion, oil spill, and response. This information will likely be developed through the NRDA process. Unavailable information on the effects to chemosynthetic communities from the *Deepwater Horizon* explosion, oil spill, and response may be relevant to reasonably foreseeable significant impacts on chemosynthetic communities. The NRDA process is investigating impacts to chemosynthetic communities; the limited available information has been considered in this analysis. It may be years before relevant information becomes available, and certainly not within the timeframe contemplated by this NEPA analysis. It is not within BOEM's ability to obtain this information, regardless of the costs involved. Nevertheless, BOEM believes that this incomplete or unavailable information would not be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231

Supplemental EIS, including because chemosynthetic communities are found throughout the Gulf and are in patchy distributions, minimizing the number that would be likely to be impacted by any single event. BOEM's subject-matter experts have included what credible scientific information is available and applied it using accepted scientific methodologies.

4.1.1.9.1. Description of the Affected Environment

The deepwater GOM is dominated by soft mud bottoms with only occasional patches of hard substrate that occur where chemosynthetic bacteria have deposited calcium carbonate. Wherever hydrocarbons seep up to the seafloor, they supply chemosynthetic bacteria with a source of carbon for their metabolism. If the hydrocarbon flow is vigorous, expulsion features such as mud volcanoes and mud flows form. Bacteria and a few other individuals of chemosynthetic species may establish in neighboring areas where conditions favor their development, but conditions are too harsh to support large chemosynthetic communities. Conversely, if the flow is very low, it may result in only bacterial communities or may support only a few larger organisms. When the flow of hydrocarbons is moderate, conditions may be favorable to support significant assemblages of chemosynthetic megafauna (large organisms).

Scientists at BOEM have analyzed decades of 3D seismic data to classify seafloor returns exhibiting anomalously high or low reflectivity. The high reflectivity results represent patches of anomalous seafloor returns that likely indicate patches of hard substrate. There are over 16,000 patches represented in the database at the time of this writing (**Figure 4-8**). Most of these hard bottoms are created by the precipitation of calcium carbonate substrate by chemosynthetic bacterial activity. Investigations have revealed that most of these patches of substrate support patches of chemosynthetic megafaunal communities and/or live bottom reef communities. This database of high positive reflectivity anomalies reveals that chemosynthetic and coral communities are much more common in the deepwater GOM than previously known (Shedd et al., 2012).

No chemosynthetic communities investigated since the 2010 *Deepwater Horizon* explosion and oil spill have exhibited any signs of damage. However, one deepwater coral site at a depth of 1,370 m (4,495 ft) has been reported as severely damaged following the *Macondo* spill (White et al., 2012). Impacts to this coral site represent impacts that could occur at a chemosynthetic site under similar circumstances. The spill released large quantities of oil into the GOM and formed underwater plumes in the deep GOM that mostly flowed to the southwest with prevailing water currents at a depth of 1,100 m (3,609 ft). Even though chemosynthetic organisms are associated with hydrocarbon seeps, it is expected that a plume of oil traveling horizontally with the water currents could still have negative effects on chemosynthetic organisms. While these organisms live in very close proximity to oil seeps, they do not experience direct oiling. Rather, the oil from a seep is released under relatively low pressure and floats upward. The damaged coral site is in Mississippi Canyon Block 294, 11 km (6.8 mi) southwest of the spill location. The site includes hard substrate supporting coral in an area approximately 10 x 12 m (33 x 39 ft), and the published results document damage to the coral community (White et al., 2012). The data analyzed in the study suggest that the *Macondo* spill is the source of the impact to this coral community (White et al., 2012). It is possible that long-term effects from the *Macondo* spill may appear at a later time in other chemosynthetic and coral communities in other parts of the GOM; however, the numerous other communities investigated since the spill remain healthy (White et al., 2012).

Deepwater chemosynthetic communities in the proposed EPA lease sale area are not expected to differ from those in the adjacent CPA. There are presently no known sites in the proposed EPA lease sale area. The deep water provides a very stable environment, especially in the depths found for the proposed EPA lease sale area (>800 m; 2,625 ft), and there are no notable environmental differences between the proposed EPA lease sale area and the adjacent CPA.

4.1.1.9.2. Impacts of Routine Events

This is a summary of potential impacts of routine events to chemosynthetic deepwater benthic communities. For additional information on the potential impacts of routine events to chemosynthetic deepwater benthic communities, refer to Chapter 4.2.1.9.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.9 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Chemosynthetic communities are susceptible to physical impacts from drilling discharges, structure placement (including templates or subsea completions), anchoring, and pipeline installation. In deep water, as opposed to shallower areas on the continental shelf, discharges of drilling fluids and cuttings at the sea surface are spread across broad areas of the seafloor and are generally distributed in thinner accumulations. The physical disturbances by structures themselves are typically limited to anchors for holding floating drilling or production facilities over the well sites. Anchors from support boats and ships (or any buoys set out to moor vessels), floating drilling units, barges used for construction of platform structures, pipelaying vessels, and pipeline repair vessels also cause disturbances to small areas of the seafloor. Normal pipelaying activities in deep water could impact areas of chemosynthetic organisms if the pipeline crossed the organisms (pipeline burial is not required at depths where chemosynthetic communities are found).

The policies described in NTL 2009-G40 greatly reduce the risk of these physical impacts by requiring avoidance of potential chemosynthetic communities that are identified on required geophysical survey records or by requiring photodocumentation to establish the absence of chemosynthetic communities prior to approval of the structure or pipeline emplacement.

Proposed Action Analysis

Chemosynthetic communities could be found in the deeper water areas of the EPA. The levels of projected activity in deep water as a result of an EPA proposed action are shown in **Table 3-2**. There is only one production structure expected to be installed during the 40-year analysis period in the proposed EPA lease sale area (>800 m; 2,625 ft) as a result of an EPA proposed action.

The NTL 2009-G40 describes BOEM's policy to search for and avoid dense chemosynthetic communities or areas that have a high potential for supporting these community types, as interpreted from geophysical records. The policies in the NTL are exercised on all applicable leases and are not optional protective measures. The requirements and discussion of the effectiveness of the NTL are presented in Chapter 4.2.1.9.2 of the 2012-2017 WPA/CPA Multisale EIS.

Deepwater chemosynthetic communities in the proposed EPA lease sale area are not expected to differ from those in the adjacent CPA. The deep water provides a very stable environment, especially in the depths found for the proposed lease sale area (>800 m; 2,625 ft), and there are no notable environmental differences between the proposed EPA lease sale area and the adjacent CPA.

Summary and Conclusion

Chemosynthetic communities are susceptible to physical impacts from structure placement (including templates or subsea completions), anchoring, and pipeline installation. Without mitigation measures, these activities could result in smothering by the suspension of sediments or the crushing of organisms residing in these communities. Information included in required hazards surveys for oil and gas activities depicts areas that could potentially harbor chemosynthetic communities. This allows BOEM to require avoidance of any areas that are conducive to chemosynthetic growth. The policies described in NTL 2009-G40 greatly reduce the risk of these physical impacts by requiring the avoidance of potential chemosynthetic communities. With the implementation of BOEM's avoidance measures, impacts on chemosynthetic communities caused by routine activities associated with an EPA proposed action would be minimal to none.

4.1.1.9.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to chemosynthetic deepwater benthic communities. For additional information on the potential impacts of accidental events to chemosynthetic deepwater benthic communities, refer to Chapter 4.2.1.9.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.9 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The most serious, impact-producing factor threatening chemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. Such disturbance would most likely come from routine events, as discussed above, and seafloor blowouts. Possible catastrophic oil spills, which are not reasonably expected and not part of an EPA proposed action, due to seafloor blowouts have the potential to devastate localized deepwater benthic habitats (**Appendix B**). However, these events are rare and would only affect a small portion of the total benthic habitat in the GOM.

Proposed Action Analysis

Accidental releases of oil could occur as a result of an EPA proposed action. The probability of one or more offshore spills ≥1,000 bbl occurring as a result of an EPA proposed action is estimated to be between 0 and 8 percent (**Table 3-21**). The probability of one or more offshore spills ≥10,000 bbl occurring as a result of an EPA proposed action is estimated to be between 0 and 2 percent (**Table 3-22**). The OSRA model estimated the combined probabilities of one or more hypothetical spills ≥1,000 bbl occurring and contacting surface waters in specific areas as a result of an EPA proposed action. **Figure 3-16** shows the probability of sea surface oiling within 10 days, and **Figure 3-17** shows the probability of oiling within 30 days. Sea surface oiling is most likely near the EPA proposed lease sale area and pipeline route but, even so, the maximum probability of oiling closest to the activity during the 40-year period is only 5 percent. The chances of oil from the surface water reaching the seafloor would be reduced based on limited physical mixing abilities, dispersion with distance from the source, and weathering and biodegradation over time. The possibility of oil from a surface spill reaching a depth of 300 m (984 ft) or greater in any measurable concentration is very small.

A spill at the seafloor could affect chemosynthetic community habitat due to the formation of subsea oil plumes. All known oil reserves in the GOM have specific gravity measures that are lighter than water, meaning that released oil would rise to the sea surface (also refer to **Chapter 3.2.1.2**). The upward movement of the oil may be reduced if methane mixed with the oil is dissolved into the water column, reducing the oil's buoyancy (Adcroft et al., 2010). If the oil is ejected into the water column under high pressure, oil droplets may become entrained in the water column (Boehm and Fiest, 1982; Adcroft et al., 2010). The occurrence of subsea plumes would be increased if dispersants are applied on the sea surface or at depth. Large oil droplets would rise to the sea surface, but micro-droplets, formed by vigorous turbulence in the plume or by the injection of dispersants, may remain neutrally buoyant in the water column, creating a subsurface plume (Adcroft et al., 2010; Joint Analysis Group, 2010). Dispersed oil in the water column begins to biodegrade and may flocculate with particulate matter, promoting sinking of the particles. Subsea oil plumes would be carried by underwater currents and the potential for impacts would be distributed in a line from the source along whatever paths the water currents travel. Oil plumes reaching chemosynthetic communities could cause oiling of organisms, resulting in the death of entire populations on localized sensitive habitats. These potential impacts would be localized because of the directional movement of oil plumes by the water currents and because the sensitive habitats have a scattered, patchy distribution. Habitats directly in the path of the oil plume would be affected if the oil contacts the seafloor. In addition, sublethal effects are possible for communities that receive a lower level of oiling. These effects could include temporary lack of feeding, expenditure of energy to remove the oil, loss of gametes and reproductive delays, loss of tissue mass, and similar effects.

An oil spill that occurs at the sea surface would result in a majority of the oil remaining at the sea surface. Lighter compounds in the oil may evaporate, and some components of the oil may dissolve in the seawater. Evaporation allows the removal of the most toxic components of the oil, while dissolution may allow bioavailability of hydrocarbons to marine organisms for a brief period of time (Lewis and Aurand, 1997). Remnants of the oil may then emulsify with water or adsorb to sediment particles and fall to the seafloor. The depth of chemosynthetic communities, greater than 300 m (984 ft), helps to protect them from a surface oil spill. Disturbance of the sea surface by storms can mix surface oil into the water column, but the effects are generally limited to the upper 10 m (33 ft). Modeling exercises have indicated that oil may reach a depth of 20 m (66 ft); at this depth, the spilled oil would be at concentrations several orders of magnitude lower than the amount shown to have an effect on marine organisms (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002).

Recent analyses reveal over 16,000 (Shedd et al., 2012) likely hard-bottom locations across the deepwater GOM. Guidance provided in NTL 2009-G40 describes required surveys and avoidance enacted for deepwater benthic communities prior to drilling or pipeline installation and greatly reduces risks to these communities. Studies have refined predictive information and have confirmed the effectiveness of these provisions throughout all depth ranges of the Gulf of Mexico (Brooks et al., 2009). With the dramatic success of this work, confidence is increasing regarding the use of geophysical signatures for the prediction of chemosynthetic communities. The application of avoidance criteria for chemosynthetic communities described in NTL 2009-G40 would preclude impacts of sedimentation from a blowout and provide buffer distance from the source of subsea oil spills.

Summary and Conclusion

The most likely threat to chemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. The possibility of oil from a surface spill reaching a depth of 300 m (984 ft) or greater in any measurable concentration is very small. Subsea oil plumes resulting from high-pressure subsea oil releases and/or the application of chemical dispersants have the potential to negatively affect chemosynthetic communities. If oil is ejected under high pressure or if dispersants are applied to an oil spill, oil would mix into the water column, be carried by underwater currents, and could eventually contact the seafloor where it may impact patches of chemosynthetic community habitat in its path.

Studies indicate that periods as long as hundreds of years are required to reestablish a seep community once it has disappeared (depending on the community type). There is evidence that substantial impacts on these communities could permanently prevent reestablishment, particularly if hard substrate required for recolonization was buried by sediments from a blowout. Other sublethal impacts include possible incremental losses of productivity, reproduction, community relationships, overall ecological functions of the community, and incremental damage to ecological relationships with the surrounding benthos.

The guidance provided in NTL 2009-G40 greatly reduces the risk of impacts. It describes the requirement to avoid potential chemosynthetic communities that are identified on the required geophysical survey records prior to approval of any structure or pipeline emplacement. The 2,000-ft (610-m) required drilling avoidance would protect sensitive communities from heavy sedimentation in the event of a blowout, with only light sediment components able to reach the communities in small quantities. BOEM's protective measures would minimize the possible impacts caused by physical disturbance of the seafloor and minor impacts from sediment resuspension or drill cutting discharges through avoidance. Potential accidental impacts from an EPA proposed action are expected to cause little damage to the ecological function or biological productivity of chemosynthetic communities. Adverse impacts would be limited by adherence to guidelines in NTL 2009-G40. Accidental impacts to deepwater chemosynthetic communities in the GOM are considered negligible because of the application of BOEM's avoidance criteria as described in NTL 2009-G40, because of their patchy distribution, and because physical interactions between oil and water are not likely to carry oil to the habitats.

4.1.1.9.4. Cumulative Impacts

This is a summary of the potential cumulative impacts on chemosynthetic deepwater benthic communities. For additional information on the potential cumulative impacts on chemosynthetic deepwater benthic communities, refer to Chapter 4.2.1.9.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.9 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The greatest potential for cumulative adverse impacts to chemosynthetic deepwater benthic communities comes from OCS-related, bottom-disturbing activities associated with pipeline and platform emplacement (including templates and subsea completions), associated anchoring activities, discharges of muds and cuttings, and seafloor blowout accidents. Other offshore activities such as fishing and trawling and events such as storms and climate change can also affect deepwater benthic communities. Impacts attributed to OCS activity occur at the same time as impacts due to other governmental and private projects and activities, as well as impacts due to pertinent natural processes and events that may adversely affect chemosynthetic communities. This cumulative analysis considers the effects of impact-producing factors related to past lease sales, the proposed lease sales, reasonably foreseeable lease sale programs, and other natural and human impacting factors.

OCS Oil- and Gas-Related Impacts

As exploration and development continue on the Federal OCS, activities have moved farther into the deeper water areas of the GOM. These activities would threaten sensitive habitats on the seafloor in their vicinity. However, these potential impacts are mitigated by the application of avoidance requirements specified in NTL 2009-G40. The extent of these disturbances would be determined by the intensity of development in these deepwater regions, the types of structures and mooring systems used, and the effective application of the avoidance criteria as described in NTL 2009-G40, which distances oil and gas activity from sensitive deepwater corals and chemosynthetic communities.

Oil and gas activities on the OCS could affect local areas of deepwater chemosynthetic communities in several ways. Routine discharges of drilling muds and cuttings have been documented to reach the seafloor in water depths >300 m (984 ft). Drill muds typically settle within about 100 m (328 ft) of the well site, while the majority of cuttings fall within 500 m (1,640 ft) (CSA, 2006). Localized areas of the seafloor may be affected by the installation of deepwater pilings, pipelines, anchors, and seafloor templates for mounting equipment. However, these potential impacts are mitigated by the application of avoidance requirements specified in NTL 2009-G40.

A blowout at the seafloor could resuspend large quantities of bottom sediments and even create a large crater, destroying any organisms in the immediate area. Subsea oil plumes resulting from a seafloor blowout could affect sensitive deepwater communities. This is especially true if dispersants are applied at depth. While it is likely that any subsea oil plume traveling more than a few miles on the deep seafloor would cross at least one of these potential habitats, the plume may not contact the seafloor at that point. If the plume did contact the seafloor, it would result in a localized effect that is not expected to alter wider populations in the GOM. Sensitive deepwater communities appear to be widely scattered and not as rare as previously expected. Recent BOEM analyses of seafloor remote-sensing data indicate over 16,000 locations in the deep GOM that represent potential hard-bottom habitats (Shedd et al., 2012). Due to the patchy nature of sensitive deepwater communities and the directional flow of subsea oil plumes, only localized patches of sensitive communities could be affected.

Non-OCS Oil- and Gas-Related Impacts

Other regional non-oil- and non-gas-related sources of cumulative impact to deepwater benthic communities would be possible, but they are considered unlikely to occur. Essentially no anchoring from non-OCS-related activities occurs at the deeper water depths considered for these resources (>300 m; 984 ft). Some impacts are highly unlikely yet not impossible, such as the sinking of a ship or barge resulting in collision or contaminant release directly on top of a sensitive, high-density chemosynthetic community. Bottom longlining for tilefish could potentially result in cumulative impact to deepwater communities, as their habitat in the GOM extends to 540 m (1,772 ft) (FishBase, 2006). The royal red shrimp is fished in depths of 250-475 m (820-1,558 ft) in the northeastern part of the Gulf of Mexico (GMFMC, 2004).

Summary and Conclusion

The most serious, impact-producing factor threatening chemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. Such disturbance would most likely come from those OCS-related activities associated with pipelaying, anchoring, structure emplacement, and seafloor blowouts. Drilling discharges and resuspended sediments have a potential to cause minor, mostly sublethal impacts to patchy, high-density chemosynthetic communities, but substantial accumulations could result in more serious impacts. Sublethal impacts may include possible incremental losses of productivity, reproduction, community relationships, overall ecological functions of the community, and incremental damage to ecological relationships with the surrounding benthos. Recovery from minor impacts is expected within several years, but even minor impacts are not expected based on avoidance measures described in NTL 2009-G40. If physical disturbance (such as anchor damage) or extensive burial by muds and cuttings were to occur to high-density communities, impacts could be severe, with recovery time as long as 200 years for mature tube-worm communities. There is evidence that substantial impacts on these communities could permanently prevent reestablishment.

Recent analyses reveal over 16,000 possible hard-bottom locations across the deepwater GOM. Guidance provided in NTL 2009-G40 describes surveys and avoidance measures required prior to drilling or pipeline installation and greatly reduces risks. Studies have refined predictive information and confirmed the effectiveness of these provisions throughout all depth ranges of the GOM (Brooks et al., 2009). With the dramatic success of this work, confidence is increasing regarding the use of geophysical signatures for the prediction of chemosynthetic communities. These geophysical signatures enable BOEM to locate possible chemosynthetic communities and to implement avoidance measures in plan and pipeline reviews, which substantially reduces the possibility of impacting a chemosynthetic community.

Possible catastrophic oil spills, which are not reasonably expected and not part of an EPA proposed action, due to seafloor blowouts have the potential to devastate localized deepwater benthic habitats. Major impacts to localized benthic habitat are possible in such an event, particularly when chemical dispersants are applied to oil releases at depth. However, these events are rare and would only affect a small portion of the sensitive benthic habitat in the GOM. The recovery time from an oiling event, if reestablishment is not permanently prevented, would be similar to that occurring from physical disturbance. Refer to **Appendix B** for a more detailed discussion of catastrophic oil spill events, which are not reasonably expected and not part of an EPA proposed action.

Activities unrelated to the OCS Program include fishing and trawling. Because of the water depths in these areas (>300 m; 984 ft) and the low density of commercially valuable fishery species, these activities are not expected to impact deepwater benthic communities.

The overall and incremental contribution of an EPA proposed action to cumulative impacts is expected to be slight and to result from the effects of the possible impacts caused by physical disturbance of the seafloor and minor impacts from sediment resuspension or drill cutting discharges. Cumulative impacts to deepwater communities in the GOM are considered negligible because of the remoteness of communities from most impacts, the scattered and patchy nature of chemosynthetic communities, and the application of BOEM’s avoidance criteria as described in NTL 2009-G40. The proposed activities in the EPA considered under the cumulative scenario are expected to cause no damage to the ecological function or biological productivity of chemosynthetic communities as a whole.

4.1.1.10. Nonchemosynthetic Deepwater Benthic Communities

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for nonchemosynthetic deepwater benthic communities can be found in Chapter 4.2.1.10 of the 2012-2017 WPA/CPA Multisale and Chapter 4.2.1.10 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.10 of the 2012-2017 WPA/CPA Multisale and Chapter 4.2.1.10 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for nonchemosynthetic communities regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for nonchemosynthetic communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for nonchemosynthetic communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on nonchemosynthetic communities, and various Internet sources were examined to determine any recent information regarding nonchemosynthetic communities. Sources investigated include the NOAA Ocean Exploration website, the Gulf of Mexico Alliance, USEPA, USGS, and coastal universities. Other websites from scientific publication databases (including Science Direct, Elsevier, CSA Illumina, and JSTOR) were checked for new information using general Internet searches based on major themes. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding nonchemosynthetic communities since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, studies and data are continuing to be developed in response to the *Deepwater Horizon* explosion, oil spill, and response. This information will likely be developed through the NRDA process. Unavailable information on the effects to nonchemosynthetic communities from the *Deepwater Horizon* explosion and oil spill may be relevant to reasonably foreseeable significant impacts. The NRDA process is investigating impacts to nonchemosynthetic communities, but information collected to date has not been made available to the public. It may be years before this information becomes available, and certainly not within the timeframe contemplated by this NEPA analysis. It is not within BOEM's ability to obtain this information, regardless of the costs involved. Nevertheless, BOEM believes that this incomplete or unavailable information would not be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, including because nonchemosynthetic communities are found throughout the Gulf and are in patchy distributions, minimizing the number that would be likely to be impacted by any single event. In addition, available data indicate significant impacts to one coral community; these impacts were only identified in one location 7 mi (11 km) downcurrent from the *Macondo* well site. BOEM's subject-matter experts have included what credible scientific information is available and applied it using accepted scientific methodologies.

4.1.1.10.1. Description of the Affected Environment

The deepwater GOM is dominated by soft mud bottoms with only occasional patches of hard substrate that support reef communities. Wherever hard substrate exists on the seafloor, organisms that cannot survive on soft bottoms can find a stable platform for permanent attachment. Thus, deepwater live bottom communities, including coral communities, can establish on these patches of hard substrate. Deepwater coral communities are now known to occur in many locations in the deep GOM (>300 m; 984 ft).

Scientists at BOEM have analyzed decades of 3D seismic data to classify seafloor returns exhibiting anomalously high or low reflectivity. The high reflectivity results represent patches of anomalous seafloor returns that likely indicate patches of hard substrate. There are over 16,000 patches represented in the database at the time of this writing (**Figure 4-8**). Most of these hard bottoms are created by the precipitation of calcium carbonate substrate by nonchemosynthetic bacterial activity. Investigations have revealed that most of these patches of substrate support patches of nonchemosynthetic communities and/or live bottom reef communities. This database of high positive reflectivity anomalies reveals that nonchemosynthetic and coral communities are much more common in the deepwater GOM than previously known (Shedd et al., 2012).

One deepwater coral site at a depth of 1,370 m (4,495 ft) has been reported as severely damaged following the 2010 *Deepwater Horizon* explosion and oil spill. The site is in Mississippi Canyon Block 294, 11 km (6.8 mi) southwest of the spill location. The site includes hard substrate supporting coral in an area approximately 10 x 12 m (33 x 39 ft) (White et al., 2012). The published results document damage to the coral community. Forty-three coral colonies were analyzed via close-up imagery: 86 percent exhibited signs of impact; 46 percent exhibited impact to at least 50 percent of the colony; and 23 percent of the colonies sustained impact to more than 90 percent of the colony (White et al., 2012). Many other associated invertebrates also exhibited signs of stress. Flocculent and organism samples were collected, and appropriate biomarkers were analyzed to determine the source of the impact. The data analyzed in the study suggest that the *Deepwater Horizon* oil spill is the source of the impact to this coral community (White et al., 2012). It is possible that long-term effects from the *Deepwater Horizon* oil spill may appear at a later time in other nonchemosynthetic and coral communities in other parts of the GOM; however, the numerous other communities investigated since the spill remain healthy (White et al., 2012).

Deepwater live bottom communities in the proposed EPA lease sale area are not expected to differ from those in the adjacent CPA. The deep water provides a very stable environment, especially in the depths found for the proposed EPA lease sale area (>800 m, 2,625 ft), and there are no notable environmental differences between the proposed EPA lease sale area and the adjacent CPA.

4.1.1.10.2. Impacts of Routine Events

This is a summary of the potential impact of routine events to nonchemosynthetic deepwater benthic communities. For additional information on the potential impacts of routine events to nonchemosynthetic deepwater benthic communities, refer to Chapter 4.2.1.10.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.10 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

Deepwater live bottom communities and deepwater soft bottom communities are susceptible to physical impacts from drilling discharges, structure placement (including templates or subsea completions), anchoring, and pipeline installation. In deep water, as opposed to shallower areas on the continental shelf, discharges of drilling fluids and cuttings at the sea surface are spread across broad areas of the seafloor and are generally distributed in thinner accumulations. The result of this dispersion is that seafloor habitats receive little additional sedimentation from drilling discharges in areas where it settles to the seafloor. The physical disturbances by structures themselves are typically limited to anchors for holding floating drilling or production facilities over the well sites. Anchors from support boats and ships (or any buoys set out to moor vessels), floating drilling units, barges used for construction of platform structures, pipelaying vessels, and pipeline repair vessels also cause disturbances to small areas of the seafloor. Normal pipelaying activities in deep water could impact areas of deepwater reef organisms if the pipeline crossed the reef (pipeline burial is not required at depths over 61 m [200 ft]). Carbonate outcrops or reefs with attached epifauna or coral may be devastated by bottom-disturbing activity, as opposed to communities in soft bottom sediments that may quickly repopulate from adjacent populations of all size classes of organisms. The hard-bottom impacted area of disturbance may be small in absolute terms but it could be a large portion of the local habitat colonized by fragile hard corals or other organisms that rely on exposed hard substrate.

The policies described in NTL 2009-G40 greatly reduce the risk of these physical impacts to deepwater benthic communities by requiring avoidance of potential deepwater live bottom communities that are identified on required geophysical survey records or by requiring photodocumentation to establish the absence of deepwater live bottom communities prior to approval of the structure or pipeline emplacement. Any soft bottom communities that may be impacted by routine oil and gas operations may quickly repopulate from adjacent populations of organisms.

Proposed Action Analysis

The routine activities associated with an EPA proposed action that would impact deepwater live bottom and soft bottom communities would come from activities associated with drilling discharges, structure placement (including templates or subsea completions), anchoring, or pipeline installation. For an EPA proposed action, only one production structure is expected to be installed during the 40-year analysis period (**Table 3-2**). Drilling muds and cuttings discharged at the seafloor or from the surface will have some limited impact to soft bottom communities at or below the sediment/water interface. The surface discharge of muds and cuttings in deeper water would reduce the impact of smothering the benthic communities on the bottom due to increased dispersal. Even in situations where the substantial burial of typical soft bottom infaunal communities occurred, recolonization by populations from neighboring soft bottom substrate would be expected over a relatively short period of time for all size ranges of organisms. In addition, impacts of pipeline contact on soft bottom would be minimal because pipeline burial is not required in water depths over 61 m (200 ft). Structure placement and anchoring would cause damage to relatively small areas of soft bottom communities. Physical disturbance or destruction of a limited area of benthos or to a limited number of megafauna organisms such as brittle stars, sea pens, or crabs would not result in a major impact to the deepwater benthos ecosystem as a whole. Additional analysis of muds and cuttings discharge and physical disturbance impacts can be found in Chapter 4.2.1.10.2 of the 2012-2017 WPA/CPA Multisale EIS.

Under the current review procedures, carbonate outcrops are targeted as a possible indication (surface amplitude anomaly on 3D seismic survey data) of the presence of deepwater live bottom communities. Unique communities that may be associated with any carbonate outcrops or other topographical features are protected through this review. Typically, all areas suspected of being hard bottom are avoided as geological hazards for any well sites and pipeline plans.

Deepwater live bottom communities in the proposed EPA lease sale area are not expected to differ from those in the adjacent CPA. The deep water provides a very stable environment, especially in the depths found for the proposed EPA lease sale area (>800 m; 2625 ft), and there are no notable environmental differences between the proposed EPA lease sale area and the adjacent CPA.

Summary and Conclusion

Some impact to soft bottom benthic communities from drilling and production activities would occur as a result of physical impact from drilling discharges, structure placement (including templates or subsea completions), anchoring, and installation of pipelines regardless of their locations. Even in situations where the substantial burial of typical, soft bottom infaunal communities occurred, recolonization from populations from widespread neighboring soft bottom substrate would be expected over a relatively short period of time for all size ranges of organisms.

Impacts to hard-bottom communities are expected to be avoided as a consequence of the application of the existing NTL 2009-G40. Geophysical conditions associated with hard-bottom habitats are generally avoided in exploration and development planning. With the implementation of BOEM's avoidance measures, impacts on deepwater live bottom communities caused by routine activities associated with an EPA proposed action would be minimal to none.

4.1.1.10.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to nonchemosynthetic deepwater benthic communities. For additional information on the potential impacts of accidental events to nonchemosynthetic deepwater benthic communities, refer to Chapter 4.2.1.10.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.10 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Introduction

The most serious, impact-producing factor threatening nonchemosynthetic seafloor communities in deep water is physical disturbance of the seafloor, which could destroy the organisms of these communities. Such disturbance would most likely come from routine events, as discussed above, and seafloor blowouts. Possible catastrophic oil spills, which are not reasonably expected and not part of an EPA proposed action, due to seafloor blowouts have the potential to devastate localized deepwater benthic habitats (**Appendix B**). However, these events are rare and would only affect a small portion of the total benthic habitat in the Gulf of Mexico.

Proposed Action Analysis

Accidental releases of oil could occur as a result of an EPA proposed action. The probability of one or more offshore spills ≥1,000 bbl occurring as a result of an EPA proposed action is estimated to be between 0 and 8 percent (**Table 3-21**). The probability of one or more offshore spills ≥10,000 bbl occurring as a result of an EPA proposed action is estimated to be between 0 and 2 percent (**Table 3-22**). The OSRA model estimated the combined probabilities of one or more hypothetical spills ≥1,000 bbl occurring and contacting surface waters in specific areas as a result of an EPA proposed action. **Figure 3-16** shows the probability of sea surface oiling within 10 days, and **Figure 3-17** shows the probability of oiling within 30 days. Sea surface oiling is most likely near the EPA proposed lease sale area and pipeline route but, even so, the maximum probability of oiling closest to the activity during the 40-year period is only 5 percent. The chances of oil from the surface water reaching the seafloor would be reduced based on limited physical mixing abilities, dispersion with distance from the source, and weathering and biodegradation over time. The possibility of oil from a surface spill reaching a depth of 300 m (984 ft) or greater in any measurable concentration is very small.

A spill at the seafloor could affect nonchemosynthetic community habitat due to the formation of subsea oil plumes. All known oil reserves in the Gulf of Mexico have specific gravity measures that are lighter than water, meaning that released oil would rise to the sea surface (also refer to **Chapter 3.2.1.2**). The upward movement of the oil may be reduced if methane mixed with the oil is dissolved into the water column, reducing the oil's buoyancy (Adcroft et al., 2010). If the oil is ejected into the water column under high pressure, oil droplets may become entrained in the water column (Boehm and Fiest, 1982; Adcroft et al., 2010). The occurrence of subsea plumes would be increased if dispersants are applied on the sea surface or at depth. Large oil droplets would rise to the sea surface, but micro-droplets, formed by vigorous turbulence in the plume or by the injection of dispersants, may remain neutrally buoyant in the water column, creating a subsurface plume (Adcroft et al., 2010; Joint Analysis Group, 2010). Dispersed oil in the water column begins to biodegrade and may flocculate with particulate matter, promoting sinking of the particles. Subsea oil plumes would be carried by underwater currents, and the potential for impacts would be distributed in a line from the source along whatever paths the water currents travel. Oil plumes reaching nonchemosynthetic communities could cause oiling of organisms, resulting in the death of entire populations on localized sensitive habitats. These potential impacts would be localized because of the directional movement of oil plumes by the water currents and because the sensitive habitats have a scattered, patchy distribution. Habitats directly in the path of the oil plume would be affected if the oil contacts the seafloor. In addition, sublethal effects are possible for communities that receive a lower level of oiling. These effects could include temporary lack of feeding, expenditure of energy to remove the oil, loss of gametes and reproductive delays, loss of tissue mass, and similar effects.

An oil spill that occurs at the sea surface would result in a majority of the oil remaining at the sea surface. Lighter compounds in the oil may evaporate, and some components of the oil may dissolve in the seawater. Evaporation allows the removal of the most toxic components of the oil, while dissolution may allow bioavailability of hydrocarbons to marine organisms for a brief period of time (Lewis and Aurand, 1997). Remnants of the oil may then emulsify with water or adsorb to sediment particles and fall to the seafloor. The depth of nonchemosynthetic communities, greater than 300 m (984 ft), helps to protect them from a surface oil spill. Disturbance of the sea surface by storms can mix surface oil into the water column, but the effects are generally limited to the upper 10 m (33 ft). Modeling exercises have indicated that oil may reach a depth of 20 m (66 ft); at this depth, the spilled oil would be at concentrations several orders of magnitude lower than the amount shown to have an effect on marine organisms (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002).

Although deepwater coral and other live bottom communities often live in close association with hydrocarbon seeps (since the carbonate substrate is precipitated by chemosynthetic communities), this does not mean they are necessarily tolerant to the effects of oil contamination. Natural seepage is very constant and at very low rates as compared with the potential volume of oil released from a blowout or pipeline rupture. In addition, live bottom organisms, such as *Lophelia pertusa*, inhabit areas around the perimeter of seeps and sites where hydrocarbon seepage has reduced its flow or stopped. Typical Gulf of Mexico oil is light and floats rapidly to the surface, rather than being carried horizontally across benthic communities by water currents (Johansen et al., 2001; MacDonald et al., 1995; Trudel et al., 2001).

Deepwater coral habitats and other potential hard-bottom communities not associated with nonchemosynthetic communities appear to be relatively rare. Typically, deepwater coral habitats form on shelf breaks or topographic highs in the Gulf of Mexico near natural hydrocarbon seeps. The topographic highs are often associated with authigenic carbonate, which is a byproduct of microbial methane oxidation and sulfate reduction that occurs at hydrocarbon seep sites (CSA, 2007). Any hard substrate communities located in deep water would be particularly sensitive to impacts. Impacts to these sensitive habitats could permanently prevent recolonization by similar organisms requiring hard substrate. Adherence to the guidance provided in NTL 2009-G40 should prevent all but minor impacts to hard-bottom communities located the prescribed distance of more than 610 m (2,000 ft) from a well site. Typically, all areas suspected of being hard bottom are avoided as a potential geological hazard for any well sites. Any proposed impacting activity in water depths >300 m (984 ft) would automatically trigger the NTL 2009-G40 evaluation described above. Under BOEM's current review procedures, carbonate outcrops (high reflectivity surface anomalies on seismic survey data) are targeted as one possible indication that sensitive hard-bottom communities are present. Any unique nonchemosynthetic communities that may be associated with carbonate outcrops or other topographical features would be avoided via this review, along with the chemosynthetic communities that may be located on the features.

Recent analyses reveal over 16,000 likely hard-bottom locations across the deepwater GOM (Shedd et al., 2012). Studies have refined predictive information and confirmed the effectiveness of these provisions throughout all depth ranges of the Gulf of Mexico (Brooks et al., 2009). With the dramatic success of this work, confidence is increasing regarding the use of geophysical signatures for the prediction of nonchemosynthetic communities. The application of avoidance criteria for nonchemosynthetic communities described in NTL 2009-G40 would preclude impacts of sedimentation from a blowout and provide buffer distance from the source of subsea oil spills.

Summary and Conclusion

The most likely threat to nonchemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. The possibility of oil from a surface spill reaching a depth of 300 m (984 ft) or greater in any measurable concentration is very small. Subsea oil plumes resulting from high-pressure subsea oil releases and/or the application of chemical dispersants have the potential to negatively affect nonchemosynthetic communities. If oil is ejected under high pressure or if dispersants are applied to an oil spill, oil would mix into the water column, be carried by underwater currents, and could eventually contact the seafloor where it may impact patches of nonchemosynthetic community habitat in its path.

Studies indicate that periods as long as hundreds of years are required to reestablish a seep community once it has disappeared (depending on the community type). There is evidence that substantial impacts on these communities could permanently prevent reestablishment, particularly if hard substrate required for recolonization was buried by sediments from a blowout. Other sublethal impacts include possible incremental losses of productivity, reproduction, community relationships, overall ecological functions of the community, and incremental damage to ecological relationships with the surrounding benthos.

The guidance provided in NTL 2009-G40 greatly reduces the risk of impacts to deepwater nonchemosynthetic communities. It describes the requirement to avoid potential nonchemosynthetic communities that are identified on the required geophysical survey records prior to approval of any structure or pipeline emplacement. The 2,000-ft (610-m) required drilling avoidance would protect sensitive communities from heavy sedimentation in the event of a blowout, with only light sediment components able to reach the communities in small quantities. BOEM's protective measures would minimize the possible impacts caused by physical disturbance of the seafloor and minor impacts from sediment resuspension or drill cutting discharges through avoidance. Potential accidental impacts from an EPA proposed action are expected to cause little damage to the ecological function or biological productivity of nonchemosynthetic communities. Accidental impacts to deepwater nonchemosynthetic communities in the GOM are considered negligible because of the application of BOEM's avoidance criteria as described in NTL 2009-G40, because of their patchy distribution, and because physical interactions between oil and water are not likely to carry oil to the habitats.

4.1.1.10.4. Cumulative Impacts

This is a summary of the potential cumulative impacts to nonchemosynthetic deepwater benthic communities. For additional information on the potential cumulative impacts to nonchemosynthetic deepwater benthic communities, refer to Chapter 4.2.1.10.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.10 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The greatest potential for cumulative adverse impacts to nonchemosynthetic deepwater benthic communities comes from OCS-related, bottom-disturbing activities associated with pipeline and platform emplacement (including templates and subsea completions), associated anchoring activities, discharges of muds and cuttings, and seafloor blowout accidents. Other offshore activities such as fishing and trawling and events such as storms and climate change can also affect deepwater benthic communities. Impacts attributed to OCS activity occur at the same time as impacts due to other governmental and private projects and activities, as well as impacts due to pertinent natural processes and events that may adversely affect nonchemosynthetic communities. The cumulative analysis considers the effects of impact-producing factors related to past lease sales, the proposed lease sales, reasonably foreseeable lease sale programs, and other natural and human impacting factors.

OCS Oil- and Gas-Related Impacts

As exploration and development continue on the Federal OCS, activities have moved farther into the deeper water areas of the Gulf of Mexico. These activities would threaten sensitive habitats on the seafloor in their vicinity. However, these potential impacts are mitigated by the application of avoidance requirements specified in NTL 2009-G40. The extent of these disturbances would be determined by the intensity of development in these deepwater regions, the types of structures and mooring systems used, and the effective application of the avoidance criteria as described in NTL 2009-G40, which distances oil and gas activity from sensitive deepwater corals and nonchemosynthetic communities.

Oil and gas activities on the OCS could affect local areas of deepwater nonchemosynthetic communities in several ways. Routine discharges of drilling muds and cuttings have been documented to reach the seafloor in water depths >300 m (984 ft). Drill muds typically settle within about 100 m (328 ft) of the well site, while the majority of cuttings fall within 500 m (1,640 ft) (CSA, 2006). Localized areas of the seafloor may be affected by the installation of deepwater pilings, pipelines, anchors, and seafloor templates for mounting equipment. However, these potential impacts are mitigated by the application of avoidance requirements specified in NTL 2009-G40.

A blowout at the seafloor could resuspend large quantities of bottom sediments and even create a large crater, destroying any organisms in the immediate area. Subsea oil plumes resulting from a seafloor blowout could affect sensitive deepwater communities. This is especially true if dispersants are applied at depth. While it is likely that any subsea oil plume traveling more than a few miles on the deep seafloor would cross at least one of these potential habitats, the plume may not contact the seafloor at that point. If the plume did contact the seafloor, it would result in a localized effect that is not expected to alter wider populations in the GOM. Sensitive deepwater communities appear to be widely scattered and not as rare as previously expected. Recent BOEM analyses of seafloor remote-sensing data indicate over 16,000 locations in the deep GOM that represent potential hard-bottom habitats (Shedd et al., 2012). Due to the patchy nature of sensitive deepwater communities and the directional flow of subsea oil plumes, only localized patches of sensitive communities could be affected.

Non-OCS Oil- and Gas-Related Impacts

Other regional non-oil- and non-gas-related sources of cumulative impact to deepwater benthic communities would be possible, but they are considered unlikely to occur. Essentially no anchoring from non-OCS-related activities occurs at the deeper water depths considered for these resources (>300 m; 984 ft). Some impacts are highly unlikely yet not impossible, such as the sinking of a ship or barge, resulting in collision or contaminant release directly on top of a sensitive, high-density nonchemosynthetic community. Bottom longlining for tilefish could potentially result in cumulative impact to deepwater communities, as their habitat in the GOM extends to 540 m (1,772 ft) (FishBase, 2006). The royal red shrimp is fished in depths of 250-475 m (820-1,558 ft) in the northeastern part of the Gulf of Mexico (GMFMC, 2004).

Summary and Conclusion

The most serious, impact-producing factor threatening nonchemosynthetic communities is physical disturbance of the seafloor, which could destroy the organisms of these communities. Such disturbance would most likely come from those OCS-related activities associated with pipelaying, anchoring, structure emplacement, and seafloor blowouts. Drilling discharges and resuspended sediments have a potential to cause minor, mostly sublethal impacts to patchy, high-density nonchemosynthetic communities, but substantial accumulations could result in more serious impacts. Sublethal impacts may include possible incremental losses of productivity, reproduction, community relationships, overall ecological functions of the community, and incremental damage to ecological relationships with the surrounding benthos. Recovery from minor impacts is expected within several years, but even minor impacts are not expected based on avoidance measures described in NTL 2009-G40. If physical disturbance (such as anchor damage) or extensive burial by muds and cuttings were to occur to high-density communities, impacts could be severe, with recovery time as long as 200 years for mature tube-worm communities. There is evidence that substantial impacts on these communities could permanently prevent reestablishment.

Recent analyses reveal over 16,000 possible hard-bottom locations across the deepwater GOM. Guidance provided in NTL 2009-G40 describes surveys and avoidance measures required prior to drilling or pipeline installation and greatly reduces risks. Studies have refined predictive information and have confirmed the effectiveness of these provisions throughout all depth ranges of the GOM (Brooks et al., 2009). With the dramatic success of this work, confidence is increasing regarding the use of geophysical signatures for the prediction of nonchemosynthetic communities. These geophysical signatures enable BOEM to locate possible nonchemosynthetic communities and to implement avoidance measures in plan and pipeline reviews, which substantially reduces the possibility of impacting a nonchemosynthetic community.

Possible catastrophic oil spills, which are not reasonably expected and not part of an EPA proposed action, due to seafloor blowouts have the potential to devastate localized deepwater benthic habitats. Major impacts to localized benthic habitat are possible in such an event, particularly when chemical dispersants are applied to oil releases at depth. However, these events are rare and would only affect a small portion of the sensitive benthic habitat in the GOM. The recovery time from an oiling event, if reestablishment is not permanently prevented, would be similar to that occurring from physical disturbance. Refer to **Appendix B** for a more detailed discussion of catastrophic spill events, which are not reasonably expected and not part of an EPA proposed action.

Activities unrelated to the OCS Program include fishing and trawling. Because of the water depths in these areas (>300 m; 984 ft) and the low density of commercially valuable fishery species, these activities are not expected to impact deepwater benthic communities.

The overall and incremental contribution of an EPA proposed action to cumulative impacts is expected to be slight and to result from the effects of the possible impacts caused by physical disturbance of the seafloor and minor impacts from sediment resuspension or drill cutting discharges. Cumulative impacts to deepwater communities in the GOM are considered negligible because of the remoteness of communities from most impacts, the scattered and patchy nature of nonchemosynthetic communities, and the application of BOEM's avoidance criteria as described in NTL 2009-G40. The proposed activities in the EPA considered under the cumulative scenario are expected to cause no damage to the ecological function or biological productivity of nonchemosynthetic communities as a whole.

4.1.1.11. Soft Bottom Benthic Communities

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for soft bottom benthic communities can be found in Chapter 4.2.1.11 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.11 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.11 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.11 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for soft bottom benthic communities regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for soft bottom benthic communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for soft bottom benthic communities presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on soft bottom benthic communities, and various Internet sources were examined to determine any recent information regarding soft bottom benthic communities. A search of Internet information sources (the NOAA Gulf Spill Restoration Publications website; the ERMA Gulf Response website; the NOAA *Deepwater Horizon* Archive Publications and Factsheets; the Gulf of Mexico Sea Grant *Deepwater Horizon* Oil Spill Research and Monitoring Activities Database; the RestoreTheGulf.gov website; and the *Deepwater Horizon* Oil Spill Portal), as well as recently published journal articles was conducted to determine the availability of recent information on the soft bottom benthic communities. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding soft bottom benthic communities since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, limited data are currently available on potential impacts of the *Deepwater Horizon* explosion, oil spill, and response on soft bottoms in the EPA. This incomplete or unavailable information may be relevant to reasonably foreseeable significant impacts to soft bottom benthic communities. Relevant data on the status of soft bottom benthic communities after the *Deepwater Horizon* explosion, oil spill, and response, however, may take years to acquire and analyze. Much of this data is being developed through the NRDA process, which may take years to complete. Little data from the NRDA process have been made available to date. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated by this NEPA analysis, regardless of the cost or resources needed. In the place of this incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches. BOEM believes, however, that this incomplete or unavailable information is not essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Because soft bottoms are ubiquitous in the Gulf of Mexico, are not considered essential fish habitat, and are repopulated relatively quickly from neighboring communities when they are impacted, this incomplete or unavailable information is not likely to be essential to a reasoned choice among alternatives for the reasons stated therein.

4.1.1.11.1. Description of the Affected Environment

The seafloor on the continental shelf in the Gulf of Mexico consists primarily of muddy to sandy sediments. The eastern shelf is primarily sand extending out to 100-m (328-ft) water depth, while the central and western shelf is a mixture of sand, silt, and clay (Brooks and Darnell, 1991). Benthic organisms found on the seafloor include infauna (animals that live in the substrate, including mostly burrowing worms, crustaceans, and mollusks) and epifauna (animals that live on or are attached to the substrate; mostly crustaceans, as well as echinoderms, mollusks, hydroids, sponges, soft and hard corals, and demersal fishes). Infauna is comprised of meiofauna, small organisms (63-500 μ; 0.063-0.5 mm) that live among the grains of sediment; and macroinfauna, slightly larger organisms (>0.5 mm; 0.02 in) that live in the sediment (Dames & Moore, Inc., 1979). Shrimp and demersal fish are closely associated with the benthic community. The most abundant organisms on the continental shelf are the deposit-feeding polychaetes. The slope and deep sea consist of vast areas of primarily fine sediments that support benthic communities with lower densities and biomass but higher diversity than the continental shelf (Rowe and Kennicutt, 2001).

Nematode worms and harpacticoid copepods are the most abundant meiofauna on the OCS of the EPA. Higher densities were recorded closer to shore, and they decreased with distance offshore. Densities tended to be highest in medium to fine sediments with a moderate to high carbonate composition (Dames & Moore, Inc., 1979). The macroinfauna on the continental shelf of the GOM is dominated by polychaetes (Dames & Moore, Inc., 1979; Woodward-Clyde Consultants and CSA, 1983). Macroinfauna exhibits greater densities inshore than offshore and density decreases with decreasing grain size (Dames & Moore, Inc., 1979; Woodward-Clyde Consultants and CSA, 1983). Macroepifauna (large attached organisms) is dominated by crustaceans and mollusks, followed by echinoderms and coelenterates, and the macroepifauna followed the same density gradient offshore as the meiofauna and macroinfauna (Dames & Moore, Inc., 1979).

The soft bottom communities in the proposed EPA lease sale area could be impacted by both routine and accidental events. The following sections discusses the possible impacts to these environments.

4.1.1.11.2. Impacts of Routine Events

This is a summary of the potential impacts of routine events on soft bottom communities. For additional information on the potential impacts of routine events on soft bottom communities, refer to Chapter 4.2.1.11.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.11 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The vast majority of the GOM seabed is comprised of soft sediments. These soft bottom benthic communities of the GOM are described in **Chapter 4.1.1.11.1**. Impacts from routine oil and gas activities to the soft bottom benthic communities are discussed in this section, as a majority of the oil and gas exploration would be conducted in soft seafloor sediments. For an EPA proposed action, all activity will take place in water 800 m (2,625 ft) or deeper. There could be 3-12 exploration and delineation wells drilled and 0-17 development and production wells drilled as a result of an EPA proposed action for the years 2012-2051 (**Table 3-2**). Only 0-1 production structures may be installed, none of which are expected to be removed by explosives. In addition, there may be 0-82 km of offshore pipeline installed as a result of an EPA proposed action. Potential impact-producing factors to these communities include infrastructure emplacement, turbidity and smothering, drilling-effluent and produced-water discharges, and infrastructure removal. Disturbances of soft bottom communities may cause localized alterations to infaunal communities and disruptions to food sources for some large invertebrate and finfish species.

Proposed Action Analysis

It is important to note that the effects of routine events on soft bottom benthos would only impact a very small portion of the seafloor in the EPA. The size of the proposed EPA lease sale area is 657,905 ac, which is a small portion of the EPA (64,563,679 ac) and GOM (159,586,843 ac,) overall (or approximately 1% of the EPA and 0.4% of the entire GOM), and only a small portion of the proposed EPA lease sale area will be affected. Impacts from the drilling of wells are generally confined to a few hundred meters from the well and impacts decrease with distance from the well. Recovery from construction impacts should begin within a year but may take several years to complete recovery (Rhodes and Germano, 1982; Neff et al., 2000; Newell et al., 1998). Recovery would depend on the benthic community composition, sediment type, and the intensity of the disturbance. Long-term operational impacts are localized and generally result in a shift in benthic community dominance (Montagna and Harper, 1996). The following paragraphs summarize the localized impacts that may occur to a small portion of the seafloor as a result of oil and gas activity in soft seafloor habitats in the EPA.

Structure placement and anchor damage from support boats and ships, floating drilling units, and pipeline-laying vessels are OCS oil- and gas-related threats that may crush benthic organisms on the seafloor. The size of the areas affected by chains associated with anchors and pipeline-laying barges would depend on the water depth, chain length, sizes of anchor and chain, method of placement, wind, and current (Lissner et al., 1991). Typical areas of seafloor affected by structure emplacement in deep water range from 0.62 to 7 ac per well. Considering that there may be up to 17 development and production wells, 10.54-119 ac of the 657,905 ac (0.002-0.02%) of the proposed EPA lease sale area may be affected by structure emplacement. Refer to **Chapter 3.1.1.3** for more details on seafloor disturbance from routine oil and gas activity and to **Chapter 3.1.1.1.1** for the scenario information.

Structure emplacement may cause localized impacts to benthic organisms through turbidity. Pipeline burial (which is required in waters 60 m [200 ft] or less) disturbs a swath of the seafloor up to 3.3 m (10 ft) deep. The trenched area is severely disturbed and creates a large turbidity plume, which can cause obstruction of filter-feeding mechanisms of sedentary organisms and gills of fishes. Adverse impacts from resuspended sediments would be temporary, primarily sublethal in nature, and the effects would be limited to areas in the vicinity of the barge. Impacts may include “changes in respiration rate, abrasion and puncturing of structures, reduced feeding, reduced water filtration rates, smothering, delayed or reduced hatching of eggs, reduced larval growth or development, abnormal larval development, or reduced response to physical stimulus” (Anchor Environmental CA, L.P., 2003). In addition, the drilling of a well may result in water-column turbidity, smothering of benthic organisms by the deposition of cuttings, coarsening of sediment near the well, trace metal contamination from cuttings, organic enrichment of the seabed, and possible hydrocarbon contamination. The above impacts will be localized to the area of disturbance.

Cuttings deposition may also locally impact benthic organisms. In deep water, such as the proposed EPA lease sale area, cuttings discharged at the sea surface may spread out to 1,000 m (3,280 ft) from the source, depending on currents, with the thickest layers at the well and the majority of the sediment within 250 m (820 ft) of deepwater wells, and the cuttings are shown to decrease beyond that distance (CSA, 2006). A rough estimate of benthic impacts can be calculated by assuming the radius of disruption around a well is 250 m (820 ft), and therefore, the area of disruption is 196,250 m^2 (0.196 km^2; 49 ac). If up to 17 individual development and production wells are drilled, the area or benthic disturbance would be 3,336,250 m^2 (3.34 km^2; 824 ac). However, if some wells are drilled from the same surface location, the surface area of the seafloor disturbed would be less than the above calculated number, but the thickness of the cuttings on the seafloor would be greater from repeated deposition. The area of seafloor disturbed by cutting and mud discharge, therefore, would only be 0.13 percent of the proposed EPA lease sale area. Although impacts are locally drastic, cumulative impacts over the seafloor of the Gulf of Mexico are anticipated to be very minimal, as such comparatively small areas are affected.

In addition, drill cuttings rarely accumulate thicknesses of about 1 m (3 ft) immediately adjacent to the well as a result of the initial steps of drilling; thicknesses are usually not higher than a few tens of centimeters (about 1 ft) in the GOM (Zingula and Larson, 1977). Cuttings settle in a patchy distribution determined by water currents and limited to about 250 m (820 ft) from the well site, and because cuttings are distributed unevenly and in patches, burial would likely be localized (CSA, 2004b). Benthic organisms are anticipated to either vertically migrate through the widespread depositional layers, or immigrants would repopulate the smothered habitat. Altered community structure may occur as a result of the environmental changes, but this alteration would be limited to a few hundred meters from the well.

Recolonization and immigration by organisms from neighboring soft bottom substrate to the impacted areas would be expected to occur within a relatively short period of time and initial recovery should be well advanced within a year following the cuttings deposition (Neff, 2005). The seafloor begins to change once drilling is completed and cuttings become flattened and begin to resemble the surrounding sediments (Monaghan et al., 1977 and 1980). In the GOM, fauna, similar to nearby benthic populations, was present in cuttings depositions 8.5 months after drilling was completed, and a complex benthic community, including burrowing organisms, was present 2 years after drilling was completed (Zingula and Larson, 1977).

Benthic organisms that repopulate the area of disturbance may experience long-term impacts such as exposure to contaminants, alteration in habitat, and a change in community structure as a result of offshore oil and gas production. These impacts are generally localized and occur close to the production platform (within 100-200 m [328-656 ft] from the platform) (Montagna and Harper, 1996; Kennicutt et al., 1996; Hart et al., 1989; Kennicutt, 1995; CSA, 2004b). Hydrocarbon enrichment (elevated levels of hydrocarbon in the sediment) has been reported up to 200 m (656 ft) from petroleum platforms, and the concentrations decreased with distance from the platforms (Hart et al., 1989; Chapman et al., 1991; Kennicutt, 1995; Kennicutt et al., 1996). The concentrations of PAH's in the sediment surrounding platforms, however, were below the biological thresholds for marine organisms and appeared to have little effect on benthic organisms (Hart et al., 1989; McDonald et al., 1996; Kennicutt et al., 1996). The sedimentary environment surrounding a well may be altered by the disposal of cuttings on the seafloor where the sediment grain size near petroleum platforms was reportedly larger and enriched with sand compared with the surrounding environment (Kennicutt et al., 1996). Sediment was coarser within 100 m (328 ft) of a discharge site, though sediment alterations have been reported as far as 500 m (1,640 ft), depending on the surrounding environment and method of disposal (surface disposal or bottom shunting) (CSA, 2004b; Kennicutt et al., 1996).

Produced waters released during production are rapidly diluted, and acute impacts are generally only observed within proximity of the discharge point (Holdway, 2002; Gittings et al., 1992b). Chronic effects including decreased fecundity; altered larval development, viability, and settlement; reduced recruitment; reduced growth; reduced photosynthesis by phytoplankton; reduced bacterial growth; alteration of community composition; and bioaccumulation of contaminants were reported for benthic organisms close to discharges and out to 1,000 m (3,281 ft) from the discharge (Holdway, 2002; Burns et al., 1999). Produced waters should only impact localized populations of the soft bottom biota. The greatest impacts are reported adjacent to the discharge and are substantially reduced less than 100 m (328 ft) from the discharge. Also, USEPA's general NPDES permit restrictions on the discharge of produced water, which require the effluent concentration 100 m (656 ft) from the outfall to be less than the 7-day "no observable effect concentration" based on laboratory exposures, would help to limit the impacts on biological resources nearby (Smith et al., 1994). Measurements taken from a platform in the GOM showed discharge to be diluted below the no observable effect concentration within 10 m (33 ft) of the discharge (Smith et al., 1994). Such low concentrations would be expected to be even further diluted at greater distances from the well. For more information on produced waters and regulations, refer to **Chapters 3.1.1.4.2 and 3.1.1.7.2**.

Benthic invertebrates are resistant to shock waves from underwater explosions that result from structure removal by explosive. Impacts are predicted to be minimal from such explosions, and BSEE has regulations to minimize structure removal impact when using explosives (O'Keeffe and Young, 1984; Schroeder and Love, 2004; USDOI, MMS, 2005). However, no production structures are predicted to be removed by explosives, so there will be no impact from explosive structure removal as a result of an EPA proposed action.

Pipelines laid on the seafloor and anchors from vessels laying the pipelines may impact soft bottom habitats. Pipeline may be laid on the seafloor by dynamically positioned vessels (that use propeller jets to hold the vessel in position) or traditional anchored vessels. Traditional anchored pipeline-laying vessels affect more seafloor than the dynamically positioned vessels. These barges typically use an array of eight anchors weighing about 9,000 kg (19,842 lb) each. While the large anchors crush organisms in their footprint, a much larger area is affected by anchor cable sweep as the barge is pulled forward to lay the pipeline by reeling-in forward cables and reeling-out aft cables. The anchors are reset repeatedly to forward positions to allow the barge to "crawl" forward. In this way, the anchor sweep scours parallel paths on each side of the vessel where the cables touch the seafloor. Approximately 0.5-1 ha (1.2-2.5 ac) of seafloor is disturbed per kilometer (0.62 mi) of pipeline laid. It is anticipated that 0-82 km (0-51 mi) of pipeline may be laid with an EPA proposed action. Infauna will not be impacted by pipeline burial; however, as no new pipeline will be installed in water depths <60 m (200 ft) where burial is required. Pipelines are anticipated to run to the west to meet existing infrastructure. The tie-in with existing pipelines will minimize bottom disturbance in the EPA. Damage to infauna as a result of anchoring may take approximately 1 year to recover, depending on the reproductive cycle and immigration of surrounding communities (Rhodes and Germano, 1982).

Summary and Conclusion

As mentioned earlier, a majority of the seafloor of the GOM is soft bottom sediments. Drilling activities would occur directly in these soft substrates and pipelines would be laid upon them; however, these routine activities would only affect a small portion of the substrate and benthic communities of the GOM. Routine operations may affect soft bottom benthic communities through infrastructure emplacement, anchoring activity, turbidity, sedimentation, drilling effluent discharges, and produced-water discharges. Of the small area affected, the resultant impacts from drilling and produced-water discharges have been measured to reach only about 100-1,000 m (328-3,281 ft) from the production well. The greatest impact is the alteration of benthic communities as a result of smothering, chemical toxicity, and substrate change. Communities that are smothered by cuttings would repopulate, and populations that are eliminated as a result of sediment toxicity or organic enrichment would be taken over by more tolerant species. The community alterations are not so much the introduction of a new benthic community as a shift in species dominance (Montagna and Harper, 1996). These localized impacts generally occur within a few hundred meters of platforms, and the greatest impacts are seen close to the platform. Infauna may also be crushed by anchors or pipelines laid upon the seafloor. The footprint of disturbance will be relatively small compared with the soft bottom habitats in the GOM, and impacted areas are expected to repopulate within a year of disturbance (Rhodes and Germano, 1982). These repopulated habitats within the GOM are probably not very different from the early successional communities that predominate throughout areas of the GOM that are frequently disturbed (Rabalais et al., 2002; Gaston et al., 1998; Diaz and Solow, 1999). Benthic communities farther from a well would not be impacted by routine oil and gas activities.

4.1.1.11.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to soft bottom benthic communities. For additional information on the potential impacts of accidental events to soft bottom benthic communities, refer to Chapter 4.2.1.11.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.11of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The majority of the seafloor of the GOM is comprised of soft substrate. The soft bottom benthic communities of the EPA are described in **Chapter 4.1.1.11.1**. Any activity that may affect the soft bottom communities would only impact a small portion of the overall area of the seafloor of the GOM. Disturbances resulting from an EPA proposed action, including oil spills and blowouts, have the potential to disrupt and alter the soft bottom benthic communities. It is anticipated that for a typical sale in the EPA for the years between 2012 and 2051 that 3-12 exploration and delineation wells and 0-17 development and production wells could be drilled (**Table 3-2**). Based on these numbers compared with the overall size of the GOM, a very small percentage of the seafloor would be disturbed by routine oil and gas activity, leading to a small probability of accidental oil spills. However, if a spill were to occur, the benthic populations will be able to recover from disturbances through nearby population recruitment and settlement because soft bottom substrate and the associated communities are ubiquitous throughout the GOM.

Proposed Action Analysis

Accidental releases of oil could occur as a result of an EPA proposed action. The probability of surface water oiling occurring as a result of an EPA proposed action was estimated by the Bureau of Ocean Energy Management's OSRA model for spills ≥1,000 bbl and ≥10,000 bbl. The mean number of offshore spills ≥1,000 bbl is estimated to be between 0 and 0.08 spills for an EPA proposed action, and the probability of one or more spills of the same size occurring is estimated to be between 0 and 8 percent (**Table 3-21**). The mean number of offshore spills ≥10,000 bbl is estimated to be fewer (between 0 and 0.02 spills for an EPA proposed action), and the probability of one or more spills of the same size occurring is estimated to be between 0 and 2 percent (**Table 3-22**).

The OSRA model estimated combined probabilities of one or more hypothetical spills ≥1,000 bbl occurring and contacting surface waters in specific polygons delineated on the GOM as a result of an EPA proposed action. The OSRA model estimated a <0.5 percent probability that the surface waters off the Florida coast from the shoreline to 300 m (984 ft) deep (polygons N8, N9, N10, N11, S8, S9, and S10) would be oiled within 10 days of a hypothetical spill, except for the few blocks in the CPA south of Mobile Bay (polygon S7) that had a 1 percent probability (**Figure 3-16**). The polygons closest to the proposed EPA lease sale area (polygons D16, D17, D18, D19, and D21) had the greatest chance of oiling within 10 days (3% probability). The OSRA model estimated a <0.5 percent probability that the surface waters along the Florida coast between the shoreline and 20 m (66 ft) deep (polygons N9, N10, and N11), as well as the waters out to 300 m (984 ft) deep off the southern portion of Florida (polygon S10) could be oiled within 30 days of a spill (**Figure 3-17**). The surface waters off the northern half of Florida in waters between 20 and 300 m (66 and 984 ft) deep had a 1 percent probability of oiling within 30 days (polygons S8 and S9) and the few blocks in the CPA, south of Mobile Bay, in waters greater than 20 m (66 ft) (polygon S7) had a 2 percent probability. The greatest probability of oiled surface waters within 30 days of a spill (4%) was in the deepwater polygons D16 and D17, near the proposed lease sale area. Other nearby deepwater polygons have a 3 percent probability of experiencing surface water oiling within 30 days of a spill (polygons D15, D18, D19, D21, and D24). The chances of oil from the surface water reaching the seafloor would be reduced based on limited physical mixing abilities, dispersion with distance from the source, weathering over time, and distance from the point of release.

Oil released to the environment as a result of an accidental event may impact soft bottom benthic communities in several ways. Oil may be physically mixed into the water column from the sea surface, be injected below the sea surface and travel with currents, be dispersed in the water column, or be adsorbed to sediment particles and sink to the seafloor. A brief description of the exposure routes is discussed below.

An oil spill that occurs at the sea surface would result in a majority of the oil remaining at the sea surface. Lighter compounds in the oil may evaporate, and some components of the oil may dissolve in the seawater. Evaporation allows the removal of the most toxic components of the oil, while dissolution may allow bioavailability of hydrocarbons to marine organisms for a brief period of time (Lewis and Aurand, 1997). Remnants of the oil may then emulsify with water or adsorb to sediment particles and fall to the seafloor.

The fact that the proposed EPA lease sale area is in deep water helps to protect the soft bottom benthic communities from a surface oil spill. Disturbance of the sea surface by storms can mix surface oil into the water column, but the effects are generally limited to the upper 10 m (33 ft). Modeling exercises have indicated that oil may reach a depth of 20 m (66 ft). Yet at this depth, the spilled oil would be at concentrations several orders of magnitude lower than the amount shown to have an effect on marine organisms (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002). Therefore, the depth of the seafloor should protect them from physical mixing of surface oil below the sea surface. Soft bottom benthic communities in water depths shallower than 10 m (33 ft) would be far removed from the source of a spill in the proposed EPA lease sale area, and therefore, the oil would be well dispersed if it were to reach the waters above the shallow water soft bottom benthic communities. The low probability of oil reaching the surface waters above shallow soft bottom benthic communities, based on the OSRA model, combined with the limited depth of the mixing of surface, function to protect the soft bottom benthic communities.

A spill that occurs below the sea surface (i.e., at the rig, along the riser between the seafloor and sea surface, or through leak paths on the BOP/wellhead) would result in most of the released oil rising to the sea surface. All known reserves in the GOM have specific gravity characteristics that would preclude oil from sinking immediately after release at a blowout site. As discussed in **Chapter 3.2.1.4.4**, oil discharges that occur at the seafloor from a pipeline or loss of well control would rise in the water column, surfacing almost directly over the source location, thus not impacting sensitive benthic communities. If the oil is ejected under high pressure, oil droplets may become entrained in the water column (Boehm and Fiest, 1982; Adcroft et al., 2010). The upward movement of the oil may be reduced if methane mixed with the oil is dissolved into the water column, reducing the oil's buoyancy (Adcroft et al., 2010). The large oil droplets would rise to the sea surface, but the smaller droplets, formed by vigorous turbulence in the plume or the injection of dispersants, may remain neutrally buoyant in the water column, creating a subsurface plume (Adcroft et al., 2010; Joint Analysis Group, 2010). Dispersed oil in the water column begins to biodegrade and may flocculate with particulate matter, promoting sinking of the particles.

A subsurface spill or plume may impact both infaunal and surface-dwelling organisms in soft bottom benthic communities. Oil or dispersed oil may cause sublethal impacts to benthic organisms if a plume reaches them. Impacts may include loss of habitat and biodiversity, contamination of substrate, change in community structure, toxicity to larvae and embryos, and failed reproductive success. Oil adhered to sediment or sedimentation as a result of a blowout would impact benthic organisms, although the greatest impact would be to those organisms closest to the spill. Communities farther from the spill may experience low-level exposure and possibly sublethal impacts.

Any impacts that may occur to benthic communities as a result of a spill would depend on the type of spill, distance from the spill, and surrounding physical characteristics of the environment (e.g., turbidity, currents). It is important to note that soft sediments cover a majority of the seafloor of the GOM and any impacts incurred, even lethal exposures, would not impact the overall population of soft bottom benthic organisms that inhabit the seafloor of the GOM. Any local communities that are lost would be repopulated fairly rapidly (Neff, 2005). Many communities are continuously in an early successional stage and would reach their previous community composition rapidly, in as little as 1 year (Gaston et al., 1998).

Summary and Conclusion

As described above, most of the oil released from a spill would rise to the sea surface and therefore reduce the amount of oil that may directly contact soft bottom benthic communities. Small droplets of oil in the water column could attach to suspended particles in the water column, sink to the seafloor, and possibly contact benthic communities (McAuliffe et al., 1975). Because of the small amount of proportional space that OCS activities occupy on the seafloor, only a very small portion of the seafloor of the GOM would be expected to experience lethal impacts in an accidental event, as a result of blowouts, surface and subsurface oil spills, and their associated effects. The greatest impacts would be closest to the spill, and impacts would decrease with distance from the spill. Contact with spilled oil at a distance from the spill would likely cause sublethal to immeasurable effects to benthic organisms because the distance of activity would prevent contact with concentrated oil. Oil from a subsurface spill that reaches benthic communities would be primarily sublethal and impacts would be at the local community level. Any sedimentation and sedimented oil would also be at low concentrations by the time it reaches benthic communities far from the location of the spill, also resulting in sublethal impacts. Also, any local communities that are lost would be repopulated fairly rapidly (Neff, 2005). Although an oil spill may have some detrimental impacts, especially closest to the occurrence of the spill, the impacts may be no greater than natural biological fluctuations (Clark, 1982), and impacts would be to an extremely small portion of the overall GOM.

4.1.1.11.4. Cumulative Impacts

This is a summary of the potential cumulative impacts to soft bottom benthic communities. For additional information on the potential cumulative impacts to soft bottom benthic communities, refer to Chapter 4.2.1.11.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.11 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

This cumulative analysis considers the effects of impact-producing factors related to soft bottoms of the Gulf of Mexico continental shelf. An EPA proposed action plus those actions related to prior and future OCS oil and gas lease sales, as well as non-oil and gas impacts, are considered. The vast majority of the Gulf of Mexico seabed is comprised of soft sediments, and drilling is focused on these sediments, so the greatest number of OCS oil- and gas-related impacts occurs on soft bottom benthic environments. Specific OCS oil- and gas-related, impact-producing factors considered in the analysis are structure emplacement and removal, anchoring, discharges from well drilling, produced waters, pipeline emplacement, oil spills, blowouts, and operational discharges. No new pipeline will be installed in water depths <60 m (200 ft) as a result of an EPA proposed action, and therefore, no burial will be necessary. In addition, no structures are to be removed as part of a proposed action. Other non-OCS oil- and gas-related impacts that may occur and adversely affect soft bottom benthic communities include commercial fisheries, natural disturbances, anchoring by recreational boats and other non-oil and gas commercial vessels, spillage from import tankering, bottom trawling, and storm events; all have the potential to damage soft bottom benthic communities.

Soft mud bottoms are the substrate upon which well drilling occurs. It is important to note, however, that because the soft bottom benthic communities comprise a majority of the seafloor of the Gulf of Mexico, impacts are not detrimental to the overall population of these habitats across the Gulf of Mexico. The size of the proposed EPA lease sale area is 657,905 ac, which is a small portion of the EPA (64,563,679 ac) and GOM (159,586,843 ac,) overall (or approximately 1% of the EPA and 0.4% of the entire GOM), and only a small portion of the proposed lease sale area will be affected. Also, because a large portion of the seafloor is subject to natural fluctuations and physical disturbances (such as storms), a permanent early successional community occupies much of the seafloor and enables rapid recovery of disturbed areas.

OCS Oil- and Gas-Related Impacts

Structure placement and anchor damage from support boats and ships, floating drilling units, and pipeline-laying vessels are OCS oil- and gas-related threats that disturb areas of the seafloor. The size of the areas affected by chains associated with anchors and pipeline-laying barges would depend on the water depth, chain length, sizes of anchor and chain, method of placement, wind, and current (Lissner et al., 1991). Anchor damage could result in the crushing and smothering of infauna. Anchoring may destroy habitat by being dragged over the seafloor or by the vessel swinging at anchor, causing the anchor chain to drag over the seafloor (Lissner et al., 1991). Typical areas of seafloor affected by structure emplacement in deep water range from 0.62 to 7 ac per well. Considering that there may be up to 17 development and production wells, 10.54-119 ac of the 657,905 ac (0.002-0.02%) of the proposed

EPA lease sale area may be affected by structure emplacement. Refer to **Chapter 3.1.1.3** for more details on seafloor disturbance from routine oil and gas activity and to **Chapter 3.1.1.1.1** for the scenario information.

Pipeline may be laid on the seafloor by dynamically positioned vessels (that use propeller jets to hold the vessel in position) or traditional anchored vessels. Traditional anchored pipeline-laying vessels affect more seafloor than the dynamically positioned vessels. These barges typically use an array of eight anchors weighing about 9,000 kg (19,842 lb) each. While the large anchors crush organisms in their footprint, a much larger area is affected by anchor cable sweep as the barge is pulled forward to lay the pipeline by reeling-in forward cables and reeling-out aft cables. The anchors are reset repeatedly to forward positions to allow the barge to "crawl" forward. In this way, the anchor sweep scours parallel paths on each side of the vessel where the cables touch the seafloor. Approximately 0.5-1 ha (1.2-2.5 ac) of seafloor is disturbed per kilometer (0.62 mi) of pipeline laid. It is anticipated that 0-82 km (0-51 mi) of pipeline may be laid with an EPA proposed action. Infauna will not be impacted by pipeline burial, however, as no new pipeline will be installed in water depths <60 m (200 ft) where burial is required. Pipelines are anticipated to run to the west to meet existing infrastructure. The tie-in with existing pipelines will minimize bottom disturbance in the EPA. Damage to infauna as a result of anchoring may take approximately 1 year to recover, depending on the reproductive cycle and immigration of surrounding communities (Rhodes and Germano, 1982).

Routine discharges of drilling muds and cuttings by oil and gas operations could affect biological communities and organisms through a variety of mechanisms, including the smothering of organisms through deposition or less obvious sublethal effects (impacts to growth and reproduction). Smothering of infauna by drilling discharges may be one of the greatest impacts to localized communities near a well. The heaviest concentrations of well cuttings and drilling fluids have been reported within 250 m (820 ft) of deepwater wells and are shown to decrease beyond that distance (CSA, 2006). A rough estimate of benthic impacts can be calculated by assuming the radius of disruption around a well is 250 m (820 ft), and therefore, the area of disruption is 196,250 m^2 (0.196 km^2; 49 ac). If up to 17 individual development and production wells are drilled, the area or benthic disturbance would be 3,336,250 m^2 (3.34 km^2; 824 ac). However, if some wells are drilled from the surface location, the surface area of the seafloor disturbed would be less than the above calculated number, but the thickness of the cuttings on the seafloor would be greater from repeated deposition. The area of seafloor disturbed by cutting and mud discharge, therefore, would only be 0.13 percent of the proposed EPA lease sale area. Although impacts are locally drastic, cumulative impacts over the seafloor of the Gulf of Mexico are anticipated to be very minimal, as such comparatively small areas are affected.

Produced waters from petroleum operations are not likely to have much impact on soft bottom communities. Produced waters are rapidly diluted, impacts are generally only observed within proximity of the discharge point, and acute toxicity that may result from produced waters occurs "within the immediate mixing zone around a production platform" (Gittings et al., 1992b; Holdway, 2002). Impacts to sediment and marine organisms are generally reported within a 100-m (328-ft) range of the produced-water discharge (Neff and Sauer, 1991; Trefry et al., 1995). Also, USEPA's general NPDES permit restrictions on the discharge of produced water require the effluent concentration 100 m (328 ft) from the outfall to be less than the 7-day no observable effect concentration based on laboratory exposures (Smith et al., 1994). Therefore, minimal impacts to infauna are anticipated from produced waters.

Oil spills may have an impact on the benthic communities of the Gulf of Mexico. Surface oil spills released from tankers may impact shallow, nearshore benthic communities through physical contact. Surface oil slicks released offshore can be moved toward shore by winds, but oil mixed into the water column is moved by water currents, which do not generally travel toward shore (Pond and Pickard, 1983; Inoue et al., 2008). Disturbance of the sea surface by storms can mix surface oil 10-20 m (33-66 ft) into the water column (Lange, 1985; McAuliffe et al., 1975 and 1981a; Tkalich and Chan, 2002). This may result in direct oil contact or exposure to water soluble fractions for shallow, nearshore benthic communities, resulting in lethal impacts to organisms (Suchanek, 1993; Beiras and Saco-Álvarez, 2006; Byrne, 1989) or impaired embryonic development (Byrne and Calder, 1977; Nicol et al., 1977; Vashchenko, 1980). If such events were to occur, recovery to pre-impact conditions could take approximately a year (Lu and Wu, 2006; Neff, 2005), with the overall recovery time depending on the extent of oiling, presence of recolonizers nearby, time of year for reproduction of those colonizers, currents and water circulation patterns, and the ability of the recolonizers to tolerate the sediment conditions (Ganning et al., 1984). Recovery of benthic populations in soft subtidal environments, however, has been reported to take up to 5-10 years after oiling (Ganning et al., 1984; Gómez Gesteira and Dauvin, 2000).

Benthic communities farther offshore, in deeper water, however, would be protected from direct physical contact of surface oil by their depth below the sea surface. Any dispersed surface oil from a tanker or rig spill that may reach the benthic communities on the seafloor of the Gulf of Mexico at a depth >10 m (33 ft) would be expected to be at very low concentrations (<1 ppm) (McAuliffe et al., 1981a and 1981b; Lewis and Aurand, 1997). Such concentrations may not be life threatening to adult stages of soft bottom benthic communities, but they may harm larval or embryonic life stages of some benthic organisms (Fucik et al., 1995; Suchanek, 1993; Beiras and Saco-Álvarez, 2006; Byrne, 1989). Other organisms, such as coral larvae and adults, have been reported to be more resistant at those concentrations (Lewis, 1971; Elgershuizen and De Kruijf, 1976; Knap, 1987; Wyers et al., 1986; Cohen et al., 1977; Jackson et al., 1989; Guzmán et al., 1991).

Potential blowouts may impact the biota of the soft bottom benthic communities. If any blowouts from wells occur, the suspended sediments should settle out of the water column fairly quickly, locally smothering benthic organisms near the well. Any oil that becomes entrained in a subsurface plume would be dispersed over a wide area as it travels in the water column, reaching low concentrations with sublethal to immeasurable effect (Vandermuelen, 1982; Tkalich and Chan, 2002). If concentrated oil were to contact the soft bottom communities directly, the impacts may include lethal effects with loss of habitat and biodiversity, contamination of substrate, change in community structure, and failed reproductive success. Damage to infauna as a result of subsurface plume exposure may take approximately 1 year to recover, depending on the reproductive cycle and immigration of surrounding communities (Rhodes and Germano, 1982).

A catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, would have similar impacts to soft bottom benthic communities as a smaller-scale spill, except the impacts to the communities would affect a larger footprint of the seafloor. The greatest impact would still remain closest to the source, and impacts would decrease with distance from the source as the oil became more diluted and degraded by mixing with water and was broken down by microbes. Impacts would include fouling of benthic organisms, their food, and their habitat. Recovery would take approximately 1 year for less impacted populations, further from the source, to 5-10 years for those populations closer to the source with heavier oiling (Rhodes and Germano, 1982; Ganning et al., 1984; Gómez Gesteira and Dauvin, 2000). Refer to **Appendix B** for a more detailed discussion of the impacts of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action.

Non-OCS Oil- and Gas-Related Impacts

Severe physical damage may occur to soft bottom sediments and the associated benthic communities as a result of non-OCS oil and gas activities. Infauna associated with soft bottom sediments of the EPA are adapted to routine exposure to natural disturbances such as turbidity and storms. Human disturbance, such as trawling or non-OCS oil and gas activity-related oil spills, may cause damage to infauna, possibly leading to changes of physical integrity, species diversity, or biological productivity. However, because some benthic communities in the northern Gulf of Mexico are permanently in early community successional stages due to frequent disturbances, full recovery may occur very quickly (Rabalais et al., 2002; Gaston et al., 1998; Diaz and Solow, 1999).

Non-OCS oil and gas activities have a greater potential to affect the soft bottom communities of the region than BOEM-regulated activities because they affect a larger area of the seafloor and therefore a larger portion of the benthic population than the localized oil and gas activities. Natural events such as storms, extreme weather, and fluctuations of environmental conditions may impact widely spread areas of soft bottom infaunal communities. Soft bottom communities occur from the shoreline into the deep waters of the Gulf of Mexico. Storms can physically affect shallow bottom environments, causing an increase in sedimentation, burial of organisms by sediment, a rapid change in salinity or dissolved oxygen levels, storm surge scouring, remobilization of contaminants in the sediment, and abrasion and clogging of gills as a result of turbidity (Engle et al., 2008). Storms have also been shown to uproot benthic organisms from the sediment and suspend organisms in the water column (Dobbs and Vozarik, 1983). Large storms may devastate infaunal populations; for example, 2 months after Hurricane Katrina, a significant decrease in the number of species, species diversity, and species density occurred in coastal waters off Louisiana, Mississippi, and Alabama (Engle et al., 2008). Such impacts may be devastating to a benthic community.

Recreational boating, fishing, and import tankering may have limited impact on soft bottom communities. Ships anchoring near major shipping fairways of the EPA or recreational fishing boats setting anchor would impact bottom habitats. Anchor placement may crush and eliminate infauna in the footprint of the anchor. However, no vessels are anticipated to anchor in the proposed EPA lease sale area other than OCS oil-and gas-related vessels.

Damage resulting from commercial fishing, especially bottom trawling, may have a severe impact on large portions of soft bottom benthic communities. Bottom trawling in the Gulf of Mexico primarily targets shrimp from nearshore waters to depths of approximately 90 m (295 ft) (NRC, 2002), which are the depths where the greatest trawling impacts are anticipated. Trawling may lead to reduced species diversity, physical removal of organisms, reduced reproductive success, increased turbidity, and a community dominated by opportunistic species (McConnaughey et al., 2000; Engel and Kvitek, 1998). Although trawling may impact other portions of the EPA, it will not impact the proposed lease sale area, which is too deep (800 m; 2,625 ft) for trawlers.

Summary and Conclusion

Impacts from routine activities of OCS oil and gas operations include anchoring, structure emplacement and removal, pipeline emplacement, drilling discharges, and discharges of produced waters. In addition, accidental subsea oil spills or blowouts associated with OCS oil and gas activities can cause damage to infaunal communities. Long-term OCS oil and gas activities are not expected to adversely impact the entire soft bottom environment because the local impacted areas are extremely small compared with the entire seafloor of the Gulf of Mexico and because impacted communities are repopulated relatively quickly. Also, USEPA's general NPDES permit restrictions on the discharge of produced water, which require the effluent concentration 100 m (328 ft) from the outfall to be less than the 7-day no observable effect concentration based on laboratory exposures, would help to limit the impacts on benthic communities (Smith et al., 1994).

Impacts from blowouts, pipeline emplacement, muds and cuttings discharges, other operational discharges, and structure removals may have local devastating impacts, but the cumulative effect on the overall seafloor and infaunal communities on the Gulf of Mexico would be very small. Soft bottom benthic communities are ubiquitous throughout and often remain in an early successional stage due to natural fluctuation, and therefore, the activities of OCS production of oil and gas would not cause additional severe cumulative impacts.

Non-OCS oil and gas activities that may occur on soft bottom benthic substrate of the EPA include recreational boating and fishing, import tankering, and natural events such as extreme weather conditions and extreme fluctuations of environmental conditions. These activities could cause temporary damage to soft bottom communities. Oil spills from non-OCS oil and gas import tankering or other activity may result in oiled benthic communities that would only repopulate once the concentration of oil in the sediment has decreased. Most non-OCS oil and gas activities (anchoring, fishing, and storm waves) should not occur in such deep water and, therefore, should not impact the proposed EPA lease sale area.

The overall and incremental contribution of an EPA proposed action to the cumulative impact is expected to be slight, with possible impacts from physical disturbance of the bottom, discharges of drilling muds and cuttings, other OCS oil and gas discharges, and oil spills. Non-OCS oil and gas factors, such as storms, trawling, and non-OCS oil- and gas-related spills are not likely to impact the proposed EPA lease sale area. Impacts from OCS oil and gas activities are also somewhat minimized by the fact that these communities are ubiquitous through the EPA and can recruit quickly from neighboring areas.

4.1.1.12. Marine Mammals

While there are many similar species in both the CPA and EPA, there are some important ecological differences (seagrass beds and warm coastal waterways of Florida) that result in the higher likelihood of seeing both Bryde's whales and manatees in the proposed EPA lease sale area. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for marine mammals can be found in Chapter 4.2.1.12 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.12 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from these chapters would be equally applicable for marine mammals regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for marine mammals presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for marine mammals presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. The analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on marine mammals, and various Internet sources were examined to determine any recent information regarding marine mammals. Sources investigated included, but were not limited to, journals and scientific articles, Google, Google Scholar, and other Federal and State natural resource management agency websites. All new relevant information was incorporated into the analyses below. No new significant information was discovered regarding marine mammals since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, BOEM concludes that the unavailable information resulting from the *Deepwater Horizon* explosion, oil spill, and response and from an ongoing unusual mortality event (UME), and impacts to marine mammals could be relevant to reasonably foreseeable significant adverse effects. Although activities will be ongoing under existing leases whether or not an EPA proposed action takes place, BOEM at this point cannot determine if the potential data and information incoming from the *Deepwater Horizon* explosion, oil spill, and response and from the UME would be essential to a reasoned choice among the alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Data are being developed through the NRDA process and at the direction of NMFS (which has jurisdiction over marine mammal strandings). It will be years before the studies currently underway produce available data. Little data, beyond raw numbers of strandings, have been made public through the NRDA process. For example, new data are still being investigated and developed 20 years after the *Exxon Valdez* event (Matkin et al., 2008). This information will not be available within the timeframe contemplated by this NEPA analysis. In its place, the scientifically credible information that is available has been incorporated using accepted scientific methodologies. Refer to the section below titled "Marine Mammal Resources in the Eastern Planning Area" for additional information on incomplete and unavailable information on impacts to marine mammals.

4.1.1.12.1. Description of the Affected Environment

The U.S. Gulf of Mexico marine mammal community is diverse and distributed throughout the northern Gulf waters. Twenty-one species of cetaceans regularly occur in the Gulf of Mexico (Jefferson et al., 1992; Davis et al., 2000) and are identified in NMFS's Gulf of Mexico Stock Assessment Reports (Waring et al., 2012) in addition to one species of Sirenian. The Gulf of Mexico's marine mammals are represented by members of the taxonomic order Cetacea, which is divided into the suborders Mysticeti (i.e., baleen whales) and Odontoceti (i.e., toothed whales), as well as the order Sirenia, which includes the manatee and dugong. Most GOM cetacean species have worldwide distributions; however, two exceptions are Atlantic spotted dolphins (*Stenella frontalis*) and clymene dolphins (*Stenella clymene*).

There are species that have been reported from Gulf waters, either by sighting or stranding, that, due to their rarity, are not considered (Wursig et al., 2000; Mullin and Fulling, 2004). These species include the blue whale (*Balaenoptera musculus*), the northern right whale (*Eubalaena glacialis*), the Sowerby's beaked whale (*Mesoplodon bidens*), the humpback whale (*Megaptera novaeangliae*), the fin whale (*Balaenoptera physalus*), the sei whale (*Balaenoptera borealis*), and the minke whale (*Balaenoptera acutorostrata*), all considered rare occasional migrants in the Gulf (Wursig et al., 2000; Mullin and Fulling, 2004). Because these species are uncommon in the GOM, they are not included in the most recent NMFS Gulf of Mexico Stock Assessment Reports (Waring et al., 2012).

The West Indian manatee (*Trichechus manatus*) is commonly found in the EPA typically inhabiting coastal marine, brackish, and freshwater areas of the southeastern U.S., Gulf of Mexico, and Caribbean Sea (Jefferson et al., 1993; O'Shea et al., 1995). While manatees are not expected to be found in the proposed EPA lease sale area, they have been seen hundreds of miles offshore and in deep waters (Fertl et al., 2005). There are two subspecies of the West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern GOM to Virginia; and the Antillean manatee (*T. m. manatus*), which ranges from northern Mexico to eastern Brazil, including the islands of the Caribbean Sea. Manatees are not expected to be seen in the proposed EPA lease sale area; however, there have been three separate manatee sitings near oil rigs in the CPA in water depths as great as 1,828 m (6,000 ft) (Epperson, official communication, 2013; Fertl et al., 2005).

Threatened or Endangered Species

There is only one cetacean, the sperm whale (*Physeter macrocephalus*), and one sirenian, the West Indian manatee (*Trichechus manatus*), that regularly occur in the GOM and that are listed as endangered under the Endangered Species Act of 1973 (ESA). The sperm whale is common in oceanic waters of the northern GOM and appears to be a resident species. The West Indian manatee (*Trichechus manatus*) typically inhabits only coastal marine, brackish, and freshwater areas and is not expected to be in the proposed EPA lease sale area.

Nonendangered Species

One baleen cetacean (Bryde's whale, *Balaenoptera edeni*) and 19 toothed cetaceans (including beaked whales and dolphins) occur in the Gulf of Mexico. None of these species are protected under the ESA; however, all marine mammals are protected under the Marine Mammal Protection Act (1972).

The only commonly occurring baleen whale in the northern Gulf of Mexico is the Bryde's whale (*Balaenoptera edeni*). The other baleen whales that have been sighted in the GOM are either considered rare or extralimital by Waring et al. (2012). The Bryde's whale (*Balaenoptera edeni*) is found in tropical and subtropical waters throughout the world. Bryde's whales in the northern GOM, with few exceptions, have been sighted along a narrow corridor near the 100-m (328-ft) isobath (Davis and Fargion, 1996; Davis et al., 2000). Most sightings have been made in the De Soto Canyon region and off western Florida, although there have been some in the west-central portion of the northeastern GOM. The best estimate of abundance for Bryde's whales in the northern GOM is 15 individuals (Waring et al., 2012).

Factors Influencing Cetacean Distribution and Abundance

The distribution and abundance of cetaceans within the northern Gulf of Mexico is strongly influenced by various mesoscale oceanographic circulation patterns. These patterns are primarily driven by river discharge (primarily the Mississippi River), wind stress, and the Loop Current and its derived circulation phenomena. Circulation on the continental shelf is largely wind-driven, with localized effects from freshwater (i.e., river) discharge. Beyond the shelf, mesoscale circulation is largely driven by the Loop Current in the eastern Gulf of Mexico. Approximately once or twice a year, the Loop Current sheds anticyclonic eddies (also called warm-core rings). Anticyclones are long-lived, dynamic features that generally migrate westward and transport large quantities of high-salinity, nutrient-poor water across the near-surface waters of the northern Gulf of Mexico. These anticyclones, in turn, spawn cyclonic eddies (also called cold-core rings) during interaction with one another and upon contact with topographic features of the continental slope and shelf edge. These cyclonic eddies contain and maintain high concentrations of nutrients and stimulate localized production (Davis et al., 2000). In the north-central Gulf of Mexico, the relatively narrow continental shelf south of the Mississippi River Delta may be an additional factor affecting cetacean distribution (Davis et al., 2000). Outflow from the mouth of the Mississippi River transports large volumes of low-salinity, nutrient-rich water southward across the continental shelf and over the slope. River outflow also may be entrained within the confluence of a cyclone-anticyclone eddy pair and transported beyond the continental slope. Marine predators such as the bottlenose dolphin focus their foraging efforts on these abundant prey locations to improve overall foraging efficiency and to reduce energy costs (Bailey and Thompson, 2010).

Unusual Mortality Event for Cetaceans in the Gulf of Mexico

On December 13, 2010, NMFS declared an unusual mortality event (UME) for cetaceans (whales and dolphins) in the Gulf of Mexico (No. 51). An UME is defined under the Marine Mammal Protect Act as a "stranding that is unexpected, involves a significant die-off of any marine mammal population, and demands immediate response." Evidence of the UME was first noted by NMFS as early as February 2010, before the *Deepwater Horizon* explosion, oil spill, and response. As of August 4, 2013, a total of 1,031 cetaceans (5% stranded alive and 95% stranded dead) have stranded since the start of the UME, with a vast majority of these strandings between Franklin County, Florida, and the Louisiana/Texas border. The 1,031 cetaceans include 6 dolphins killed during a fish-related scientific study and 1 dolphin killed incidental to trawl relocation for a dredging project. More detail on the UME can be found on NMFS's website at http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico2010.htm (USDOC, NMFS, 2013a).

In addition to investigating all other potential causes, scientists are investigating what role *Brucella* may have played in the UME and this continues today. As of June 30, 2013, 27 out of 107 dolphins tested were positive or suspect positive for *Brucella*. *Brucella* spp. refers to a genus of bacteria that infect many terrestrial and aquatic vertebrates around the world. The disease, called brucellosis, is best known for its role in causing abortion in domestic livestock and undulant fever in people.

It is unclear at this time whether the increase in strandings is related partially, wholly, or not at all to the *Deepwater Horizon* explosion, oil spill, and response. The NMFS has documented an additional 12 UME's that have been previously declared in the GOM for cetaceans (an additional 7 specific to manatees only) since 1991. According to their website, NMFS considers the investigation into the cause of the UME and the potential role of the *Deepwater Horizon* explosion, oil spill, and response to be "ongoing and no definitive cause has yet been identified for the increase in cetacean strandings in the northern Gulf in 2010 to the present." It is therefore unclear whether increases in stranded cetaceans during and after the *Deepwater Horizon* response period are or are not related to impacts from the *Deepwater Horizon* explosion, oil spill, and response, and it will likely remain unclear until NMFS completes its UME and NRDA evaluation processes.

On May 9, 2012, NOAA declared an UME for bottlenose dolphins in five Texas counties (No. 56). The UME lasted from November 2011-March 2012, when 123 bottlenose dolphins stranded in Aransas, Calhoun, Kleberg, Galveston, and Brazoria Counties in Texas. Of the 123 animals stranded, only 4 were found alive. Preliminary findings included infection in the lung, poor body condition, discoloration of the teeth, and in four animals, a black/grey, thick mud-like substance in the stomachs was found. The strandings were coincident with a harmful algal bloom of *Karenia brevis* that started in September 2011 in southern Texas, but researchers have not determined that was the cause of the event. Currently, there are no red tide blooms occurring in the region, and stranding rates have returned to normal levels (USDOC, NMFS, 2013b).

As of March 11, 2013, a red tide event in southwest Florida has claimed 174 manatees so far this year, since first detecting the red tide bloom in late September 2012. Although results are preliminary, this is the highest number of red tide-related deaths in a single calendar year on record. State and Federal scientists are monitoring and responding to manatees affected by the ongoing red tide bloom along the southwest Florida coast (Florida Fish and Wildlife Conservation Commission, 2013). Research into the causes of death is currently ongoing and undetermined for the No. 58 Florida UME. A previous UME in 2011 (No. 52) was caused by ecological factors.

Deepwater Horizon Explosion, Oil Spill, and Response

The *Deepwater Horizon* explosion in Mississippi Canyon Block 252 and the resulting oil spill and related spill-response activities (including use of dispersants) have impacted marine mammals that have come into contact with oil and remediation efforts. According to the Dolphins and Whales of the Gulf of Mexico Oil Spill website, within the designated *Deepwater Horizon* explosion and oil spill area, 171 marine mammals (89% of which were deceased) were reported and collected from directed captures and from strandings (visibly oiled, not visibly oiled, or pending further data). This includes 155 bottlenose dolphins, 2 *Kogia* spp., 2 melon-headed whales, 6 spinner dolphins, 2 sperm whales, and 4 unknown species (USDOC, NFMS, 2012b). All marine mammals collected either alive or dead were found east of the Louisiana/Texas border through Apalachicola, Florida. The highest concentration of strandings has occurred off eastern Louisiana, Mississippi, and Alabama, with a significantly lesser number off western Louisiana and western Florida (USDOC, NMFS, 2012b). Due to known low-detection rates of carcasses, it is possible that the number of deaths of marine mammals is underestimated (Williams et al., 2011a). It is also important to note that evaluations have not yet confirmed the cause of death, and it is possible that many, some, or no carcasses were related to the oil spill resulting from the *Deepwater Horizon* explosion. These stranding numbers are significantly greater than reported in past years, though it should be further noted that stranding coverage (i.e., effort in collecting strategies) has increased considerably due to the *Deepwater Horizon* explosion, oil spill, and response.

Marine Mammal Resources in the Eastern Planning Area

The final determinations on damages to marine mammal resources from the *Deepwater Horizon* explosion, oil spill, and response will ultimately be made through the NRDA process. The *Deepwater Horizon* explosion, oil spill, and response will ultimately allow a better understanding of any realized effects from such a low-probability catastrophic spill, which is not reasonably expected and not part of an EPA proposed action. However, the best available information on impacts to marine mammals does not yet provide a complete understanding of the effects of the oil spill and active response/cleanup activities from the *Deepwater Horizon* explosion, oil spill, and response on marine mammals as a whole in the GOM and in the EPA in particular, and whether these impacts reach a population level. There is also an incomplete understanding of the potential for population-level impacts from the ongoing UME.

Here, BOEM concludes that the unavailable information from these events may be relevant to reasonably foreseeable significant adverse impacts to marine mammals. In some specific cases, such as with bottlenose dolphins as noted below, the unavailable information may also be relevant to a reasoned choice among the alternatives based on the discussion below. The cost of obtaining data on the effects from the UME and/or *Deepwater Horizon* explosion, oil spill, and response are exorbitant; duplicative of efforts already being undertaken as part of the UME and NRDA and would likewise take years to acquire and analyze through the existing NRDA and UME processes. Further, impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. For example, even 20 years after the *Exxon Valdez* spill, long-term impacts to marine mammal populations are still being investigated (Matkin et al., 2008). Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

BOEM does, however, provide the following analyses for select marine mammal species as they relate to the EPA, relevant to the *Deepwater Horizon* explosion, oil spill, and response, and UME discussion:

- **Sperm whales** are found in oceanic waters throughout the GOM and appear to be a resident species. During and following the *Deepwater Horizon* explosion, oil spill, and response, two dead sperm whales have been documented within the *Deepwater Horizon* affected area (USDOC, NMFS, 2012b). It is yet unknown whether the *Deepwater Horizon* explosion, oil spill, and response was the cause of death for these two individuals. Waring et al. (2012) reported the estimated population size of the northern GOM sperm whale population to be 1,665 individuals. Further, the Potential Biological Removal for this population is 2.8 animals, based on a minimum population estimate of 1,409. The Potential Biological Removal is defined as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population" (Waring et al., 2012). If a protective assumption is made that the two sperm whales detected above were removed from the population as a result of the spilled oil and not natural causes (and coincidentally found floating in oiled areas), then the Potential Biological Removal was not reached. Given other sperm whales may have been killed but gone undetected (again this is a protective assumption due to low detection rates as described above), there is the potential that the Potential Biological Removal was reached and the population would no longer be operating at its optimum sustainable level.

It is important to note that "optimum sustainable level" does not mean jeopardy to the population (i.e., a change leading to extinction). Rather, it is defined under the Marine Mammal Protection Act to mean "a population size which falls within a range from the population level of a given species or stock which is the largest supportable within the ecosystem to the population level that results in maximum net productivity. Maximum net productivity is the greatest net annual increment in population numbers or biomass resulting from additions to the population due to reproduction and/or growth less losses due to natural mortality" (50 CFR § 216.3). In contrast, the term "jeopardy" under the ESA means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR § 402.02). So, exceeding the Potential Biological Removal does not imply jeopardizing the continued existence of the population but rather that it may no longer be operating as its optimum sustainable level.

BOEM concludes that the unavailable information resulting from the *Deepwater Horizon* explosion, oil spill, and response and its impact to the sperm whale population baseline could be relevant to reasonably foreseeable significant adverse effects. Although activities will be ongoing under existing leases whether or not an EPA proposed action takes place, BOEM at this point cannot determine if potential data and information incoming from the *Deepwater Horizon* explosion, oil spill, and response would be essential to a reasoned choice among the alternatives. As noted above, these data are being developed through the NRDA process and at the direction of NMFS (which has jurisdiction over marine mammal strandings). It will be years before the studies currently underway produce available data. Little data, beyond raw numbers of strandings, have been made public through the NRDA process. For example, new data are still being investigated and developed 20 years after the *Exxon Valdez* spill. In any event, this information will not be available within the timeframe of this EIS. In its place, the scientifically credible information that is available has been incorporated using accepted scientific methodologies. In addition, the ESA consultation, which includes sperm whales, has been reinitiated and is ongoing; an interim coordination program, which may include additional mitigations, is being developed with NMFS and FWS.

- **Bryde's whale** is the only known baleen whale species to occur regularly in the Gulf of Mexico. The NMFS treats Bryde's whales found in the northern GOM as a separate stock and estimates a minimum population size at 15 animals. Most sightings have occurred (based on limited survey effort) within De Soto Canyon, which are deeper waters off the coasts of Alabama and the western panhandle of Florida (Waring et al., 2012). It is unknown whether any individuals of this stock were affected by the *Deepwater Horizon* explosion, oil spill, and response, although no reports of effects to Bryde's whales have been made at this time. There is then the potential that this unavailable information could be relevant to reasonably foreseeable significant adverse effects. Activities will be ongoing under existing leases whether or not an EPA proposed action takes place. However, baseline information about this population even prior to the *Deepwater Horizon* explosion, oil spill, and response was minimal, and BOEM at this point cannot determine if potential data and information incoming from the *Deepwater Horizon* explosion, oil spill, and response would be essential to a reasoned choice among the alternatives. Due to difficulties inherent in researching this species in the Gulf (e.g., small population size), it is unlikely that research could be initiated, completed, and analyzed within the timeframe of this EIS. The NRDA process may provide additional information about this species and potential impacts from the *Deepwater Horizon* explosion, oil spill, and response; however, these data are not currently available and it may be years before such data are released or known. What scientifically credible information is available has been incorporated and applied using accepted scientific methodologies.

- The major concentrations of stranded **bottlenose dolphins** from the ongoing UME occur within the eastern Louisiana, Mississippi, and Alabama coasts (USDOC, NMFS, 2013a). For bottlenose dolphins, BOEM concludes that the unavailable information resulting from the *Deepwater Horizon* explosion, oil spill, and response and UME could be relevant to reasonably foreseeable significant adverse effects. The OCS activities will be ongoing under existing leases whether or not an EPA proposed action takes place. However, BOEM believes that the unavailable information may be essential to a reasoned choice among alternatives, particularly regarding the dolphin stocks affected by the UME and/or *Deepwater Horizon* explosion, oil spill, and response. The NMFS is the lead agency investigating marine mammal strandings, including both the current UME and the *Deepwater Horizon* explosion, oil spill, and response. To date, NMFS has released only raw data on strandings. We are therefore unable to determine, at this point and time, what effect (if any) the *Deepwater Horizon* explosion, oil spill, and response had on bottlenose dolphins also affected by the UME. Due to legal constraints with marine mammal strandings (left solely within NMFS's jurisdiction), BOEM does not have the ability to obtain its own data on stranded animals. The NMFS process will attempt to determine the cause of the UME, but this may take years to complete. Impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

- **Manatees** generally occur in the GOM along the Gulf Coast of Florida from the Everglades National Park northward to the Suwannee River in northwestern Florida during warmer months (June to September) and southward during the winter. They are less common farther west; however, individuals have been increasingly spotted as far as Texas during the summer months (USDOI, FWS, 2001; Fertl et al., 2005; Pabody et al., 2009) and should be expected anywhere within the multisale area when Gulf water temperatures are greater than 68 ºF. In Alabama, a number of manatees (1-15 individuals) are routinely seen in the calm, shallow waters of rivers and sub-embayments of Mobile Bay and the Mobile-Tensaw Delta. However, manatees have been observed in the coastal areas, off barrier islands, and up to 145 km (90 mi) offshore (Fertl et al., 2005; Pabody et al., 2009). Manatees are often sighted in Alabama between mid-April through mid-October, though sightings of manatees have been reported in all months except March (Pabody et al., 2009). Manatees have been sighted in Mississippi and Louisiana typically in estuarine and river mouth habitats including sightings in Lake Pontchartrain, Louisiana, and near barrier islands and offshore of both states (Fertl et al., 2005). Further, there have not been any reported cases of manatees within areas affected by the *Deepwater Horizon* explosion, oil spill, and response. BOEM concludes that available information is sufficient to conclude that there was likely little to no effect to manatees from the *Deepwater Horizon* explosion, oil spill, and response and that the potential for impacts from an EPA proposed action also remains insignificant given the distance and the low number of manatees that may occur within the proposed EPA lease sale area.

- The final determinations on impacts to marine mammal resources from the *Deepwater Horizon* explosion, oil spill, and response will ultimately be made through the NRDA process. The *Deepwater Horizon* explosion, oil spill, and response will ultimately allow a better understanding of any realized effects from such a low-probability catastrophic spill, which is not reasonably expected and not part of an EPA proposed action. However, the best available information on impacts to marine mammals does not yet provide a complete understanding of the effects of the oil spill and active response/cleanup activities from the *Deepwater Horizon* explosion, oil spill, and response on marine mammals as a whole in the GOM and whether these impacts reach a population level. There is also an incomplete understanding of the potential for population-level impacts from the ongoing UME. Here, BOEM concludes that the unavailable information from these events may be relevant to foreseeable significant adverse impacts to marine mammals. Relevant data on the status of marine mammal populations after the UME and *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. For example, even 20 years after the *Exxon Valdez* spill, long-term impacts to marine mammal populations are still being investigated (Matkin et al., 2008). Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

Recent Section 7 Endangered Species Act Consultation

The Endangered Species Act of 1973 (ESA) (16 U.S.C. 1631 et seq.) establishes a national policy designed to protect and conserve threatened and endangered species and the ecosystems upon which they depend. BOEM and BSEE are currently in ESA consultation with NMFS and FWS to consider all OCS oil and gas activities pursuant to leases issued through 2022, including those in the 2012-2017 Five-Year Program (e.g., EPA Lease Sales 225 and 226), as well as permitted G&G activities. The programmatic consultation will include postlease activities associated with OCS oil and gas activities in the Gulf of Mexico, including G&G and decommissioning activities. This consultation also considers any changes in baseline environmental conditions following the *Deepwater Horizon* explosion, oil spill, and response.

BOEM and BSEE have submitted the Biological Assessment to NMFS for this consultation. BOEM, BSEE, and NMFS have identified a proposed timeline for completion of the consultation and have identified major milestones throughout the consultation process. Given the complexities of this programmatic approach, NMFS expects to issue a Biological Opinion in the second half of 2014. BOEM and BSEE have also submitted a Biological Assessment to FWS, and BOEM and BSEE are currently working with FWS on a similar process. BOEM will continue to work with NMFS and FWS to (1) identify timelines for completing this ESA consultation and (2) establish procedures to ensure consideration of any on-the-water activities resulting from new lease sales that may be requested prior to completion of the new consultation (i.e., expanding the current ESA interim process with NMFS to include actions resulting from the 2012-2017 Five-Year Program).

With consultation ongoing, the current BOEM- and BSEE-required minimization measures, mitigation, and monitoring will continue to comply with all Reasonable and Prudent Measures and the Terms and Conditions under these existing consultations, along with implementing the current BOEM- and BSEE-required mitigation, monitoring, and reporting requirements. Based on the most recent and best available information at the time, BOEM and BSEE will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under NEPA, the ESA, and other statutes.

4.1.1.12.2. Impacts of Routine Events

Background/Information

The potential effects on marine mammal species may occur from routine activities associated with an EPA proposed action. The major impact-producing factors affecting marine mammals as a result of routine OCS activities include the degradation of water quality from operational discharges; noise generated by aircraft, vessels, operating platforms, and drillships; vessel traffic; explosive structure removals; seismic surveys; and marine debris from service vessels and OCS structures.

Proposed Action Analysis

Service-vessel round trips projected for an EPA proposed action (i.e., lease sale) are 144-17,000 trips (**Table 3-2**) over the 40-year analysis period of an EPA proposed action. Noise from service-vessel traffic may elicit a startle and/or avoidance reaction from marine mammals or mask their sound reception (refer to **Chapter 3.1.1.6** for further discussion). There is the possibility of short-term disruption of movement patterns and behavior (such as feeding), but such disruptions are expected to be short term and unlikely to affect survival or productivity. It is not known whether toothed whales exposed to recurring vessel disturbance would experience stress or would be otherwise affected in a negative but less conspicuous way. Increased ship traffic could increase the probability of collisions between ships and marine mammals, resulting in injury or death to some animals. Dolphins may approach vessels that are in transit to bow-ride. Vessel strike is the most common human-induced mortality factor for manatees, and most manatees bear prop scars from contact with vessels. The rapid increase in the exploration and development of petroleum resources in deep oceanic waters of the northern GOM has increased the risk of OCS vessel collisions with sperm whales and other deep-diving cetaceans (e.g., *Kogia* and beaked whales). Deep-diving whales may be more vulnerable to vessel strikes (NTL 2012-JOINT-G01) because of the extended surface period required to recover from extended deep dives.

Aircraft operations (helicopter take-off and landings) projected for an EPA proposed action are 0-27 operations (**Table 3-2**) over the 40-year analysis period of an EPA proposed action. The Federal Aviation Administration's Advisory Circular 91-36D (September 17, 2004) encourages pilots to maintain an altitude of higher than 2,000 ft (610 m) over noise-sensitive areas. Corporate helicopter policy states that helicopters should maintain a minimum altitude of 700 ft (213 m) while in transit offshore and 500 ft (152 m) while working between platforms. In addition, guidelines and regulations issued by NMFS under the authority of the Marine Mammal Protection Act include provisions specifying helicopter pilots to maintain an altitude of 1,000 ft (305 m) within 100 yd (91 m) of marine mammals. It is unlikely that marine mammals would be affected by routine OCS helicopter traffic operating at these altitudes. It is expected that about 10 percent of helicopter operations would occur at altitudes below the specified minimums listed above as a result of inclement weather. Routine overflights may elicit a startle response from and interrupt marine mammals nearby (depending on the activity of the animals). This temporary disturbance to marine mammals may occur as helicopters approach or depart OCS facilities if animals are near the facility, and such disturbance is believed to be negligible.

A total of 3-12 exploration and delineation wells and 0-17 development wells are projected to be drilled as a result of an EPA proposed action. A total of 0-1 platforms is projected to be installed as a result of an EPA proposed action. These wells and platform could produce sounds at intensities and frequencies that could be heard by marine mammals; however, most drilling and production noise is thought to be at frequencies below which most GOM marine mammals can hear. It is expected that noise from drilling activities would be relatively constant during the temporary duration of drilling. Baleen whales are apparently more dependent on low-frequency sounds than other marine mammals and may be species of concern regarding OCS-industry noise. However, all baleen whale species, except for the Bryde's whale, are considered rare or extralimital in the GOM (Waring et al., 2012). The temporary and transient noise associated with drilling and production is not expected to produce more than negligible impacts on marine mammals.

Although there will always be some level of incomplete information on the effects from routine activities under an EPA proposed action on marine mammals, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects. Also, routine activities will be ongoing in the proposed EPA lease sale area as a result of existing leases and related activities. Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that routine activities from the preexisting OCS Program are significantly impacting marine mammal populations.

Summary and Conclusion

Some routine activities related to an EPA proposed action have the potential to have adverse, but not significant, impacts to marine mammal populations in the GOM. Impacts from vessel traffic, structure removals, and seismic activity could negatively impact marine mammals; however, when mitigated as required by BOEM and NMFS, these activities are not expected to have long-term impacts on the size and productivity of any marine mammal species or population. Most other routine activities (discharges, aircraft, marine debris) are expected to have negligible effects.

4.1.1.12.3. Impacts of Accidental Events

Background/Information

Accidental, unexpected events associated with an EPA proposed action could negatively impact marine mammals. Such impacts would primarily be the result of blowouts, oil spills, and oil-spill-response activities. Low-probability catastrophic events, which are not reasonably expected and not part of an EPA proposed action, similar to the *Deepwater Horizon* explosion and oil spill are analyzed in **Appendix B**.

Proposed Action Analysis

The potential effects associated with a low-probability large spill may be more severe than a smaller accidental spill. The effect could potentially contribute to more significant and longer-lasting impacts that could include mortality and longer-lasting chronic or sublethal effects. **Appendix B** discusses, in general, the magnitude and duration of effects possible if a low-probability, large-volume spill, which is not reasonably expected and not part of an EPA proposed action, were to occur in the GOM.

Marine mammals occur in the inshore, coastal, and oceanic waters of the GOM and could be impacted by accidental spills resulting from operations associated with an EPA proposed action. The greatest diversity and abundance of cetaceans inhabiting the GOM is found in its oceanic and OCS waters. Individual cetaceans are not necessarily randomly distributed in the offshore environment, but they are instead prone to forming groups of varying sizes. In some cases, several species may be found aggregating in the same area. Large spills, particularly those continuing to flow fresh hydrocarbons into oceanic and/or outer shelf waters for extended periods (i.e., days, weeks, months), pose an increased likelihood of impacting cetacean populations inhabiting these waters. Based on abundance estimates and a hypothetical spill surface area, spills occurring in these waters could impact more species and more individuals than coastal spills, potentially impacting coastal marine mammal species.

The OSRA model's combined probabilities indicate East and West Louisiana State waters as most likely to be contacted by a hypothetical spill ≥1,000 bbl occurring based on an EPA proposed action (<0.5-1% for 10 and 30 days) (**Figure 3-8**). Plaquemines Parish, Louisiana, is the only parish that has the probability of a hypothetical spill contacting the coastline as >0.5 percent (0-1% for 10 and 30 days) (**Figure 3-9**). The Pinnacle Trend area also has a <0.5-1 percent spill probability for 10 and 30 days (**Figure 3-14**). The highest resource estimate shows an 8 percent probability of one or more spills ≥1,000 bbl to occur from platforms, pipelines, and tankers associated with an EPA proposed action (2012-2017) (**Table 3-21**). The most likely cause is from pipelines. The estimated probability of one or more hypothetical spills ≥1,000 bbl occurring and contacting the West Indian manatee within 10 and 30 days as a result of an EPA proposed action is <0.5 percent, except the 0-1 percent 30-day probability west of Alabama through Texas (**Figure 3-18**).

The probability of an individual marine mammal encountering an oil slick from a single, small spill is extremely low. However, several factors increase the probability of marine mammal/oil-spill contact, including (1) marine mammals often travel long distances in the Gulf, increasing the geographic areas of potential impact; (2) marine mammals are relatively long-lived and have many years during which they may be exposed; (3) the life of an EPA proposed action also means many years for an impact to occur; and (4) some spills would be larger increasing the area of potential impact. It is impossible to know precisely which cetacean species, population, or individuals will be most impacted, to what magnitude, or in what numbers, since each species has unique distribution patterns in the Gulf and because of difficulties attributed to predicting when and where oil spills will occur over a 40-year period.

Given the distribution of available leases and pipelines associated with an EPA proposed action and the distribution of marine mammals in the northern GOM, the fate of an oil spill must be considered relative to the region and period of exposure. Spills of any size degrade water quality, and residuals become available for bioaccumulation within the food chain. Slicks may spread at the sea surface or may migrate underwater from the seafloor through the water column and never broach the sea surface.

Regardless, a slick is an expanding but aggregated mass of oil that, with time, will disperse into smaller units as it evaporates (if at the sea surface) and weathers.

Although marine mammals may (or may not) avoid oil spills or slicks, it is highly unlikely that they are capable of avoiding spill residuals in their environment. Consequently, the probability that a marine mammal is exposed to hydrocarbons resulting from a spill extends well after the oil spill has dispersed from its initial aggregated mass. Populations of marine mammals in the northern Gulf will likely be exposed to residuals of spilled oil throughout their lifetime.

Summary and Conclusion

Accidental events related to an EPA proposed action have the potential to have adverse, but not significant, impacts to marine mammal populations in the Gulf of Mexico. Accidental blowouts, oil spills, and spill-response activities may impact marine mammals in the Gulf of Mexico. Characteristics of impacts (i.e., acute vs. chronic impacts) depend on the magnitude, frequency, location, and date of accidents; characteristics of spilled oil; spill-response capabilities and timing; and various meteorological and hydrological factors.

Oil spills may cause chronic (long-term lethal or sublethal oil-related injuries) and acute (spill-related deaths occurring during a spill) effects on mammals. Long-term effects include (1) decreases in prey availability and abundance because of increased mortality rates, (2) change in age-class population structure because certain year-classes were impacted more by oil, (3) decreased reproductive rate, and (4) increased rate of disease or neurological problems from exposure to oil (Harvey and Dahlheim, 1994). The effects of cleanup activities are unknown, but increased human presence (e.g., vessels) could add to changes in marine mammal behavior and/or distribution, thereby additionally stressing animals, and perhaps making them more vulnerable to various physiologic and toxic effects.

Even after the spill is stopped, oiling or deaths of marine mammals would still occur due to oil and dispersants persisting in the water, past marine mammal/oil or dispersant interactions, and ingestion of contaminated prey. The animals' exposure to hydrocarbons persisting in the sea may result in sublethal impacts (e.g., decreased health, reproductive fitness, and longevity; and increased vulnerability to disease) and some soft tissue irritation, respiratory stress from inhalation of toxic fumes, food reduction or contamination, direct ingestion of oil and/or tar, and temporary displacement from preferred habitats. These long-term impacts could have population-level effects (USDOC, NMFS, 2010).

4.1.1.12.4. Cumulative Impacts

Background/Information

The cumulative analysis considers past, ongoing, and foreseeable future human and natural activities that may occur and adversely affect marine mammals in the same general area that may be affected by an EPA proposed action. The major potential impact-producing factors affecting protected marine mammals in the GOM as a result of cumulative OCS energy-related activities include marine debris, contaminant spills and spill-response activities, vessel traffic, noise, seismic surveys, and explosive structure removals. Specific types of impact-producing factors considered in this cumulative analysis include noise from numerous sources, pollution, habitat degradation, vessel strikes, and ingestion and entanglement in marine debris.

OCS Oil- and Gas-Related Impacts

Noise in the ocean has become a worldwide topic of concern, particularly in the last two decades. The GOM is very noisy, and those noises originate from a broad range of sources, both natural and anthropogenic. Virtually all of the marine mammal species in the GOM have been exposed to OCS industrial noise due to the rapid advance into GOM deep oceanic waters by the oil and gas industry in recent years; whereas, 20 years ago, the confinement of industry to shallower coastal and continental shelf waters generally only exposed two species of marine mammals (the bottlenose dolphin and the Atlantic spotted dolphin) to industry activities and the related sounds. Most marine mammal species in the GOM, and particularly the deepwater mammals, rely on echolocation for basic and vital life processes including feeding, navigation, and conspecific and mate communication. Noise levels that interfere with these basic mammal capabilities could have impacts on individuals and populations. The OCS-industry operations contribute noise to the marine environment from several different operations. It is believed that most of the industry-related noise is at lower frequencies than is detectable or in the sensitivity range of most of the GOM marine mammal species (Southall et al., 2007). Cumulative impacts on marine mammals are expected to result in a number of chronic and sporadic sublethal effects (i.e., behavioral effects and nonfatal exposure to or intake of OCS-related contaminants or discarded debris) that may stress and/or weaken individuals of a local group or population and predispose them to infection from natural or anthropogenic sources (Harvey and Dahlheim, 1994). Disturbance (noise from vessel traffic and drilling operations) and/or exposure to sublethal levels of toxins and anthropogenic contaminants may stress animals, weaken their immune systems, and make them more vulnerable to parasites and diseases that normally would not be fatal (Harvey and Dahlheim, 1994). The net result of any disturbance will depend upon the size and percentage of the population likely to be affected, the ecological importance of the disturbed area, the environmental and biological parameters that influence an animal's sensitivity to disturbance and stress, or the accommodation time in response to prolonged disturbance (Geraci and St. Aubin, 1980). As discussed in **Appendix B**, a low-probability, large-scale catastrophic event, which is not reasonably expected and not part of an EPA proposed action, could have population-level effects on marine mammals.

Unavailable information on the effects to marine mammals from the UME and *Deepwater Horizon* explosion, oil spill, and response (and thus changes to the marine mammal baseline in the affected environment) makes an understanding of the cumulative effects less clear. BOEM concludes that the unavailable information from these events may be relevant to foreseeable significant adverse impacts to marine mammals. For marine mammals occurring in the EPA, the Bureau of Ocean Energy Management cannot rule out that incomplete or unavailable information may be essential to a reasoned choice among the alternatives for this EIS. Relevant data on the status of marine mammal populations after the UME and *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Further, there are already scientific processes in place through NRDA and UME responses to investigate these remaining questions. The NMFS has jurisdiction for the investigation of marine mammal strandings and has only released raw data on stranding numbers to date. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

Nevertheless, there are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities. In addition, non-OCS energy-related activities discussed below will continue to occur in the EPA irrespective of an EPA proposed action. The potential for effects from changes to the affected environment (post-*Deepwater Horizon*), routine activities, accidental spills, low-probability catastrophic spills, which are not reasonably expected and not part of an EPA proposed action, , and cumulative effects remains whether or not the No Action or Action alternative is chosen under this EIS. Impacts on marine mammals from either smaller accidental events or low-probability catastrophic spill events, which are not reasonably expected and not part of an EPA proposed action, would remain the same.

Non-OCS Oil- and Gas-Related Impacts

Non-OCS energy-related activities that may affect marine mammal populations include vessel traffic and related noise (including from commercial shipping, research vessels), military operations, commercial fishing, pollution, scientific research, and natural phenomena.

Other groups such as the military (U.S. Navy and USCG) and other Federal agencies (USEPA, COE, and NMFS), dredges, commercial fishermen, and recreational boaters operate vessels and contribute to the ambient noise in the Gulf. Although air traffic well offshore is limited, the military maintains 11 military warning areas and 6 water test areas in the Gulf. Some commercial fisheries include aerial surveillance. Scientific research aerial surveys are occasionally scheduled over the Gulf of Mexico. Commercial and private aircraft also traverse the area. Flight-level minimum guidelines from NMFS and corporate helicopter policy should help mitigate the industry-related flight noise, although lower altitudes near shore and as the helicopter lands and departs from rigs could impact marine mammals in close proximity to the structures or shore bases. Occasional overflights are not expected to have long-term impacts on marine mammals.

Pollution in the ocean comes from many point and nonpoint sources, and the GOM is certainly no exception. The drainage of the Mississippi River results in massive amounts of chemicals and other pollutants being constantly discharged into the Gulf.

Tropical storms and hurricanes are normal occurrences in the Gulf and along the coast. Generally, the impacts have been localized and infrequent. The actual impacts of these storms on the animals in the Gulf, and the listed species and critical habitat in particular, have not yet been determined and, for the most part, may remain very difficult to quantify.

Summary and Conclusion

The effects of an EPA proposed action, when viewed in light of the effects associated with other past, present, and reasonably foreseeable future activities may result in greater impacts to marine mammals than before the *Deepwater Horizon* explosion, oil spill, and response; however, the magnitude of those effects cannot yet be determined. Nonetheless, operators are required to follow all applicable lease stipulations and regulations, as clarified by NTL's, to minimize these potential interactions and impacts. The operator's reaffirmed compliance with NTL 2012-JOINT-G01 ("Vessel Strike Avoidance and Injured/Dead Protected Species Reporting") and NTL 2012-BSEE-G01 ("Marine Trash and Debris Awareness and Elimination"), as well as the limited scope, timing, and geographic location of an EPA proposed action, would result in negligible effects from the proposed drilling activities on marine mammals. In addition, NTL 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program," minimizes the potential of harm from seismic operations to marine mammals. These mitigations include onboard observers, airgun shut-downs for whales in the exclusion zone, ramp-up procedures, and the use of a minimum sound source. Therefore, no significant cumulative impacts to marine mammals would be expected as a result of the proposed exploration activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other ongoing activities in the area.

Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations. Therefore, in light of an EPA proposed action and its impacts, the incremental effect of an EPA proposed action on marine mammal populations is not expected to be significant when compared with non-OCS energy-related activities.

4.1.1.13. Sea Turtles

Though this EIS pertains to an EPA proposed action, the proposed EPA lease sale blocks are not significantly different with regards to sea turtle habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. The EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for sea turtles can be found in Chapter 4.2.1.13 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.13 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from these chapters would be equally applicable for sea turtles regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for sea turtles presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for sea turtles presented. The impact conclusions for sea turtles presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are hereby incorporated by reference as applicable for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on sea turtles, and various Internet sources were examined to determine any recent information regarding sea turtles. Sources investigated included, but were not limited to, journals and scientific articles, Google, Google Scholar, and other Federal and State natural resource management agency websites. All new relevant information was incorporated into the analyses below. No new significant information was discovered regarding sea turtles since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, BOEM concludes that there remains incomplete or unavailable information that may be relevant to reasonably foreseeable significant adverse impacts to sea turtles, including those from noncatastrophic spills/accidental events. There is incomplete information on the impacts to sea turtle populations from the *Deepwater Horizon* explosion, oil spill, and response and whether the individuals or populations may be susceptible to greater impacts in light of the increased stranding event or the *Deepwater Horizon* explosion, oil spill, and response. Relevant data on the status of and impacts to sea turtle populations from the increased stranding event and the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. The NMFS to date has only released raw data on the number of strandings, and BOEM does not have the ability to investigate these strandings independently. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this Supplemental EIS, regardless of the cost or resources needed. In the absence of this information, BOEM's subject-matter experts have used what scientifically credible information that is available and applied it using accepted scientific methodologies. BOEM cannot rule out that unavailable or incomplete information on accidental impacts may be essential to a reasoned choice among the alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, including in light of the increased stranding event and the *Deepwater Horizon* explosion, oil spill, and response. Activities that could result in an accidental spill in the EPA would be ongoing whether or not an EPA proposed action occurred. Refer to the section below titled "Sea Turtle Resources in the Eastern Planning Area" for additional information on incomplete and unavailable information on impacts to sea turtles.

4.1.1.13.1. Description of the Affected Environment

Five sea turtles are known to inhabit the waters of the GOM (Pritchard, 1997): the leatherback (endangered, listed June 2, 1970); green turtle (breeding colony populations in Florida and on the Pacific Coast of Mexico are listed as endangered; all others are listed as threatened; listed July 28, 1978); hawksbill (endangered, listed June 2, 1970); Kemp's ridley (endangered, listed December 2, 1970); and loggerhead (threatened, listed July 28, 1978). These five species are all highly migratory. Individual animals will make migrations into nearshore waters as well as other areas of the North Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea. Although migratory, these migration patterns are not well defined. There is currently no critical habitat designated in the GOM or along the Gulf Coast. The NMFS has issued a final rule to list nine distinct population segments of loggerhead sea turtles under the ESA (*Federal Register*, 2011b). The Gulf of Mexico is located within the ESA Threatened Northwest Atlantic Ocean distinct population segment. On February 17, 2010, NMFS and FWS were jointly petitioned to designate critical habitat for Kemp's ridley sea turtles for nesting beaches along the Texas coast and marine habitats in the Gulf of Mexico and Atlantic Ocean. The NMFS is currently reviewing the petition.

The FWS and NMFS share Federal jurisdiction for sea turtles under the ESA. The FWS has responsibility for sea turtles (eggs, hatchlings, and nesting turtles) on the nesting beaches. The NMFS has jurisdiction for sea turtles in the marine environment.

In August 2007, FWS and NMFS published 5-Year Status Reviews for federally listed sea turtles in the GOM (USDOC, NMFS and USDOI, FWS, 2007a-e). A 5-Year Status Review is an ESA-mandated process that is conducted to ensure the listing classification of a species as either threatened or endangered is still accurate. Both agencies share jurisdiction for federally listed sea turtles and jointly conducted the reviews. After reviewing all of the best scientific and commercially available information and data, the agencies' biologists recommended that the current listing classification for the five sea turtle species remain unchanged.

In 2011, loggerhead sea turtle nest counts on Florida's beaches were close to the average of the previous 5 years, totaling 68,587 nests (6,751 west coast). Green sea turtle nest counts have increased approximately tenfold from 1989 to 2011 on Florida index beaches. The green sea turtle nest count in 2011 was the highest for that period, totaling 15,352 nests (63 west coast). A near-record number of leatherback nests in 2011 were recorded on beaches in Florida, totaling 1,652 nests (1 west coast). Similar to the nest counts for green turtles, leatherback nest counts have been increasing exponentially on Florida index beaches (Florida Fish and Wildlife Conservation Commission, 2012a). A total of 84 nests in 2011 along the Alabama Gulf Coast were discovered. Tropical Storm Lee, however, inundated several nests. In 2010, Alabama had reported 41 loggerhead nests and 2 Kemp's ridley nests (Share the Beach, 2012).

The loggerhead sea turtle was listed as a threatened species on July 28, 1978 (*Federal Register*, 1978a). In 2011, NMFS and FWS listed nine distinct population segments of loggerhead sea turtles under the ESA (*Federal Register*, 2011b). Loggerheads found in the GOM are part of the Northwest Atlantic Ocean Distinct Population Segment. On March 25, 2013, FWS published a proposed rule for the Designation of Critical Habitat for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle (*Caretta caretta*) (Docket No. FWS-R4-ES-2012-0103). On July 18, 2013, NMFS published a proposed rule for the Endangered and Threatened Species: Designation of Critical Habitat for the Northwest Atlantic Ocean Loggerhead Sea Turtle Distinct Population Segment and Determination Regarding Critical Habitat for the North Pacific Ocean Loggerhead Distinct Population Segment (Docket No. NOAA-NMFS-2013-0079).

Sea Turtle Strandings in the Gulf of Mexico

Since January 1, 2011, a notable increase in sea turtle strandings has occurred in the northern GOM, primarily in Mississippi. While turtle strandings in this region typically increase in the spring, the recent increase is a cause for concern. The Sea Turtle Stranding and Salvage Network is monitoring and investigating this increase. The network encompasses the coastal areas of the 18 states from Maine through Texas. There are many possible reasons for the increase in strandings in the northern GOM, both natural and human caused (USDOC, NMFS, 2013c). These sea turtle species include loggerhead, green, Kemp's ridley, leatherback, hawksbill, and unidentified. As of July 16, 2013, NMFS has identified 199 strandings in Alabama, 472 strandings in Louisiana, and 634 strandings in Mississippi. The NMFS has identified 204 strandings in Texas (upper Texas coast—Zone 18).

Over the last 2 years, NOAA has documented necropsy results from many of the stranded turtles, indicating mortality due to forced submergence, which is commonly associated with fishery interactions, and acute toxicosis (e.g., harmful algal blooms).

In June 2011, NMFS announced that it will begin scoping for the preparation of a draft EIS to reduce incidental bycatch and mortality of sea turtles in the southeastern U.S. shrimp fishery (*Federal Register*, 2011c).

Deepwater Horizon Explosion, Oil Spill, and Response

The *Deepwater Horizon* explosion and oil spill in Mississippi Canyon Block 252 and the related spill-response activities (including use of dispersants) have impacted sea turtles that have come into contact with oil and remediation efforts. For the latest available information on oiled or affected sea turtles documented in the area, refer to NMFS's "Sea Turtles and the Gulf of Mexico Oil Spill" website (USDOC, NMFS, 2012d).

According to this NMFS website, 1,146 sea turtles have been collected (537 alive, 609 deceased) as of February 15, 2011, which is the most recent date listed on NMFS's *Deepwater Horizon* website. Of these, 201 were greens, 16 Hawksbills, 809 Kemp's ridleys, 88 loggerheads, and the remaining 32 unknown (USDOC, NMFS, 2012d). Individuals were documented either through strandings or directed offshore captures. Due to low detection rates of carcasses in prior events, it is possible that the number of deaths of sea turtles is underestimated (Epperly et al., 1996). It is also important to note that evaluations have not yet confirmed the cause of death, and it is possible that not all carcasses were related to the oil spill resulting from the *Deepwater Horizon* explosion. These stranding numbers are significantly greater than reported in past years; though it should be further noted that stranding coverage has increased considerably due to the oil spill resulting from the *Deepwater Horizon* explosion.

As a preventative measure during the *Deepwater Horizon* response effort, NMFS and FWS translocated a number of sea turtle nests and eggs that were located on beaches affected or potentially affected by spilled oil. According to the latest information on the NMFS stranding network website (USDOC, NMFS, 2012d), a total of 274 nests were translocated from GOM beaches to the east coast of

Florida. These nests were mainly for hatchlings that would enter waters off Alabama and Florida's northwest Gulf Coast. Of these, 4 were from green turtles, 5 from Kemp's ridley and 265 from loggerheads. The translocation effort ended August 19, 2010, at the time when biologists determined that risks to hatchlings emerging from beaches and entering waters off Alabama and Florida's northwest Gulf Coast had diminished significantly and that the risks of translocating nests during late incubation to the east coast of Florida outweighed the risks of letting hatchlings emerge into the Gulf of Mexico. The hatchlings resulting from the translocations were all released as of September 9, 2010.

As of August 3, 2010, in open water, there was no evidence that sea turtles were still being exposed to chemicals from the *Deepwater Horizon* explosion, oil spill, and response (OSAT, 2010). This report states, "Since 3 August [2010], no exceedances of the aquatic life benchmark for PAH's in water that were consistent with MC252 oil." It is likely that there were effects on individual sea turtles in the vicinity of the oil spill resulting from the *Deepwater Horizon* explosion; these effects were caused by spilled oil and/or response activities. Depending upon the species' sensitivity and/or low resiliency, individual sea turtles may be experiencing residual effects provided sufficient exposure. Further, it is uncertain whether or how many sea turtle individuals affected by the spill would be present in the EPA when activities first occur as a result of an EPA proposed action. Without any further data than what exist from NMFS and FWS (which have jurisdiction over sea turtles in water and on land, respectively), it is impossible to determine if the spill has led to population-level effects or if sea turtles are experiencing chronic effects or persistent adverse impacts from the spill at the population level. Information is still being gathered to develop a more complete picture of impacts and the length of time for any changed baseline conditions to return to pre-spill conditions (refer to "Sea Turtle Resources in the Eastern Planning Area" below). It is also important to note that evaluations have not yet confirmed the cause of death, including whether or not it is related to the oil spill resulting from the *Deepwater Horizon* explosion.

Sea Turtle Resources in the Eastern Planning Area

The final determinations on damages to sea turtle resources from the *Deepwater Horizon* explosion, oil spill, and response will ultimately be made through the NRDA process. For sea turtles, investigations as part of the NRDA process are under the jurisdiction of NMFS and FWS. The *Deepwater Horizon* explosion, oil spill, and response will allow a better understanding of any realized effects from such a low-probability catastrophic spill, which is not reasonably expected and not part of an EPA proposed action. However, the best available information on impacts to sea turtles does not yet provide a complete understanding of the effects of the oil spill and active response/cleanup activities from the *Deepwater Horizon* explosion, oil spill, and response on sea turtles in the GOM as a whole and in the EPA in particular, and whether these impacts reach a population level. There is also an incomplete understanding of the potential for population-level impacts from the ongoing increased stranding event.

BOEM concludes that the unavailable information identified above, including that resulting from the *Deepwater Horizon* explosion, oil spill, and response and increased stranding events, could be relevant to reasonably foreseeable significant adverse effects. The OCS activities will be ongoing under existing leases whether or not an EPA proposed action takes place. However, BOEM believes that the unavailable information may be essential to a reasoned choice among alternatives, particularly regarding sea turtles affected by the increased stranding and/or *Deepwater Horizon* explosion, oil spill, and response. The NMFS and FWS have jurisdiction for investigating sea turtle impacts, including both the current increased stranding event and the *Deepwater Horizon* explosion, oil spill, and response. To date, NMFS has released only raw data on strandings. BOEM is therefore unable to determine, at this point and time, what effect (if any) the *Deepwater Horizon* explosion, oil spill, and response had on sea turtles also affected by the increased stranding event. Due to NMFS's and FWS's jurisdiction and role in the investigation, BOEM does not have the ability to obtain its own data on stranded animals. The NRDA process and the increased stranding investigation may take years to complete, and it may be some time before analyses and data are released to the public. Impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

Further, the analyses in this EIS and in **Appendix B** conclude that there is a potential for low-probability catastrophic events, which are not reasonably expected and not part of an EPA proposed action, to result in significant, population-level effects on affected sea turtle species. BOEM continues to agree with these conclusions irrespective of any incomplete information, changes to the existing environment from the *Deepwater Horizon* explosion, oil spill, and response, or even the effectiveness of implementation of the improved post-*Deepwater Horizon* explosion, oil spill, and response safety and oil-spill-response requirements.

Recent Section 7 Endangered Species Act Consultation

The Endangered Species Act of 1973 (ESA) (16 U.S.C. §§ 1631 *et seq*.), as amended (43 U.S.C. §§ 1331 *et seq*.), establishes a national policy designed to protect and conserve threatened and endangered species and the ecosystems upon which they depend. BOEM is currently in consultation with NMFS and FWS regarding the OCS oil and gas program in the Gulf of Mexico, including as it relates to an EPA proposed action. The programmatic consultation was expanded in scope after reinitiation of consultation by BOEM following the *Deepwater Horizon* explosion and oil spill, and it will include both existing and future OCS oil and gas leases in the Gulf of Mexico over a 10-year period. The programmatic consultation will also include postlease activities associated with OCS oil and gas activities in the Gulf of Mexico, including G&G and decommissioning activities. BOEM is acting as the lead agency in the ongoing consultation, with BSEE assistance and involvement.

With consultation ongoing, the current BOEM- and BSEE-required minimization measures, mitigation, and monitoring will continue to comply with all Reasonable and Prudent Measures and the Terms and Conditions under these existing consultations, along with implementing the current BOEM- and BSEE-required mitigation, monitoring, and reporting requirements. Based on the most recent and best available information at the time, BOEM and BSEE will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under NEPA, the ESA, and other statutes.

4.1.1.13.2. Impacts of Routine Events

Background/Information

Routine activities resulting from an EPA proposed action have the potential to harm sea turtles, although this potential is unlikely to rise to a level of significance due to the activity already present in the GOM and due to mitigations that are in place and discussed below. The major impact-producing factors resulting from the routine activities associated with an EPA proposed action that may affect loggerhead, Kemp's ridley, hawksbill, green, and leatherback turtles include the degradation of water quality resulting from operational discharges; noise generated by helicopter and vessel traffic, platforms, drillships, and seismic exploration; vessel collisions; and marine debris generated by service vessels and OCS facilities.

Hearing sensitivity includes the hearing threshold (the minimum sound level that an animal can perceive in the absence of significant background noise) and the hearing bandwidth (the range of frequencies that an animal can hear). There is very little published data on sea turtle hearing sensitivities, but the little available data suggest that sea turtle species exhibit best hearing at low frequencies of 200-700 Hz (USDOI, BOEM, 2012b), with an upper hearing limit of 1,600 Hz (Dow et al. 2008). Reported hearing thresholds are also of low frequency, estimated to be between 50 and 1,000 Hz (Tech Environmental, Inc. 2006). Threshold detection levels for these species over this frequency range are relatively high (>100 dB referenced to 1 micropascal within 1 meter of the source [dB re 1 μPa-m]) (Tech Environmental, Inc. 2006). Due to their poor hearing sensitivity, noise impacts related to oil and gas activities would most likely result in behavioral changes as sea turtles move away from the noise source. These impacts are not expected to result in long-term effects or in population-level impacts. Recovery rates of affected sea turtles are expected to be short term (USDOI, BOEM, 2012b).

Proposed Action Analysis

An estimated 144-17,000 service-vessel round trips are expected to occur throughout the 40-year analysis period, or 3-425 round trips annually, as a result of an EPA proposed action. Transportation corridors would be through areas where sea turtles have been sighted. Helicopter operations (take-offs and landings) are expected to be 0-27 over the 40-year analysis period, or approximately 0-<1 annually, as a result of an EPA proposed action. Noise from service-vessel traffic and helicopter overflights may elicit a startle reaction from sea turtles, and there is the possibility of short-term disruption of activity patterns. Sea turtles located in shallower waters have shorter surface intervals, whereas turtles occurring in deeper waters have longer surface intervals. It is not known whether turtles exposed to recurring vessel disturbance will be stressed or otherwise affected in a negative but inconspicuous way. Increased vessel traffic would increase the probability of collisions between vessels and turtles, potentially resulting in injury or death to some animals.

Vessel noise and vessel collisions are impact-producing factors associated with an EPA proposed action that could affect ESA-listed sea turtles. The dominant source of noise from vessels is propeller operation, and the intensity of this noise is largely related to ship size and speed. Vessel noise from activities resulting from an EPA proposed action would produce low levels of noise, generally in the 150- to 170-dB re 1 µPa-m at frequencies below 1,000 hertz. Vessel noise is transitory and generally does not propagate at great distances from the vessel. Also, available information indicates that sea turtles are not thought to rely on acoustics. As a result, NMFS's 2007 Biological Opinion concluded that effects to sea turtles from vessel noise are "discountable" (USDOC, NMFS, 2007).

Drilling activities would produce sounds transmitted into the water that could be intermittent, sudden, and at times could be high intensity as operations take place. However, sea turtles are not expected to be impacted by this disturbance because NMFS, in their 2007 Biological Opinion, determined that "drilling is not expected to produce amplitudes sufficient to cause hearing or behavioral effects to sea turtles or sperm whales; therefore, these effects are insignificant."

To date, there have been no reported strikes of sea turtles by drilling vessels. Given the scope, timing, and transitory nature of an EPA proposed action and with this established mitigation, the effects to sea turtles from drilling vessel collisions is expected to be negligible.

A total of 3-12 exploration wells and 0-17 producing development wells are projected to be drilled as a result of an EPA proposed action. A total of 0-1 platforms is projected to be installed as a result of an EPA proposed action. There is no projection for platform removal with explosives. These structures could generate sounds at intensities and frequencies that could be heard by turtles. There is some evidence suggesting that turtles may be receptive to low-frequency sounds, which is at the level where most industrial noise energy is concentrated. Potential effects on turtles include disturbance (e.g., subtle changes in behavior and interruption of activity), the masking of other sounds (e.g., surf, predators, and vessels), and stress (physiological).

Although there will always be some level of incomplete information relevant to the effects from routine activities under an EPA proposed action on sea turtles, BOEM does not believe it is essential to a reasoned choice among alternatives. There is credible scientific information available, and applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be sublethal in nature and not in themselves be expected to rise to the level of reasonably foreseeable significant adverse (population-level) effects. As noted above in the description of the affected environment , however, BOEM cannot rule out that incomplete or unavailable information on the effects of the increased stranding event or the *Deepwater Horizon* explosion, oil spill, and response on sea turtles may be essential to a reasoned choice among alternatives (and that this information cannot be obtained within the timeline contemplated by this EIS). As such, BOEM acknowledges that impacts from routine activities could be greater on individuals or populations already impacted by the *Deepwater Horizon* explosion, oil spill, and response or increased stranding event. Nevertheless, routine activities are ongoing in the proposed EPA lease sale area as a result of existing leases and related activities. Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no previous data to suggest that routine activities from the preexisting OCS Program were significantly impacting sea turtles.

Summary and Conclusion

BOEM has reexamined the analysis for sea turtles and has considered the recent reports cited above and other new information. Because of the mitigations (e.g., BOEM and BSEE proposed compliance with NTL 2012-JOINT-G01, NTL 2012-JOINT-G02, and NTL 2012-BSEE-G01) described in the above analysis, routine activities (e.g., operational discharges, noise, vessel traffic, and marine debris) related to an EPA proposed action are not expected to have long-term adverse effects on the size and productivity of any sea turtle species or populations in the northern GOM. Lethal effects could occur from chance collisions with OCS service vessels or ingestion of accidentally released plastic materials from OCS vessels and facilities. Most routine OCS energy-related activities are then expected to have sublethal effects that are not expected to rise to the level of significance.

4.1.1.13.3. Impacts of Accidental Events

Background/Information

This chapter discusses the impacts of accidental events associated with an EPA proposed action on sea turtles. This chapter treats both the expected accidental spill as well as the low-probability, large-volume spill with catastrophic events, which is not reasonably expected and not part of an EPA proposed action. Further, general analyses of a catastrophic spill event, which is not reasonably expected and not part of an EPA proposed action, in the GOM can also be found in **Appendix B**.

Proposed Action Analysis

Accidental activities resulting from an EPA proposed action have the potential to harm sea turtles. The major impact-producing factors resulting from the accidental activities associated with an EPA proposed action that may affect loggerhead, Kemp's ridley, hawksbill, green, and leatherback turtles include accidental blowouts, oil spills, and spill-response activities. These have the potential to impact small to large numbers of sea turtles in the GOM, depending on the magnitude and frequency of accidents, the ability to respond to accidents, the location and date of accidents, and various meteorological and hydrological factors. Chronic or acute exposure may result in harassment, harm, or mortality of sea turtles occurring in the northern Gulf. Exposure to hydrocarbons persisting in the sea following the dispersal of an oil slick are expected to most often result in sublethal impacts (e.g., decreased health and/or reproductive fitness, and increased vulnerability to disease) to sea turtles. Sea turtle hatchling exposure to, fouling by, or consumption of tarballs persisting in the sea following the dispersal of an oil slick would likely be fatal. Sea turtle eggs are likely to be lethally impacted by contact with spilled oil (USDOI, NPS, 2010). The potential effects associated with a low-probability large spill may be more severe than a smaller accidental spill and could potentially contribute to longer-lasting and larger-scale effects. **Appendix B** discusses, in general, the magnitude and duration of the effects possible if a low-probability, large-volume spill, which is not reasonably expected and not part of an EPA proposed action, was to occur in the GOM.

The OSRA model's combined probabilities indicate East and West Louisiana State waters as most likely to be contacted by a hypothetical spill ≥1,000 bbl occurring, based on an EPA proposed action (<0.5-1% for 10 and 30 days) (**Figure 3-8**). The highest resource estimate shows an 8 percent probability of one or more hypothetical spills ≥1,000 bbl to occur from platforms, pipelines, and tankers associated with an EPA proposed action (2012-2017) (**Table 21**). The most likely cause is from pipelines. Plaquemines Parish, Louisiana is the only parish that has the probability of a hypothetical spill contacting coastline >0.5 percent (0-1% for 10 and 30 days) (**Figure 3-9**).

Depending on the timing of the spill's occurrence in coastal waters, its impact and resulting cleanup may interrupt sea turtle migration, feeding, mating, and/ or nesting activity for extended periods (days, weeks, months). Spills originating in or migrating through coastal waters of Florida may impact any of the five sea turtle species inhabiting the Gulf. Aside from the acute effects noted if sea turtles encounter an oil slick, the displacement of sea turtles to less suitable habitats from habitual feeding areas impacted by oil spills may increase vulnerability to predators, disease, or anthropogenic mortality. A high incidence of juvenile sea turtle foraging occurs along certain coastal regions of the Gulf Coast. The interruption of mating and nesting activities for extended periods may influence the recovery of sea turtle populations.

There is an extremely small probability that a single sea turtle would encounter an oil slick resulting from a single, small spill. Increasing the size of a slick or factoring in the number of estimated spills over 40 years increases the likelihood that an animal would encounter a single slick during the lifetime of an animal; many sea turtle species are long-lived and may traverse throughout waters of the northern Gulf. The web of reasoning is incomplete without considering the abundance (stock or population) of each species inhabiting the Gulf. The likelihood that members of a sea turtle population may encounter an oil slick resulting from a single spill during a 40-year period is greater than that of a single individual encountering a slick during its lifetime. It is impossible to estimate precisely what sea turtle species, populations, or individuals would be impacted, to what magnitude, or in what numbers, since each species has unique distribution patterns in the Gulf and because of difficulties attributed to estimating when and where oil spills would occur over a 40-year period.

Given the distribution of available leases and pipelines associated with an EPA proposed action and the distribution of sea turtles in the northern GOM, the fate of an oil spill must be considered relative to the region and period of exposure. Spill estimates derived from data documenting historical trends of oil spills in coastal and offshore waters indicate that an EPA proposed action may introduce 0-0.211 BBO and 0-0.502 Tcf of gas into Gulf offshore and coastal environments over 40 years (**Table 3-1**). Spills of any size degrade water quality, and residuals become available for bioaccumulation within the food chain. Slicks may spread at the sea surface or may migrate underwater from the seafloor through the water column and never broach the sea surface. Regardless, a slick is an expanding, but aggregated mass of oil that, with time, will disperse into smaller units as it evaporates (if at the sea surface) and weathers. **Chapters 3.2.1.2 and 3.2.1.4.4**. details the persistence, spreading, and weathering process for offshore spills. As the slick breaks up into smaller units (e.g., slickets) and soluble components dissolve into the seawater, tarballs may remain within the water column. Tarballs may subsequently settle to the seafloor or attach to other particles or bodies in the sea. As residues of an oil spill disperse and commit to the physical environment (water, sediments, and particulates), sea turtles of any life history stage may be exposed via the waters that they drink and swim, as well as via the prey they consume. For example, tarballs may be consumed by sea turtles and by other marine organisms, and eventually bioaccumulate within sea turtles. Although sea turtles may (or may not) avoid oil spills or slicks, it is highly unlikely that they are capable of avoiding spill residuals in their environment. Consequently, the probability that a sea turtle is exposed to oil resulting from a spill extends well after the oil spill has dispersed from its initial aggregated mass. Populations of sea turtles in the northern GOM would be exposed to residuals of oils spilled as a result of an EPA proposed action during their lifetimes.

Due to spill response and cleanup efforts, much of an oil spill may be recovered before it reaches the coast. However, cleanup efforts in offshore waters may result in additional harm or mortality of sea turtles, particularly to neonates and juveniles. Oil spills and spill-response activities at nesting beaches, such as beach sand removal and compaction, can negatively affect sea turtles. Although spill-response activities such as vehicular and vessel traffic during nesting season are assumed to affect sea turtle habitats, further harm may be limited because of efforts designed to prevent spilled oil from contacting these areas. Increased human presence could influence turtle behavior and/or distribution, thereby stressing animals and making them more vulnerable to predators, the toxicological effects of oil, or other anthropogenic sources of mortality.

Loggerheads may bioaccumulate heavy metals found in drill muds resulting in debilitation or death. Oil exploration and development on live bottom areas may disrupt foraging grounds by smothering benthic organisms with sediments and drilling muds (Coston-Clements and Hoss, 1983). The explosive removal of offshore oil and gas platforms is known to have impacts on loggerheads ranging from capillary damage, disorientation, loss of motor control, and mortality (NRC, 1996; Klima et al., 1988; Viada et al., 2008). The impacts of offshore, lighted oil production platforms on loggerheads are not well understood. Lighted platforms may attract hatchlings, making them more susceptible to predation (de Silva, 1982). Neritic juveniles and adults may be attracted by high prey concentrations around the structures, making them more susceptible to ingestion of petroleum products. Further data are needed to fully understand the processes above.

BOEM concludes that there remains incomplete or unavailable information that may be relevant to reasonably foreseeable significant adverse impacts to sea turtles, including those from noncatastrophic spills/accidental events. Since March 15, 2011, a notable increase in sea turtle strandings has occurred in the northern Gulf of Mexico, primarily in Mississippi. While turtle strandings in this region typically increase in the spring, the recent increase is a cause for concern. The Sea Turtle Stranding and Salvage Network is monitoring and investigating this increase. Many of the stranded turtles were reported from Mississippi and Alabama waters, and very few showed signs of external oiling from the *Deepwater Horizon* explosion and oil spill. Necropsy results from many of the stranded turtles indicate mortality due to forced submergence, which is commonly associated with fishery interactions. In June 2011, NMFS announced that it will begin scoping for the preparation of a draft EIS to reduce incidental bycatch and mortality of sea turtles in the southeastern U.S. shrimp fishery (*Federal Register*, 2011b). There is incomplete information on impacts to sea turtle populations from the *Deepwater Horizon* explosion, oil spill, and response and whether individuals or populations may be susceptible to greater impacts in light of the increased stranding event or *Deepwater Horizon* explosion, oil spill, and response. Relevant data on the status of and impacts to sea turtle populations from the increased stranding event and *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. The NMFS to date has only released raw data on the number of strandings, and BOEM does not have the ability to investigate these strandings independently. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In the absence of this information, BOEM's subject-matter experts have used what scientifically credible information that is available and applied it using accepted scientific methodologies. BOEM cannot rule out that unavailable or incomplete information on accidental impacts may be essential to a reasoned choice among the alternatives, in light of the increased stranding event and *Deepwater Horizon* explosion, oil spill, and response. Activities that could result in an accidental spill in the EPA would be ongoing whether or not an EPA proposed action takes place. Also, there are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities that could result in an accidental spill.

BOEM is not able to determine at this point that activities under an EPA proposed action or those already occurring on issued leases are responsible in part or whole for the current increased stranding event or that they may contribute to such a stranding event in the future. BOEM is also unable to determine, at this point and time, what effect (if any) the *Deepwater Horizon* explosion, oil spill, and response had on sea turtles also affected by the increased stranding event. Instead, we are stating that these determinations cannot be made based on available information. Further, the costs for obtaining data on the effects from the increased stranding event and/or *Deepwater Horizon* explosion, oil spill, and response are exorbitant and will take years to acquire and analyze through the existing NRDA and increased stranding event processes. Impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated by this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted methods and approaches.

Summary and Conclusion

Accidental blowouts, oil spills, and spill-response activities resulting from an EPA proposed action have the potential to impact small to large numbers of sea turtles in the GOM, depending on the magnitude and frequency of accidents, the ability to respond to accidents, the location and date of accidents, and various meteorological and hydrological factors. Impacts on sea turtles from smaller accidental events are likely to affect individual sea turtles in the spill area, but they are unlikely to rise to the level of population effects (or significance) given the size and scope of such spills. Further, the potential remains for smaller accidental spills to occur in the proposed EPA lease sale area regardless of whether or not an EPA proposed action takes place, given there are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities.

4.1.1.13.4. Cumulative Impacts

Background/Information

This cumulative analysis considers the effects of impact-producing factors related to an EPA proposed action along with impacts of other commercial, military, recreational, offshore, and coastal activities that may occur and adversely affect populations of sea turtles in the same general area of an EPA proposed action. The major impact-producing factors resulting from cumulative OCS energy-related activities associated with an EPA proposed action that may affect loggerhead, Kemp's ridley, hawksbill, green, and leatherback turtles and their habitats include marine debris, contaminant spills and spill-response activities, vessel traffic, noise, seismic surveys, and explosive structure removals. Non-OCS energy-related activities that may affect sea turtle populations include vessel traffic and related noise (including from commercial shipping, research vessels), military operations, commercial fishing, and pollution.

OCS Oil- and Gas-Related Impacts

The cumulative impact of these ongoing OCS energy-related activities on sea turtles is expected to result in a number of chronic and sporadic sublethal effects (i.e., behavioral effects and nonfatal exposure to or intake of OCS-related contaminants or discarded debris) because these activities may stress and/or weaken individuals of a local group or population and may predispose them to infection from natural or anthropogenic sources.

Few deaths are expected from chance collisions with OCS service vessels, ingestion of plastic material, commercial fishing, and pathogens. Disturbance (noise from vessel traffic and drilling operations) and/or exposure to sublethal levels of toxins and anthropogenic contaminants may stress animals, weaken their immune systems, and make them more vulnerable to parasites and diseases that normally would not be fatal during their life cycle. The net result of any disturbance depends upon the size and percentage of the population likely to be affected, the ecological importance of the disturbed area, the environmental and biological parameters that influence an animal's sensitivity to disturbance and stress, or the accommodation time in response to prolonged disturbance (Geraci and St. Aubin, 1980). Lease stipulations and regulations are in place to reduce vessel strike mortalities. As discussed in **Appendix B**, a low-probability, large-scale catastrophic event, which is not reasonably expected and not part of an EPA proposed action, could have population-level effects on sea turtles.

Unavailable information on the effects to sea turtles from the *Deepwater Horizon* explosion, oil spill, and response and increased stranding events (and thus changes to the sea turtle baseline in the affected environment) makes an understanding of the cumulative effects less clear. Here, BOEM concludes that the unavailable information from these events may be relevant to reasonably foreseeable significant adverse impacts to sea turtles. For sea turtles occurring in the EPA, BOEM cannot rule out that incomplete or unavailable information may be essential to a reasoned choice among the alternatives for this EIS. Relevant data on the status of the sea turtle population after the increased stranding event and *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Further, there are already scientific processes in place through the NRDA and increased stranding responses to investigate these remaining questions. The NMFS has only released raw data on stranding numbers to date. BOEM does not have the ability to investigate the sea turtle strandings independently. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

Nevertheless, there are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities. In addition, non-OCS energy-related activities discussed below will continue to occur in the EPA irrespective of an EPA proposed action (i.e., fishing, military activities, and scientific research). The potential for effects from changes to the affected environment (post-*Deepwater Horizon*), routine activities, accidental spills (including low-probability catastrophic spills, which are not reasonably expected and not part of an EPA proposed action), and cumulative effects remains whether or not the No Action or Action alternative is chosen under this EIS.

Non-OCS Oil- and Gas-Related Impacts

Non-OCS energy-related activities that may affect sea turtle populations include vessel traffic and related noise (including from commercial shipping, research vessels), military operations, commercial fishing, and pollution.

Non-OCS energy program-related activities include historic overexploitation (which led to listing of the species), commercial fishery interactions, habitat loss, dredging, pollution, vessel strikes, and pathogens. The Gulf Coast is a well-populated and growing area, and development of previously unusable land for residential and commercial purposes is common. Although some areas of the Gulf Coast have begun to cater to ecotourism by better management of resources, other areas continue to increase attractions particularly for tourists, such as jet skis and thrill craft, which may pose a threat to listed species or their habitats. Increased populations often result in increased runoff and dumping. Many areas around the Gulf already suffer from very high contaminant counts due to river and coastal runoff and discharges. Contaminants may accumulate in species or in prey species.

Summary and Conclusion

The effects of an EPA proposed action, when viewed in light of the effects associated with other past, present, and reasonably foreseeable future OCS activities, may result in greater impacts to sea turtles than before the *Deepwater Horizon* explosion, oil spill, and response; however, the magnitude of those effects cannot yet be determined. Nonetheless, operators are required to follow all applicable lease stipulations and regulations, as clarified by NTL's, to minimize these potential interactions and impacts. The operator's reaffirmed compliance with NTL 2012-JOINT-G01 ("Vessel-Strike Avoidance and Injured/Dead Protected Species Reporting") and NTL 2012-BSEE-G01 ("Marine Trash and Debris Awareness Elimination"), as well as the limited scope, timing, and geographic location of an EPA proposed action, would result in negligible effects from the proposed drilling activities on sea turtles. In addition, NTL 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program," minimizes the potential of harm from seismic operations to sea turtles and marine mammals; these mitigations include onboard observers, airgun shut-downs for whales in the exclusion zone, ramp-up procedures, and the use of a minimum sound source. Therefore, no significant cumulative impacts to sea turtles would be expected as a result of the proposed exploration activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other ongoing activities in the area.

Adverse effects may result from the incremental contribution of an EPA proposed action combined with non-OCS oil- and gas-related activities. The biological significance of any mortality or adverse impact would depend, in part, on the size and reproductive rates of the affected populations, as well as the number, age, and size of animals affected. However, the potential for impacts is mainly focused on the individual, and population-level impacts are not anticipated based on the best available information.

Incremental injury effects from an EPA proposed action on sea turtles are expected to be negligible for drilling and vessel noise and minor for vessel collisions, but it would not rise to the level of significance because of the limited scope, duration, and geographic area of the proposed drilling and vessel activities and the relevant regulatory requirements.

The effects of an EPA proposed action, when viewed in light of the effects associated with other relevant non-OCS activities, may affect sea turtles occurring in the GOM. With the enforcement of regulatory requirements for drilling and vessel operations and the scope of an EPA proposed action, incremental effects from the proposed drilling activities on sea turtles would be negligible (drilling and vessel noise) to minor (vessel strikes). The best available scientific information indicates that sea turtles do not rely on acoustics; therefore, vessel noise and related activities would have limited effect. Consequently, no significant cumulative impacts would be expected from an EPA proposed action's activities or as the result of past, present, or reasonably foreseeable oil and gas leasing, exploration, development, and production in the GOM. Even taking into account the additional effects resulting from non-OCS oil- and gas-related activities, the potential for impacts from an EPA proposed action is mainly focused on the individual. Population-level impacts are not anticipated based on the best available information.

In any event, the incremental contribution of an EPA proposed action would not be likely to result in a significant incremental impact on sea turtles within the EPA; in comparison, non-OCS-related activities, such as overexploitation, commercial fishing, and pollution, have historically proved to be a greater threat to sea turtles.

4.1.1.14. Diamondback Terrapins

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for diamondback terrapins can be found in Chapter 4.2.1.14 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.14 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.14 of the 2012-2017 Multisale EIS and Chapter 4.2.1.14 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for coastal water quality regarding the EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for diamondback terrapins presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for diamondback terrapins presented. The impact conclusions for diamondback terrapins presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are hereby incorporated by reference as applicable for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on diamondback terrapins, and various Internet sources were examined to determine any recent information regarding diamondback terrapins. Sources investigated included, but were not limited to, journals and scientific articles, Google, Google Scholar, and other Federal and State natural resource management agency websites. All new relevant information was incorporated into the analyses below. No new significant information was discovered regarding diamondback terrapins since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, BOEM concludes that there remains incomplete or unavailable information regarding diamondback terrapins that could be relevant to reasonably foreseeable significant adverse effects. This includes information that may be forthcoming regarding impacts from the *Deepwater Horizon* explosion, oil spill, and response. The OCS activities will be ongoing under existing leases whether or not an EPA proposed action takes place. However, BOEM believes that the unavailable information may be essential to a reasoned choice among alternatives, particularly to the extent that diamondback terrapins were affected by the *Deepwater Horizon* explosion, oil spill, and response. The FWS has jurisdiction for investigating terrapin impacts from the *Deepwater Horizon* explosion, oil spill, and response through the NRDA process. To date, there are no data available on impacts to terrapins from the *Deepwater Horizon* explosion, oil spill, and response. BOEM is therefore unable to determine, at this point and time, what effect (if any) the *Deepwater Horizon* explosion, oil spill, and response had on terrapins. The NRDA process may take years to complete. Impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

4.1.1.14.1. Description of the Affected Environment

Diamondback terrapins occur in 16 states along the Atlantic and Gulf Coasts; the coastline of Florida represents approximately 20 percent of their full range (Butler et al., 2006). Only two of the seven terrapin subspecies have ranges entirely outside of Florida. Little is known of these subspecies but terrapins are the only species, other than sea turtles, to evolve for life exclusively in marine environments. This is also the only turtle in North America that exclusively inhabits estuarine waters and salt marshes.

The four terrapin subspecies that occur in the EPA and within Florida are the Florida east coast terrapin (*Malaclemys terrapin tequesta*); mangrove diamondback terrapin (*Malaclemys terrapin rhizophorarum*); ornate diamondback terrapin (*Malaclemys terrapin macrospilota*); and the Mississippi diamondback terrapin (*Malaclemys terrapin pileata*) (Butler et al., 2006). The Florida east coast terrapin occurs in the upper Keys (Monroe County) and the east coast of Florida. The mangrove diamondback terrapin is found in the lower Florida Keys, south of Vaca Key (Monroe County). The ornate diamondback terrapin occurs from Monroe County to the western part of the Florida panhandle (Walton County). The Mississippi diamondback terrapin (listed November 15, 1994) has a range that includes Louisiana, Mississippi, Alabama, Georgia, and Florida (Okaloosa County westward) (USDOI, FWS, 2011a).

The primary subspecies of terrapin that occurs in the CPA and that is a Federal species of concern is the Mississippi diamondback terrapin (*Malaclemys terrapin pileata*) and the Texas diamondback terrapin (*Malaclemys terrapin littoralis*; listed November 15, 1994), which has a range from Louisiana through Texas (USDOI, FWS, 2011a).

Malaclemys terrapin are federally listed as a species of concern. "Species of concern" is an informal term that refers to those species that might be in need of concentrated conservation actions. Such conservation actions vary depending on the health of the populations and degree and types of threats. At one extreme, there may only need to be periodic monitoring of populations and threats to the species and its habitat. At the other extreme, a species may need to be listed as a federally threatened or endangered species under the ESA. Species of concern receive no legal protection above those already afforded the species under other laws, and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. At the present time, the diamondback terrapin is neither a listed species nor a candidate for listing under the ESA.

Deepwater Horizon **Explosion, Oil Spill, and Response**

The *Deepwater Horizon* explosion, oil spill, and response may have impacted the terrapin community and associated brackish habitats. According to OSAT-2 (2011), possible environmental effects from the *Deepwater Horizon* explosion, oil spill, and response could occur within terrapin marsh habitat via food or from nesting habitat since no active intervention (natural remediation) is the preferred protocol.

The *Deepwater Horizon* Unified Command reported daily fish and wildlife collection reports that included turtles; this can be found at RestoreTheGulf.gov (2012a). As of May 2012, two other reptiles (not yet identified as terrapin and other than sea turtles) have been collected in the CPA (RestoreTheGulf.gov, 2012a). There is photographic evidence of one terrapin found oiled on Grand Terre Isle, Louisiana, on June 8, 2010 (State of Louisiana, Coastal Protection and Restoration Authority, 2012b). It is not clear whether this terrapin was included with the two reptiles collected in the CPA, described at RestoreTheGulf.gov (2012a). As data continue to be gathered and impact assessments completed, a better characterization of the full scope of impacts to the terrapin populations in the GOM from the *Deepwater Horizon* explosion, oil spill, and response will be available.

Diamondback Terrapin Resources in the Eastern Planning Area

The four terrapin subspecies that occur in the EPA and within Florida are the Florida east coast terrapin (*Malaclemys terrapin tequesta*), mangrove diamondback terrapin (*Malaclemys terrapin rhizophorarum*), ornate diamondback terrapin (*Malaclemys terrapin macrospilota*), and the Mississippi diamondback terrapin (*Malaclemys terrapin pileata*) (Butler et al., 2006). The primary subspecies of terrapin that occur in the CPA are the Mississippi diamondback terrapin (*Malaclemys terrapin pileata*) and the Texas diamondback terrapin (*Malaclemys terrapin littoralis*) (USDOI, FWS, 2011a). The shortest distance from the EPA to terrapin habitat is approximately 125 mi (201 km) to Florida and 150 mi (241 km) to Louisiana. The final determinations on damages to diamondback terrapin resources from the *Deepwater Horizon* explosion, oil spill, and response will ultimately be made through the NRDA process. The *Deepwater Horizon* explosion, oil spill, and response will ultimately allow a better understanding of any realized effects from such a low-probability catastrophic spill, which is not reasonably expected and not part of an EPA proposed action. However, the best available information on impacts to diamondback terrapins does not yet provide a complete understanding of the effects of the oil spilled and active response/cleanup activities from the *Deepwater Horizon* explosion, oil spill, and response on diamondback terrapins as a whole in the GOM and whether these impacts reach a population level.

BOEM concludes that there remains incomplete or unavailable information regarding diamondback terrapins that could be relevant to reasonably foreseeable significant adverse effects. This includes information that may be forthcoming regarding impacts from the *Deepwater Horizon* explosion, oil spill, and response. The OCS activities will be ongoing under existing leases whether or not an EPA proposed action takes place. However, BOEM believes that the unavailable information may be essential to a reasoned choice among alternatives, particularly to the extent that diamondback terrapins were affected by the *Deepwater Horizon* explosion, oil spill, and response. The FWS has jurisdiction for investigating terrapin impacts from the *Deepwater Horizon* explosion, oil spill, and response through the NRDA process. To date, there are no data available on impacts to terrapins from the *Deepwater Horizon* explosion, oil spill, and response. BOEM is therefore unable to determine, at this point and time, what effect (if any) the *Deepwater Horizon* explosion, oil spill, and response had on terrapins. The NRDA process may take years to complete. Impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

4.1.1.14.2. Impacts of Routine Events

Background/Information

The major impact-producing factors resulting from the routine activities associated with an EPA proposed action that may affect the four terrapin subspecies within the EPA and the two terrapin subspecies within the CPA include beach trash and debris generated by service vessels and OCS facilities, efforts undertaken for the removal of marine debris or for beach restoration, and vessel traffic with associated habitat erosion.

Proposed Action Analysis

The major routine impact-producing factors associated with an EPA proposed action that may affect terrapins include beach trash and debris generated by service vessels and OCS facilities, efforts undertaken for the removal of marine debris or for beach restoration, and vessel traffic with associated habitat erosion. Greatly improved handling of waste and trash by industry, along with the annual awareness training required by the marine debris mitigations, is decreasing the plastics in the ocean and minimizing the devastating effects on wildlife. The incidental ingestion of marine debris and entanglement could adversely affect terrapins. The BSEE requires compliance with the established guidelines provided in NTL 2012-BSEE-G01, "Marine Trash and Debris Awareness and Elimination," which appreciably reduces the likelihood of encountering marine debris from an EPA proposed action. An EPA proposed action is expected to contribute negligible marine debris or disruption to terrapin habitat. Unless properly regulated, personnel removing marine debris may temporarily disturb terrapins or trample nesting sites. Due to the extended distance from shore, most impacts associated with the OCS Program are not expected to impact terrapins or their habitat.

There have been no documented terrapin collisions with drilling and service vessels in the GOM. To further minimize the potential for vessel strikes, BOEM and BSEE issued NTL 2012-JOINT-G01, which clarifies 30 CFR § 550.282 and 30 CFR § 250.282 and which provides NMFS guidelines for monitoring procedures related to vessel strike avoidance measures. BOEM and BSEE monitor for any takes that have occurred as a result of vessel strikes and also require that any operator immediately report the striking of any marine animal (30 CFR § 550.282, 30 CFR § 250.282, and NTL 2012-JOINT-G01). Other potential impacts that are indirectly associated with OCS energy-related activities are wake erosion of terrapin habitat resulting from vessel traffic and additional onshore development.

Little or no damage is expected to the physical integrity, species diversity, or biological productivity of terrapin habitat as a result of an EPA proposed action.

Although there will always be some level of incomplete information on the effects from routine activities under an EPA proposed action on diamondback terrapin, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts from routine activities would be sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects. Because completion of the NRDA process may be years away, BOEM cannot definitively determine if the information resulting from the process may be essential to a reasoned choice among alternatives. Routine activities, however, will be ongoing in the proposed EPA lease sale area as a result of existing leases and related activities. Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that routine activities from the preexisting OCS Program are significantly impacting diamondback terrapin populations. As such, even with this uncertainty, the potential impacts from routine activities associated with an EPA proposed action are unlikely to result in significant, population-level impacts on diamondback terrapins due to their distance from most offshore activities and the limited potential for activities occurring in or near their habitat (0-1 pipeline landfalls and other coastal infrastructure, which is subject to permitting and location requirements). Therefore, a fuller understanding of any incomplete or unavailable information on the effects of routine activities is likely not essential to make a reasoned choice among the alternatives.

Summary and Conclusion

Adverse impacts due to routine activities resulting from an EPA proposed action are possible but unlikely. Because of the greatly improved handling of waste and trash by industry and because of the annual awareness training required by the marine debris mitigations, the plastics in the ocean are decreasing and the devastating effects on offshore and coastal marine life are minimizing. The routine activities of an EPA proposed action are unlikely to have significant adverse effects on the size and recovery of any terrapin species or population in the GOM. Most routine OCS energy-related activities are expected to have sublethal effects, such as behavioral effects, that are not expected to rise to the level of significance to the populations.

4.1.1.14.3. Impacts of Accidental Events

Background/Information

The major impact-producing factors resulting from the accidental events associated with an EPA proposed action that may affect the five terrapin subspecies that occur in the EPA and CPA include offshore and coastal oil spills and spill-response activities. Potential impacts from a low-probability catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, are addressed in **Appendix B**.

Proposed Action Analysis

Accidental blowouts, oil spills, and spill-response activities resulting from an EPA proposed action have the potential to impact small to large numbers of terrapins within their habitat, depending on the magnitude and frequency of accidents, the ability to respond to accidents, the location and date of accidents, and various meteorological and hydrological factors. Populations of terrapins in the GOM may be exposed to residuals of oils spilled as a result of an EPA proposed action during their lifetimes. Chronic or acute exposure may result in the harassment, harm, or mortality to terrapins occurring in the Gulf. In most foreseeable cases, exposure to hydrocarbons persisting within the wetlands following the dispersal of an oil slick could result in sublethal impacts (e.g., decreased health, reproductive fitness, and longevity; and increased vulnerability to disease). Terrapin hatchling exposure to, fouling by, or consumption of tarballs persisting inland following the dispersal of an oil slick would likely be fatal but unlikely. Impacts from the dispersants are unknown, but they may have similar irritants to tissues and sensitive membranes as they are known to have had on seabirds and sea turtles (NRC, 2005). The impacts to diamondback terrapins from chemical dispersants could include nonlethal injury (e.g., tissue irritation and inhalation), long-term exposure through bioaccumulation, and potential shifts in distribution from some habitats.

Burger (1994) described the behavior of 11 female diamondback terrapins that were oiled during the January 1990 spill of No. 2 fuel oil in Arthur Kill, New York. The terrapins were hibernating at the time of the spill, and when they emerged from hibernation, they were found to be oiled. The terrapins voided oil from their digestive tracks for 2 weeks in rehabilitation. At 3 weeks, the terrapins scored low on strength tests and were slow to right themselves when placed on their backs. At 4 weeks, they developed edema and appetite suppression. Eight of the 11 died; these animals had traces of oil in their tissues and exhibited lesions in their digestive tract consistent with oil exposure (Burger, 1994).

The OSRA model's combined probabilities indicate East and West Louisiana State waters as most likely to be contacted by a hypothetical spill ≥1,000 bbl occurring based on an EPA proposed action (<0.5-1% for 10 and 30 days) (**Figure 3-8**). The highest resource estimate shows an 8 percent probability of one or more hypothetical spills ≥1,000 bbl to occur from platforms, pipelines and tankers associated with an EPA proposed action (2012-2017) (**Table 3-21**). The most likely cause is from pipelines. Plaquemines Parish, Louisiana is the only parish that has the probability of a spill contacting the coastline >0.5 percent (0-1% for 10 and 30 days) (**Figure 3-9**).

BOEM concludes that there is incomplete or unavailable information that may be relevant to reasonably foreseeable significant adverse impacts from noncatastrophic spills/accidental events to terrapins that were potentially impacted by the *Deepwater Horizon* explosion, oil spill, and response. For example, there is incomplete information on impacts to terrapin populations from the *Deepwater Horizon* explosion, oil spill, and response and whether individuals or populations may be susceptible to greater impacts in light of the *Deepwater Horizon* explosion, oil spill, and response. Relevant data on the status of and impacts to terrapin populations from the *Deepwater Horizon* explosion, oil spill, and response is being developed through the NRDA process and may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. No data on terrapins impacted by the *Deepwater Horizon* explosion, oil spill, and response have been released. It is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In the absence of this information, BOEM's subject-matter experts have used what scientifically credible information is available and applied it using accepted scientific methodologies. Activities that could result in an accidental spill in the proposed EPA lease sale area would be ongoing whether or not an EPA proposed action takes place, given there are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities that could result in an accidental spill.

Summary and Conclusion

Impacts on diamondback terrapins from smaller accidental events are likely to affect individual diamondback terrapins in the spill area, as described above, but they are unlikely to rise to the level of population effects (or significance) given the probable size and scope of such spills. Further, the potential remains for smaller accidental spills to occur in the proposed EPA lease sale area regardless of whether or not an EPA proposed action takes place, given there are existing leases already in the EPA with either ongoing or the potential for exploration, drilling, and production activities.

The analyses in this EIS and in **Appendix B** conclude that there is a low probability for catastrophic spills and that a catastrophic spill is not reasonably expected and not part of an EPA proposed action. **Appendix B** also concludes that a low-probability catastrophic event, though not reasonably expected and not part of an EPA proposed action, if it were to occur, could result in significant, population-level effects on affected diamondback terrapin species. BOEM continues to concur with the conclusions from these analyses.

For those terrapin populations that may not have been impacted by the *Deepwater Horizon* explosion, oil spill, and response, it is unlikely that a future accidental event related to an EPA proposed action would result in significant impacts due to the distance of most terrapin habitat from offshore OCS energy-related activities. A low-probability, large-scale catastrophic event, which is not reasonably expected and not part of an EPA proposed action, of the size and type that could reach these habitats is discussed in **Appendix B**.

4.1.1.14.4. Cumulative Impacts

Background/Information

The major impact-producing factors that may affect the four terrapin subspecies within the EPA and the two terrapin subspecies within the CPA include oil spills and spill-response activities, alteration and reduction of habitat, and consumption of trash and debris.

OCS Oil- and Gas-Related Impacts

Most spills related to an EPA proposed action, as well as oil spills stemming from import tankering and prior and future lease sales, are not expected to contact terrapins or their habitats. The incremental contribution of an EPA proposed action to cumulative impacts on the terrapin is expected to be minimal.

Spending most of their lives within their limited home ranges at the aquatic-terrestrial boundary in estuaries, terrapins are susceptible to habitat destruction (i.e., urban development, subsidence, sea-level rise, direct oil contact, and associated cleanup efforts). Habitat loss has the potential to increase terrapin vulnerability to predation and to increase competition. Pipelines from offshore oil and gas and other shoreline crossings have contributed to habitat loss. Behavioral effects and nonfatal exposure to or intake of OCS energy-related contaminants or discarded debris may stress and/or weaken individuals of a local group or population and predispose them to infection from natural or anthropogenic sources. Even after the oil is no longer visible, terrapins may still be exposed while they forage in the salt marshes lining the edges of estuaries where oil may have accumulated under the sediments and within the food chain (Burger, 1994; Roosenburg et al., 1999). Nests can also be disturbed or destroyed by cleanup efforts.

Unavailable information on the effects to diamondback terrapins, including those that may have resulted from the *Deepwater Horizon* explosion, oil spill, and response (and thus changes to the diamondback terrapin baseline in the affected environment), make an understanding of the cumulative effects less clear. Here, BOEM concludes that the unavailable information from these events may be relevant to foreseeable significant adverse impacts to diamondback terrapins. Relevant data on the status of diamondback terrapin populations after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated by this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches.

Nevertheless, BOEM believes that incomplete or unavailable information regarding effects of the *Deepwater Horizon* explosion, oil spill, and response on terrapins is not essential to a reasoned choice among alternatives in the cumulative effects analysis. The rate of current and historic loss of terrapin habitat in Louisiana, for example, far exceeds the potential impacts to terrapin habitat from the *Deepwater Horizon* explosion, oil spill, and response.

Non-OCS Oil- and Gas-Related Impacts

Cumulative activities posing the greatest potential harm to terrapins are non-OCS energy-related factors (i.e., coastal spills) and natural catastrophes (i.e., hurricanes and tropical storms), which, in combination, could potentially deplete some terrapin populations to unsustainable levels.

Habitat destruction, road construction, and drowning in crab traps are the most recent threats to diamondback terrapins. In the 1800's, populations declined due to overharvesting for meat (Hogan, 2003). Tropical storms, hurricanes, and beach erosion threaten their preferred nesting habitats.

Summary and Conclusion

Diamondback terrapins have experienced impacting pressures from habitat destruction, road construction, drowning in crab traps, and past overharvesting resulting in historical reductions in their habitat range and declines in populations. Inshore oil spills from non-OCS energy-related sources are potential threats to terrapins in their brackish coastal marshes. Pipelines from offshore oil and gas and other shoreline crossings have contributed to marsh erosion. However, an EPA proposed action includes only 0-1 pipeline landfalls and 0-1 gas processing facilities, and modern regulations require avoidance or mitigation of wetland impacts. Low-probability, large-scale catastrophic offshore oil spills, which are not reasonably expected and not part of an EPA proposed action, could affect the coastal marsh environment but such events are rare occurrences and may not reach the shore, even if they do occur. Therefore, the incremental contribution of an EPA proposed action is expected to be minimal compared with non-OCS activities. The major impact-producing factors resulting from the cumulative activities associated with an EPA proposed action that may affect the diamondback terrapin include oil spills and spill-response activities, alteration and reduction of habitat, and consumption of trash and debris. Due to the extended distance from shore, impacts associated with activities occurring in the OCS Program are not expected to impact terrapins or their habitat. No substantial information was found at this time that would alter the overall conclusion that cumulative impacts on diamondback terrapins associated with an EPA proposed action is expected to be minimal.

In addition, non-OCS energy-related activities (i.e., crabbing, fishing, military activities, scientific research, and shoreline development) will continue to occur in the EPA irrespective of an EPA proposed action. The potential for effects from changes to the affected environment (post-*Deepwater Horizon*), routine activities, accidental spills (including low-probability catastrophic spills, which are not reasonably expected and not part of an EPA proposed action), and cumulative effects remains whether or not the No Action or Action alternative is chosen under this EIS. Impacts on diamondback terrapins from either smaller accidental events or low-probability catastrophic spill events, which is not reasonably expected and not part of an EPA proposed action, will remain the same.

Overall, within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting diamondback terrapin populations. Non-OCS energy-related activities will continue to occur in the EPA irrespective of an EPA proposed lease sale (i.e., crabbing, fishing, military activities, scientific research, and shoreline development). Therefore, in light of an EPA proposed action and its impacts, the incremental effect of an EPA proposed action on diamondback terrapins populations is not expected to be significant when compared with historic and current non-OCS energy-related activities, such as habitat loss, overharvesting, crabbing, and fishing.

4.1.1.15. Beach Mice

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for beach mice can be found in Chapter 4.2.1.15 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.15 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.15 of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS would be equally applicable for beach mice regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for beach mice presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for beach mice presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Therefore, the impact conclusions are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on beach mice, and various Internet sources were examined to determine any recent information regarding beach mice. Sources investigated included, but were not limited to, journals and scientific articles Google Advanced Scholar Search, and Google Advanced Book Search. Searches were based on major themes. No new significant information was discovered since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding beach mice since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, BOEM acknowledges that there remains incomplete or unavailable information regarding beach mice, including information regarding the *Deepwater Horizon* explosion, oil spill, and response and impacts from that spill to beach mice. Nevertheless, there is scientifically credible information regarding the likelihood that beach mice were minimally impacted by oil and related tarballs from the *Deepwater Horizon* explosion and oil spill. The *Deepwater Horizon* explosion, oil spill, and response has no recorded ecological changes for the Alabama beach mouse and probably no ecological changes for the other three subspecies (Leblanc, official communication, 2011). There is a pending study investigating the effects of the *Deepwater Horizon* explosion, oil spill, and response activities on beach mice and their habitat. The ongoing research on the potential impacts from the cleanup activities to beach mice is being conducted through the NRDA process. The NRDA research projects may be years from completion, and data and conclusions have not been released to the public. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In its place, BOEM has included what scientifically credible information is available and applied it using accepted scientific methodologies. Although information resulting from this study may be relevant to reasonably foreseeable adverse impacts on beach mice and their habitat, BOEM's subject-matter experts have determined that it is not essential to a reasoned choice among alternatives. BOEM has conservatively considered the potential for impacts from cleanup activities in the accidental analysis.

4.1.1.15.1. Description of the Affected Environment

Hall (1981) recognizes 16 subspecies of field mouse (*Peromyscus polionotus*), 8 of which are collectively known as beach mice. Of Gulf Coast subspecies, the Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice occupy restricted habitats in the mature coastal dunes of Florida and Alabama. All four mice are listed as endangered: the Alabama subspecies in Alabama (listed June 6, 1985); and the Perdido Key subspecies (listed June 6, 1985), St. Andrew subspecies (listed December 18, 1998), and Choctawhatchee subspecies (listed June 6, 1985) in Florida (USDOI, FWS, 2010a). Ecological data relating to the listing and critical habitat of the four subspecies can be found in USDOI, FWS (1985) and the *Federal Register* (1985a and 1998b). Current critical habitat for beach mouse can be found in USDOI, FWS (2010b) as follows: Alabama subspecies (pages 326-337); Choctawhatchee subspecies (pages 337-381); Perdido Key subspecies (pages 381-404); and St. Andrew subspecies (pages 415-465). The Santa Rosa beach mouse (*Peromyscus polionotus leucocephalus*) occurs in Florida in the northern Gulf, but it is not listed as threatened or endangered. The primary reason for not listing this subspecies is the large area of relatively undeveloped habitat, especially in Gulf Islands National Seashore and Eglin Air Force Base. The southeastern beach mouse (*Peromyscus polionotus niveiventris*) is listed as threatened (May 12, 1989) and the Anastasia Island beach mouse (*Peromyscus polionotus phasma*) is listed as endangered (May 12, 1989) on the east coast of Florida. Populations of listed species have fallen to levels approaching extinction. For example, in the late 1980's, estimates of total remaining beach mice were less than 900 for the Alabama beach mouse, about 80 for the Perdido Key beach mouse, and about 500 for the Choctawhatchee beach mouse.

Beach mice have such dynamic populations that population estimates based on numbers of individuals are rarely made because it is too labor intensive (Frater, official communication, 2011). Instead, populations are generally estimated by acres of occupied habitat. At the present time, all beach mouse subspecies populations are well distributed; therefore, all critical habitat units are occupied, with two exceptions. One exception is for Choctawhatchee beach mouse, which does not occupy two isolated State parks: Henderson (96 ac; 39 ha) and St. Andrew (113 ac; 46 ha); this total of 209 ac (85 ha) can be subtracted from the overall acres of designated critical habitat. The other exception is for the St. Andrew beach mouse, which does not currently occupy the Palm Point Unit; therefore, 162 ac (66 ha) can be subtracted from the overall acres of designated critical habitat. For the Alabama beach mouse, critical habitat is not designated for the entire range of the Alabama beach mouse; therefore, the occupied range of the Alabama beach mouse is used as the population estimate. The current estimate is 2,375 ac (961 ha) on Fort Morgan and 130 ac (53 ha) at Gulf State Park in Gulf Shores. Resulting total areas of occupied habitat for the four species of beach mice are as follows: 2,505 ac (1,014 ha) for the Alabama beach mouse; 1,300 ac (525 ha) for the Perdido Key beach mouse; 2,195 ac (886 ha) for the Choctawhatchee beach mouse; and 2,328 ac (940 ha) for the St. Andrew beach mouse (Frater, official communication, 2011; Leblanc, official communication, 2011; *Federal Register*, 2006c and 2007a).

Continued monitoring of populations of all subspecies along the Gulf Coast between 1985 and the present indicates that approximately 32.3 mi (52 km) of coastal dune habitat are now occupied by the four listed subspecies (1/3 of historic range). Beach mice were listed because of the loss of coastal habitat from human development. The reduced distribution and numbers of beach mice have continued because of multiple habitat threats over their entire range (coastal development and associated human activities, military activities, coastal erosion, and sea states caused by severe weather). Development of beachfront real estate along coastal areas and catastrophic alteration by hurricanes are the primary contributors to loss of habitat. Recent studies indicate that this continues to be a problem (Douglass et al., 1999; South Alabama Regional Planning Commission, 2001).

The inland extent of beach mouse habitat may vary depending on the configuration of the sand dune system and the vegetation present. The habitat generally is in long, narrow bands along high-energy shorelines. Between open beaches and maritime hummocks, vegetation is strongly affected by wind, wave action, and battering salt spray. Vegetation includes low-growing vines, grasses, other herbs, and salt-tolerant shrubs, including plants adapted to disturbed soil such as railroad embankments and dunes.

There are commonly several rows of dunes paralleling the shoreline and within these rows there are generally three types of microhabitat. The first microhabitat is the frontal dunes (from the beach face proceeding inland, these compose the primary and secondary dunes). These features are sparsely vegetated with widely scattered coarse grasses including sea oats (*Uniola paniculata*), bunch grass (*Andropogon maritimus*), and beach grass (*Panicum amarum* and *P. repens*), and with seaside rosemary (*Ceratiola ericoides*), beach morning glory (*Ipomoea stolonifera*), and railroad vine (*I. Pes-caprae*). Primary and secondary dunes only differ in location relative to the beach. Bitter panic grass (*Panicum amarum* var. *amarulum*) has low freshwater moisture requirements and tolerates low nutrient levels, high sand temperatures, and sand burial (Lonard and Judd, 2011). The second microhabitat is the higher rear scrub dunes (tertiary dunes), which support growth of slash pine (*Pinus elliotti*), sand pine (*P. clausa*), and scrubby shrubs and oaks, including yaupon (*Ilex vomitoria*), marsh elder (*Iva* sp.), scrub oak (*Quercus myrtifolia*), and sand-live oak (*Q. virginiana* var. *maritima*). The third microhabitat is the interdunal areas, which contain sedges (*Cyperus* sp.), rushes (*Juncus scirpoides*), and salt grass (*Distichlis spicata)*.

Beach mice are restricted to the coastal barrier sand dunes along the Gulf. Optimal overall beach mouse habitat is currently thought to be comprised of a heterogeneous mix of interconnected habitats including frontal dunes, scrub (tertiary) dunes farther inland, and interdunal areas between these dune habitats, as discussed above. Beach mice dig burrows mainly in the frontal dunes and interior scrub dunes where the vegetation provides suitable cover. Most beach mouse surveys conducted prior to the mid-1990's were in primary and secondary frontal dunes because the investigators assumed that these habitats are the preferred habitat of beach mice. A limited number of surveys in scrub dunes and other interior habitat resulted in less knowledge of the distribution and relative abundance there. In coastal environments, the terms "scrub" and "scrub dune" refer to habitat or vegetation communities adjacent to and landward of primary and secondary dune types where scrub oaks are visually dominant. Interior habitat can include vegetation types such as grass-like forbs (forbs or phorbs are the herbs other than grasses). There is substantial variation in scrub oak density and cover within and among scrub dunes throughout ranges of beach mice. The variation, an ecological gradient, is represented by scrub oak woodland with a relatively closed canopy at one end of a continuum. At the other extreme of the gradient, scrub dunes are relatively open with patchy scrub ridges and intervening swales or interdunal flats dominated by herbaceous plants.

Beach mice feed nocturnally in the dunes and remain in burrows during the day. Their diets vary seasonally but consist mainly of seeds, fruits, and insects (Ehrhart, 1978; Moyers, 1996). Consumption of foods is determined largely by availability of foods in dune habitat. Changes in the availability of foods result in changes in diets between seasons and account for variability of seasonal diets between years. Management practices designed to promote recovery of dune habitat, increase food sources, and enhance habitat heterogeneity may aid in the recovery of beach mouse populations. Autumn diets of beach mice consist primarily of seeds and fruits of sea oats, evening primrose (*Oenothera humifusa*), the grass Gulf bluestem (*Schizachyrium maritimum*), and dune spurge (*Chamaesyce ammannioides*). Sea oats and the legume beach pea (*Galactia* sp.) dominate winter diets. Spring diets primarily consist of dune toadflax (*Nuttallanthus floridana*), the evergreen yaupon holly (*Ilex vomitoria)*, seashore elder (*Iva imbricata*) which tolerates high wind and salt spray, and greenbrier (*Smilax* sp.). Summer diets are dominated by evening primrose, insects, dune toadflax, and coastal ground cherry (*Physalis angustifolia*) (Moyers, 1996). Sea oats and Gulf bluestem tolerate low freshwater moisture, low nutrient levels, high sand temperatures, and sand burial (Lonard and Judd, 2010; Lonard et al., 2011). Sea oats tolerate salt spray (Lonard et al., 2011). Transplanted Gulf bluestem survival and growth were high regardless of distance from the Gulf (92-200 m [302-656 ft] landward from the shoreline) (Miller et al., 2008).

Management practices designed to promote recovery of dune habitat, increase food sources, and enhance habitat heterogeneity may aid in the recovery of beach mouse populations. Some authors propose that primary succession is an important process in dune vegetation dynamics in northwest Florida (Johnson, 1997; Miller et al., 2009; Gornish and Miller, 2010). Chronosequences are used to support the hypothesis that succession exists. Chronosequences substitute space for time in determining the sequences of succession (for example, in northwest Florida, Johnson [1997] substituted species' position along transects in northwest Florida coastal dunes for species' historical succession sequences over several decades of time). However, empirical evidence invalidates chronosequence-based sequences in the four classic studies of succession (Johnson and Miyanishi, 2008).

In wild populations, beach mice have an average life span of about 9 months. Males and females reach adulthood and are able to reproduce at approximately 35 days of age. Females can nurse one litter while pregnant with another litter. From captive colonies we know that litter size is 1-8 with an average of four. Young are weaned in 2-3 weeks and are generally on their own 1-2 weeks later.

Hurricanes are a natural environmental phenomenon affecting the Gulf Coast, and beach mice have evolved and persisted in coastal dune habitats since the Pleistocene. Hurricanes generally produce damaging winds, storm tides and surges, and rain that erode barrier-island, peninsular, and mainland beaches and dunes. Hurricanes can impact beach mice either directly (e.g., drowning) or indirectly (loss of habitat). Additionally, hurricanes can affect beach mice on either a short-term basis (temporary loss of habitat) or long-term basis (loss of food, which in turn may lead to increased juvenile mortality, which can lead to a depressed breeding season). The frequency of severe weather events could compromise the ability of beach mouse to survive and recover. A predominant threat to the beach mouse is tropical storms and hurricanes, which are considered to be a primary factor in the beach mouse's decline.

The frequency of severe weather events could compromise the ability of the beach mouse to survive and recover. Hurricanes are part of a repeated cycle of destruction, alteration, and recovery of dune habitat. The extensive coastal dune habitat that existed along the Gulf Coast before the fairly recent commercial and residential development allowed beach mice to survive even the most severe hurricane events to repopulate dune habitat as it recovered. Beach mice are affected by the passage of hurricanes along the northwest Florida and Alabama Gulf Coast. Within the historic ranges of the four Gulf Coast beach mouse subspecies, 58 hurricanes have made landfall in northwest Florida and 21 hurricanes have made landfall in Alabama between 1851 and 2006 (McAdie et al., 2009; USDOC, NOAA, National Hurricane Center, 2012). Hurricanes cause increased fragmentation of habitat, which is correlated with increased distance between fragments that must be crossed by beach mice at night if they are to move between habitat patches. Gap distance travelled may decrease when visibility is poor during the new moon, making predators harder to see (Wilkinson et al., 2009). Gap distance travelled may increase if beach mice know in advance that the target patch is environmentally more favorable, making risk of predation worthwhile (Wilkinson et al., 2009). Following hurricanes, the dune system begins a slow natural repair process that may take 3-20 years, depending on the magnitude of dune loss (Salmon et al., 1982). During this period, sea oats and other pioneer dune vegetation become established, collecting sand and building dunes. As the dunes grow and become stable, other successional dune vegetation colonizes the area (Gibson and Looney, 1994), and beach mouse food sources and habitats are reestablished. The rate of recovery of food supplies for beach mice is variable, with some areas adversely affected for an extended period of time by hurricane and post-hurricane conditions. Beach mice consume seeds and pass them in their feces, promoting colonization of bare areas of vegetation.

Tropical storms periodically devastate Gulf Coast sand dune communities, dramatically altering or destroying habitat, and either drowning beach mice or forcing them to concentrate on high scrub dunes where they are exposed to predators. How a hurricane affects beach mice depends primarily on its characteristics (magnitude of winds, storm surge, rainfall); the time of year (midsummer is the worst); where the eye, west side, and east side cross land; population size; storm impacts to habitat and food sources; and post-hurricane conditions. The interior dunes and related access corridors may be essential habitats for beach mice following survival of a hurricane. The Primary Constituent Elements that are known to require special management considerations or protection are as follows: (1) a continuous mosaic of primary, secondary, and scrub vegetation and dune structure, with a balanced level of competition, and predation and few or no competitive or predacious nonnative species present, that collectively provide foraging opportunities, cover, and burrow sites; (2) primary and secondary dunes, generally dominated by sea oats that, despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes, provide abundant food resources, burrow sites, and protection from predators; (3) scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites and that provide elevated refugia during and after intense flooding due to rainfall and/or hurricane-induced storm surge; (4) unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas; and (5) a natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, which is necessary for normal behavior, growth, and viability of all life stages (*Federal Register*, 2006c and 2007a). Such special management considerations or protection include the following: (1) management of nonnative predators and competitors; (2) management of nonnative plants; and (3) protection of beach mice and their habitat from threats by road construction, urban and commercial development, heavy machinery, and recreational activities (*Federal Register*, 2006c and 2007a). Beach mice have existed in an environment subject to recurring hurricanes, but tropical storms and hurricanes are now considered to be a primary factor in the beach mouse's decline. It is only within the last 20-30 years that the combination of habitat loss due to beachfront development, isolation of remaining beach mouse habitat areas and populations, and destruction of remaining habitat by hurricanes have increased the threat of extinction of several subspecies of beach mice.

The FWS reported considerable damage to 10 national wildlife refuges in Alabama, Mississippi, Louisiana, and the Panhandle of Florida caused by Hurricane Ivan in 2004 (USDOI, FWS, 2004a). Perdido Key, Florida, was hit hard by Hurricane Ivan, and beach mouse dune habitat and populations were greatly reduced. The mice take refuge on higher ground during severe storms. Hurricane Ivan adversely impacted an estimated 90-95 percent of primary and secondary dune habitat throughout the range of the Alabama beach mouse (USDOI, FWS, 2004b). Trapping data indicate that mice may have become locally extinct in these low-lying areas (USDOI, FWS, 2004b). Approximately 3,460 ha (1,400 ac) of higher elevation scrub habitat did not appear to be inundated by storm surge from either Hurricanes Ivan or Katrina (U.S. Dept. of the Army, COE, 2002; USDOI, FWS, 2004b, 2004c, and 2005; ENSR Corporation, 2004), but it did receive moderate damage from salt spray and wind (Boyd et al., 2003; USDOI, FWS, 2004a). The worst damage from Hurricane Ivan occurred in Alabama to Bon Secour National Wildlife Refuge located west of Gulf Shores, Alabama, along the Fort Morgan Peninsula. Major primary dunes at Bon Secour were almost completely destroyed and tons of debris washed up on the refuge.

Following Hurricane Opal in 1995, Swilling et al. (1998) reported higher Alabama beach mouse densities in the scrub than the foredunes nearly 1 year after the storm. As vegetation began to recover, however, the primary and secondary dunes were reoccupied by Alabama beach mice, and population densities surpassed those in the scrub in the fall and winter following the storm. Similar movement and habitat occupation patterns were observed following Hurricane Georges in 1998. Therefore, while Alabama beach mouse numbers and habitat quality in the frontal dunes ebb and flow in response to tropical storms, the higher elevation scrub habitat is important to mouse conservation as a more stable environment during and after storm events.

In a population genetics study of the Alabama beach mouse, adult males were often trapped with adult females, probably their mates in this monogamous species (Tenaglia et al., 2007). These pairs were more distantly related than expected, probably because kin recognition allowed selection of unrelated mates to avoid inbreeding depression as a result of breeding of related individuals. Inbreeding depression is an increase in the frequency of harmful homozygous recessive genes, which cause reduced fitness of a population. As population levels have declined, inbreeding avoidance has become important to this subspecies. Subadults were often captured with related mice, suggesting that mice form sibling and adult-subadult familial bonds before final adult dispersal, which itself is a short distance (Tenaglia et al., 2007). Consequences for inbreeding impacts need further investigation.

Beach Mice Resources in the Eastern Planning Area

Beachfront development continues to be the greatest threat to beach mouse survival (Holler and Rave, 1991; Humphrey, 1992). Habitat reduction and fragmentation have affected the ability of beach mice to quickly recover following tropical storms. The combinations of habitat loss to beachfront development, isolation of remaining habitat blocks and beach mouse populations, and destruction of remaining habitat by hurricanes have increased the threat of extinction for the Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice within the last 20-30 years (*Federal Register*, 2006c and 2007a).

BOEM acknowledges that there remains incomplete or unavailable information regarding beach mice, including information regarding the *Deepwater Horizon* explosion, oil spill, and response and impacts from that spill to beach mice. Nevertheless, there is scientifically credible information regarding the likelihood that beach mice were minimally impacted by oil and related tarballs from the *Deepwater Horizon* explosion and oil spill. The *Deepwater Horizon* explosion, oil spill, and response has no recorded ecological changes for the Alabama beach mouse and probably no ecological changes for the other three subspecies (Leblanc, official communication, 2011). There is a pending study investigating the effects of *Deepwater Horizon* explosion, oil spill, and response activities on beach mice and their habitat. The ongoing research on potential impacts from the cleanup activities to beach mice is being conducted through the NRDA process. The NRDA research projects may be years from completion, and data and conclusions have not been released to the public. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In its place, BOEM has included what scientifically credible information is available and applied it using accepted scientific methodologies. Although information resulting from this study may be relevant to reasonably foreseeable adverse impacts on beach mice and their habitat, BOEM's subject-matter experts have determined that it is not essential to a reasoned choice among alternatives. BOEM has conservatively considered the potential for impacts from cleanup activities in the accidental analysis.

Recent Section 7 Endangered Species Act Consultation

The Endangered Species Act of 1973 (ESA) (16 U.S.C. §§ 1631 *et seq*.), as amended (43 U.S.C. §§ 1331 *et seq*.), establishes a national policy designed to protect and conserve threatened and endangered species and the ecosystems upon which they depend. As mandated by the ESA, BOEM consults with NMFS and FWS on possible and potential impacts from BOEM's proposed actions on endangered/threatened species and designated critical habitat under their jurisdiction. On July 30, 2010, BOEM reinitiated ESA Section 7 Consultation on the previous 2007-2012 WPA/CPA Multisale EIS with both FWS and NMFS. This request was made as a response to the *Deepwater Horizon* explosion, oil spill, and response to comply with 50 CFR § 402.16, "Reinitiation of formal consultation." The programmatic consultation was expanded in scope, after reinitiation of consultation by BOEM following the *Deepwater Horizon* explosion and oil spill, and it will include both existing and future OCS oil and gas leases in the Gulf of Mexico over a 10-year period. The programmatic consultation will also include postlease activities associated with OCS oil and gas activities in the Gulf of Mexico, including G&G and decommissioning activities. At present, BOEM is acting as the lead agency in the ongoing expanded programmatic consultation initiated to address lease sales after the 2007-2012 Five-Year Program, with BSEE assistance and involvement.

With consultation ongoing, the current BOEM- and BSEE-required minimization measures, mitigation, and monitoring will continue to comply with all Reasonable and Prudent Measures and the Terms and Conditions under these existing consultations, along with implementing the current BOEM and BSEE required mitigation, monitoring, and reporting requirements. Based on the most recent and best available information at the time, BOEM and BSEE will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under NEPA, ESA, and other statutes.

4.1.1.15.2. Impacts of Routine Events

Background/Information

This chapter discusses the possible effects of routine activities associated with an EPA proposed action on the Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice, which are designated as protected species under the ESA. The Santa Rosa beach mouse is in the same area but is not listed under the ESA. Included in this analysis are the southeastern beach mouse (listed as threatened under the ESA) and the Anastasia Island beach mouse (listed as endangered under the ESA) on the east coast of Florida.

Proposed Action Analysis

The major impact-producing factors associated with routine activities of an EPA proposed action that may affect beach mice include beach trash and debris, and efforts undertaken for the removal of marine debris or for beach restoration. Beach mice may consume trash and debris. Mice may become entangled in the debris. An EPA proposed action is expected to contribute negligible marine debris or disruption to beach mice areas. Their burrows are about 1-3 m (3-10 ft) long and involve a plugged escape tunnel, which would function if the main burrow entrance was trampled by foot traffic of insufficiently trained debris cleanup personnel (beach mice would dig themselves out through the plug) (Mitchell, official communication, 2010). Alternatively, beach mice could dig themselves out through the main entrance. However, their burrows are located very close to each other; therefore, both the main entrance and escape tunnel may be crushed or closed by equipment and inadvertently by foot traffic. Depending on the impact factor, foot traffic or equipment, the chance of a beach mouse digging out of a closed or crushed burrow could vary. No impacts of coastal and nearshore OCS support activities on beach mice are expected for the following reasons: beach mouse critical habitat is protected from pipeline landfalls, terminals, and other onshore OCS-related construction; any coastal discharges into the water would not affect beach mice, which rely on fresh rather than saline drinking water; boat traffic would have no impact on beach mouse habitat, which is above high tide; and helicopter traffic is expected to occur only well to the west of beach mouse habitat.

Summary and Conclusion

An impact from the routine activities associated with an EPA proposed action on the Alabama, Choctawhatchee, St. Andrew, Perdido Key, southeastern, and Anastasia Island beach mice is possible but unlikely. Impact may result from consumption of or entanglement in beach trash and debris. Because an EPA proposed action would deposit only a small portion of the total debris that would reach the habitat, the impacts would be minimal. Unless all personnel are adequately trained, efforts undertaken for the removal of marine debris may temporarily scare away beach mice or destroy their food resources, such as sea oats. Their burrows are about 1-3 m (3-10 ft) long and involve a plugged escape tunnel, which would function after the main burrow entrance was trampled by foot traffic of insufficiently trained debris cleanup personnel. Alternatively, mice could dig themselves out through the trampled main entrance. However, their burrows are located very close to each other; therefore, both the main entrance and escape tunnel may be crushed or closed by equipment and inadvertently by foot traffic. Depending on the impact factor, foot traffic or equipment, the chance of a beach mouse digging out of a closed or crushed burrow could vary.

4.1.1.15.3. Impacts of Accidental Events

Background/Information

This chapter discusses the possible effects of accidental events associated with an EPA proposed action on the Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice, which are designated as protected species under the Endangered Species Act. The major impact-producing factors resulting from accidental events associated with an EPA proposed action that may affect beach mice include offshore and coastal oil spills, and spill-response activities.

Proposed Action Analysis

Direct contact with spilled oil can cause contact dermatitis. Fur will mat and therefore lose its insulation against heat and cold. Other direct toxic effects may result from oil ingestion or asphyxiation or from inhalation of fumes. An inhaled hydrocarbon (naphthalene) produced nasal lesions and tumors in laboratory rats (Long et al., 2003). Indirect effects may include contamination and depletion of food supply, destruction of habitat, and fouling of burrows.

The oiling of beach mice could result in local extinction, but this is very unlikely. The estimated combined probability of one or more spills ≥1,000 bbl both occurring and contacting the shoreline inhabited by the Alabama, Choctawhatchee, St. Andrews, Perdido Key, southeastern, and Anastasia Island beach mice as a result of an EPA proposed action is estimated to be <0.5 percent after 10 or 30 days of a spill (**Figure 3-10**), and the area of viable habitat is broad relative to the area potentially contacted by a large spill. Probabilities for the unlisted Santa Rosa beach mouse are similar to those of listed species (<0.5%) (**Figure 3-10**). Spills in coastal waters could occur at storage or processing facilities and at service bases supporting an EPA proposed action; however, these facilities would not likely be located near beach mouse habitat.

Recovery of habitat from hurricanes involves a vital link between mouse food supply (involving seeds of dune-stabilizing vegetation) and habitat. The seeds are spread in mouse feces so vegetation will colonize bare areas created by hurricanes. The link may be lost after an oil spill; this loss may result in extinction of the beach mouse after later serious storms or hurricanes or further beachfront development disrupts habitat. Impacts can also occur from spill-response activities. Vehicular traffic and other activities associated with oil-spill cleanup can degrade preferred habitat and cause displacement of mice from these areas without thorough training of all personnel, which in an emergency would need to happen on short notice. Burrow entrances could be crushed by cleanup vehicles or trampled by cleanup personnel. However, beach mice might dig themselves out of an obstructed burrow.

There is no definitive information on the persistence of oil in the event that a spill was to contact beach mouse habitat. In Prince William Sound, Alaska, after the *Exxon Valdez* spill in 1989, buried oil has been measured in the intertidal zone of beaches, but no effort has been made to search for residual buried oil above high tide. Similarly, NRC (2003) makes no mention of studies of oil left above high tide after a spill. Regardless of the potential for persistence of oil in beach mouse habitat, a slick cannot wash over the foredunes unless carried by a heavy storm swell.

Destruction of the remaining habitat due to a catastrophic spill and cleanup activities, which are not reasonably expected and not part of an EPA proposed action, would increase the threat of extinction, but the potential for a catastrophic spill that would substantially affect beach mice habitat is low. Impacts on beach mice from a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**.

Summary and Conclusion

The oiling of beach mice could result in local extinction. Oil-spill-response and cleanup activities could also have a substantial impact to the beach mice and their habitat if all cleanup personnel are not adequately trained. However, potential spills that could result from an EPA proposed action are not expected to contact beach mice or their habitats. The estimated combined probability of one or more spills ≥1,000 bbl both occurring and contacting the shoreline inhabited by the Alabama, Choctawhatchee, St. Andrews, Perdido Key, southeastern, and Anastasia Island beach mice as a result of an EPA proposed action is always <0.5 percent after 10 or 30 days of a spill, and the area of viable habitat is broad relative to the area potentially contacted by a large spill. Therefore, the probability of contact with the shoreline next to beach mouse habitat is unlikely (always a <0.5% probability), and the probability of oil washing over the foredunes to beach mouse habitat is even less. Also, inshore facilities related to an EPA proposed action are unlikely to be located on beach mouse habitat.

A review of the available information shows that impacts on beach mice from accidental impacts associated with an EPA proposed action would be minimal.

4.1.1.15.4. Cumulative Impacts

Background/Information

This chapter discusses the possible cumulative effects of all activities in the study area (past, present, and reasonably foreseeable), along with the effects of an EPA proposed action on the Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice, which are designated as protected species under the ESA. The Santa Rosa beach mouse is in the same area but is not listed under the ESA. Also included in this analysis are the southeastern beach mouse (listed as threatened under the ESA) and the Anastasia Island beach mouse (listed as endangered under the ESA) on the east coast of Florida.

The major impact-producing factors that affect beach mice include OCS-related impacting factors such as oil spills (offshore and coastal) and associated cleanup operations, alteration and reduction of habitat, and consumption of and entanglement in beach trash and debris; and non-OCS-related impact-producing factors such as beach development and alteration and reduction of habitat, predation (especially from domestic cats), competition, and natural catastrophes (i.e., hurricanes and tropical storms).

OCS Oil- and Gas-Related Impacts

Most proposed action-related spills, as well as oil spills stemming from prior and future lease sales, are not expected to contact beach mice or their habitats, and no major impacts from associated cleanup operations are expected. If personnel are properly trained (on short notice if under emergency conditions) and supervised, these impacts could be reduced. Cumulative impacts could potentially deplete some beach mice populations to unsustainable levels. The expected incremental contribution of an EPA proposed action to the cumulative impacts is negligible.

Due to the extended distance of most OCS activities from shore, the incremental impacts associated with an EPA proposed action are not expected to impact beach mice when compared with the cumulative effects of non-OCS Program factors.

Non-OCS Oil- and Gas-Related Impacts

Beachfront real estate development is the greatest threat to beach mouse survival. Habitat reduction and fragmentation have affected the ability of beach mice to quickly recover following tropical storms. Intrusion of (predatory) domestic cats into beach mouse habitat also impact survival. Competition between the hispid cotton rat (*Sigmodon hispidus*) and Alabama beach mouse may increase after a hurricane if the beach mouse is forced into a smaller habitat area (interior dune refuges) by hurricane damage to foredune habitat (Falcy, 2011; Yuro, 2011). Oil spills from import tankering are not expected to contact beach mice or their habitats, and no major impacts from associated cleanup operations are expected. If personnel are properly trained (on short notice if under emergency conditions) and supervised, these impacts could be reduced.

Population viability analysis is essentially a demographic modeling exercise to predict the likelihood a population will continue to persist over time (Groom and Pascual, 1998). Population viability analysis models have potential problems with usefulness to managers because they are untested and complex (Hanski, 1999). The objective of a population viability analysis for beach mice is to determine how large and what configuration of habitat is necessary to reasonably assure that the species will survive to recover. In the first version of a population viability analysis model of the Alabama beach mouse (Traylor-Holzer et al., 2005), many of the model parameters were uncertain and may have been inaccurate, resulting in uncertainty in the probability of Alabama beach mouse extinction. The model was revised after Hurricane Ivan (Traylor-Holzer, 2005) and then data collected after Hurricane Katrina were used in a second revision of the model (Reed and Traylor-Holzer, 2006). The most recent revised model projects a risk of extinction of 26.8 ± 1.0 percent over the next 100 years. Destruction of migration corridors between populations raises the risk to 41.2 ± 1.1 percent, but only 34.9 ± 1.1 percent with the translocation of mice. Total loss of private land as suitable habitat raises the risk further to 46.8 ± 1.1 percent, but only 40.8 ± 1.1 percent with the translocation of mice.

Falcy (2011) used modeling to show smooth recovery of Alabama beach mouse populations during the 4 years after Hurricane Ivan (2004) and Hurricane Katrina (2005). Further modeling (Falcy, 2011) showed that increasing the rate of population growth in a refuge, like interior dunes after a hurricane, would have a much larger effect on population persistence than increasing the rate of recovery of damaged habitat, like foredunes after a hurricane. Yuro (2011) studied Hurricanes Ivan and Katrina and showed that the Alabama beach mouse has the ability to survive hurricanes if they are not successive. Data do not conclusively demonstrate that climate change is causing an increase in hurricane frequency (Webster et al., 2005; Trenberth, 2005).

Summary and Conclusion

Cumulative activities have the potential to harm or reduce the numbers of Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice. Those activities include oil spills, alteration and reduction of habitat, predation and competition, consumption of and entanglement in beach trash and debris, beach development, and natural catastrophes (hurricanes and tropical storms). Most spills related to an EPA proposed action and prior and future lease sales are not expected to contact beach mice or their habitats because the species lives above the intertidal zone where contact is less likely. Cumulative impacts could potentially deplete some beach mice populations to unsustainable levels. Within the last 20-30 years, the combination of habitat loss due to beachfront development, the isolation of remaining beach mouse habitat areas and populations, and the destruction of remaining habitat by tropical storms and hurricanes have increased the threat of extinction of several subspecies of beach mice. Impacts from OCS activities could come from trash and debris and effort to remove them, as well as oil spills and cleanup operations. If personnel are properly trained (on short notice if under emergency conditions) and supervised, these impacts could be reduced. The expected incremental contribution of an EPA proposed action to the cumulative impacts is negligible.

4.1.1.16. Coastal and Marine Birds

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the

CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for coastal and marine birds can be found in Chapter 4.2.1.16 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.16 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.16 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.16 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for coastal and marine birds regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for coastal and marine birds presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for coastal and marine birds presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. Therefore, the impact conclusions are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on coastal and marine birds, and various Internet sources were examined to determine any recent information regarding coastal and marine birds. Searches were based on major themes. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding coastal and marine birds since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and despite the new information identified and provided below, there remains some incomplete or unavailable information. Refer to **Chapters 4.1.1.16.2**, **4.1.1.16.3, and 4.1.1.16.4** below for a discussion of incomplete and unavailable information on the impacts to coastal and marine birds.

4.1.1.16.1. Description of the Affected Environment

Area Classifications

The Gulf of Mexico OCS and adjacent lands encompass three distinct land-based Bird Conservation Regions (BCR's) and two Pelagic BCR's (74 and 77). The land-based BCR's in the Gulf of Mexico include BCR 27 (Southeastern Coastal Plain), BCR 31 (Peninsular Florida), and BCR 37 (Gulf Coast Prairie) (refer to Tables 4-9, 4-10, and 4-11 in the 2012-2017 WPA/CPA Multisale EIS). The BCR's 27 and 31 are exclusively contained within the EPA, whereas BCR 37 extends from the western boundary of the EPA through the CPA and into the WPA. Of the >60 Important Bird Areas identified in the Gulf of Mexico, over half occur in the EPA and are associated with the Gulf Coast of Florida (**Figure 4-9**).

It should also be noted that the Gulf of Mexico includes numerous National Wildlife Refuges managed and maintained by FWS. Refuges with a marine component in Alabama (1 refuge; 7,152 ac [2,894 ha]), Florida (19 refuges; 758,997 ac [307,155 ha]), Louisiana (7 refuges; 250,070 ac [101,200 ha]), and Mississippi (2 refuges; 27,470 ac [11,117 ha]) are managed primarily for the protection and conservation of migratory birds (Figure 4-12 of the 2012-2017 WPA/CPA Multisale EIS).

Nonendangered and Nonthreatened Species

The Gulf of Mexico is populated by both resident breeding and nonbreeding migratory species of coastal and marine birds (Parnell et al., 1988; Visser and Peterson, 1994; Mikuska et al., 1998). Estimates of the number of breeding and nonbreeding migratory species (values in parentheses represent number of breeding and wintering species, respectively) by states (1950-2011) are as follows: Alabama (209, 389); Florida (331, 554); Louisiana (251, 434); and Mississippi (207, 358). Of the Gulf Coast States, Florida is second only to Texas in avian diversity for both breeding and wintering species. The breeding period was defined as occurring in June-July, whereas the wintering period included all other months.

Herein, the more common coastal and marine species are separated into seven generic groups: diving birds; seabirds; shorebirds; passerines (songbirds); marsh and wading birds; waterfowl; and raptors. It should be noted that inclusion of the State of Florida in the analysis increases the diversity (and abundance) within and among the seven avian species groups listed above. Additional information specific to each of these seven avian species groups can be found in the 2012-2017 WPA/CPA Multisale EIS (pages 4-772 through 4-779); therefore, avian species subheadings and detailed descriptions are not provided below.

Passerines, also referred to as songbirds, are the most diverse and numerically most abundant of the seven avian species groups considered herein, even though they represent a small fraction of the Birds of Conservation Concern in BCR's 27, 31, and 37. Representative species of this group likely represent >75 percent of all breeding and wintering birds within the Gulf Coast States. Passerines comprised a major proportion of all birds identified by Russell (2005, Table 6.12) at offshore platforms (1998-2000). Many species of passerines migrate across the Gulf of Mexico each spring (3-week peak; April 22-May 13) and fall (~4-week period; September 25-October 15) (Russell, 2005). Russell (2005) estimated on the order of 147-316 million migrant birds crossed the Gulf of Mexico, of which, approximately 190 species were passerines. Rappole and Ramos (1994) described the migration of birds occurring as being circum-Gulf and trans-Gulf with differences in pathways occurring in the spring versus fall, as well as being influenced primarily by wind direction. **Figure 4-10** roughly depicts migration routes of migratory birds (mostly neotropical migrants) across the Gulf of Mexico relative to distribution of offshore oil and gas platforms (also refer to Lincoln et al., 1998, Figure 18).

Some species (seabirds) are relegated to primarily the pelagic (offshore) environment (e.g., northern gannet; Audubon's, Cory's, and greater shearwater) and, therefore, are rarely observed in the nearshore environment. The remaining species are found within coastal and inshore habitats and may be more susceptible to potential deleterious effects resulting from OCS-related activities because many of these species largely overlap spatially and temporally with OCS activities (Clapp et al., 1982 and 1983). Previous surveys indicate that Florida and Louisiana (and Texas) are among the primary states in the southern and southeastern U.S. for both nesting colonies and total number of breeding coastal and marine birds (Portnoy, 1978 and 1981; Hunter et al., 2006) .

Avian species show varying levels of fidelity to both breeding and wintering areas; therefore, discussions of available, unaltered habitat should be kept in context. Without a thorough understanding of species' habitat use and preferences, a species' ability to locate and colonize alternative habitat, and the population structure, it is difficult to make inferences regarding the ability of individual birds or groups to successfully emigrate and colonize novel, undisturbed habitat (assuming it is available). Refer to Tables 4-8 through 4-11 of the 2012-2017 WPA/CPA Multisale EIS for additional information on the various representative species associated with each BCR, their breeding status, and general habitat.

Although this information may be relevant to reasonably foreseeable adverse impacts on birds, it would also be difficult to discern effects from other factors, and it is not within BOEM's ability to obtain this information across species and vast habitat areas in the timeline of this EIS and without exorbitant costs. BOEM's subject-matter experts, however, feel this information is not essential to a reasoned choice among alternatives, including the No Action alternative. BOEM's subject-matter experts have included what scientifically credible information is available, applied using accepted scientific methodologies. In addition, BOEM has conservatively assumed that birds may not be able to relocate to suitable replacement habitat, and as described below, impacts would still not be expected to be significant, with the possible exception of a low-probability catastrophic event, which is not reasonably expected and not part of an EPA proposed action (**Appendix B**).

Threatened and Endangered Species

Herein, we consider 18 avian species identified as threatened or endangered, previously delisted, or as candidate species (**Table 4-5**). Avian species included below represent a compilation of those recommended for consideration by FWS (USDOI, FWS, official communication, 2011b), as well as additional species that can be found in the Gulf Coast States. For additional information, on these species refer to Table 4-14 in the 2012-2017 WPA/CPA Multisale EIS.

Of the 18 avian species, 11 occur in the CPA and are considered further with regard to endangered and threatened protections: 1 threatened, 5 endangered, 2 candidate, and 3 delisted. Of the 18 avian species, 12 are known to occur in the EPA and are considered further with regard to endangered and threatened protections: 1 threatened, 7 endangered, 1 candidate, and 3 delisted. All species listed in the in Table 4-14 in the 2012-2017 WPA/CPA Multisale EIS [plus the Audubon's Crested Caracara (*Polyborus plancus audubonii*)] were considered for analysis, but several species were not analyzed in detail because, among other reasons, BOEM determined that those species were not expected to occur within the EPA proposed action area or EPA, or because of their reliance on more terrestrial habitats to carry out their life-history functions and were therefore not likely to be adversely affected by an EPA proposed action. The piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii dougallii*), wood stork (*Mycteria americana*), whooping crane (*Grus americana*), Mississippi sandhill crane (*Grus canadensis pulla*), bald eagle (*Haliaeetus leucocephalus*), eastern brown pelican (*Pelecanus occidentalis*), Cape Sable seaside sparrow, red knot (*Calidris canutus rufa*), and American peregrine falcon (*Falco peregrinus anatum*) are analyzed in detail in this EIS (**Table 4-5**).

The red-cockaded woodpecker (*Picoides borealis*), least tern (*Sterna antillarum*), Attwater's prairie chicken (*Tympanuchus cupido attwateri*), northern aplomado falcon (*Falco femoralis septentrionalis*), mountain plover (*Charadrius montanus*), Everglade snail kite (*Rostrhamus sociabilis plumbeus*), Audubon's Crested Caracara, and Sprague's pipit (*Anthus spragueii*) are not considered further because they do not occur within the EPA proposed action area or EPA, because of their reliance on more terrestrial habitats to carry out their life-history functions, or because there are little to no data indicating they occur on the OCS. Least terns nesting along the coast in the GOM are not considered part of the federally-listed Interior population and therefore, they were not analyzed. These species were not analyzed further as they are not likely to be adversely affected by an EPA proposed action.

As mandated by the ESA, BOEM consults with NMFS and FWS on possible and potential impacts from BOEM's proposed actions on endangered/threatened species and designated critical habitat under their jurisdiction. On July 30, 2010, BOEM reinitiated ESA Section 7 Consultation on the previous 2007-2012 WPA/CPA Multisale EIS with both FWS and NMFS. This request was made in response to the *Deepwater Horizon* explosion, oil spill, and response and to comply with 50 CFR § 402.16, "Reinitiation of formal consultation." The programmatic consultation was expanded in scope, after reinitiation of consultation by BOEM following the *Deepwater Horizon* explosion and oil spill, and it will include both existing and future OCS oil and gas leases in the Gulf of Mexico over a 10-year period. The programmatic consultation will also include postlease activities associated with OCS oil and gas activities in the Gulf of Mexico, including G&G and decommissioning activities. At present, BOEM is acting as the lead agency in the formal programmatic consultation, with BSEE acting as a cooperating agency.

With consultation ongoing, the current BOEM- and BSEE-required minimization measures, mitigation, and monitoring will continue to comply with all Reasonable and Prudent Measures and the Terms and Conditions under these existing consultations, along with implementing the current BOEM- and BSEE-required mitigation, monitoring, and reporting requirements. Based on the most recent and best available information at the time, BOEM and BSEE will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under NEPA, ESA, and other statutes.

Piping Plover

Three populations of piping plovers (*Charadrius melodus*) are recognized under the Endangered Species Act: Great Lakes (endangered); Great Plains (threatened); and the Atlantic (threatened) (*Federal Register*, 1985b).

Possibly as high as 75 percent of all breeding piping plovers, regardless of population affiliation, may winter in the Gulf of Mexico, spending up to 8 months on the wintering grounds. Seventy-five percent of Great Lakes breeders were found along the Atlantic Coast from North Carolina to the Florida Keys (also used by 77% of eastern Canada breeders), compared with only 7 percent of breeders from the U.S. Northern Great Plains and 4 percent from Prairie Canada (Gratto-Trevor et al., 2012, Figure 1). In comparison, Mississippi, Louisiana, and Texas coasts harbored 71 percent of observed birds from the U.S. Northern Great Plains and 88 percent of those from Prairie Canada, but only 2 percent of Great Lakes breeders (Gratto-Trevor et al., 2012; USDOI, FWS, 2009a). They begin arriving on the wintering grounds in July and continue arriving through September. In late February, piping plovers begin leaving the wintering grounds to migrate back to their breeding sites. Northward migration peaks in late March, and by late May most birds have left the wintering grounds. A 5-Year Review was completed on September 29, 2009, with recommendations that their status remain unchanged. Habitat loss and degradation due to commercial, residential, and recreational developments on both breeding and wintering areas is the likely cause for declines. Similar to the least tern, alteration of natural water flow regimes on the Missouri River has contributed to loss of breeding habitat for the Northern Great Plains

Population. The piping plover is considered a State species of conservation concern in all Gulf Coast States (Louisiana, Mississippi, Alabama, and Florida) considered. Unlike the more optimistic population trajectory for the Interior least tern, that of the piping plover suggests declines for at least two of the three breeding populations (Great Lakes and Atlantic) (Haig et al., 2005; Roche et al., 2010).

Twelve different critical habitat rules have been published for piping plovers including designations for coastal wintering areas of the following states: North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (*Federal Register*, 2001a). Specifically, there are 20 units (parcels of land designated as critical habitat) in western Florida south to Tampa Bay, 3 areas in Alabama, 15 in Mississippi, 7 in Louisiana, and 18 in Texas. Critical wintering habitat includes the land between mean low water and any densely vegetated habitat that is not used by the piping plover. The habitats used by wintering birds include beaches, mud flats, sand flats, algal flats, and washover passes (areas where breaks in the sand dunes result in an inlet). Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions. It has been hypothesized that specific wintering habitat, which includes coastal sand flats and mud flats in close proximity to large inlets or passes, may attract the largest concentrations of piping plovers because of a preferred prey base and/or because the substrate color provides protection from aerial predators due to cryptic blending camouflage color. Of the Gulf Coast States, Florida, Mississippi, and Texas consider the piping plover as a State Species of Conservation Concern.

For additional details on this species, refer to the 2012-2017 WPA/CPA Multisale EIS (Table 4-14 and pages 4-780 through 4-781).

Roseate Tern

Roseate terns (*Sterna dougallii dougallii*) are considered as two distinct population segments: the Northeastern Population fluctuating about 3,500 pairs, which is listed as endangered; and the Caribbean Population (including breeding birds in Florida, Puerto Rico, and the Virgin Islands) with between 4,000 and 5,000 breeding pairs, which is listed as threatened (Gochfeld et al., 1998). In Florida, the traditional breeding location was in the lower Florida Keys and Dry Tortugas, but by the 1990's the traditional colony was no longer productive and the only remaining birds nested at two sites: at Pelican Shoal and on the rooftop of the Marathon Government Building (Zambrano et al., 2000). Efforts to reestablish a breeding population in the Dry Tortugas was initiated in 2007 by State (Florida Fish and Wildlife Conservation Commission) and Federal agency (National Park Service) personnel through the use of social attraction (using decoys and sound system broadcast calling). Present estimates in Florida are ~350 breeding pairs estimated, with 15-225 pairs in the Dry Tortugas (USDOI, FWS, 2010c). The Northeastern population breeds in the northeastern United States (16-20 colonies in Maine, New York, Connecticut, and Massachusetts) and eastern Canada (only ~120-150 pairs, primarily in Nova Scotia; Kirkham and Nettleship, 1987), with migratory routes over the open ocean to the West Indies and South America; they may travel down the coast at least as far as North Carolina before embarking on the long-distance migration. Migratory information for the Caribbean population is less understood, but information for the Florida breeders suggests peak arrival probably in mid-April to mid-May and peak departure in mid-Augusts to mid-September; they may mix with other species of terns during "direct" trans-Atlantic migratory flights to wintering ground (Gochfeld et al., 1998; USDOI, FWS, 2010c).

Both populations were listed on November 11, 1987 (*Federal Register*, 1987). Recovery Plans for the Caribbean and Northeast were completed on September 24, 1993 and November 5, 1998, respectively. A 5-Year Status Review (USDOI, FWS, 2010c) was completed on September 30, 2010, resulting in no change to the status of either "population." No Critical Habitat rules have been published for either population of this species. The roseate tern is considered a State Species of Conservation Concern only in Florida.

The roseate tern feeds almost exclusively on small marine fish (Gochfeld et al., 1998). Therefore, it would be vulnerable to coastal or offshore spills that reach its marine foraging habitat.

Whooping Crane

Whooping cranes (*Grus americana*) are found only in North America. They currently exist in the wild at three locations and in captivity at nine sites (Canadian Wildlife Service and USDOI, FWS, 2007; USDOI, FWS, 2009b). More recently, a release site (White Lake Wetlands Conservation Area in

Vermilion Parish) was added in Louisiana. Only 3 of the 10 cranes originally released on February 22, 2011, were still alive on December 1, 2011. At that time, 16 additional cranes were released at that site. Whooping cranes in Louisiana (*Federal Register*, 2011d) and Florida (*Federal Register*, 2001b) represent nonessential, experimental populations; "the population is considered experimental because it is being (re)introduced into suitable habitat that is outside of the whooping crane's current range, but within its historic range. It is designated not essential because the likelihood of survival of the whooping crane, as a species, would not be reduced if this entire population was not successful and was lost."

According to Harrold (official communication, 2012), some members of this population may use salt marshes and may be vulnerable to coastal or offshore spills that reach that habitat. Similarly, according to Brooks, official communication (2012), young-of-the-year whooping cranes spend their first winter in salt and estuarine marshes in the coastal St. Marks and Chassahowitzka National Wildlife Refuges in northwest Florida. In subsequent winters, a minority of adults may utilize these habitats for short periods of time (Brooks, official communication, 2012). Coastal or offshore spills may reach salt and estuarine marshes in both wildlife refuges.

As of April 2009, the three wild populations were estimated at 365 individuals (USDOI, FWS, 2009b, page 7). This includes the following: 247 individuals in the only self-sustaining Aransas-Wood Buffalo National Park Population that nests in Wood Buffalo National Park and adjacent areas in Canada and winters in coastal marshes in Texas; 30 individuals from the nonmigratory Florida Population in central Florida; and 88 individuals that migrate between Wisconsin and Florida in an eastern migratory population (USDOI, FWS, 2009b). All of the wild populations are listed as endangered. The majority of the Aransas-Wood Buffalo National Park Population migrates down through the Dakotas, Nebraska, Kansas, and Oklahoma before arriving on the wintering grounds in the coastal marshes and estuarine habitats along the Gulf Coast in the Aransas National Wildlife Refuge in Texas (USDOI, FWS, 2009b, Figure 1). An effort to establish a migratory Rocky Mountains Population resulted in a complete failure of the population (Harrold, official communication, 2012). The third wild population is the first step in an effort to establish a nonmigratory population in Florida (Canadian Wildlife Service and USDOI, FWS, 2007). Thus, as of April 2009, there were a total of 516 whooping cranes in North America.

The whooping crane is considered endangered throughout its range in the U.S. except where nonessential, experimental flocks have been established. The Gulf Coast States that have these nonessential, experimental flocks include Alabama, Louisiana, Mississippi, and Florida. The whooping crane was unofficially "listed" in 1967 as threatened, then reclassified as endangered in 1970, being grandfathered into ESA in 1973. It was listed primarily due to overhunting and habitat loss. A 3rd Revision to the Recovery Plan (Canadian Wildlife Service and USDOI, FWS, 2007) was completed on May 29, 2007. The original Recovery Plan was approved on January 23, 1980. Initiation of the 5-Year Status Review was provided on March 29, 2010 (*Federal Register*, 2010c).

For additional details on this species, refer to the 2012-2017 WPA/CPA Multisale EIS (Table 4-14 and pages 4-781 through 4-782).

Wood Stork

This species (*Mycteria americana*) is the only stork and largest breeding wading bird in the United States. It was originally listed likely as a result of three potentially interacting factors: reduction in preferred wetland habitats and associated available nesting sites; lack of protection at nest sites; and reductions in preferred foraging habitats and/or food items (Brooks and Dean, 2008). Its distribution is restricted to the southeastern U.S., including North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana; although it is no longer considered a breeder in the latter three states (Coulter et al., 1999). This species also breeds in Mexico, northern and southern Central America, Cuba, Dominican Republic, and South America (Coulter et al., 1999). Breeding locations often change annually due to variation in wetland conditions and because of the ability of breeding pairs to track resource availability (wetland conditions and food); not all colonies are occupied every year (Kushlan, 1986; Bryan et al., 2008). Birds located at the northern edge of the breeding range tend to migrate south to winter in Florida and southern Georgia (USDOI, FWS, 2007). Though it does breed throughout Florida, it appears the centroid of the traditional breeding range has shifted northward primarily into north and central Florida, Georgia, and South Carolina (Kushlan and Frohring, 1986; Ogden et al., 1987; Rodgers et al., 2008). There is evidence of relatively major post-breeding dispersal with large numbers of birds frequently observed in the Mississippi River Valley; some mixing of U.S. and Mexican populations may occur (Bryan et al., 2008).

The U.S. breeding population of the wood stork was listed as endangered on February 28, 1984 (*Federal Register*, 1984). A Revised Recovery Plan for the U.S. breeding population of the wood stork was completed on January 27, 1997. A 5-Year Status Review was completed on September 21, 2007, with recommendations that the wood stork breeding population in the southeastern U.S. be reclassified as threatened. On December 26, 2012, there was a Notice of Petition and Finding (*Federal Register*, 2012c) to reclassify the continental U.S. breeding population of wood storks from endangered to threatened. The wood stork is considered a State Species of Conservation Concern in all Gulf Coast States considered, except Louisiana. No Critical Habitat rules have been published for this species.

The wood stork population in the southeastern U.S. appears to be stable or increasing (~5,000-11,000 breeding pairs) (Borkhataria et al., 2008; Brooks and Dean, 2008).

The wood stork sometimes feeds in estuarine emergent wetlands (marshes), tidal creeks, and tidal pools (Coulter et al., 1999). Therefore, it would be vulnerable to coastal or offshore oil spills reaching their feeding habitat.

Mississippi Sandhill Crane

There are six subspecies of sandhill cranes, three of which are migratory and three of which are nonmigratory (Tacha et al., 1992; Rhymer et al., 2001). The population of Mississippi sandhill crane (*Grus canadensis pulla*) has a nonmigratory, resident population with an extremely limited distribution (Jackson County, Mississippi). This species was listed as endangered on June 4, 1973 *(Federal Register*, 1973*)*. The small population size (<120 birds), restricted distribution, habitat loss (wet pine savanna), and fragmentation were the original reasons for its listing. This species is presently reproductively isolated and persists primarily due to augmentation of the "wild" population through a captive-rearing program.

At present, some of its habitat is protected via the Mississippi Sandhill Crane National Wildlife Refuge. High mortality of nestlings and 1st-year birds appears to be the major bottleneck in the wild population. The original Recovery Plan was approved on September 14, 1976. A Third Revision to the Recovery Plan was completed on September 6, 1991. Initiation of the 5-Year Status Review was provided on April 9, 2010 (*Federal Register*, 2010d). Three separate Critical Habitat designations were completed in the 1970's, but none since: June 30, 1975 (*Federal Register*, 1975a); September 3, 1975 (*Federal Register*, 1975b), and August 8, 1977 (*Federal Register*, 1977a). The I-10 corridor jeopardized existence of this population, but a settlement agreement resulted in the Mississippi Department of Transportation purchasing 1,960 ac (793 ha) and an interchange was built (USDOI, FWS, 1991). Of the approximately 26,000 ac (10,522 ha) of Designated Critical Habitat, the Mississippi Sandhill Crane National Wildlife Refuge represents nearly 19,273 ac (7,800 ha) or roughly 74 percent of the total (USDOI, FWS, 1991).

Florida also has a nonmigratory resident sandhill crane population (with some birds found in Okefenokee Swamp in southeast Georgia); it is federally listed as threatened. The nonmigratory population consists of 4,000-6,000 individuals (Tacha et al., 1992), and these birds are considered a Distinct Population Segment compared with the birds in Mississippi (refer to Rhymer et al., 2001).

The sandhill crane feeds primarily on land or in shallow emergent wetlands (Tacha et al., 1992). In fall and winter, Mississippi sandhill cranes roost mainly in Pascagoula Marsh (Tacha et al., 1992), and they could be vulnerable to coastal or offshore oil spills reaching their roosting habitat if some of them choose to roost instead in estuarine marshes.

Bald Eagle

Certain population(s) of the bald eagle (*Haliaeetus leucocephalus*) were listed on February 14, 1978 (*Federal Register,* 1978b). Specifically, the original listing (March 11, 1967) only considered the Southern bald eagle for listing. It was originally listed due to population-level effects (e.g., eggshell thinning) from organochlorine pesticides such as DDT/DDE. Once the use of this family of pesticides was banned, the affected bald eagle populations responded relatively quickly. The 1978 *Federal Register* notice included listing all bald eagles in the conterminous 48 states as endangered except those populations breeding in Washington, Oregon, Minnesota, and Michigan. Five recovery plans were completed: Southwestern Bald Eagle Recovery Plan (September 8, 1982); Northern States Bald Eagle

Recovery Plan (July 29, 1983); Recovery Plan for the Pacific Bald Eagle (August 25, 1986); Southeastern States Bald Eagle Recovery Plan (April 19, 1989); and Chesapeake Bay Bald Eagle Recovery Plan (September 27, 1990). A Special Rule regarding take under the Bald and Golden Eagle Protection Act was published on June 5, 2007 (*Federal Register*, 2007b). On July 9, 2007, the bald eagle was delisted (*Federal Register*, 2007c). The Post-Delisting Monitoring Plan was completed on May 25, 2010, with a follow-up Notice of Availability on June 4, 2010 (*Federal Register*, 2010e). No Critical Habitat rules were ever published for this species.

Of the Gulf Coast States, only Louisiana and Mississippi consider the bald eagle as a State Species of Conservation Concern. Bald eagles continue to receive protection under the Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-712) and the Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. §§ 668-668c). A population estimate of 9,789 breeding pairs in 2006 (well above the recovery objective) was obtained by FWS (USDOI, FWS, 2009c). This estimate includes the following number of breeding pairs: Florida (1,133); Louisiana (284); Texas (156); Alabama (77); and Mississippi (31). The Post-Delisting Monitoring Plan (USDOI, FWS, 2009c) will monitor the status of the bald eagle by collecting data on occupied nests over a 20-year period with sampling conducted once every 5 years beginning in 2009. The Plan will continue the nest check monitoring activities conducted by State wildlife agencies over the past years and incorporate additional area sample plots.

In most regions, the bald eagle seeks aquatic habitats and prefers fish (Buehler, 2000). It winters in southeast coastal areas, and in North America it breeds in aquatic habitats (including coastal areas), including those with forested shorelines (Buehler, 2000). Therefore, it would be vulnerable to coastal or offshore oil spills reaching their wintering or breeding habitat.

For additional details on this species, refer to the 2012-2017 WPA/CPA Multisale EIS (Table 4-14 and page 4-783).

Brown Pelican

The eastern brown pelican (*Pelecanus occidentalis*) was nearly extirpated from North America between the 1950’s and 1970’s when pesticides entering the marine food web caused major population declines. The pesticide endrin resulted in the direct mortality of pelicans, whereas DDT reduced reproductive success through eggshell thinning. A conservative combined estimate of 50,000 brown pelicans was documented for Texas and Louisiana, prior to its extirpation in Louisiana in the early 1960’s (Holm et al., 2003). Pesticide contamination was largely responsible for major pelican declines in Texas (King et al., 1985), whereas endrin contamination of prey fish was considered the cause of its extirpation in Louisiana (Nesbitt et al., 1978; Blus et al., 1979). It was initially listed under the Endangered Species Conservation Act of 1969, in the United States List of Endangered Foreign Fish and Wildlife on June 2, 1970, and also in the United States List of Endangered Native Fish and Wildlife on October 13, 1970. These lists were republished on January 4, 1974 (*Federal Register*, 1974), after passage of the Endangered Species Act of 1973. Three Recovery Plans were completed, all in the 1980’s: Recovery Plan for the Eastern Brown Pelican (August 1, 1980); California Brown Pelican Recovery Plan (February 3, 1984); and Brown Pelican Recovery Plan—Puerto Rico and Virgin Islands Population (December 24, 1986). No critical habitat rules were ever published for this species. A 5-Year Status Review was completed on February 7, 2007, with a recommendation to delist. The Final Rule for delisting the brown pelican throughout its range was completed on November 17, 2009 (*Federal Register*, 2009a); this rule applies to the entire listed species, which includes all six brown pelican (*Pelecanus occidentalis*) subspecies.

Beginning in 1968, the Louisiana Department of Wildlife and Fisheries and the Florida Fish and Wildlife Conservation Commission began a reintroduction program with release of 1,276 nestlings from Florida to three sites in Louisiana (Nesbitt et al., 1978; McNease et al., 1984). During the spring of 1975, ~40 percent of the restoration population in Louisiana died as a result of endrin pollution.

By the late 1980’s, brown pelicans had increased to record numbers in several southeastern states including Florida, North Carolina, and South Carolina, and had increased substantially in Louisiana (Wilkinson et al., 1994). Using data from fixed-wing aerial surveys conducted by the Louisiana Department of Wildlife and Fisheries, Holm et al. (2003) estimated an intrinsic growth rate of 0.25 (1971-2001), with a peak in number of nests (16,405) during 2001. In this same study, the peak number of nesting colonies occurred in 2000 when 11 colonies were documented. The population in Louisiana appears to have stabilized at around 15,000 nests (Visser et al., 2005). Coastal erosion appears to be reducing available nesting habitat for brown pelicans in Louisiana even though the State contains the largest area of undeveloped coastal barriers in the U.S. (Visser et al., 2005). It should be noted that one of the largest known brown pelican breeding colonies in Louisiana (Breton National Wildlife Refuge) has declined to the point of almost disappearing, with no obvious evidence of adult dispersal (Hunter et al., 2006:24). In 2005 and 2006, brown pelican productivity in the Breton National Wildlife Refuge apparently was unsuccessful due to the effects of Hurricane Katrina and the related overwashing of beaches and fouling by oil (Hunter et al., 2006, page 24). Another important nesting colony was established on Gaillard Island, in Mobile Bay, Alabama (Wilkinson et al., 1994). A 1,300-ac (526-ha) artificial island that was created by COE using dredged materials from the shipping canal now includes >1,000 brown pelican nests annually, as well as a diversity of other beach-nesting species (Landin, 1988).

Even though the eastern brown pelican was delisted under the ESA, all Gulf Coast States except Alabama recognize it as a State Species of Conservation Concern. The brown pelican is extremely susceptible to environmental contaminants because of its reliance on the ocean for food resources (i.e., bioaccumulation of contaminants in fish) and because pelicans spend a large proportion of their diurnal activity budgets in the water, increasing potential for exposure. For example, this species seems fairly susceptible to negative effects from oiling because pelicans spend much time swimming in, diving in, and foraging in the water (Shields, 2002).

For additional details on this species, refer to the 2012-2017 WPA/CPA Multisale EIS (Table 4-14 and pages 4-783 through 4-784).

Cape Sable Seaside Sparrow

The Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) is considered an endangered species. It is a saltwater-brackish marsh habitat specialist found in six “isolated,” small populations in Florida. Habitat loss and fragmentation through wetland drainage, tiling, diking, agriculture activities, and commercial and private development in its preferred habitat are likely the primary causes for its original listing. The species appears to have highly variable nest success and survival (Boulton et al., 2009 and 2011), which is problematic for a species with such low population numbers. Manipulation of water levels (i.e., flooding nests) and fire frequency (via controlled burns) in the Everglades ecosystem can have dramatic effects on these two population parameters (Curnutt et al., 1998; Lockwood et al., 2001, Jenkins et al., 2003). Overall, this population appears to be limited by available nesting habitat and the “normal” onset of summer rains that result in decreased productivity later in the nesting season (Nott et al., 1998; Elderd and Nott, 2008) rather than by limited dispersal ability (Van Houtan et al., 2010). A more detailed review of the conservation and management of this species and the effects of management and research recommendations can be found in Walters et al. (2000).

The Cape Sable seaside sparrow was originally listed as endangered on March 11, 1967. A South Florida Multi-Species Recovery Plan was completed on May 18, 1999. A 5-Year Status Review was completed on August 18, 2010, indicating continued declines; no change to its status. The average estimated populations size for all six subpopulations from 2005 through 2009 was 3,021 individuals; less than half identified in the recovery criterion (USDOI, FWS 2010b). Final Rules for Critical Habitat designations occurred in 1977 (August 11, 1977 [*Federal Register*, 1977b]; September 22, 1977 [*Federal Register*, 1977c]) and in 2007 (November 6, 2007 [*Federal Register*, 2007d]).

Red Knot

The red knot (*Calidris canutus rufa*) is presently considered a Federal candidate species. It was originally (September 2006) considered as a Category 6 Candidate, but it was upgraded (more urgent) to a Category 3 Candidate in December 2008. It remains as a Category 3 as of February 2013 (USDOI, FWS, 2013). Three of the six subspecies of red knot occur in North America, all three of which breed in the Arctic (central Canadian Arctic and on the north coast of Alaska from the Seward Peninsula to the Canadian border). It uses coastal beaches, bays, tidal flats, salt marshes, and lagoons primarily along the Atlantic Coast (a major stopover is in Delaware Bay) during spring and fall migration in transit from its breeding grounds in the Arctic to its wintering grounds at Tierra del Fuego, Argentina, and back. Rather steep declines (~505 between late 1980’s and 2003; Morrison et al., 2004) have been observed in the population that departs the central Canadian Arctic in August, embarking on a 15,000-km (9,321-mi) migration to northern Brazil and Tierra del Fuego, Argentina (Morrison et al., 2006; Niles et al., 2008).

During the fall migration, this population stops on its way south in Delaware Bay where individuals almost exclusively consume (and require) large quantities (both in number and volume) of horseshoe crab (*Limulus polyphemus*) eggs to fatten-up prior to departure (Harrington, 2001). On the spring return flight, these same birds spend ~2 weeks in the same general area in an effort to recover energy lost (some as much as 30% lighter) during the migration from the wintering grounds (Niles et al., 2008). This is the single most important staging area for this population of red knots. There has been a major increase in the commercial fishing harvest of adult horseshoe crabs, likely resulting in major reductions in availability of the species that produce the eggs in which the red knots rely (Karpanty et al., 2006; Wells, 2007).

The FWS received its first petition to list this species on August 9, 2004, with two additional petitions, both received on August 5, 2005. The associated formal review, which was completed on September 12, 2006 (*Federal Register*, 2006d), indicated a listing priority of 6. Subsequently, FWS has completed formal reviews for this species in 2007 (December 6, 2007; *Federal Register*, 2007e), 2008 (December 10, 2008; *Federal Register*, 2008), 2009 (November 9, 2009; *Federal Register*, 2009b), and 2010 (November 10, 2010; *Federal Register*, 2010f). As indicated above, it is now considered a Category 3 Candidate species.

Within the Gulf of Mexico region, wintering birds are found primarily in Florida, but the species has also been observed in Texas (e.g., Bolivar Flats), Louisiana (e.g., barrier islands and headlands along the coast), Mississippi, and Alabama (e-Birds, 2013), and it is considered a State Species of Conservation Concern in Florida and Mississippi. Apparently, the numbers of wintering and staging red knots using coastal beaches in Gulf Coast States other than Florida have declined dramatically; now most are found along the Gulf and Atlantic Coasts of Florida, as well as the Atlantic Coast of Georgia and South Carolina (Harrington, 2001; Niles et al., 2008, Figures 8-9 and 11). Both natural (i.e., hurricanes, subsidence, and saltwater intrusion) and anthropogenic (i.e., coastal development, oil and gas infrastructure onshore, increased levels of disturbance, and/or chronic disturbance) factors influencing coastal wetlands and associated barrier island and beach habitats on the wintering and staging areas in the southeastern U.S. may be contributing to the change in distribution (and possibly population declines) of red knots over time (Wells, 2007; Niles et al., 2010).

Peregrine Falcon

The American and Arctic peregrine falcons were listed as endangered throughout their ranges in 1970 under the Endangered Species Act of 1969, which became the Endangered Species Act of 1973 (Russell, 2005, Chapter 10). The reason for endangerment was bioaccumulation (by this species at the top of the food chain) of organochlorine insecticides. Impacts were reduced egg shell thickness and possibly also mortality (this is less certain because it is harder to measure). After the pesticides were banned in the United States, the two subspecies recovered and were delisted in 1994 (Arctic subspecies) and August 25, 1999 (American subspecies) (USDOI, FWS, 1999). The species preys mostly on small birds, often pursuing and catching or striking them over open areas. The species mostly nests near water.

In fall 1999, 60 percent of recorded trans-Gulf migrants were first detected between September 29 and October 12. Number per platform (for recorded stopovers on 10 study platforms) ranged from 5 to 63. It is possible that the majority of North American juvenile peregrine falcons are trans-Gulf migrants and stop over on platforms (Russell, 2005, Chapter 10).

Deepwater Horizon **Explosion, Oil Spill, and Response and New Baseline Conditions**

A summary (last updated May 12, 2011) of birds collected by FWS (USDOI, FWS, 2011c) as part of the post-*Deepwater Horizon* spill monitoring and collection process can be found in **Table 4-6**. As of May 12, 2011, 7,256 individuals representing 104 different species had been collected. Not all birds recovered were oiled (oiled [0.36], unoiled [0.47], and unknown [0.17]), suggesting that search effort alone accounted for a large number of the birds collected. The Top 5 most-impacted species based on the number of birds collected (# collected, # oiled, oiling rate) were all representatives of the seabird group: laughing gull (*Larus atricilla*) (n = 2,981, n = 1,182, 0.40); Eastern brown pelican (*Pelecanus occidentalis*) (n = 826, n = 339, 0.41); northern gannet (*Morus bassanus*) (n = 475, n = 297, 0.63); royal tern (*Sterna maxima*) (n = 289, n = 149, 0.52); and black skimmer (*Rynchops niger*) (n = 253, n = 55, 0.22). All species listed above, except the northern gannet, have representative breeding populations in the northern Gulf of Mexico (Hunter et al., 2002 and 2006; USDOI, FWS, 2010d), and all species listed have the potential to be affected in the event of an oil spill in the EPA. There is a large number of Important Bird Areas (IBA's; **Figure 4-9**) and other habitat areas that have been identified as critically important to both breeding and wintering migratory bird populations, some of which were oiled (**Figure 4-11**). Calculated oiling rates (% ± SE) by avian species group in descending order were seabirds (0.34 ± 0.05), waterfowl (0.33 ± 0.12), diving birds (0.27 ± 0.15), marsh/wading birds (0.26 ± 0.05), passerines (0.19 ± 0.07), shorebirds (0.18 ± 0.09), and raptors (0.04 ± 0.04) (**Figure 4-12**; Estimate ± 95% Confidence Intervals). Based on small sample sizes for some species, oiling rates were potentially greatly influenced by small numbers of individuals for each species that were or were not oiled. For example, the oiling rate for shorebirds was likely biased low due to several species within the group that had ≤3 unoiled individuals collected (i.e., zero-inflated). Conversely, the oiling rate for passerines was likely biased high due to due to several species within the group that had ≤2 oiled individuals collected (oiling rates of 0.50 or 1.00). Refer to the individual species rows and associated values within each column in **Table 4-6** for additional details.

Limited information was available regarding the temporal or spatial aspects of search effort related to *Deepwater Horizon* avian monitoring, so it is difficult to determine how effort may have influenced species composition or numbers of individuals collected/species. If we assume, however, that overall search effort was commensurate with the size of the spill, then the species composition (**Table 4-6**) should be a reasonable approximation of species available to be oiled. It has been well documented previously (e.g., Piatt and Ford, 1996, Table 1; Castege et al., 2007, Table 2) that the number of birds collected post-spill reflects some unknown fraction (range of 0-59% in Piatt and Ford, 1996) of the total modeled estimated avian mortality for a myriad of reasons (refer to Byrd et al., 2009).

4.1.1.16.2. Impacts of Routine Events

In general, the effects from routine activities in the EPA are expected to result in far less negative effects to coastal and marine birds than impacts from routine activities in the CPA due to much lower levels of activities (service-vessel trips and helicopter support trips) and the small number (0-2 platforms over 40-year period) of production platforms expected to be installed (**Tables 3-2** and **3-3**). The majority of the effects resulting from routine activities of an EPA proposed action on threatened or endangered and nonthreatened and nonendangered coastal and marine birds are expected to be sublethal, e.g., primarily disturbance-related effects (but refer to the discussion in Chapter 4.2.1.16.2 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.16 of the WPA 233/CPA 231 Supplemental EIS).

As can be inferred from data in Russell (2005), collision-related mortality of trans-Gulf migrant landbirds does occur. Over the life of the GOM platform archipelago (a 40-year period), including the additional platforms, mortality estimates may be on the order of 7-12 million birds (refer to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS). The additional contribution of predicted 2,000-4,000 avian deaths associated with the proposed activities is trivial and it is insignificant compared with other anthropogenic sources of avian mortality (refer to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS). These avian mortality estimates should be considered conservative given that (1) they only include deaths due to collisions and (2) these estimates do not account for issues related to detection bias.

Each spring, migratory land birds, most of which are passerines, cross the Gulf of Mexico from wintering grounds in Latin America to breeding grounds north of the Gulf of Mexico. A similar reverse migration occurs again in the fall. Some birds use offshore platforms as stopover sites for this migration. Some have previously argued that the presence of platforms may provide some benefit (i.e., net gain in either adult survival, long-term reproductive success, or both) to trans-Gulf migrants (refer to Williams et al., 2002; Schmutz, 2009). It is well understood that the pre-departure fat and protein stores for most neotropical migrants is likely approaching some optimal threshold prior to departure (at staging areas before crossing the Gulf), and therefore, time spent engaged in nocturnal circulations (see below) likely exploits a considerable amount of endogenous reserves if the circulations are sufficiently sustained, thereby reducing the probability of successfully completing the migration (Weber et al., 1998 and 1999; McWilliams et al., 2004; Schaub et al., 2008). An uncertain proportion of birds "resting" on platforms is individuals below the population mean level (correcting for sex-age differences) of body reserves (fat stores) necessary to complete the migration (Yong and Moore, 1997; Simons et al., 2000). The loss of these individuals represents a natural source of mortality and natural selection.

Resting may be beneficial but will cost time unless a stopover at a platform eliminates the need for a subsequent stopover soon or just after trans-Gulf migration is complete, which may often happen. During migration, total time not spent in flight during migration is a cost to the time budget (Moore and Aborn, 2000; Buler et al., 2007). The timing of arrival for avian migration is particularly critical in the spring as compared with the fall (McNamara et al., 1998). Early-nesting individuals within a given species tend to be the most productive (Smith and Moore, 2003 and 2005). The earliest arriving individuals at their breeding destination tend to select and establish the most optimal territorial habitats with superabundant food resources (quickly replenishing endogenous reserves with exogenous resources) and the best singing perches. They quickly begin singing and other courtship behavior, attract and secure mates, and breed. Birds arriving on the wintering grounds are almost immediately able to capitalize on some superabundant food resource (Moore et al., 1990 and 1995; Buler and Moore, 2011). However, there appears to be some time spent exploring novel habitats at stopover locations with unpredictable food resources (Aborn and Moore, 1997). Russell (2005) documented that only 11 percent of 7,261 landbirds that stopped on platforms in spring actually engaged in foraging activities. However, in the fall and in certain species groups, a higher portion forage. Russell (2005) lists 18 small bird species for which more than half of the individuals foraged. Foraging was as high as 846 for the pine warbler. At times, large numbers of insects and water were available (although migrants rarely drank). Benefits to trans-Gulf migrants would likely be realized by the several species of migrating raptors such as peregrine falcons (refer to Russell, 2005) for several reasons: (1) an abundance of available raptor perch sites; (2) raptor prey is superabundant; (3) raptor prey is available in an open environment, increasing capture success; and (4) raptor prey available represents individuals that are weak, starving, or dead, thereby increasing individual foraging efficiency and energy uptake compared with the pursuit of healthy prey in more challenging habitats. Other than species' composition and relative abundance of migrating birds, the use of offshore platforms remains poorly understood.

In discussing nocturnal circulation events, Russell (2005) noted that migrants sometimes arrived at certain platforms shortly after nightfall and proceeded to circle those platforms for variable periods ranging from minutes to hours; 40 nocturnal circulation events were documented in spring 2000. Flock size varied, as did the duration of such events, with the longest single event lasting >8 hours (Russell, 2005). These nocturnal circulations clearly occurred because nocturnal migrants were attracted to platform light (in the form of flares and lighting) and tended to occur on overcast nights. Such circulations apparently were prevalent when birds got trapped inside the cone of light surrounding platforms, and birds seemed reluctant to leave the light to penetrate the "wall of darkness" (Montevecchi, 2006; Poot et al., 2008). Circulations put birds at risk for collision with platforms (Russell, 2005). Trans-Gulf migrant bird collision mortality may be due to the fact that the presence of elevated platforms occurs in what historically was an otherwise featureless landscape (devoid of vertical structure) representing an evolutionarily recent phenomenon (barriers to movement). That is, birds have not had sufficient time to adapt to the presence of above sea-surface obstructions in the Gulf of Mexico (Drewitt and Langston, 2008; Manville, 2009).

The OCS-related, disturbance-related impacts (e.g., from helicopter and service vessel traffic) do not typically result in direct mortality. Rather, effects tend to manifest themselves through behavioral changes. Disturbances from OCS-related helicopter or service-vessel traffic to coastal birds can result from the mechanical noise or physical presence (or wake) of the vehicle. Routine presence and low speeds of service vessels within inland and coastal waterways would diminish the effects of disturbance from service vessels on nearshore and inland populations of coastal and marine birds.

Although there will always be some level of incomplete information on the effects from routine activities under an EPA proposed action on birds, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be generally sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects. Also, routine activities will be ongoing in the EPA as a result of existing leases and related activities. Within the EPA, there are no data to suggest that routine activities from the preexisting OCS Program are significantly impacting bird populations. Therefore, a full understanding of any incomplete or unavailable information on the effects of routine activities is not essential to make a reasoned choice among the alternatives. Particularly when compared with other causes of bird mortality, the routine events associated with the OCS Program are unlikely to result in population-level impacts to avian species.

Overall, impacts to avian species from routine activities are expected to be adverse but not significant. The impacts include the following:

- temporary behavioral changes, temporary or permanent changes in habitat use, temporary changes in foraging behavior, temporary changes to preferred foods or prey switching, temporary or permanent emigration, temporary or permanent reductions in nesting, hatching, and fledging success;
- sublethal, chronic effects due to exposure to or intake of OCS-related contaminants via spilled oil, pollutants in the water from service vessels, produced water, or discarded debris;
- nocturnal circulation around platforms may create acute sublethal stress from energy loss and the addition of platforms will increase collision risk;
- minimal habitat impacts (based on actual acres of footprint) are expected (onshore or within State waters) to occur directly from routine activities resulting from an EPA proposed action; and
- secondary impacts from pipeline and navigation canals to coastal habitats will occur over the long term and may ultimately displace species to other habitats, if available.

The five most relevant impact-producing factors for coastal and marine birds associated with routine events are as follows: (1) collision-related mortality (Russell, 2005); (2) energetic losses and migration delays associated with nocturnal circulation events; (3) unknown but potentially negative effects to seabirds associated with presence of produced waters (Fraser et al., 2006); (4) the occurrence of reasonably foreseeable small oil spills at platforms; and (5) disturbance-related service-vessel and helicopter traffic. It is well documented that platforms attract seabirds for a myriad of reasons (Tasker et al., 1986; Wiese et al., 2001) and that this attraction, coupled with the impact-producing factors mentioned above, increases the risk to both trans-Gulf migratory birds (primarily passerines, but refer to Russell, 2005, Table 6.12) and more resident seabirds using the offshore environment. For a more detailed discussion on the latter three impact-producing factors, refer to Chapter 4.2.1.16.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.16 of the WPA 233/CPA 231 Supplemental EIS.

Summary and Conclusion

In general, the effects from routine activities in the EPA are not expected to exceed those in the CPA or WPA due to major reductions in the number of proposed (and current) platforms (n =1), onshore infrastructure and pipeline landfalls, and the number of service support vessel and helicopter trips (refer to **Table 3-2** of this EIS and to Tables 3-2 and 3-3 of the 2012-2017 WPA/CPA Multisale EIS for a comparison). The majority of the effects resulting from routine activities of an EPA proposed action on threatened or endangered and nonthreatened and nonendangered coastal and marine birds are expected to be sublethal, e.g., primarily disturbance-related effects (but refer to the discussion above and also refer to Chapter 4.2.1.16.2 of the 2012-2017 WPA/CPA Multisale EIS). However, as has been documented by Russell (2005), collision-related mortality of trans-Gulf migrant landbirds does occur. There is likely an unknown number of avian mortalities associated with small oil spills (**Chapter 3.2**) and produced water (**Chapter 3.1.1.4.2**). This represents an adverse, but not significant, impact to coastal and marine birds. Platform-related mortality estimates should be considered conservative given that (1) they only include deaths due to collisions and (2) these estimates do not account for issues related to detection bias. Although there will always be some level of incomplete information on the effects from routine activities under an EPA proposed action on birds, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be generally sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects. Also, routine activities are expected in the proposed EPA lease sale area as a result of existing leases and related activities.

BOEM expects 0-1 platforms to be installed in the EPA as a result of an EPA proposed action. Because we expect at most one platform, BOEM does not expect significant impacts to birds from nocturnal circulation events in the EPA. The discussion of routine impacts, including much data from Russell (2005), uses rigorous scientific reasoning and determines that impacts due to nocturnal circulation events and platform collisions are not expected to be significant. A full understanding of any incomplete or unavailable information on the effects of routine activities is not essential to make a reasoned choice among the alternatives. Particularly given the level of activities related to an EPA proposed action and in comparison with other causes of bird mortality (refer to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS), the routine events in the EPA associated with an EPA proposed action are unlikely to result in population-level impacts to avian species. Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS lists anthropogenic sources of bird mortality nationwide..

4.1.1.16.3. Impacts of Accidental Events

Oil spills represent the greatest potential direct and indirect impact to coastal and marine bird populations. Timing (i.e., if peak periods in bird density overlap temporally with the spill) and location (high versus low bird density area), in conjunction with distance from shore, wind conditions, and wave action, probably have a greater overall effect on total bird mortality than spill volume or fluid type (Piatt et al., 1990a and 1990b; Wilhelm et al., 2007; Castège et al., 2007). Given the timing of the spill, the size/volume of the *Deepwater Horizon* oil spill, and the fact that it was flowing continuously for nearly 3 months, impacts to migratory bird resources in the northern Gulf of Mexico were predicted/expected to be catastrophic (American Bird Conservancy, 2010; National Audubon Society, Inc., 2010; Natural Resources Defense Council, 2011). However, the limited data available to date suggest relatively minor overall direct impacts to both locally breeding and wintering populations of migratory birds, particularly given the size (~5 million barrels or 21 million gallons) and duration (87 days) of the spill (McNutt et al., 2011). As of May 12, 2011, 7,258 birds had been collected as part of the *Deepwater Horizon* explosion, oil spill, and response monitoring activities (**Table 4-6**). However, it is difficult to assess potential carry-over effects (Harrison et al., 2011; Henkel et al., 2012) of the *Deepwater Horizon* explosion, oil spill, and response to wintering populations that breed elsewhere (e.g., northern gannet, common loon, greater shearwater, American white pelican). Similarly, it is challenging to evaluate long-term, sublethal effects to populations of breeding birds that may be "resident" (e.g., eastern brown pelican, royal tern, black skimmer, and clapper rail) to the northern Gulf of Mexico (refer to Table 4-13 of the 2012-2017 WPA/CPA Multisale EIS). Establishing a connection between the *Deepwater Horizon* explosion, oil spill, and response and the deleterious effects to birds on their northern breeding grounds would only be possible if these migrant species, their demography, and environmental contaminants in potentially affected populations were being monitored before and after the spill (Green, 1984; Underwood, 1992; Osenberg et al., 1994).

Even low levels of oil may have multiple deleterious effects, including the following:

- changes in behavior;
- interference with feeding drive and food detection;
- alteration of food preferences and ability to discriminate between poor versus ideal food items;
- predator detection and avoidance;
- locating and defending breeding and feeding territories;
- kin and mate recognition;
- weakening of pair bonds;
- changes in incubation behavior;
- reduced provisioning of nestlings and fledglings leading to reduced growth and survival; and
- alteration of homing ability and fidelity for highly philopatric species.

Proposed Action Analysis and Possible Impacts

Representative species of the seven avian species groups identified in Chapter 4.1.1.16.1 of the 2012-2017 WPA/CPA Multisale EIS, except for several of the threatened and endangered species (e.g., the whooping crane), are widely distributed across the Gulf. Therefore, an oil spill, depending on its location, timing, size, and chemical composition, would likely affect only a small fraction of a given species' population (refer to Tables 4-9 through 4-11 of the 2012-2017 WPA/CPA Multisale EIS and to the figures below). The combined probabilities (which represent the estimated probability that 1 or more hypothetical spills ≥1,000 bbl *will both occur and contact* a resource) associated with avian habitats varied little, irrespective of spill duration (10 days versus 30 days) and the avian species group or threatened or endangered species considered.

Taking a conservative approach with regards to bird species and the OSRA outputs (**Figure 3-9**), there is a <0.5 percent probability of oil contacting habitat utilized by birds within 10-30 days, except in Plaquemines Parish, Louisiana, where there is up to a 1 percent probability of oil contacting habitat utilized by birds within 10-30 days. The wood stork, piping plover, Aplomado falcon, and whooping crane have limited habitat area as compared with birds in general; however, their habitats fall within the OSRA domain discussed above (**Figure 3-9**). Should a spill occur, for bird species with habitat on the Chandeleur Islands, the maximum probability of oil contacting habitat within 30 days is 1 percent (**Figure 3-14**).

In comparison with the CPA and WPA, OSRA probability estimates for the EPA were much lower (refer to Chapter 4.2.1.16 in the 2012-2017 WPA/CPA Multisale EIS). However, this does not imply that the risk (Oil Spill Commission 2011a, pages 217-247) of a spill per se will be less from an associated EPA proposed action (**Tables 3-17, 3-21, and 3-22**). Rather, results from the typical OSRA run associated with an EPA proposed action suggest a lower combined probability of a hypothetical oil spill contacting avian habitats, as compared with the typical OSRA run associated with CPA or WPA proposed action (for comparison refer to Chapters 4.1.1.14.3 and 4.2.1.16.3 of the 2012-2017 WPA/CPA Multisale EIS). Caveats related to OSRA with respect to avian resources and their habitats are as follows: (1) it does not take into account or consider spatial and temporal patterns in avian distribution at finer scales (for which data is also lacking); (2) it does not take into account species-specific densities; (3) it does not take into account or consider species-specific habitat preferences, food habits, or behavior; (4) it does not take into account or consider relative vulnerabilities to oiling among the avian species groups or among species within each of the groups (**Figure 4-12**; also refer to Williams et al., 1995; Camphuysen, 2006); and (5) it does not take into account or consider species-specific life-history strategies, their demography, or a species' recovery potential (refer to Figures 4-18 and 4-19 of the 2012-2017 WPA/CPA Multisale EIS). It should be noted that if an oil spill occurred and it overlapped the peak timing and intensity of the Loop Current, then IBA's (**Figure 4-9**) along the west coast of Florida, the Florida Keys, and even the east coast of Florida may be at increased risk of oiling (**Figure 4-7**). For additional information on OSRA considered herein, refer to **Chapters 3.2.1.4 through 3.2.1.8**.

Accidental releases of oil could occur as a result of an EPA proposed action. The mean number of offshore spills ≥1,000 bbl is estimated to be between 0 and 0.08 spills for an EPA proposed action and the probability of one or more spills of the same size occurring is estimated to be between 0 and 8 percent (**Table 3-21**). The mean number of offshore spills ≥10,000 bbl is estimated to be fewer (between 0 and 0.02 spills for an EPA proposed action) and the probability of one or more spills of the same size occurring is estimated to be between 0 and 2 percent (**Table 3-22**).

Additional information on oil-spill impacts to birds and results from avian monitoring related to the *Deepwater Horizon* explosion, oil spill, and response can be found in Chapter 4.2.1.16 of the 2012-2017 WPA/CPA Multisale EIS.

Uncertainty and separating confounding effects (e.g., annual variation [Schooley, 1994] or spatial variation [Stewart-Oaten and Bence, 2001]) from actual impacts to avian populations associated with the *Deepwater Horizon* explosion, oil spill, and response will be challenging (Parker and Wiens, 2005; Wiens et al., 2010). There remains unavailable information on the effects to coastal and marine birds from the *Deepwater Horizon* explosion, oil spill, and response (and thus changes to the avian baseline in the affected environment and impacts from future accidental events). BOEM concludes that the unavailable information from these events may be relevant to foreseeable significant adverse impacts to coastal and marine birds. BOEM believes that this incomplete or unavailable information regarding the effects of the *Deepwater Horizon* explosion, oil spill, and response on birds may be essential to a reasoned choice among alternatives, particularly for species listed as endangered or threatened. Relevant data on the status of bird populations after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze through the NRDA process, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and based upon accepted scientific methodologies and approaches.

Summary and Conclusions

Overall, impacts to coastal and marine birds associated with accidental events (oil spills regardless of size) in the EPA should be much less compared with either the CPA or WPA due to the following factors: only a single platform is proposed; lower oil-spill probabilities; and a much lower number of predicted oil spills over the life of an EPA proposed action (**Tables 3-17**). However, if oil from a spill were to reach the coast north, northeast, or east of the EPA proposed action area, then avian mortality could be high due to avian species diversity, abundance, and density for numerous species of beach-nesting waterbirds and coastal marshbirds (**Figure 4-9**) (Hunter et al., 2002 and 2006). The impact of the spill to avian species generally restricted to the nearshore environment would be dependent on the timing of the spill, spill volume and oil characteristics, ocean currents, and wind direction (**Figure 4-7**). If oil were to reach any of the greater than 30 Important Bird Areas (**Figure 4-9**) during peak nesting, then major losses to several species (USDOI, FWS, 2010d) can be expected.

Oil spills (and disturbance impacts associated with response) have the greatest impact on coastal and marine birds. Depending on the timing and location of the spill, even small spills can result in major avian mortality events. Small amounts of oil can affect birds, and mortality from oil spills is often related to numerous symptoms of toxicity (Albers, 2006). Data from actual spills strongly suggest that impacts to a bird species' food supply are typically delayed after initial impacts from direct oiling (e.g., Esler et al., 2002; Velando et al., 2005; Zabala et al., 2010). Sublethal, long-term effects of oil on birds have previously been documented (Esler et al., 2000; Alonso-Alvarez et al., 2007).

Oil-spill impacts on birds from an EPA proposed action are expected to be adverse, but not significant, given the number and relatively small size of spills expected over the 40-year life of an EPA proposed action. Impacts of oil-spill response from an EPA proposed action are also expected to be adverse, but not significant, but could be negligible depending on the scope and scale of efforts. In the event of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, depending on the timing, location, and size of the spill, impacts to coastal and marine birds could result in significant impacts. For additional information on a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, refer to **Appendix B**.

4.1.1.16.4. Cumulative Impacts

A detailed impact analysis of the coastal and marine birds for an EPA proposed action can be found in **Chapters 4.1.1.16.1 through 4.1.1.16.3**. The following is a summary of information that has become available since the *Deepwater Horizon* explosion, oil spill, and response (Oil Spill Commission, 2011b; McNutt et al., 2011), the 2012-2017 WPA/CPA Multisale EIS, and the WPA 233/CPA 231 Supplemental EIS. Additional information on oil-spill impacts to birds and results from avian monitoring related to the *Deepwater Horizon* explosion, oil spill, and response can be found in **Chapter 4.1.1.16.3** (also refer to **Table 4-6 and Figure 4-12**) (USDOI, FWS, 2011c). In a cumulative context, for the avian resources considered herein, it is important to consider not only an EPA proposed action but also the potential effects related to OCS oil and gas activities in the CPA and WPA, as well as potential effects from the *Deepwater Horizon* explosion, oil spill, and response (refer to case law review by Smith, 2006). This information is discussed in detail in Chapters 4.1.1.14 and 4.2.1.16 of the 2012-2017 WPA/CPA Multisale EIS. Additional relevant information to decisionmakers in the wake of the *Deepwater Horizon* explosion, oil spill, and response includes changes in policy, regulations, laws, and environmental reviews provided by Harm-Benson (2009), Houck (2010), Flournoy (2011), and Zellmer et al. (2011). More detailed information regarding procedures, policies, reviews from case law, challenges associated with cumulative impacts assessment, NEPA evaluation, recognizing and reducing uncertainty, and influence of cumulative impact assessment in the decisionmaking process can be found in Halpern et al. (2008), Schultz (2010), and Krausman (2011). Information regarding an EPA proposed action and the associated activity levels and oil-spill information can be found in **Chapters 3.1.1.1 through 3.1.1.8**, herein.

This cumulative analysis considers impact-producing factors (also refer to CEQ, 1997) that may adversely affect populations of threatened and endangered avian species (**Table 4-4**), as well as nonthreatened and nonendangered species related to OCS and non-OCS activities (Tables 4-9 through 4-11 of the 2012-2017 WPA/CPA Multisale EIS). For brevity and clarity, both listed and nonlisted avian species are considered together, although it is recognized that potential impacts from OCS activities may have relatively greater overall negative effects to listed species than to nonthreatened and nonendangered species (dashed line in **Figure 4-13**; also refer to Figure 4-18 of the 2012-2017 WPA/CPA Multisale EIS).

OCS Oil- and Gas-Related Impacts

Several anthropogenic OCS-related activities can negatively affect individuals of populations comprising the seven avian species groups found in the Gulf of Mexico (refer to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS). The OCS-related activities identified previously (**Chapter 4.1.1.16.2** of this EIS and Chapters 4.1.1.14.4 and 4.2.1.16.4 of the 2012-2017 WPA/CPA Multisale EIS) that are relevant to discussion of the potential effects in the EPA are as follows: habitat loss, alteration, or fragmentation; disturbance-related effects (e.g., support vessels and helicopters); attraction to and collision with offshore platforms; nocturnal circulation (night flights) around them and the potential associated energetic demands; discharge of produced waters; oil spills; and chronic oil pollution.

The potential for negative impacts from OCS-related activities at the population level for coastal and marine birds in the GOM will depend not only on the number of individuals lost per species but also on the sex and age composition comprising a given mortality event. Though there are annual mortality risks for all avian species, mortality risk may be higher during certain specific life-history periods, i.e., breeding, molting, staging, wintering, and migrating (refer to Esler, 2000). In some cases, the cumulative loss of these individuals due to multiple mortality factors and their interactions may result in population-level impacts (Newton, 1998, pages 353-375). The relationship of various mortality factors may not result in simple linear population declines or accumulate in a simple additive nature (e.g., mortality from factor a + mortality from factor b = - n individuals at time t or t + 1) but rather the relationships among mortality factors may result in interactions or synergistic effects on individuals and impacts to their respective populations acting at multiple spatial scales (Crain et al., 2008; also refer to Johnson et al., 2005; Johnson and St-Laurent, 2011, Figure 3.2; also refer Table 4-13 and Figures 4-18 and 4-19 of the 2012-2017 WPA/CPA Multisale EIS).

The predicted levels of OCS-related activity associated with an EPA (**Table 3-2**) proposed action represent a small fraction compared with the WPA (Tables 3-2 and 3-5 of the 2012-2017 WPA/CPA Multisale EIS) or CPA (Tables 3-3 and 3-6 of the 2012-2017 WPA/CPA Multisale EIS). Impacts from this small fraction are considered alongside impacts from ongoing WPA and CPA OCS-related activities and alongside impacts from non-OCS-related cumulative activities. Both the contribution of an EPA proposed action's activities and the contribution of the impacts from all other activities (OCS and non-OCS) are analyzed in the cumulative impacts analysis. The impacts from the contribution of an EPA proposed action's activities may by themselves be low. Those impacts might not still be low when their increment is combined with impacts of all the other activities when they are not low. There is a paucity of data with which to draw inferences and inform decisions regarding some of the potential effects of OCS-related effects on avian resources in the offshore environment (Williams, 2001 and 2011; Williams et al., 2002 and 2011b). This lack of research on the potential effects of oil and gas activities on coastal and marine birds should not be misinterpreted as indicative of no effects/impacts to this resource. What limited information is available indicates direct mortality due to collisions with platforms, as well as potential negative energetic consequences associated with nocturnal circulation events (Russell, 2005). Some have suggested that, in the absence of data or when only limited data are available to assist decisionmakers, they implement a more conservative precautionary principle (Lemons et al., 1997; McIntyre and Mosedale, 1997) to minimize or reduce the potential risk (Type II error; Mapstone, 1995; Buhl-Mortenson, 1996; Santillo et al., 1998) associated with a given action or proposed activity.

Habitat loss, alteration, and fragmentation of preferred breeding, staging, and wintering habitats represent the greatest negative impact to birds, in general, including coastal and marine birds (Fahrig, 1997 and 1998; McNew et al., 2011). However, OCS activities that include pipeline landfalls, oil and gas processing terminals, and associated roads and infrastructure result in the destruction or fragmentation of otherwise suitable avian habitats, forcing affected individuals to disperse or emigrate to other non-impacted habitats, assuming it is available and of similar or greater quality. If such habitats are either not available or of lesser quality, then it represents a net loss of realized habitat to these affected individuals due to the activity. In the offshore environment, disturbance-related effects can result in temporary functional loss of habitat, as individuals are forced to disperse from impacted sites. Many of the overwintering shorebird species remain within relatively well-defined, winter-use areas throughout the season, and some species exhibit among-year wintering site fidelity, at least when not disturbed by humans. These species are particularly vulnerable to localized impacts, resulting in habitat loss or fragmentation unless they disperse to other favorable habitats when disturbed. Again, this assumes that such habitats are available, in proximity to, and are of similar or greater quality compared with the disturbed habitat (Dolman and Sutherland, 1995; Sutherland, 1998).

The OCS-related, disturbance-related impacts (e.g., from helicopter and service vessel traffic) do not typically result in direct mortality (but consider, eggs/young depredated in the absence of a disturbed female during incubation). Rather, effects tend to manifest themselves through behavioral changes such as decreased foraging time, reduced foraging efficiency, increased energy expenditure due to flight associated with a disturbance, etc.

Migratory land birds may be impacted by OCS-related attraction to platforms, nocturnal circulation (night flights) around platforms, and collision with platforms. Every spring, migratory landbirds, including a proportionately large percentage of neotropical passerines, cross the GOM from wintering grounds in Latin America to breeding grounds north of the GOM; there is a peak from mid-March through the end of May (Russell, 2005). The southerly migration is repeated in the fall with peak timing of migration estimated to occur from roughly mid-August through early November (Russell, 2005). Migrants sometimes arrive at platforms shortly after night fall or later and proceed to circle those platforms (referred to as nocturnal circulation event) for variable periods ranging from minutes to hours (Russell, 2005). Nocturnal circulation events around platforms may create lethal effects from collisions with platforms (refer to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS), acute sublethal stress from energy loss, and increased predation risks. Data supporting the premise that platforms represent suitable stopover habitat for migratory birds is equivocal. At present, it is unknown if birds participating in nocturnal circulation events actually have sufficient energy reserves after participating in a nocturnal circulation event to successfully complete their migration. It is estimated that collisions with platforms in the GOM across the entire platform archipelago result in annual avian mortality estimates of 200,000-321,000 birds (Table 4-7, footnote 5 of the 2012-2017 WPA/CPA Multisale EIS). Conservatively, an EPA proposed action may increase the level of mortality by only 50-100 birds/year or 2,000-4,000 over the life of the projected 1-2 newly installed platform(s). Over the life of the entire platform archipelago, a range of >7.6 million birds may be killed, primarily due to collisions (Table 4-7, footnote 5 of the 2012-2017 WPA/CPA Multisale EIS; also refer to Russell, 2005, page 304). Russell (2005) noted a caveat to the estimated annual mortality ". . . is that future development of the eastern GOM may result in a disproportionately large increase in collision mortality in neotropical migrants. This possibility is raised by the numerous lines of evidence suggesting that the main fall migration route of neotropical migrants is across the eastern GOM." Mitigation measures such as changing the lighting type, light color, and/or light intensity may decrease the attraction to platforms and the associated collision risk to migratory birds (Wiese et al., 2001; Montevecchi, 2006) and potentially reduce the frequency and duration of nocturnal circulation events associated with well-lit (standard white lights) platforms.

Produced water is an important OCS-related factor affecting birds. The annual production of and cumulative volume of produced water associated with an EPA proposed action will be a small fraction of produced water compared with that generated from OCS activities in either the WPA and CPA. However, due to its proximity to the CPA, produced waters generated from activities in the EPA should not be considered separate from or independent of potential effects to avian resources from this routine event. Pollutants discharged into navigable waters of the U.S. are regulated by USEPA under the Clean Water Act of 1972 and subsequent provisions (33 U.S.C. §§1251 *et seq*.; **Chapter 3.1.1.4.2**). Specifically, an NPDES permit must be obtained from USEPA under Sections 301(h) and 403 (*Federal Register*, 1980, October 3, 1980) of the Clean Water Act. From 2000 to 2012, OCS-related activities generated a range of 489.0 to 648.2 MMbbl of produced waters (refer to **Chapter 3.1.1.4 and Table 3-5** of this EIS; also refer to Chapter 3.1.1.4 of the 2012-2017 WPA/CPA Multisale EIS). Produced water, including its constituent pollutants, is the largest waste stream associated with oil and gas production (Veil et al., 2004; Welch and Rychel, 2004; Clark and Veil, 2009). The volume of produced water is not constant over time and increases over the life of an individual well (Veil et al., 2004). It has been estimated that U.S. wells produce 7 bbl of produced water for every barrel of oil and may comprise as much as 98 percent of the material brought to the surface for wells nearing the end of productivity (Veil et al., 2004). Produced water is comprised of a number of different substances including trace heavy metals, radionuclides, sulfates, treatment chemicals, produced solids, and hydrocarbons (refer to Veil et al., 2004, Table 2-1, for a complete list of substances and amounts from GOM wells). Impacts to birds from pollutants remaining in produced water may be from ingestion or contact (direct) or from the changes in the abundance, distribution, or composition of preferred foods (indirect). O'Hara and Morandin (2010) documented measurable oil transfer to feathers and impacts to feather microstructure at sheen thickness as low as 0.1-0.3 micrometers. Even a light coating of hydrocarbons and other substances found in produced water can negatively affect feather microstructure, potentially compromising its buoyancy, insulation (i.e., thermoregulatory function and capacity), and flight characteristics (Stephenson, 1997; O'Hara and Morandin, 2010). Produced water has previously received limited attention relative to potential effects to birds using offshore waters or as a chronic source of pollution (Stephenson, 1997; Wiese et al, 2001). Analyses herein are based, in part, on the following assumptions: (1) the regulatory limits established by USEPA eliminate or significantly reduce the potential for negative effects to most birds; and (2) produced water and its constituent pollutants will be diluted simply as a function of the dilution potential of the ocean, minimizing potential harm to birds. It should be noted that BOEM relies on self-reporting and self-monitoring by individual companies relative to produced waters. In addition, it should also be acknowledged that not all water pollutants are regulated or regulated at levels that will prevent effects to wildlife, including birds (Fraser et al., 2006, pages 148-150). There is a high level of uncertainty as to the potential effects of this routine activity on seabirds that overlap spatially and temporally with produced-water discharge events in the EPA (and in other planning areas) (refer to Burke et al., 2012).

Predicted or anticipated oil spills and chronic oil pollution associated with an EPA proposed action are likely to be a fraction of that compared with OCS-related activities in either the WPA or CPA (refer to **Chapter 3.1.1.7**). Mortality is associated with oil spills or chronic oil pollution (Wiese and Robertson, 2004, Wilhelm et al., 2009, Camphuysen, 2010). It is well understood that the anthropogenic input of accidental spills varies temporally, and in the GOM, years in which major hurricanes occurred resulted in a higher frequency of spills as well as a greater annual volume (USDOI, MMS, 2009a; Anderson et al., 2012). Oil spills and chronic oil pollution (Camphuysen, 1998 and 2010; Hampton et al., 2003a and 2003b) both result in the direct mortality of seabirds worldwide and results in major avian losses regionally and locally (Newton, 1998, pages 429-431; also refer to Table 4-15 of the 2012-2017 WPA/CPA Multisale EIS). The potential effects associated with accidental oil spills are only briefly discussed here. A more detailed discussion of oil-spill effects/impacts to avian resources is provided in **Chapter 4.1.1.16.3** of this EIS and in Chapter 4.2.1.16.3 of the 2012-2017 WPA/CPA Multisale EIS. Oil spills (and disturbance impacts associated with response) have the greatest impact on coastal and marine birds. Depending on the timing and location of the spill, even small spills can result in major avian mortality events (refer to Dunnet, 1982; Piatt et al., 1990a; Castège et al., 2007). Small amounts of oil can affect birds, and mortality from oil spills is often related to numerous symptoms of toxicity (Albers, 2006). Data from actual spills strongly suggest that impacts to an avian species' food supply are typically delayed after initial impacts from direct oiling (Esler et al., 2002; Velando et al., 2005; Zabala et al., 2010). Sublethal, long-term effects of oil on birds (Esler et al., 2000; Alonso-Alvarez et al., 2007) may even exceed the direct mortality associated with a given oil-spill event; in some cases, effects may persist for ≥20 years (e.g., Peterson et al., 2003). Though the *Deepwater Horizon* explosion, oil spill, and response only resulted in the collection of >7,000 birds (**Table 4-6** of this EIS; also refer to Figure 4-17 of the 2012-2017 WPA/CPA Multisale EIS), the total model-estimated mortality associated with this spill has not yet been determined. The effects to impacted populations are presently poorly understood, though species-specific life-history traits will largely determine a given species response to the spill (refer to Table 4-13 of the 2012-2017 WPA/CPA Multisale EIS). Refer to Anderson et al. (2012) for additional information specific to OCS-related oil spills. A more detailed discussion of catastrophic oil-spill events, which are not reasonably expected and not part of an EPA proposed action, can be found in **Appendix B**.

Non-OCS Oil- and Gas-Related Impacts

Non-OCS-related impacts on birds include climate change; habitat loss, alteration, and fragmentation; and predation. Numerous species of coastal and marine birds are vulnerable to the effects associated with climate change (North American Bird Conservation Initiative, 2010). Of the 84 avian species considered, 74 were considered to be moderately or highly vulnerable to climate change impacts (North American Bird Conservation Initiative, 2010). In particular, those species that select low-lying habitats such as islands, beaches, flats, dunes, bars, and similar inshore habitats for nesting (USDOI, FWS, 2010d) are particularly vulnerable due to annual increases in sea-level (Fitzgerald et al., 2007; Intergovernmental Panel on Climate Change, 2007). As well, saltmarsh obligate species (e.g., seaside sparrow, Nelson's sharp-tailed sparrow, Rallidae-yellow rail, black rail, clapper rail, king rail) are also extremely sensitive to loss of saltmarsh habitat. Of the avian species groups considered herein (Tables 4-9 through 4-11 of the 2012-2017 WPA/CPA Multisale EIS), those species considered habitat specialists that also exhibit delayed sexual maturity, small clutch sizes, and low re-nesting propensity will be the most heavily impacted (refer to the examples in Table 4-13 of the 2012-2017 WPA/CPA Multisale EIS; Sæther et al., 2004a and 2004b). Other climate change impacts include increasing sea surface temperature and the increasing frequency and intensity of storms (and associated erosion) (Michener et al., 1997). Effects from these various factors will most likely dramatically alter the species composition and abundance, as well as the distribution of potentially affected species primarily due to major reductions (and shifting zones inland) in available habitat, and secondarily to changes in the distribution and abundance of preferred foods (refer to the review by Grémillet and Boulinier, 2009). The magnitude of potential effects associated with climate change will likely depend on the individual species, its starting population size, its population trajectory, and its life-history characteristics against the backdrop of species-specific habitat preferences and climate-induced declines in available habitat. **Figure 4-13** provides a hypothetical avian species response to declines in available habitat as a result of sea-level rise in the GOM. It should be understood that, for most avian species considered, habitat losses presently occur in the absence of climate change effects. Though there is some uncertainty associated with mitigation measures and some of the potential effects (Zedler, 2004) associated with climate change (but refer to Lawler et al., 2010; Conroy et al., 2011; Nichols et al., 2011), what is more certain is that there will be major changes to both the breeding and wintering avian communities in the coastal regions of the GOM (Galbraith et al., 2002; Erwin et al., 2006; Rush et al., 2009). Much habitat loss, alteration, and fragmentation occurs in the nearshore environment or onshore and is not OCS-related, e.g., commercial and private development (Hunter et al., 2002 and 2006). Non-OCS-related impacts on habitat operate in a way similar to the OCS-related impacts on habitat discussed previously in this section. A study done on the Isles Dernieres barrier island complex in Louisiana suggests that colonial nesting seabirds are impacted on some barrier island breeding habitat by raccoon, rat, and coyote predation on eggs and young (Leumas, 2010).

At present, there are no mitigations in place to address most OCS-related impacts on birds: effects from habitat loss, alteration, or fragmentation in the nearshore environment associated with OCS-related pipeline landfalls, oil and gas processing facilities, or associated infrastructure; attraction to and collision with offshore platforms and potential negative energetic consequences associated with nocturnal circulation around them; potential oiling of seabirds due to produced water from offshore oil and gas platforms; and oil spills and chronic oil pollution (Burke et al., 2005; Fifield et al., 2009; Burke et al., 2012). A Memorandum of Understanding including this Agency and FWS regarding the conservation of migratory birds was signed in June 2009 (USDOI, FWS and USDOI, MMS, 2009).

Unavailable information on the cumulative effects to coastal and marine birds, including the effects occurring after the *Deepwater Horizon* explosion, oil spill, and response (and thus related changes to the avian baseline in the affected environment), makes an understanding of the potential impacts from an EPA proposed action less clear. BOEM concludes that the unavailable information about these events may be relevant to foreseeable significant adverse impacts to coastal and marine birds. Nevertheless, relevant data on the status of bird populations after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze through the NRDA process, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted scientific methods and approaches. However, BOEM believes that this incomplete or unavailable information regarding the effects of the *Deepwater Horizon* explosion, oil spill, and response on birds would not likely be essential to a reasoned choice among alternatives. Compared with non-OCS Program factors, such as habitat loss, collisions with non-OCS-related structures, disease and other anthropogenic factors, which may result in billions of avian deaths annually from anthropogenic factors (Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS), the incremental effect of an EPA proposed action is particularly small. Any information obtained from the *Deepwater Horizon* explosion, oil spill, and response is unlikely to be so significant as to change the relative importance of non-OCS mortality factors specific to their populations.

In conclusion, the incremental contribution of an EPA proposed action to the cumulative impact is considered adverse, but not significant when compared with the impacts of other OCS Program-related and non-OCS Program-related factors.

Summary and Conclusions

Overall, impacts to coastal and marine birds associated with cumulative impacts in the EPA, particularly those effects related directly to OCS activities, should be less overall compared with either the WPA or CPA. A myriad of different anthropogenic (both OCS-related and non-OCS-related) and natural (e.g., disease, predation, weather) mortality factors (refer to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS) can negatively affect individuals of populations comprising the seven avian species groups found in the Gulf of Mexico (Tables 4-9, 4-10, and 4-11 of the 2012-2017 WPA/CPA Multisale EIS). Of the OCS-related activities identified previously (**Chapter 4.1.1.16.2** of this EIS and Chapters 4.1.1.14.4 and 4.2.1.16.4 of the 2012-2017 WPA/CPA Multisale EIS), several are relevant to the discussion of their potential effects: habitat loss, alteration, or fragmentation; disturbance-related effects (e.g., support vessels and helicopters); attraction to and collision with offshore platforms; nocturnal circulation (night flights) around them and the potential associated energetic demands; discharge of produced waters; oil spills; and chronic oil pollution. All but the latter factor represents factors associated with routine OCS activities. Unfortunately, little information exists with respect to either direct or indirect effects to avian resources for most of these impact-producing factors, except for collision-related mortality (refer to **Chapter 4.1.1.16.2** of this EIS; refer also to Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS). For the factors not studied to date, it is inappropriate to assume that these factors result in no effects (Peterson et al., 2001; Parker and Wiens, 2005; Burke et al., 2012). It is predicted that the EPA's anticipated level of activity, including one platform, will result in 50-100 bird deaths/year or 2,000-4,000 over the life of the newly installed platform. This is in addition to the estimated 200,000-321,000 bird deaths/year over the entire platform archipelago. This number represents a small fraction compared with other anthropogenic sources of avian mortality (Table 4-7 of the 2012-2017 WPA/CPA Multisale EIS), though there is limited population-level information available to assess long-term impacts to individual species migrating across the GOM (refer to Arnold and Zink, 2011). Of the various factors to consider for avian resources in the GOM associated with climate change (Møller et al., 2004; North American Bird Conservation Initiative, 2010), the factor with the greatest potential net negative impact, at least for the coastal breeding avian assemblage, would be sea-level rise (Galbraith et al., 2002; Erwin et al., 2006). Of the 84 avian species considered, 74 were considered to be moderately or highly vulnerable to climate change impacts (North American Bird Conservation Initiative, 2010). In particular, those species that select low-lying habitats such as islands, beaches, flats, dunes, bars, and similar inshore habitats (USDOI, FWS, 2010d) are particularly vulnerable due to annual sea-level rise (Fitzgerald et al., 2007; Intergovernmental Panel on Climate Change, 2007). As well, saltmarsh obligate species (e.g., seaside sparrow, Nelson's sharp-tailed sparrow, Rallidae-yellow rail, black rail, clapper rail, king rail) are also extremely sensitive to loss of saltmarsh habitat. For more detailed information regarding cumulative impacts, refer to the discussion above and to Chapter 4.2.1.16.4 of the 2012-2017 WPA/CPA Multisale EIS. The incremental contribution of an EPA proposed action to the cumulative impact is considered adverse, but not significant.

4.1.1.17. Fish Resources and Essential Fish Habitat

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for fish resources and essential fish habitat (EFH) can be found in Chapters 4.1.1.15 and 4.2.1.18 of the 2012-2017 WPA/CPA Multisale EIS and in Chapters

4.1.1.15 and 4.2.1.18 the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.18 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.18 the WPA 233/CPA 231 Supplemental EIS would be equally applicable for fish resources and EFH regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for fish resources and EFH presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for fish resources and EFH presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on fish resources and EFH, and various Internet sources were examined to determine any recent information regarding fish resources and EFH. Sources investigated include BOEM, USDOC/NOAA/NMFS, Gulf of Mexico Alliance, State environmental agencies, and coastal universities. Other websites from scientific publication databases (including Science Direct, Elsevier, CSA Illumina, and JSTOR) were checked for new information using general Internet searches based on major themes. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding fish resources and EFH since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, although there is incomplete or unavailable information on the impacts of the *Deepwater Horizon* explosion, oil spill, and response on fish resources and EFH, BOEM has determined that it is impossible to obtain this information, regardless of cost, within the timeframe contemplated by this NEPA analysis, and it may be years before the information is available. This information is being developed through the NRDA process, data are still incoming and have not been made publicly available, and it is expected to be years before the information is available. This information may be relevant to reasonably foreseeable significant impacts, and BOEM cannot definitively state at the present time whether this information may be essential to a reasoned choice among alternatives. BOEM's subject-matter experts, however, have used the scientifically credible information that is available and applied it using accepted scientific methodologies. Nevertheless, BOEM believes that this information is not essential to a reasoned choice among alternatives.

4.1.1.17.1. Description of the Affected Environment

Fish Resources

The Gulf of Mexico supports a great diversity of fish. Distribution of fish species are related to variable ecological factors that include salinity, primary productivity, and bottom type. These factors differ widely across the Gulf of Mexico and between the inshore and offshore waters. Characteristic fish resources are associated with the various environments and are not randomly distributed. Major gradients include rainfall and river output, bottom composition, and depth. High densities of fish resources are associated with particular habitat types. Most finfish resources are linked both directly and indirectly to the vast estuaries that surround the Gulf of Mexico. Estuaries serve as nursery grounds for a large number of marine fishes that live on the inner continental shelves, such as the anchovies, herrings, mojarras, and drums.

Estuaries and rivers of the GOM export considerable quantities of organic material, thereby enriching the adjacent continental shelf areas. From the shoreline to a depth of about 20 m (66 ft), the fish fauna is dominated by sea catfishes (Ariidae), lizardfishes (Synodontidae), and sciaenids (drums, seatrout, kingfish, and others in Scianidae) (McEachran and Fechhelm, 1998). These fish are very dependent on estuaries as nursery grounds. Gulf menhaden (*Brevoortia patronus*) and members of the Sciaenidae family are directly dependent on estuaries during various phases of their life history.

Out to a depth of 40-50 m (131-164 ft), on muddy bottoms, the fish fauna is dominated by porgies (Sparidae), batfishes (Ogcocephalidae), sea-robins (Triglidae), sea basses (Serranidae), and left-eyed flounders (Bothidae). These species are also largely dependent on estuaries as nursery grounds. On shell or hard bottoms in the same depth range (20 to 40 or 50 m; 66 to 131 or 164 ft), a slightly different species group occurs, which is dominated by snappers (Lutjanidae) and other spiny-rayed fishes with a preference for hard substrate (McEachran and Fechhelm, 1998).

The remaining OCS, to a depth of approximately 200 m (656 ft), generally has a muddy or silty soft bottom. Fishes dominating this habitat include hakes (Phycidae), scorpionfishes (Scorpaenidae), and ogcocephalids (batfishes) (McEachran and Fechhelm, 1998). In this region where hard bottom occurs, some of the reef fish species that occur on the upper shelf can also be found. In addition, some species, including snowy grouper, warsaw grouper, yellowedge grouper, and gag grouper (Serranidae), are particularly adapted for deeper hard-bottom areas.

Deepwater demersal fishes below several hundred meters of depth are better known than the deep pelagic species. There is less information about these species. From the current information, the Macrouridae (rattails) was the most speciose family, represented by 30 species, followed by Ophidiidae (cusk-eels) with 23 species.

Pelagic fishes occur throughout the water column from the beach to the open ocean. Water-column structure (i.e., temperature, salinity, and turbidity) is the only partitioning of this vast habitat. Four ecological groups of pelagics (i.e., coastal, oceanic, mesopelagic, and bathypolagic) are the focus here. Coastal pelagic species traverse shelf waters of the region throughout the year. The distribution of most species depends upon water-column structure, which varies spatially and seasonally. Some coastal pelagic species show an affinity for vertical structure and are often observed around natural or artificial structures, where they are best classified as transients rather than true residents. There are large predatory species such as mackerels (*Scomberomorus* spp.), cobia (*Rachycentron canadum*), and little tunny (*Euthynnus alletteratus*). These species typically form schools, undergo migrations, grow rapidly, mature early, and exhibit high fecundity. Each of these species is important to some extent to regional fisheries. Another group of pelagics are smaller in body size and are planktivorous but exhibit similar life history characteristics as the larger predators. This group includes anchovies (*Anchoa* spp.), Gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*), and thread herring (*Opisthonema oglinum*). Species in the second group are preyed upon by the larger species in the first group; thus, the two are ecologically important in energy transfer in the nearshore environment. Oceanic pelagic species occur throughout the GOM, especially at or beyond the shelf edge. Oceanic pelagics are reportedly associated with mesoscale hydrographic features such as fronts, eddies, and discontinuities. Many of the oceanic fishes also associate with drifting *Sargassum*, which provides forage areas and/or nursery refugia. Oceanic species are generally the highly migratory species and include tunas (*Thunnus* spp.), marlins (Istiophoridae), sailfish (*Istiophorus platypterus*), swordfish (*Xiphias gladius*),and many sharks (Elasmobranchii). Mesopelagic fish assemblages in the GOM are numerically dominated by lanternfishes (Myctophidae) others include bristlemouths (Gonostomatidae) and hachetfishes (Sternoptychidae). These fishes make extensive vertical migrations during the night from mesopelagic depths (200-1,000 m; 656-3,281 ft) to feed in higher, food rich layers of the water column (McEachran and Fechhelm, 1998). Mesopelagic fishes are important ecologically because they transfer substantial amounts of energy between mesopelagic and epipelagic zones over each diel cycle. The deeper-dwelling bathypelagic fishes inhabit the water column at depths >1,000 m (3,281 ft) and seldom migrate into shallower waters. Numerous species of gonostomatids (bristlemouths or lightfishes) and scaleless black dragonfishes (Melanostomiidae) are found in the bathypelagic of the Gulf.

Protected Nearshore Fish Species

There are two ESA-protected fish species in the Gulf of Mexico, both inshore or nearshore inhabitants. The first is the Gulf sturgeon (*Acipenser oxyrinchus desotoi*). The NMFS and FWS listed the Gulf sturgeon as a threatened species on September 30, 1991. Subsequently, a recovery plan was developed to ensure the preservation and protection of Gulf sturgeon spawning habitat (USDOI, FWS and Gulf States Marine Fisheries Commission, 1995). Critical habitat was proposed on June 6, 2002, in the *Federal Register* (*Federal Register*, 2002) and was designated on April 18, 2003. Critical habitat for this species is limited to coastal bays and rivers on the Gulf Coast from the Pearl and Bogue Chitto Rivers in the Pontchartrain Basin, Louisiana, to Apalachicola Bay, Florida. The decline of the Gulf sturgeon is believed to be due to overfishing and habitat destruction, primarily the damming of coastal rivers and the degradation of water quality (Barkuloo, 1988). An EPA proposed action is located in the De Soto Canyon and Walker Ridge leasing areas of the Gulf of Mexico, approximately ~201 km (~125 mi) south of the northern Gulf Coast and not within any habitat known to be inhabited by the Gulf sturgeon.

The other ESA-protected fish species is the smalltooth sawfish (*Pristis pectinata*), which is listed as endangered. These elasmobranchs were once common in the Gulf of Mexico and on the East Coast of the United States. Fishing pressure, both recreational as well as commercial, and habitat loss is believed to have caused significant population declines. A recent study by Simpfendorfer (2006) identifies the southwestern portion of the State of Florida as the core of the habitat for the smalltooth sawfish. The study further identifies habitats associated with the species as shallow areas, areas close to shore with mangroves and seagrasses. However, the author speculated that larger individuals may move to the edge of the reef tract during colder months. An EPA proposed action is ~523 km (~325 mi) west of the area of the known species range.

Essential Fish Habitat

This is a summary of fish resources and EFH including the Gulf sturgeon. For additional information on these resources, refer to Chapters 4.2.1.17 and 4.2.1.18 of the 2012-2017 WPA/CPA Multisale EIS and to Chapters 4.2.1.17 and 4.2.1.18 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

A large portion of the GOM is designated EFH because of the number of managed species and their different life history stages and the variety of habitats in the GOM. The EFH regulations (50 CFR part 600) require NMFS to describe and identify habitats determined to be EFH for each life stage of each managed species. The EFH that are covered throughout this document are water quality (**Chapters 4.1.1.2.1 and 4.1.1.2.2**), wetlands (**Chapter 4.1.1.4**), seagrass communities (**Chapter 4.1.1.5**), live bottoms (**Chapters 4.1.1.6.1 and 4.1.1.6.2**), topographic features (**Chapter 4.1.1.7**), *Sargassum* communities (**Chapter 4.1.1.8**), chemosynthetic deepwater benthic communities (**Chapter 4.1.1.9**), nonchemosynthetic deepwater benthic communities (**Chapter 4.1.1.10**), and soft bottom benthic communities (**Chapter 4.1.1.11**). These events and the effects to EFH are also summarized in **Appendix D**.

4.1.1.17.2. Impacts of Routine Events

This is a summary the potential impacts of routine events to fish resources and EFH including the Gulf sturgeon. For additional information on the potential impacts of routine events to fishes and EFH including the Gulf sturgeon, refer to Chapters 4.2.1.17.2 and 4.2.1.18.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapters 4.2.1.17 and 4.2.1.18 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

Effects on fish resources and EFH from routine activities associated with an EPA proposed action could result from coastal environmental degradation, marine environmental degradation, pipeline trenching, and offshore discharges of drilling muds and produced waters. Since the majority of fish species within the northern GOM are estuary dependent, coastal environmental degradation resulting from an EPA proposed action has the potential to adversely affect EFH and fish resources. The EFH that are covered throughout this document and that are affected by routine activities are water quality (**Chapters 4.1.1.2.1.2 and 4.1.1.2.2.2**), wetlands (**Chapter 4.1.1.4.2**), seagrass communities (**Chapter 4.1.1.5.2**), live bottoms (**Chapters 4.1.1.6.1 and 4.1.1.6.1.2**), topographic features (**Chapter 4.1.1.7.2**), *Sargassum* communities (**Chapter 4.1.1.8.2**), chemosynthetic deepwater benthic communities (**Chapter 4.1.1.9.2**), nonchemosynthetic deepwater benthic communities (**Chapter 4.1.1.10.2**), and soft bottom benthic communities (**Chapter 4.1.1.11.2**). These events and the effects to EFH are also summarized in **Appendix D**.

Proposed Action Analysis

Routine activities such as pipeline trenching and OCS discharge of drilling muds and produced water could affect fish resources or EFH. It is expected that any possible coastal and marine environmental degradation from routine activities associated with an EPA proposed action is expected to cause a nondetectable decrease in fish resources or in EFH. This is because of regulations, mitigations, and practices that reduce the undesirable effects on coastal habitats from dredging and other construction activities. Permit requirements should ensure that pipeline routes either avoid different coastal habitat types or that certain techniques are used to decrease impacts. At the expected level of impact, possible impacts would be short term and localized; therefore, they would only affect small portions of fish populations and selected areas of EFH. As a result, there would be little disturbance to fish resources or EFH. In deepwater areas, many of the EFH's are protected under stipulations and regulations currently set in place.

The NTL 2009-G40 advise operators to avoid hard-bottom habitats that support fish populations. Offshore water quality is affected temporarily and in a limited area by the discharge of produced water and the overboard discharge of drill muds. Pipeline trenching, maintenance dredging, and canal widening in inshore areas cause only the temporary suspension of sediments. Negative impacts from most of these routine operations would require a short time for fish resources to recover. This is because of multiple life history and environmental factors such as fecundity or year-class recruitment through oceanographic circulation.

Additional hard-substrate habitat provided by structure installation in areas where natural hard bottom is rare will tend to increase fish populations or attract fish populations. The removal of these structures will eliminate that habitat, except when decommissioned platforms are used as artificial reef material. This practice is expected to increase over time.

Protected Nearshore Fish Species

Potential routine impacts on Gulf sturgeon and their designated critical habitat may occur from drilling and produced-water discharges, bottom degradation of estuarine and marine water quality by nonpoint runoff from estuarine OCS-related facilities, vessel traffic, and pipeline installation. Because of the permitted discharge limits mandated and enforced in the Federal and State regulatory process, the dilution and low toxicity of this pollution is expected to result in negligible impact of an EPA proposed action on Gulf sturgeon. Vessel traffic would generally only pose a risk to Gulf sturgeon when the vessels are leaving and returning to port. However, there is a relatively low number of vessel trips estimated associated with an EPA proposed action, and these vessels would use existing waterways and ports (**Table 3-2**). Major navigation channels are excluded from critical habitat and these channels would not be expected to change with an EPA proposed action. Also, the Gulf sturgeon's characteristics of bottom-feeding and general avoidance of disturbance make the probability of vessel strike extremely remote. If the 0-1 pipeline is installed nearshore as a result of an EPA proposed action, then regulatory permit requirements governing pipeline placement and dredging, combined with recent noninvasive techniques for locating pipelines, would result in very minimal impact to the Gulf sturgeon's critical habitat. No new onshore facilities are expected to be constructed as a result of an EPA proposed action, with the possible exception of 0-1 gas processing facilities. Due to regulations, mitigations, and the distance of routine activities from known Gulf sturgeon habitats, impacts from routine activities of an EPA proposed action would be expected to have negligible effects on Gulf sturgeon and their designated critical habitat.

Examples of potential routine impacts associated with an EPA proposed action on the OCS that could affect smalltooth sawfish and their designated critical habitat are drilling and produced-water discharges, bottom degradation of estuarine and marine water quality by nonpoint runoff from estuarine OCS-related facilities, vessel traffic, and pipeline installation. However, these activities will be far from the south Florida designated critical habitat for the species. Because of the distance from routine activities associated with an EPA proposed action, there will be undistinguishable effects to the smalltooth sawfish.

Summary and Conclusion

Routine activities such as pipeline trenching and OCS discharge of drilling muds and produced water could affect fish resources or EFH. It is expected that any possible coastal and marine environmental degradation from routine activities associated with an EPA proposed action is expected to cause a nondetectable decrease in fish resources or in EFH. This is because of regulations, mitigations, and the fact that Gulf of Mexico fish stocks have retained both diversity and biomass throughout the years of offshore development; an EPA proposed action is expected to result in a minimal decrease in fish resources and/or standing stocks or in EFH.

4.1.1.17.3. Impacts of Accidental Events

This is a summary of the potential impacts of accidental events to fish resources and EFH including the Gulf sturgeon. For additional information on the potential impacts of accidental events to fish resources and EFH including the Gulf sturgeon, refer to Chapters 4.2.1.17.3, and 4.2.1.18.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapters 4.2.1.17 and 4.2.1.18 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

Accidental events that could impact fish resources and EFH include blowouts and oil or chemical spills. Because subsurface blowouts, although a highly unlikely occurrence, suspend large amounts of sediment, they have the potential to adversely affect fish resources in the immediate area of the blowout. Also, any accidental event that could affect water quality or sensitive habitats has the potential to affect fish resources. The EFH that are covered throughout this document and that are affected by these possible accidents are water quality (**Chapters 4.1.1.2.1.3 and 4.1.1.2.2.3**), wetlands (**Chapter 4.1.1.4.3**), seagrass communities (**Chapter 4.1.1.5.3**), live bottoms (**Chapters 4.1.1.6.1.3 and 4.1.1.6.2.3)**, topographic features (**Chapter 4.1.1.7.3**), *Sargassum* communities (**Chapter 4.1.1.8.3**), chemosynthetic deepwater benthic communities (**Chapter 4.1.1.9.3**), nonchemosynthetic deepwater benthic communities (**Chapter 4.1.1.10.3**), and soft bottom benthic communities (**Chapter 4.1.1.11.3**). These events and the effects to EFH are also summarized in **Appendix D**.

Proposed Action Analysis

The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past as long as the levels of energy-related industry, commercial, and recreational activities remain the same as estimated for the 2012-2017 WPA/CPA Multisale EIS. Therefore, the coastal waters of Louisiana, Texas, Mississippi, Alabama, and Florida will have a total of 200, 20, 30, 10, and 30 spills <1,000 bbl/year, respectively, from all sources. When limited to just oil- and gas-related spill sources such as platforms, pipelines, MODU's, and support vessels, Louisiana, Texas, Mississippi, Alabama, and Florida will have totals of 130-170, 5-10, 3-5, ~2, and ~3 spills <1,000 bbl/year, respectively. Louisiana and Texas are the states most likely to have a spill ≥1,000 bbl occur in coastal waters. The most likely cause is from platforms located in State waters.

A total of <1-140 bbl of oil is estimated from offshore spills <1,000 bbl as a result of an EPA proposed action. Most offshore spills <1,000 bbl on the OCS would likely occur from a mishap on a production facility, most likely related to a failure related to storage of oil. During the 40-year analysis period, 96 percent of all spills estimated to occur as a result of an EPA proposed action would be small spills (≤1 bbl), and 2 percent of the volume of oil spilled would be the result of spills ≤1 bbl (Anderson et al., 2012).

For an EPA proposed action, there is a 7 percent chance of one offshore hypothetical spill ≥1,000 bbl occurring, a <0.5 percent chance of two offshore spills ≥1,000 bbl occurring, and a <0.5 percent chance of three offshore hypothetical spills ≥1,000 bbl occurring (**Table 3-21**). If oil spills due to an EPA proposed action were to occur in open waters of the OCS proximate to mobile adult finfish, the effects would likely be nonfatal and the extent of damage would be reduced because adult fish have the ability to move away from a spill, to metabolize hydrocarbons, and to excrete both metabolites and parent hydrocarbon compounds. Benthic EFH's would have decreased effects from oil spills because of the depths many occupy and because of the distance these low-probability spills would occur from benthic habitats (due to stipulations, NTL's, etc.). The Pinnacle Trend and the Chandeleur Islands are the only HAPC with a combined probability above 0.5 percent of oil exposure according to the OSRA model, and they both have a range of probability 0.5-1 percent (**Figure 3-14**). The possible effects to specific EFH covered in this EIS can be found in their respective sections. There is also a summary in **Appendix D**. Fish populations may be impacted by an oil spill but they would be primarily affected if the oil reaches the shelf and estuarine areas because these are the most productive areas. Many species reside in estuaries for at least part of their life cycle or are dependent on the nutrients exported from the estuaries to the shelf region, but the probability of a spill in these areas is low. Also, much of the coastal northern Gulf of Mexico is a moderate- to high-energy environment; therefore, sediment transport and tidal stratification should reduce the chances for oil persisting in these habitats if they are oiled. Early life stages of animals are usually more sensitive to environmental stress than adults (Moore and Dwyer, 1974). Oil can be lethal to fish, especially in larval and egg stages, depending on the time of the year that the event happened. The extent of the impacts of the oil would depend on the properties of the oil and the time of year of the event.

Protected Nearshore Fish Species

Due to the proximity of inshore spills to critical habitat for Gulf sturgeon and smalltooth sawfish, inshore spills pose the greatest threat. Unusually low tidal events, increased wave energy, or the use of oil dispersants increases the risk of impact with bottom-feeding and/bottom-dwelling fauna. For this reason, dispersants are not expected to be used with coastal spills. Winds and currents would also reduce the volume of a slick. Plaquemines Parish in Louisiana has the highest combined probability (<0.5-1 %) of an oil spill occurring and contacting its coastal waters and habitats (**Figures 3-8 and 3-9**). The spreading of a slick would reduce the oil concentrations that might impact the coastal Gulf sturgeon and smalltooth sawfish critical habitat. However, there is a <0.5-1 percent combined probability of an offshore spill associated with an EPA proposed action occurring and contacting the critical habitat of the Gulf sturgeon (**Figure 3-12**). There is a <0.5 percent combined probability of an offshore spill associated with an EPA proposed action occurring and contacting the critical habitat of the smalltooth sawfish (**Figure 3-13**).

The potential risk to sturgeon would result from either direct contact with oil spills (potential PAH's introduced through the spill) or long-term exposure to produced water. The likelihood of OCS activities affecting Gulf sturgeon and smalltooth sawfish in coastal waters is reduced by both the distance from a potential spill or production area and the concentration of contaminants that reach the area of Gulf sturgeon and smalltooth sawfish activity. Except for direct pipeline spills in the nearshore environment, the Gulf sturgeon would be at greater risk of a PAH encounter during the inland river migrations due to the industrial and farm waste introduced into these coastal rivers than with an accidental event resulting from an EPA proposed action.

Due to the distance of the activity from shore and Gulf sturgeon and smalltooth sawfish critical habitat, there is a minimal risk of any oil coming in contact with Gulf sturgeon and smalltooth sawfish from an offshore spill. Even for a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, the proximity, type of oil, weather conditions, as well as the amount and location (distance offshore and water depth) of the dispersant treatment, may contribute to the severity of the spill's impact to the Gulf sturgeon and smalltooth sawfish and their habitat.

The effect of proposed-action-related oil spills on fish resources is expected to cause a minimal decrease in standing stocks of any population because most spill events would be small in scale and localized; therefore, they would affect generally only a small portion of fish populations. Historically, there have been no oil spills of any size in the Gulf of Mexico that have had a long-term impact on fishery populations. The fish populations of the GOM have repeatedly proven to be resilient to large, annually occurring areas of anoxia, major hurricanes, and oil spills. An EPA proposed action is not expected to significantly affect fish populations or EFH's in the Gulf of Mexico.

The likely size of an accidental event resulting from an EPA proposed action would be small and unlikely to impact coastal and estuarine habitats where juvenile and larval stages of fish resources are predominant, and adult fish tend to avoid adverse water conditions.

Summary and Conclusion

Accidental events that could impact fish resources and EFH include blowouts and oil or chemical spills. Because subsurface blowouts, although a highly unlikely occurrence, suspend large amounts of sediment, they have the potential to adversely affect fish resources in the immediate area of the blowout.

Also, any accidental event that could affect water quality or sensitive habitats has the potential to affect fish resources. If oil spills due to an EPA proposed action were to occur in open waters of the OCS proximate to mobile adult finfish, the effects would likely be nonfatal and the extent of damage would be reduced because adult fish have the ability to move away from a spill, to metabolize hydrocarbons, and to excrete both metabolites and parent hydrocarbon compounds. Benthic EFH's would have decreased effects from oil spills because of the depths many occupy and because of the distance these low-probability spills would occur from benthic habitats (due to stipulations, NTL's, etc.). The likely size of an accidental event resulting from an EPA proposed action would be small and unlikely to impact coastal and estuarine habitats where juvenile and larval stages of fish resources are predominant, and adult fish tend to avoid adverse water conditions.

4.1.1.17.4. Cumulative Impacts

This is a summary of the potential cumulative impacts to fish resources and EFH including the Gulf sturgeon. For additional information regarding fish resources and EFH including the Gulf sturgeon, refer to Chapters 4.1.1.15.4, 4.2.1.17.4, and 4.2.1.18.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapters 4.2.1.17 and 4.2.1.18 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Along with an EPA proposed action and the ongoing and proposed activities in the CPA, there are widespread anthropogenic and natural factors that impact EFH and fish populations in the Gulf of Mexico. These OCS-related activities include structure emplacement and removal, oil spills, degradation of water quality, overfishing, and storm events. The EFH that are covered throughout this EIS and that may experience a variety of cumulative impacts are water quality (**Chapters 4.1.1.2.1.4 and 4.1.1.2.2.4**), wetlands (**Chapter 4.1.1.4.4**), seagrass communities (**Chapter 4.1.1.5.4**), live bottoms (**Chapters 4.1.1.6.1.4 and 4.1.1.6.2.4**), topographic features (**Chapter 4.1.1.7.4**), *Sargassum* communities (**Chapter 4.1.1.8.4**), chemosynthetic deepwater benthic communities (**Chapter 4.1.1.9.4**), nonchemosynthetic deepwater benthic communities (**Chapter 4.1.1.10.4**), and soft bottom benthic communities (**Chapter 4.1.1.11.4**). These events and the effects to EFH are also summarized in **Appendix D**.

OCS Oil- and Gas-Related Impacts

Some OCS activities such as the emplacement of structures and of artificial reefs also have a positive effect by providing habitat and/or food for reef fishes, but their removals can be detrimental. Discharges from OCS activities such as drill mud and produced water have an incremental effect on offshore water quality. All discharges are regulated by USEPA or State agencies. Oil spills, although considered rare events, can affect offshore waters. Adult fish may actively avoid areas of oil spills as they avoid any area of adverse water quality, such as hypoxic waters (Wannamaker and Rice, 2000; Kane et al., 2005). The OCS-related activities that could physically destroy live bottoms (e.g., anchoring and using anchor chains) are mitigated by BOEM. The OCS factors potentially impacting fish resources in the Gulf of Mexico are federally regulated or mitigated and are small. There could be impacts from a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action (more detail is provided in **Appendix B**), but most of the specific impacts are dependent on where the spill occurs, time of year of the spill, and what species were in the vicinity of the blowout.

Non-OCS Oil- and Gas-Related Impacts

There are many anthropogenic factors that are regulated by Federal and State agencies, and there are natural factors that cannot be regulated. Also to be considered is the variability in GOM fish populations due to natural factors such as spawning success and juvenile survival. Overall, the incremental contribution of the OCS effects to fish populations is small.

The coastal waters of the EPA are expected to continue to experience nutrient enrichment, low-dissolved oxygen, and toxin and pesticide contamination, resulting in the loss of both commercial and recreational uses of the affected waters. The degradation of water quality is expected to continue due to contamination by point- and nonpoint-source discharges. Resource management agencies, both State and Federal, set restrictions and permits in an effort to mitigate both the effects of development projects and industry activities. The Federal and State governments are also funding research and coastal restoration projects; however, it may take decades of monitoring to ascertain the long-term feasibility of these coastal restoration efforts.

Overfishing (including bycatch) has impacted some populations of GOM fish. The Magnuson-Stevens Fishery Conservation and Management Act and its amendments address sustainable fisheries and set guidelines for protecting marine resources and habitat from fishing- and nonfishing-related activities. Limits on catch and fishing seasons are set by the GMFMC. State agencies regulate inshore fishing seasons and limits.

Naturally occurring tropical cyclones can cause damage to various EFH's. These can be onshore as with wetland loss and offshore with damaged topographic features. These storms are a continual part of the Gulf of Mexico climate.

All of these events and activities cause some sort of effect on fish resources and different EFH's. Many anthropogenic inputs, including an EPA proposed action, are now monitored, regulated, and mitigated by the permitting agency or State. These efforts will continue in the future, and restoration of habitats could increase with better technologies. While fish resources and EFH are impacted by these many factors, an EPA proposed action would add a minimal amount to the overall cumulative effects.

Protected Nearshore Fish Species

OCS Oil- and Gas-Related Impacts

The Gulf sturgeon and smalltooth sawfish and their critical habitats can be cumulatively impacted by activities such as dredging, oil spills, natural catastrophes, and other factors that can result in changes to habitats. An EPA proposed action would not require dredging near natal rivers used as migratory routes to upstream spawning areas. While there could be a need for maintenance dredging in the nearshore waters, juvenile or adult sturgeon using these areas have the ability to avoid the regulated dredging activity.

The effects from contact with spilled oil would be sublethal and last for less than 1 month (Berg, 2006). Because of the low probability of an offshore oil spill from an EPA proposed action occurring and contacting Gulf sturgeon (<0.5-1.0%; **Figure 3-12**) and smalltooth sawfish (<0.5%; **Figure 3-13**) critical habitat, Gulf sturgeon and smalltooth sawfish contact with oil is expected to be minimal. The amount of oil projected to spill with a coastal spill is small, and it would have localized effects. A catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, has a small probability of occurring, and the oil would be weathered by the time it reached the inshore waters of these fishes critical habitats (**Appendix B**).

Non-OCS Oil- and Gas-Related Impacts

Substantial damage to Gulf sturgeon and smalltooth sawfish critical habitats is expected from inshore alteration activities and natural catastrophes. As a result, it is expected that the Gulf sturgeon and smalltooth sawfish would experience a decline in population sizes and a displacement from their current distribution that would last more than one generation.

The incremental contribution of an EPA proposed action to the cumulative impacts on Gulf sturgeon and smalltooth sawfish is negligible. This is because the effect of contact between sale-specific oil spills and Gulf sturgeon and smalltooth sawfish is expected to be sublethal and usually lasts less than 1 month, and regulations and mitigations decrease impacts from routine events. Other non-OCS Program-related activities, including storms and anthropogenic factors on habitat, are expected to result in more cumulative impacts to these two species.

Summary and Conclusion

Along with an EPA proposed action there are widespread anthropogenic and natural factors that impact EFH and fish populations in the Gulf of Mexico. These different impact-producing factors include structure emplacement and removal, oil spills, degradation of water quality, overfishing, and storm events. The activities associated with an EPA proposed action potentially impacting fish resources in the Gulf of Mexico are generally federally regulated or mitigated and are small. Overfishing is reduced by limits on catch and fishing seasons set by the GMFMC. State agencies regulate inshore fishing seasons and limits. Naturally occurring tropical cyclones can cause damage to various EFH's. However, these storms are a continual part of the Gulf of Mexico climate. While fish resources and EFH are impacted by these many factors, an EPA proposed action would add a minimal amount to the overall cumulative effects.

4.1.1.18. Commercial Fisheries

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for commercial fisheries can be found in Chapter 4.2.1.19 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.19 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.19 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.19 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for commercial fisheries regarding the EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for commercial fisheries presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for commercial fisheries presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on commercial fisheries, and various Internet sources were examined to determine any recent information regarding commercial fisheries. Sources investigated include BOEM, USDOC/NOAA/NMFS, Gulf of Mexico Alliance, State environmental agencies, and coastal universities. This new information has been integrated into information presented in this EIS and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. No new significant information was discovered regarding commercial fisheries since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, unavailable information on the effects to commercial fisheries from the *Deepwater Horizon* explosion, oil spill, and response (and thus changes to the commercial fisheries baseline) makes an understanding of the cumulative effects less clear. BOEM concludes that the unavailable information from these events may be relevant to foreseeable significant adverse impacts to the commercial fishing industry and commercially important fish resources. Relevant data on the status of commercially important fish populations and the commercial fishing industry after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated by this NEPA analysis, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted methods and approaches. Nevertheless, BOEM believes that incomplete or unavailable information regarding the effects of the *Deepwater Horizon* explosion, oil spill, and response on the commercial fishing industry is not essential to a reasoned choice among alternatives in the effects analysis for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. The impacts of a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* explosion recently experienced in the Gulf of Mexico, based on limited data now available, are discussed in **Appendix B**.

4.1.1.18.1. Description of the Affected Environment

The Gulf of Mexico has provided between 30 and 40 percent of the seafood (in pounds) landed in the continental United Stated between the years 2005 and 2010 (USDOC NMFS, 2011a). During 2010, commercial landings of all fisheries in the Gulf totaled 1.285 billion pounds; these landings were valued at about $639.4 million (USDOC, NMFS, 2011a).

The commercial fishing industry is an important component of the economy of the Gulf of Mexico. **Table 4-7** provides an overview of the economic significance of the commercial fishing industry in the Gulf of Mexico. Commercial fishing landings in the Gulf were worth over $629 million in 2009, $640 million in 2010, and $824 million in 2011. Landings revenue supports economic activity along the commercial fishing supply chain. **Table 4-7** presents estimates of sales and employment in the economy that depends on commercial fishing activity. Approximately $17 billion in combined sales activity and approximately 128,000 jobs depend directly or indirectly on commercial fishing in the GOM. Of the Gulf Coast States, Florida has the highest level of overall commercial fishing-dependent jobs due to a large number of seafood importers, retail outlets, and seafood distributors located in the state. Louisiana has approximately 29,000 jobs in the industry, while Alabama and Mississippi each have fewer than 10,000 jobs.

All commercial fisheries data referenced in this section were obtained from NMFS (USDOC, NMFS, 2012e). The Gulf of Mexico provided 40 percent, 33 percent, and 42 percent of the number of pounds of seafood landed in the United States (with the exception of Alaska) in the years 2009, 2010, and 2011 respectively. This amounted to approximately 25 percent, 22 percent, and 24 percent of the dollar value of the total catch for each of these respective years in the United States, again excluding Alaska.

Menhaden (*Brevoortia patronus*), with landings of over 1.6 billion pounds and valued at over $110 million, was the most important Gulf species in terms of quantity landed during 2011. The catch was up 65 percent from 2010, when the catch was approximately 967 thousand pounds valued at $66 million. Menhaden are harvested extensively for their oil, which is included in animal food and human supplements as Omega-3 fatty acid. This species is harvested primarily in Louisiana and Mississippi.

Commercial shellfish of most importance to the central Gulf Coast include shrimp (primarily brown and white; *Farfantepenaeus aztecus* and *Litopenaeus setiferus*), blue crabs (*Callinectes sapidus*), and Eastern oyster (*Crassostera virginica*). The 2010 harvest of white shrimp from the central and eastern Gulf Coast States (Louisiana, Mississippi, Alabama, and western Florida) was 89 million pounds (85% of the U.S. harvest). The 2011 harvest of white shrimp for the central and eastern Gulf Coast States was nearly 63 million pounds, approximately 62 percent of the entire harvest for the U.S. The 2010 and 2011 harvest of brown shrimp for the same area was approximately 25 million pounds and 58 million pounds (31% and 46% of the U.S. harvest), respectively. Blue crab harvest in the central and eastern Gulf Coast States was approximately 37.7 million pounds in 2010, which is 20 percent of the total U.S. harvest for that year. In 2011, blue crab harvest in these states was nearly 53 million pounds, approximately 27 percent of the entire harvest of the U.S. Eastern oyster harvest in 2010 from the central and eastern Gulf Coast States totaled 10.6 million pounds. The 2011 harvest for the central and eastern Gulf Coast States was approximately 14 million pounds or approximately 67 percent of the entire U.S harvest.

The 2010 total fisheries landings in Louisiana were approximately 1 billion pounds valued at approximately $248 million. Total Louisiana fisheries landings in 2011 were over 1.5 billion pounds valued at slightly over $340 million. Louisiana landings in 2010 and 2011 were dominated by menhaden. Shellfish catch was dominated by white shrimp, blue crab, and brown shrimp.

Total Mississippi fisheries catch in 2010 decreased to 111 million pounds ($21.9 million), a 52 percent decrease over the 2009 catch. Total Mississippi fisheries catch in 2011 was approximately 278 million pounds, approximately 2.5 times the amount caught in 2010, valued at approximately $30.3 million. Total fisheries landings in Mississippi in 2010, and 2011 were dominated by the menhaden fishery. Shellfish harvest was dominated by brown shrimp and white shrimp, in all 3 years.

The 2010 total catch in Alabama was 14.6 million pounds valued at approximately $27.7 million. Catch values from 2011 show a total of slightly over 26 million pounds valued at approximately $51 million. Finfish catch in Alabama has been dominated by striped mullet (*Mugil cephalus*) in recent years. In 2010 the striped mullet catch was 1.1 million pounds valued at $560 thousand. In 2011, the striped mullet catch was 1.2 million pounds valued at approximately $675 thousand. Shellfish harvested in Alabama, in decreasing order of pounds harvested in 2010 and 2011 were brown shrimp, white shrimp, and blue crabs.

Total fisheries harvest from the West Coast of Florida from 2010 was approximately 62 million pounds valued at about $137.6 million. Values from 2011 were 77.6 million pounds valued at nearly $164 million. Striped mullet constituted the largest catch in pounds, with 7.1 million pounds in 2010 and 11.3 million pounds in 2011; however, red grouper (*Epinephelus morio*) was the most valuable finfish catch at $9 million in 2010 and $15.1 million in 2011. Shellfish harvested from the West Coast of Florida in 2010 and 2011 included Caribbean spiny lobster (*Panulirus argus*), blue crabs, pink shrimp (*Farfantepenaeus duorarum*), and the Eastern oyster.

Stock Status

The NMFS reports each year to the Congress and Fishery Management Councils on the status of all fish stocks in the Nation. As of the 2012 status report (USDOC, NMFS, 2013d), overfished species in the Gulf of Mexico are red snapper, greater amberjack, gag grouper, and gray triggerfish. The dominant fisheries landings for the entire Gulf Coast area and the associated economic benefit derived from the fisheries are the result of harvesting estuarine-dependent species of fish and shellfish that are harvested from estuarine or shelf areas. In the proposed EPA lease sale area, there are two predominant fisheries, the royal red shrimp (*Pleoticus robustus*) and long-line migratory pelagic fishery. A portion of the proposed EPA lease sale area (**Figure 4-14**), those leases located in De Soto Canyon, are closed to longline fishing and have been since August 4, 2000.

On August 4, 2000, NMFS announced some new regulations to reduce bycatch and bycatch mortality in the pelagic longline fishery. On November 1, 2000, NMFS put into effect a new regulation to reduce bycatch and bycatch mortality in the pelagic longline fishery. Two rectangular areas in the Gulf of Mexico (one of which lies over a portion of the region known as De Soto Canyon) are included in an EPA proposed action and are closed year-round to pelagic longline fishing. These closed areas cover 84,852 km^2 (32,800 mi^2).

Upper Area	
North boundary	30^o N. latitude
South boundary	28^o N. latitude
East boundary	86^o W. longitude
West boundary	88^o W. longitude
Lower Area	
North boundary	28^o N. latitude
South boundary	26^o N. latitude
East boundary	84^o W. longitude
West boundary	86^o W. longitude

The royal red shrimp fishery is a limited fishery because the equipment and practice of deepwater fishing are substantial in terms of size, weight, time, and expense. Royal red shrimp have, however, been harvested by fishers from deepwater Gulf areas in limited quantities for many years, and the market is increasing. Due to the depth (200-400 m; ~656-1,312 mi) at which this species is harvested (which requires specialized gear), time involved, and also given the localized, patchy nature of the occurrence of this species, trawling and harvest has been the effort of a very small number of fishermen. It is unlikely that fishing for this species will increase exponentially in the future.

4.1.1.18.2. Impacts of Routine Events

For additional information, refer to Chapter 4.2.1.19.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.19 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

Direct effects on commercial fishing from routine offshore activities could result from the installation of production platforms, the discharge of offshore waste, and underwater OCS obstructions including pipelines, production platform removals, and seismic surveys. Offshore structures can cause space-use conflicts with commercial fishing, especially with longline fishing. Exploratory drilling rigs cause temporary interference to commercial fishing, lasting approximately 30-150 days. Major production platforms present a permanent area unavailable for fishing that includes structures and safety zones. Underwater OCS obstructions such as pipelines can cause loss of trawl catch, as well as fishing downtime and vessel damage. An estimated 3-29 wells would be drilled and 0-50 mi (0-82 km) of pipelines would be installed as a result of an EPA proposed lease sale from 2012 through 2051. Few vessels fish at this depth and at this distance from shore. It is, therefore, expected that the impacts of routine activities will not significantly affect commercial fisheries in the area (**Table 3-2**).

There will be 0 platform removals expected by explosions associated with an EPA proposed lease sale from 2012 through 2051 (**Table 3-2**). Intense sounds generated by seismic surveys affect the spatial distribution of fish during and for some period following exposure. Intense sounds generated by seismic surveys affect the spatial distribution of fish during and for some period following exposure. It is estimated that <1 percent of the blocks for all planning areas would be surveyed as a result of an EPA proposed lease sale.

Proposed Action Analysis

Drill mud contains metals such as mercury and cadmium, which are toxic to fishery resources. Drilling mud plumes, however, have been shown to disperse rapidly to very near background levels at a distance of 1,000 m (3,281 ft) and they are usually undetectable at distances >3,000 m (9,843 ft). Drilling muds can be discharged into the ocean only if they meet the U.S. Environmental Protection Agency's NPDES permit requirements, which include testing for toxicity prior to discharge. Produced water commonly contains brine, trace metals, hydrocarbons, organic acids, and radionuclides. Any or all of these constituents, in high enough concentration, can be toxic to fish at any stage of their life cycle. Offshore discharges of produced water are expected to disperse and dilute to background levels within 1,000 m (3,281 ft) of the discharge point. These discharges must meet the general toxicity limits in the NPDES general permit. Discharge and monitoring records must be kept.

Additionally, routine OCS activities may impact inshore commercial fisheries indirectly. These activities include the construction or expansion of onshore facilities in wetland areas, pipeline emplacement in wetland areas, vessel usage of navigation channels and access canals, maintenance of navigation channels, and inshore disposal of OCS-generated, petroleum-field wastes. For more details on these effects from an EPA proposed action on the coastal communities, refer to **Chapters 4.1.1.3.2, 4.1.1.4.2, and 4.1.1.5.2**. Marine environmental degradation resulting from routine offshore activities also has the potential to indirectly affect commercial fish resources by reducing food stocks in soft bottom and reef habitats.

Summary and Conclusion

Drilling muds can be discharged into the ocean only if they meet the U.S. Environmental Protection Agency's NPDES permit requirements, which include testing for toxicity prior to discharge. Offshore discharges of produced water are expected to disperse and dilute to background levels within 1,000 m (3,281 ft) of the discharge point. These discharges must meet the general toxicity limits in the NPDES general permit. Discharge and monitoring records must be kept. Marine environmental degradation resulting from routine offshore activities also has the potential to indirectly affect commercial fish resources by reducing food stocks in soft bottom and reef habitats. However, activities are monitored and subject to regulations so there would be an overall minimal impact to commercial fisheries from routine activities associated with an EPA proposed action.

4.1.1.18.3. Impacts of Accidental Events

For additional information, refer to Chapter 4.2.1.19.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.19 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

The accidental events that could impact commercial fisheries include well blowouts, primarily gas well blowouts, and/or oil spills. A low-probability, subsurface gas blowout event has the potential to affect fish within a few hundred feet of the blowout. A blowout at the seafloor could cause a crater that might result in a localized increase in suspended sediments with the potential to clog finfish gills and interfere with respiration and sight feeding. Such an event could also temporarily interfere with longlining in the near vicinity.

Proposed Action Analysis

Oil or oil and gas mixture blowouts offshore may affect commercial fisheries populations, depending on their exposure to the oil, the type of oil, and the time of year of the spill. These spill events are rare, and the probability of oil spills ≥1,000 bbl occurring offshore are presented in **Chapter 4.1.1.17.3** above.

In the presence of oil, most adult commercial fisheries populations, with the exception of some marine invertebrates such as oysters (*Crassostrea virginica*), whelks (*Busycon sinistrum*), hard clams (*Mercenaria mercenaria),* and bay scallops (*Argopecten irradians*) are mobile and are able to avoid areas of adverse conditions in both offshore and inshore areas. Effects of oil spills on commercial populations, therefore, occur primarily if the oil is spilled during the spawning season(s) of commercial fish or shellfish and in the critical area, whether that area is offshore or inshore, exposing larvae and juveniles.

Most common commercial species including shellfish (the Eastern oyster [*Crassostrea virginica*], blue crabs [*Callinectes sapidus*], shrimp [brown, pink, and white; *Farfantepaneus aztecus, Litopenaeus setiferous, and Farfantepenaeus brevirostris*]) and finfish species including mullet (*Mugil cephalus*), croaker (*Micropogon undulates*), spot (*Leiostomus xanthurus*), spotted seatrout (*Cynoscion nebulosus*), sheepshead (*Archosargus probatocephalus*), pompano (*Trachinotus carolinus*), and pinfish (*Lagodon rhomboidoies*) are affected if the oil reaches the shelf or the shallow inshore estuarine waters during the period of the year during which these commercial species spend a critical portion of their life cycle. Oil spilled in the offshore areas is usually localized and has a very low probability of reaching shelf waters and coastal estuaries, except in the event of a catastrophic event, which is not reasonably expected and not part of an EPA proposed action (**Appendix B**). This is particularly true given the distance an EPA proposed action would maintain from shore. As a result, the economic impacts of an oil spill would be limited, except in the case of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action (**Appendix B**).

Few of the commercial finfish and shellfish species are affected by offshore oil, with the exception of red crab, royal red shrimp, swordfish, red snapper, grouper, and bluefin tuna. Tuna are only affected in the eastern part of the GOM if oil is spilled during the time of the year favorable for their migration to the Atlantic. Tilefish are benthic and primarily affected by oil remaining on the bottom sediments.

The combined probability of one or more hypothetical spills occurring and contacting surface waters in specific polygons delineated on the GOM as a result of an EPA proposed action was estimated by the OSRA model for hypothetical spills ≥1,000 bbl. The OSRA model estimated a <0.5 percent probability that the surface waters off the Florida coast from the shoreline to 300 m (984 ft) deep (polygons N8, N9, N10, N11, S8, S9, and S10) would be oiled within 10 days of a hypothetical modeled spill, except for the few blocks in the CPA south of Mobile Bay (polygon S7), which had a 1 percent probability (**Figure 3-16)**.

The OSRA model estimated a <0.5 percent probability that the surface waters along the Florida coast between the shoreline and 20 m (66 ft) depth (polygons N9, N10, and N11), as well as the waters out to 300 m (984 ft) deep off the southern portion of Florida (polygon S10) could be oiled within 30 days of a hypothetical spill (**Figure 3-17**). The surface waters off the northern half of Florida in water depths between 20 and 300 m (66 and 984 ft) had a 1 percent probability of oiling within 30 days (polygons S8 and S9) and the few blocks in the CPA, south of Mobile Bay, in water depths >20 m (66 ft) (polygon S7) had a 2 percent probability.

The probability and size of potential of oil spills occurring from pipeline breaks and production facilities in the inshore area or of an offshore spill reaching inshore waters are also presented in **Chapter 4.1.1.17.3** above. As a result, the economic impacts of an oil spill on commercial species should be minimal, except in the case of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action (**Appendix B**).

Commercial fishermen would actively avoid the area of a small spill in both inshore and offshore areas, but they may be prevented from fishing by Federal or State agency closures in some areas in the case of larger spills. Federal and/or State commercial and recreational fishing closures are usually done to protect human health. Once an area has been closed as a result of a spill (as recently seen with *Deepwater Horizon* explosion, oil spill, and response) or any other perceived health hazard, an adverse public perception of the health of the area could linger long after the area is reopened.

Summary and Conclusion

The potential for an oil spill from the EPA affecting commercial species, as calculated by OSRA modeling, is small. Most commercial fish and shellfish species spend at least part of their life cycle in inshore waters, and this area, according to OSRA calculations, is unlikely to be affected by a spill in the EPA. Few offshore species would be affected primarily because they are mobile and able to avoid adverse conditions. Benthic fish, such as tile fish, may be affected if the oil remains on the bottom.

Commercial offshore fishermen (longliners and shrimp fisheries) would be forced to move temporarily from the area of the oil spill. The potential for such an event, however, is small, as evidenced by the OSRA model. The actual effect of oil spills on commercial fisheries is anticipated to be small. Perception of contamination fisheries from the area can and does often affect sales more than the oil spill actually affects the fish.

4.1.1.18.4. Cumulative Impacts

For additional information, refer to Chapter 4.2.1.19.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.19 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

Specific types of impact-producing factors considered in the cumulative analysis include the following: installation and removal of production platforms and underwater OCS obstructions; seismic surveys; pipeline trenching; offshore discharges; spills and blowouts; commercial fishing techniques or practices; wetland loss; and hurricanes.

OCS Oil- and Gas-Related Impacts

Production Platforms and Underwater Obstructions

Productions facilities compete with commercial fishing interests for physical space in the open ocean. The facilities can also be associated with underwater OCS obstructions that pose hazards to fishing nets. These facilities are also known fish-attracting devices, so fish often congregate around them for food and shelter from predators. The area occupied by these structures is small compared with the area available in the GOM for fishing.

While there is no projected structure removal by explosives associated with an EPA proposed action, they still occur in the GOM. The removal of platforms not only frees the area for commercial fishing but also removes them as fish-attracting devices. There is the possibility the structures can be used in a Rigs-to-Reefs program where they would serve as artificial habitat for fish. There are structures that are anticipated to be removed using explosives. Explosives do cause mortality in fish with swim bladders when they are either associated with the platform or transient in the area at the time of the explosions, but these impacts would be localized to the immediate area of concern and related to fish either associated with the platform or transient in the area at the time of the explosions.

Seismic Surveys

Seismic surveys are used in both shallow-water and deepwater areas of the GOM. Seismic surveys are limited in time and space, and the observed fish response is to avoid the area of the survey for a short period of time. Although it has been alleged that catch rates are lower after seismic surveys, fishermen are usually precluded from the area for several days and fish elsewhere.

Pipeline Trenching

Pipeline trenching also has the potential to affect commercial fisheries as a result of sediment suspension. Sandy sediments from either source are quickly redeposited within 400 m (1,312 ft) of the trench, and finer sediments are widely dispersed and redeposited over a period of hours to days within a few thousand meters of the event. No extensive effects to commercial fisheries are anticipated as a result of pipeline trenching.

Offshore Discharge of Drilling Muds and Produced Waters

Offshore discharges of drilling muds and produced water also disperse and dilute to near background levels within 1,000 m (3,281 ft) of the discharge point and have a negligible cumulative effect on fisheries. Offshore live bottoms would not be impacted. Offshore discharges and subsequent changes to marine water quality are regulated by the U.S. Environmental Protection Agency's NPDES permits. Though the biomagnification of mercury in large fish of higher trophic levels has often been perceived as a problem in the GOM, recent data suggest that mercury in sediments near drilling platforms is not in a bioavailable form.

The input of drilling mud and produced waters is limited and is diluted very quickly in the marine environment. Their environmental effects are, therefore, expected to be limited. Sampling results of methylmercury in the vicinity of OCS structures does not vary significantly from background concentrations.

Petroleum Spills and Subsurface Blowouts

The potential causes, sizes, and probabilities of petroleum spills that could occur during activities associated with an EPA proposed action are discussed in detail in **Chapter 3.2.1**. The effects from these spills on fishes and on commercial fishing activity are discussed in **Chapters 4.1.1.17.3 and 4.1.1.18.3**. Large spills can potentially affect commercial fisheries resources by causing potential losses to commercial fish populations and potential closures to commercial fishing areas. The effects of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**. The majority of coastal spills in the GOM are expected to be small (<1 bbl) and to cause a minimal decrease in commercial fishing local to the spill area. Because these spills are small, the resultant influence on commercial fishing, landings, or the value of those landings is not expected to be distinguishable from natural population variations.

The loss of well control and resultant blowouts seldom occur in the Gulf of Mexico OCS over a 40-year time period. Sandy sediments are quickly redeposited within 400 m (1,312 ft) of a blowout site, and finer sediments are widely dispersed and redeposited within a few thousand meters or feet over a period of 30 days or longer. These events are expected to have a negligible impact on fish populations. It is expected that the infrequent subsurface natural gas blowout that can occur on the Gulf of Mexico OCS would have a negligible effect on commercial fish resources.

Subsurface blowouts that include both oil and natural gas have the potential to affect fish populations, particularly eggs, larvae, and juveniles. The specific effects of this type of spill on individual fish populations in the GOM are currently unknown, and spills of this type are a low-probability event.

Non-OCS Oil- and Gas-Related Impacts

Commercial Fishing Practices

There is competition among large numbers of commercial fishermen, among commercial operations employing different fishing methods, and between commercial and recreational fishermen for a given fishery resource. That competition, coupled with natural phenomena such as hurricanes, hypoxia, and red or brown tides, can impact commercial fishing activities. When practiced nonselectively, fishing techniques such as trawling, gill netting, or purse seining may reduce the standing stocks of the desired target species. This can also significantly affect species other than the target. In addition, continued fishing of most commercial species at the present levels can result in rapid declines in the landings and the eventual failure of certain fisheries.

Overfished species in the GOM, as defined by USDOC, NMFS (2013), include the gag grouper, greater amberjack, red snapper, and gray triggerfish. These species are discussed in **Chapter 4.1.1.17** of this EIS and in Chapter 4.2.1.18.1 of the 2012-2017 WPA/CPA Multisale EIS, and their decline is the result of overfishing or bycatch from the shrimp industry (red snapper). The Magnuson-Stevens Fishery Conservation and Management Act and its amendments address sustainable fisheries and set guidelines for protecting marine resources and habitat from fishing- and nonfishing-related activities. Limits on catch and fishing seasons are set by the Gulf Coast Fisheries Management Council. State agencies regulate inshore fishing seasons and limits.

Wetland Loss

The most serious impact to commercial fisheries is the cumulative effects on wetlands that occur at an ever-increasing rate. These effects are primarily from the population increase and associated infrastructure development, including pipeline canals of the Gulf Coast States along with recent major storms events and relative sea-level rise. Wetland conversion to open water would result in a permanent loss of nursery and foraging habitat for many commercial fish stocks. The loss of wetlands also contributes to the intrusion of saltwater into oyster-producing waters. This increases oyster mortality by increasing disease and predators in the oyster beds, and increased salinity not suitable for oyster habitats.

Hurricanes

Hurricanes may impact commercial fishing by damaging gear and shore facilities and by dispersing resources over a wide geographic area. Hurricanes may also affect the availability and price of key supplies and services (e.g., port facilities and fuel) that also affect commercial fishing. Hurricanes suspend fishing activity and are destructive to wetlands that act as nursery grounds to many commercial fish. Hurricanes can be extremely destructive to oyster beds by causing siltation over the beds and smothering spat along with adult oysters. However, natural disaster impacts such as these are easily distinguished from incremental impacts of OCS activities.

Summary and Conclusion

In summary, there are widespread anthropogenic and natural factors that impact fish populations in the GOM.

While productions facilities compete with commercial fishing interests for physical space in the open ocean, the area occupied by these structures is small compared with the area available in the GOM for fishing. Also, the emplacement of structures and artificial reefs has a positive effect on fish resources by providing habitat and/or food for reef fishes. Discharges from OCS activities such as drill mud and produced water have an incremental effect on offshore water quality. All discharges are regulated by the USEPA or State agencies.

Oil spills can affect offshore waters. Adult fish are known to actively avoid oil-spill areas because they avoid any area of adverse water quality. The impacts of a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**. The OCS factors potentially impacting fish resources in the GOM are federally regulated or mitigated and are small. Also to be considered is the variability in GOM fish populations due to natural factors such as spawning success and juvenile survival.

Overfishing (including bycatch) has contributed in a large way to the decline of some populations of GOM fish. The Magnuson-Stevens Fishery Conservation and Management Act and its amendments address sustainable fisheries and set guidelines for protecting marine resources and habitat. Limits on catch and fishing seasons are set by Fisheries Management Councils, and State agencies regulate inshore fishing seasons and limits.

Wetland loss decreases nursery habitat, which includes shelter for larvae and juveniles of many species. Resource management agencies, both Federal and State, set restrictions and permits in an effort to mitigate the effects of development projects, i.e., industry activities. The Federal and State governments are also funding research and coastal restoration projects; however, it may take decades of monitoring to ascertain the long-term feasibility of these coastal restoration efforts.

With the ongoing presence of a number of manmade and natural potential disturbances in the Gulf of Mexico, the Gulf of Mexico commercial fish and shellfish populations have remained generally healthy. In recent years, since 2005, the major contributors to the lower fisheries catches in the GOM have been hurricanes, fisheries closures, and freshwater diversions. The expected incremental effect of an EPA proposed action remains small, when viewed in light of other historic, ongoing, and reasonably foreseeable future factors impacting commercial fishing, such as fishing pressures, habitat loss, and hurricanes described above.

4.1.1.19. Recreational Fishing

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for recreational fishing can be found in Chapter 4.2.1.20 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.20 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.2020 of the 2012-2017 WPA/CPA Multisale and Chapter 4.2.1.20 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for recreational fishing regarding the EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for recreational fishing presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for recreational fishing presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on recreational fishing, and various Internet sources were examined to determine any recent information regarding recreational fishing. The primary new data source is an annual update to recreational fishing data for the Gulf of Mexico (USDOC, NMFS, 2012f). This update provides updates to the preliminary 2011 data that were used in the 2012-2017 WPA/CPA Multisale EIS. In 2012, NMFS also updated its data for previous years. This data source provides data on both the species caught and the amount of angler effort in any particular year. Namely, there was an increase in catch levels for a number of inland-based species such as Atlantic croaker, sand seatrout, and sheepshead. However, there were somewhat lower catch levels for some ocean-based species (such as red snapper and king mackerel) during 2010 and 2011. This new information was incorporated into the impact analyses below. No new significant information was discovered regarding recreational fishing since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and despite the new information identified and provided below, there remains incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on recreational fishing. Much of this information relates to the *Deepwater Horizon* explosion, oil spill, and response and is continuing to be collected and developed through the NRDA process. These data collection and research projects may be years from completion. Few data or conclusions have been released to the public to date. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In light of this incomplete and unavailable information, BOEM's subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology. Given the available data that have been released, as described in this section, BOEM believes that this incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.1.1.19.1. Description of the Affected Environment

An EPA proposed action has the potential to impact a number of recreational fishing areas in the Gulf of Mexico. This section discusses the baseline environment for recreational fishing along the coasts of Louisiana, Mississippi, Alabama, and Florida. Data on angler effort and on catch levels for the most-often fished species are presented first. Data both prior to and after the *Deepwater Horizon* explosion, oil spill, and response are presented; these data provide some perspective on the impacts of the oil spill on recreational fishing activity. This is followed by a description of the interaction between recreational fishing activity and the broader economy of the region. The final section presents a brief discussion on the potential for the *Deepwater Horizon* explosion, oil spill, and response to affect recreational fishing activity in the future.

Catch and Effort Data

Data on angler effort and on the levels of individual species caught by anglers is provided by NMFS (USDOC, NMFS, 2012f). **Table 4-8** presents data on the number of angler trips in Alabama, West Florida, Louisiana, and Mississippi during 2009, 2010, and 2011. In the Gulf as a whole, there were 22.6 million angler trips in 2009, 21.0 million angler trips in 2010, and 22.6 million angler trips in 2011. Thus, while there was a decrease in recreational fishing activity in 2010, overall recreational fishing activity in 2011 returned to the same level as that which occurred in 2009. **Table 4-8** also breaks down these trips by location and mode. The three geographic locations for each state are inland, State ocean waters, and Federal ocean waters. The three modes of fishing are shore fishing, charter fishing, and private/rental fishing. Ocean-based recreational fishing activity was still lower in 2011 than in 2009; however, this was offset by an increase in recreational fishing activity closer to shore. Recreational fishing activity was higher in 2011 than in 2009 in Alabama, Louisiana, and Mississippi, while recreational fishing activity in West Florida was lower in 2011 than in 2009. **Table 4-9** presents data on the most commonly landed species by recreational fishermen in Louisiana, Mississippi, Alabama, and Florida during each year from 2007 through 2011. In general, the catch data for 2011 seem consistent with the effort data for 2011. Namely, there was an increase in catch levels for a number of inland-based species such as Atlantic croaker, sand seatrout, and sheepshead. However, there were somewhat lower catch levels for some ocean-based species (such as red snapper and king mackerel) during 2010 and 2011.

Economic Effects of the Recreational Fishing Industry

Recreational fishing activity can affect a regional economy in a number of ways. The most direct manner in which anglers affect the economy is through direct spending on fishing-related goods and services. This direct spending includes both trip expenditures and expenditures on durable equipment. Trip expenditures include such things as transportation costs, boat fees, and bait expenses. Durable purchases include spending on things such as fishing equipment and fishing boats. **Table 4-10** presents data on total direct spending by anglers in each state along the Gulf of Mexico. There was approximately $10.1 billion in direct spending by anglers in 2009; roughly half of this spending occurred in West Florida. Louisiana and Texas each had over $2 billion in spending, while Alabama and Mississippi each had over $400 million in spending.

Direct spending by fishermen also supports firms in related industries along an economy’s supply chain. In addition, spending by fishermen serves as income to other agents in an economy, which supports overall spending patterns. The NMFS conducted an economic analysis that attempted to quantify this dependence of the regional economy on recreational fishing activity (USDOC, NMFS, 2011b); this analysis utilizes many of the techniques of an earlier study by Gentner and Steinbeck (2008). These studies utilize input-output economic models, which create multipliers that can be used to predict levels of sales, value added, and jobs that result from direct spending on recreational fishing. As can be seen in **Table 4-10**, direct spending by anglers supported approximately $9.8 billion in sales. One reason that sales are lower than spending is that only spending on newly produced goods contributes to economic activity (i.e., sales of used equipment does not). In addition, some spending that occurs by anglers would likely be replaced by spending by others if angler spending levels were to change. These sales contributed to $5.1 billion in value-added in the economy. While the sales data aggregate spending at different stages of production, value-added only includes the incremental production at each level in the supply chain. Finally, it is estimated that spending by anglers supports over 70,000 jobs in Louisiana, Mississippi, Alabama, and Florida.

Deepwater Horizon Explosion, Oil Spill, and Response

While the previous data provide useful historical data on the level of recreational fishing activity, there is more uncertainty regarding the long-term implications of the oil spill resulting from the *Deepwater Horizon* explosion on recreational fishing. The most important determinant of the longer-term effects of the spill will be the manner in which the fish ecosystems in the Gulf of Mexico evolve in response to the spill. Greater New Orleans, Inc. (2010) provides an overview of the factors that determine the extent to which some fish species will be able to adapt to the spill. However, one factor that makes these issues hard to gauge at this point is that, for many species, oil is more damaging to eggs and larvae than to adults. Thus, even if recreational fishing activity is maintained in the near term, it will take some time to observe if, and to what degree, the reproductive cycle of particular species has been impacted. Fish resources that are important in recreational fishing and the effects and potential effects of the *Deepwater Horizon* explosion, oil spill, and response on these resources are described in **Chapter 4.1.1.17.1**.

Impacts to the recreational fishing industry will also be determined by the ability of the people and firms in the industry to weather the impacts that the spill had on certain areas. Fishing closures occurred during a normally strong period for recreational fishing. In addition, many firms that cater to recreational fishing are small and may lack the ability to weather the resulting lack of business. Greater New Orleans, Inc. (2010) presents some survey results regarding the effects of the spill on local fishermen. While a number of fishermen in affected areas were idled directly after the spill, Louisiana officials opened a number of areas to recreational fishing in mid-July 2010 (Federal Reserve Bank of Atlanta, 2010). In addition, a number of people were supported short term by BP claims and by the Vessels of Opportunity Program. For example, businesses and individuals in the fishing industry have received over $743 million in compensation payments as of March 5, 2012 (Gulf Coast Claims Facility, 2012).

The fate of the recreational fishing industry will also depend on the extent to which confidence can be restored in the tourism and seafood industries along the Gulf Coast. This is a particularly hard issue to quantify at this point, in part because this issue will be determined by the success of government policy initiatives. For example, Louisiana will receive $78 million from BP to monitor seafood and to promote tourism. Thus, while a number of fishermen and businesses catering to them have been financially damaged by the spill, it appears that, if long-term impacts to recreational fishing do result from the *Deepwater Horizon* explosion, oil spill, and response, they will primarily be determined by the extent to which the fish ecosystems in the Gulf of Mexico are able to adapt to the spill over time.

There remains incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on recreational fishing. Much of this information relates to the *Deepwater Horizon* explosion, oil spill, and response and is continuing to be collected and developed through the NRDA process. These data collection and research projects may be years from completion. Few data or conclusions have been released to the public to date. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline of this EIS. In light of this incomplete and unavailable information, BOEM's subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology. Given the available data that have been released, as described in this section, BOEM believes that this incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.1.1.19.2. Impacts of Routine Events

Background/Introduction

Routine OCS actions can affect recreational fishing activity in a number of ways. The most direct impacts of OCS actions occur through their impacts on the fish populations that support recreational fishing activity. Many of the species fished by recreational anglers are the same as those caught by commercial fishermen. The main exception is menhaden, which is primarily a commercially fished species. The effects of routine OCS activities on commercial fishing are discussed in **Chapter 4.1.1.18**.

The OCS activities can cause coastal environmental degradation either through effects on water quality or on wetland habitats. The effects of environment degradation on fish resources and essential fish habitat are discussed in detail in **Chapter 4.1.1.17**. Construction operations and vessel traffic could also cause some degree of space-use conflict with recreational fishing vessels. Since the majority of recreational fishing activity in the GOM occurs fairly close to shore, space-use conflicts would primarily arise near onshore ports (primarily during the construction phase). **Chapter 4.1.1.22.1** discusses the structure of the coastal infrastructure that supports OCS activities. However, even if a space-use conflict was to arise in a particular instance, it is likely to be temporary in nature; it is also likely that a number of substitute recreational fishing sites would be available.

Oil platforms are particularly important to the recreational fishing industry due to their unique role as artificial reefs for fish habitats. Oil platforms often act as fish-attracting devices and, as such, attract a large fish population due to their particular suitability as reef structures. The Atlantic and Gulf States Marine Fisheries Commissions (2004) provide more information regarding the features of oil and gas platforms that make them particularly supportive of fish populations. Hiett and Milon (2002) estimate that over 20 percent of all recreational fishing activity in the GOM occurs within 300 ft (91 m) of an oil and gas structure. The extent to which a rig will serve as an attractor to fish will depend on the fish populations in nearby areas. The NOAA's Center for Coastal Monitoring and Assessment's website provides a set of maps that outlines the areas in the GOM in which certain fish species are prevalent (USDOC, NOAA, 2012c). In general, rigs that are closer to shore are more likely to be supportive of recreational fishing activity.

Since oil/gas platforms often attract a large fish population, the effects of OCS actions become particularly important during the decommissioning stage of an oil platform's life cycle. Namely, the removal of an oil rig from a particular site has the potential to damage the fish assemblages that often develop on an oil rig. This in turn will also affect recreational fishing activity in a particular area. Gitschlag et al. (2001) conducted an analysis of the impacts to fish populations from the use of explosives to remove decommissioned oil platforms. They found that species such as red snapper and sheepshead are particularly vulnerable to the use of explosives; however, they also reported that the scale of these impacts were relatively small at the sites that were included in the study.

As an alternative to removing an oil platform, the owner of an oil rig has the option to participate in the Rigs-to-Reefs program of the appropriate state. These programs allow for portions of oil platforms to remain in the water as reefs after the productive life of a platform has ended. Platforms that are a part of these programs are either toppled in place or are moved to a location that is a suitable fish habitat. The U.S. policy towards artificial reef creation is outlined in the *National Artificial Reef Plan: Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs* (USDOC, NOAA, 2007). The BSEE policy regarding Rigs-to-Reefs programs is outlined in *Rigs-to-Reefs Policy, Progress, and Perspective* (USDOI, MMS, 2000b) and was updated in *Rigs to Reefs Policy Addendum: Enhanced Reviewing and Approval Guidelines in Response to the Post-Hurricane Katrina Regulatory Environment* (USDOI, MMS, 2009b) in light of Hurricane Katrina.

Proposed Action Analysis

An EPA proposed action would lead to 0-1 oil and gas production structures (**Table 3-2**). This could lead to minor space-use conflicts with recreational fishermen, primarily during the construction phase. An EPA proposed action could also lead to some forms of environmental degradation that could affect fish populations, and this would also impact recreational fishing activity. These effects on fish populations are discussed in more detail in **Chapter 4.1.1.17**. However, these effects are expected to be minimal, particularly given the small scale of an EPA proposed action relative to the existing OCS oil and gas program. In addition, the fact that an EPA proposed action is quite far from shore will minimize its impacts to recreational fishing activity.

The extent to which the proposed oil platform will support recreational fishing activity will depend on their location. For example, oil rigs very far offshore are less likely to support recreational fishing activity. In addition, the extent to which oil platforms will hurt or harm recreational fishing populations after decommissioning will depend on the extent to which platforms will be maintained through Rigs-to-Reefs programs. However, given the large distance of an EPA proposed action from shore, the proposed oil platforms would have minimal effects on recreational fishing activity.

Summary and Conclusion

There could be short-term, space-use conflicts with recreational fishermen during the initial phases of an EPA proposed action. An EPA proposed action could also lead to low-level environmental degradation of fish habitat, which would also negatively impact recreational fishing activity. However, these minor negative effects would likely be offset by the beneficial role that oil rigs serve as artificial reefs for fish populations. The degree to which oil platforms would become a part of a particular State's Rigs-to-Reefs program would be an important determinant of the degree to which an EPA proposed action would impact recreational fishing activity in the long term. However, given the small scale of an EPA proposed action, as well as the large distance of an EPA proposed action area from shore, the overall impacts of routine activities on recreational fishing activity should be minimal.

4.1.1.19.3. Impacts of Accidental Events

Background/Introduction

The most direct manner in which oil spills and other accidental events would impact recreational fishing activity would be through their effects on fish and their habitats in the affected areas. A spill could either contaminate fish in the immediate area or cause fish to move during the duration of the spill. A spill would likely cause more direct harm to larvae and eggs than adults that, depending on the time of the year of the spill, could possibly affect recreational species recruitment and growth in the longer term. The effects of accidental events on fish resources and essential fish habitats are discussed in **Chapter 4.1.1.17.3**. The fish species most important to recreational fishing in certain regions are discussed in **Chapter 4.1.1.19.1**. A number of these species are also important to the commercial fishing industry. The effects of accidental effects on commercial fisheries are described in **Chapter 4.1.1.18.3**. A large amount of recreational fishing activity in the Gulf of Mexico occurs in the bays and wetlands areas along the Gulf Coast; the impacts of accidental events on wetland areas are described in **Chapter 4.1.1.4.3**.

The effects of an oil spill on recreational fishing are different from those experienced by the commercial fishing industry in several ways. Most directly, the benefits received by anglers from fishing activity are determined by subtle issues such as the enjoyment of the fishing process and the aesthetics of a particular fishing site. As a result, the damage of an oil spill to recreational fishing will be determined by issues such as the availability of substitute fishing sites in a region and the additional costs of attending alternate sites. These effects are most often analyzed using a variety of mathematical modeling techniques; an overview of these techniques is presented by NRC (2006) and the European Inland Fisheries Advisory Commission (2010). The two primary types of methods to evaluate the impacts of changes to fisheries available to anglers are revealed preference models and stated preference models. Revealed preference models infer the value anglers attach to certain fishery attributes through their observed behavior, while stated preference models ask anglers how they would adjust their fishing behavior in hypothetical situations. The features of a particular fishing site that will determine its value to anglers include its travel distance, species densities, catch rates, and the level of support facilities. Haab et al. (2000 and 2010) and Greene et al. (1997) are examples of applications of these methods to fisheries in the Gulf of Mexico. The *Exxon Valdez* spill was an example of a spill that occurred in an area with a large recreational fishing industry. Carson and Hanemann (1992) provide an economic analysis of the direct recreational fishing losses due to the spill. This study arrives at a rough estimate of $31 million in damage due to the *Exxon Valdez* spill. However, this study also discusses the numerous sources of uncertainty in arriving at this estimate. Mills (1992) provides a more detailed description of the trends in recreational fishing activity in Alaska before and after the *Exxon Valdez* spill.

Any disruption to recreational fishing activity would also have broader economic implications to a particular geographic region. Disruptions to recreational fishing would affect boat launches, bait shops, and durable fishing equipment manufacturers. Gentner Consulting Group (2010) attempts to quantify the potential losses to State economies due to recreational fishing closures in light of the *Deepwater Horizon* explosion, oil spill, and response. This study uses the expenditure estimates and input-output modeling framework of Gentner and Steinbeck (2008) to derive a daily measure of the potential losses in the economy due to fishing closures in the Gulf of Mexico. This study estimates that the recreational fishing industry contributes $9.8 million in direct expenditures, $23 million in total sales, and 183 jobs per day to the economy of the Gulf of Mexico. One can estimate the cost of a spill by restricting these estimates to a particular region and then multiplying the daily estimates by the total duration of a fishing closure brought about by an oil spill. It is also possible that an oil spill's effects on the recreational fishing industry could have broader effects on tourism. Namely, the loss of recreational fishing options at certain locations could dissuade visitors from taking trips to an overall area. Similarly, recreational fishing may suffer in areas not directly affected by oil due to uncertainty or to misperceptions regarding the extent of the oil damage. These effects of an oil spill on tourism activity would be particularly acute following a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action; an analysis of the impacts of a catastrophic spill on recreational fishing activity can be found in **Appendix B**.

Proposed Action Analysis

An EPA proposed action would lead to 0-1 production structures. If a production structure would arise from an EPA proposed action, it would be in a water depth >800 m (2,625 ft). Given the depth and distance of the production structure, there would be minimal recreational fishing activity in the immediate vicinity of the structure. In **Table 3-1**, there would be a 2 percent chance of a platform spill ≥1,000 bbl and a 6 percent chance of a pipeline spill ≥1,000 bbl. The extent to which a spill would affect recreational fishing activity in a broader region would depend on the size, location, and trajectory of the oil spill. The NOAA's Center for Coastal Monitoring and Assessment's website provides a set of maps that outlines the areas in the Gulf of Mexico in which certain fish species are prevalent (USDOC, NOAA, 2012c). However, the effects of an oil spill on recreational fishing activity would likely be minimal unless the spill was very large; the effects of a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**.

Summary and Conclusion

An oil spill would likely lead to recreational fishing closures in the vicinity of the oil spill. Small-scale spills should not affect recreational fishing to a large degree due to the likely availability of substitute fishing sites in neighboring regions. A large spill such as the one resulting from the *Deepwater Horizon* explosion may have more noticeable effects due to the larger potential closure regions and due to the wider economic implications such closures may have (**Appendix B**). However, the longer-term implications of a large oil spill would primarily depend on the extent to which fish ecosystems recover after the spill has been cleaned.

4.1.1.19.4. Cumulative Impacts

Background/Introduction

The cumulative impacts to recreational fishing activity will arise from an EPA proposed action, the existing OCS Program, and the expected progression of the recreational fishing industry in the Gulf of Mexico. These impacts would arise from the cumulative effects on fish resources in the Gulf of Mexico, which are discussed in **Chapter 4.1.1.17.4**. Because many of the recreationally sought fishes are also harvested commercially, a number of the cumulative impacts to the recreational fishing industry are similar to those of the commercial fishing industry; the cumulative impacts to the commercial fishing industry are discussed in **Chapter 4.1.1.18.4**. This is true even though recreational fishing is primarily confined to smaller, closer inshore areas of the Gulf of Mexico than commercial fishing. The cumulative impacts unique to recreational fishing activity are discussed below.

OCS Oil- and Gas-Related Impacts

Routine OCS Processes

The impacts of production platforms, underwater obstructions, seismic surveys, pipeline trenching, and discharges of drilling mud and produced waters on commercial fishing activity are discussed in **Chapter 4.1.1.18**. The impacts of these factors will be similar for recreational fishing activity to a large extent. The main difference is that recreational fishing activity generally occurs closer to shore than commercial fishing; therefore, these impacts will occur for recreational fishing activity mainly if these activities occur close to shore. Recreational fishing activity could also be negatively impacted if the aforementioned activities temporarily negatively affect the aesthetics of fishing in nearby areas.

However, in most instances, there would likely be a number of suitable substitute recreational fishing sites if any temporary disruptions arose due to OCS activities.

Oil Spills

An EPA proposed action would contribute to the risk of an oil spill arising from the broader OCS Program. As noted in **Table 3-1**, there would be a 2 percent chance of a hypothetical platform spill ≥1,000 bbl and a 6 percent chance of a pipeline spill ≥1,000 bbl. The impacts of low to moderate oil spills are discussed in **Chapter 4.1.1.19.3**. The impacts of a low-probability catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**. In general, the small scale of an EPA proposed action suggests that it would only slightly increase the likelihood of oil spills relative to the likelihood of oil spills that could arise from the broader OCS Program and other sources unrelated to OCS oil and gas development.

Rigs-to-Reefs and Artificial Reef Development

An EPA proposed action would contribute to the existing role that oil platforms serve as artificial reefs for fish habitats. Hiett and Milon (2002) estimate that over 20 percent of all recreational fishing activity in the Gulf of Mexico occurs within 300 ft (91 m) of an oil and gas structure. The extent to which a rig will serve as additional habitat for fish will depend on the fish populations in nearby areas. The NOAA's Center for Coastal Monitoring and Assessment's website provides a set of maps that outline the areas in the Gulf of Mexico in which certain fish species are prevalent (USDOC, NOAA, 2012c). In general, rigs that are closer to shore are more likely to be supportive of recreational fishing activity.

Since oil/gas platforms often attract a large fish population, the effects of OCS actions become particularly important during the decommissioning stage of an oil platform's life cycle. Namely, the removal of an oil rig from a particular site has the potential to damage the fish assemblages that often develop on an oil rig. This in turn will also affect recreational fishing activity in a particular area. Gitschlag et al. (2001) conducted an analysis of the impacts to fish populations from the use of explosives to remove decommissioned oil platforms. They found that species such as red snapper and sheepshead are particularly vulnerable to the use of explosives; however, they also reported that the scale of these impacts were relatively small at the sites that were included in the study.

As an alternative to removing an oil platform, the owner of an oil rig has the option to participate in the "Rigs-to-Reefs" program of the appropriate state. These programs allow for portions of oil platforms to remain in the water as reefs after the productive life of a platform has ended. Platforms that are a part of these programs are either toppled in place or are moved to a location that is a suitable fish habitat. The U.S. policy towards artificial reef creation is outlined in the *National Artificial Reef Plan: Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs* (USDOC, NOAA, 2007). The BSEE policy regarding Rigs-to-Reefs programs is outlined in *Rigs-to-Reefs Policy, Progress, and Perspective* (Dauterive, 2000) and was updated in *Rigs to Reefs Policy Addendum: Enhanced Reviewing and Approval Guidelines in Response to the Post-Hurricane Katrina Regulatory Environment* (USDOI, MMS, 2009b) in light of Hurricane Katrina.

Deepwater Horizon ***Explosion, Oil Spill, and Response***

The *Deepwater Horizon* explosion, oil spill, and response may heighten the sensitivity of recreational fishing activity in the EPA to additional oil spills that may occur. This is because the fish populations in the Gulf of Mexico are still responding to the spill, the ultimate outcome of which is not yet clear (refer to **Chapter 4.1.1.17** for more information). The particular sensitivity of recreational fishing to the *Deepwater Horizon* explosion, oil spill, and response is also due to the complex manner in which recreational fishing activity and tourism interact. Namely, recreational fishing activity is one of a number of factors that draw tourists to a particular region. The high level of national attention focused on the *Deepwater Horizon* explosion, oil spill, and response suggests that future oil spills, even if smaller in scale, could raise greater concerns regarding recreational fishing in affected areas among tourists. While this effect may be offset by additional fishing by others, any decrease in fishing-based tourism could have broader impacts to a local economy.

Non-OCS Oil- and Gas-Related Impacts

State and Federal Fisheries Management Plans

An EPA proposed action could have cumulative impacts to the extent to which it alters or interacts with State and Federal Fisheries Management Plans. Recreational fishing activity is highly regulated, primarily to ensure a sustainable fisheries population through time. This often takes the form of catch limits per trip and quotas for overall catch per species during a given season. Recreational fishing activity in Federal waters is governed by the Gulf of Mexico Fishery Management Council; their most recent policies are outlined in GMFMC (2012). Each State has its own guidelines for recreational fishing in State waters. State fisheries policies can be found at Louisiana Dept. of Wildlife and Fisheries (2012), Mississippi Dept. of Marine Resources (2012), Alabama Dept. of Conservation and Natural Resources (2011), and Florida Fish and Wildlife Conservation Commission (2012b). Federal Fisheries Management Plans could exacerbate the impacts of OCS actions if both were to impact certain species or fishing sites. However, fisheries management plans could also serve to mitigate the effects of an oil spill since these plans are often designed to maintain stable fishing activity. For example, the GMFMC allowed for a supplemental red snapper season in October 2010 since red snapper catch was unusually low during the *Deepwater Horizon* explosion, oil spill, and response (GMFMC, 2010). This supplemental red snapper season was designed to allow the 2010 quota for red snapper catch to be reached.

Hurricanes

The impacts of the EPA proposed action on recreational fishing should be viewed in light of the ongoing risk of hurricanes in the Gulf of Mexico. Hurricanes cause short-term disruptions to recreational fishing activity in the immediate geographic area. This is particularly true if a particular hurricane were to approach a shoreline since most recreational fishing activity occurs fairly close to shore. Recreational fishing activity is also vulnerable to the disruptions in overall tourism activity that would arise in light of a hurricane. Finally, hurricanes can degrade the wetland areas that play important roles in fish ecosystems; refer to **Chapters 4.1.1.4 and 4.1.1.17** for more information.

Economic Factors

The level of recreational fishing activity is dependent on various economic factors. Recreational fishing activity will likely positively correlate to overall economic conditions. This is both due to the costs of recreational fishing activity and due to the tendency of consumers to direct lower levels of spending towards leisure activities during a recession. Recreational fishing activity should also correlate with broader tourism trends in particular areas. In addition, recreational fishing activity will likely correlate with trends in input costs, particularly fuel prices. Finally, recreational fishing activity is fairly seasonal. In 2011, 31 percent of angler trips in the Gulf occurred between January and April, 41 percent of angler trips occurred between May and August, and 28 percent of angler trips occurred between September and December (USDOC, NMFS, 2012f).

Summary and Conclusion

An EPA proposed action and the broader OCS Program have varied effects on recreational fishing activity. The OCS Program has generally enhanced recreational fishing opportunities due to the role of oil platforms as artificial reefs. This effect depends importantly on the extent to which rigs are removed at decommissioning or are maintained through Rigs-to-Reefs programs. However, oil spills can have important negative consequences on recreational fishing activity due to the resultant fishing closures and longer-term effects oil spills can have on fish populations. The incremental contribution of an EPA proposed action to these positive and negative cumulative effects would be minimal because of the relatively small amount of activity expected with an EPA proposed action. In addition, it is likely that Fisheries Management Plans of the Federal and State governments would serve to keep overall recreational fishing activity reasonably stable through time.

4.1.1.20. Recreational Resources

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. The EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for recreational resources can be found in Chapter 4.2.1.21 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.21 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.21 of the 2012-2017 WPA/CPA Multisale and Chapter 4.2.1.21 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for recreational fishing regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for recreational resources presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for recreational resources presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA. As summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are applicable and hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

BOEM also conducted a search of information sources (such as Internet articles and known economic data providers) to determine the availability of recent information related to recreational resources. This new information has been integrated into information presented in this EIS, in the 2012-2017 WPA/CPA Multisale EIS, and in the WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and despite the new information identified and provided below, there remains incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on recreational resources. Much of this information relates to the *Deepwater Horizon* explosion, oil spill, and response and is continuing to be collected and developed through the NRDA process. These data collection and research projects may be years from completion. Few data or conclusions have been released to the public to date. Regardless of the costs involved, it is not within BOEM’s ability to obtain this information from the NRDA process within the timeline of this EIS. In light of this incomplete and unavailable information, BOEM’s subject-matter experts have used credible scientific information that is available and applied it using scientifically accepted methodology. Given the available data that have been released, as described in this section, BOEM believes that this incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.1.1.20.1. Description of the Affected Environment

An EPA proposed action has the potential to affect the diverse set of recreational resources located throughout the coast of the Gulf of Mexico. The Gulf Coast is one of the major recreational regions of the United States. The shorefronts along the coasts of Florida, Alabama, Mississippi, Louisiana, and Texas support activities such as beach visitation, marine fishing, and nature-based recreation. These recreational opportunities attract visitors from around the world to the region. As such, these recreational resources are integral components to the broader economy of the Gulf of Mexico, supporting activities such as restaurants, lodging, and transportation. This section discusses the baseline conditions for recreational resources along the coasts of Louisiana, Alabama, Mississippi, and Florida since these are the primary areas that could be impacted by an EPA proposed action. The economic significance of the recreation and tourism industries in the coastal zones of these states is presented first. This is followed by a more in-depth discussion of the structure of the recreational industries in Florida, Mississippi, Alabama, and Louisiana. The final section presents a discussion of the impacts of the *Deepwater Horizon* explosion, oil spill, and response on these states.

Economic Significance of the Recreational Industry in the Gulf Coast

The recreation and tourism industries are major sources of employment along the Gulf Coast. **Table 4-11** presents employment statistics for a set of geographic regions in the Gulf of Mexico. Panel A of **Table 4-11** presents data on the number of employees in the leisure/hospitality industry from 2001 through 2009 in 13 BOEM-defined EIA's; these regions are defined in **Figure 4-15**. (All employment data were obtained through the U.S. Dept. of Labor, Bureau of Labor Statistics.) In **Table 4-11**, the leisure/hospitality industry corresponds to the definition used by the North American Industrial Classification System; this definition includes sub-industries such as entertainment providers, lodging services, and food/beverage services. Panel A of **Table 4-11** shows that approximately 685,000 people worked in the leisure/hospitality industry in EIA's in Florida, Alabama, Mississippi, and Louisiana in 2009. FL-3 and FL-4 had the largest concentration of recreation employees, with a total of about 423,000 workers. LA-4 also has a sizable recreation industry, with over 67,000 workers. Most of the EIA's showed steady employment growth from 2001 through 2008; employment fell in all EIA's (except FL-1) in 2009 with the onset of the global economic downturn during that time. A notable exception to the steady growth experienced by most regions occurred in 2005 in LA-4 and MS-1. Hurricanes Katrina and Rita hit these two regions extremely hard, slashing tourism/recreation employment by almost half (the data presented are as of December 2005; thus, the figure for 2005 should fully reflect the impact of Hurricane Katrina). Recreation employment in these regions has recovered a fair amount, although employment in 2009 is still below employment in 2004 in both LA-4 and MS-1 (U.S. Dept. of Labor, Bureau of Labor Statistics, 2010).

Panel B of **Table 4-11** presents the number of recreation/tourism employees in the EIA counties/parishes that are directly along the Gulf Coast. These counties/parishes are particularly vulnerable to the effects of OCS activities. As can be seen in **Table 4-11**, there are over 566,000 recreation jobs in the Florida, Alabama, Mississippi, and Louisiana coastal EIA counties/parishes. Over 400,000 of these jobs are in Florida, whose economy is particularly dependent on coastal recreation. Panel C of **Table 4-11** presents data on the total number of jobs in the recreation and tourism industries in each state; these data are primarily presented in order to provide some perspective on the relative size of the coastal recreational economies in these states. **Table 4-12** presents data on total wages earned in the leisure/hospitality industry for the same geographic regions discussed in **Table 4-11**. In 2009, workers in the leisure and hospitality industries in the Florida, Alabama, Mississippi, and Louisiana EIA's earned approximately $14 billion. The trends for each EIA over time are similar as is seen in **Table 4-11**. The effect on wages in 2005 in LA-4 and MS-1 from Hurricanes Katrina and Rita would appear to be less than that was observed for employment; however, this is simply a data issue since wages in 2005 include wages earned before the onset of Hurricanes Katrina and Rita in August and September 2005. It is worth noting that higher than average wages in LA-4, MS-1, FL-3, and FL-4 lead total wages in these areas to represent a greater fraction of total wages than these areas have in total employment (the average salary of workers can be closely approximated by dividing total wages by total employment in any geographic region). Similarly, wages were lower than average in LA-2, LA-3, AL-1, and FL-2.

Table 4-13 presents data on total tourism spending in each of the Gulf Coast States (U.S. Travel Association, 2011). This is a somewhat different perspective than the wage data shown in **Table 4-12**. Total spending is higher than total wages since only a fraction of tourism spending translates into wages. For example, a portion of spending will end up as profit to the owners of the enterprises. In addition, spending on some items, particularly manufactured goods, may translate into wages to workers that are not categorized as being in the leisure/hospitality industry. Thus, looking at total spending provides a broader measure of the impact of tourism on the economies of the Gulf Coast States. However, it is important to note that the data in **Table 4-13** focus only on spending by visitors and ignore spending on recreational activity by local residents. Therefore, the total economic impact of the recreation/tourism industry is somewhat greater than the data show.

Table 4-13 shows that visitors to the Gulf Coast States of Florida, Alabama, Mississippi, and Louisiana spent approximately $94 billion in 2008. The trends observed for spending are reasonably similar as was observed for wages. As seen in **Table 4-13**, there has been a gradual increase in tourism spending in most years in these states. BOEM sees the decline in spending in Louisiana and Mississippi associated with Hurricanes Katrina and Rita; however, 2006 was the first full year after the hurricanes and, thus, more fully reflects their impacts on tourism in these states. Tourism spending in these four states fell to $86 billion in 2009, which was likely primarily due to the severe recession that was occurring during that year.

Another manner in which OCS activity can affect recreation is through the effects of oil and gas structures themselves. Namely, there is a substantial amount of recreational fishing and recreational diving activity associated with these structures in the Gulf of Mexico. Hiett and Milon (2002) estimated that roughly 22 percent of all fishing trips in the Gulf of Mexico were taken within 300 ft (91 m) of an oil or gas structure during 1999. The study also found that approximately 94 percent of recreational diving trips took place near an oil or gas structure. The study also estimated that these trips led to $13.2 million in diving expenditures and $159.7 million in recreational fishing expenditures. More information on the structure of the recreational fishing industry in the Gulf of Mexico can be found in **Chapter 4.1.1.19.1**.

Recreational Resources in Florida, Alabama, Mississippi, and Louisiana

The Gulf Coast is host to a diverse range of recreational resources. For example, the beaches along the Gulf Coast support a number of recreational activities. **Table 4-14** presents the number of beaches and the number of visitors to these beaches in each Gulf Coast State. A detailed list of these beaches can be found in USEPA's *National List of Beaches* (USEPA, 2008c); a map of the location of each of these beach areas can be accessed using USEPA's online beach mapping tool (USEPA, 2011d). There are also a number of national parks, wildlife refuges, and marine sanctuaries that support recreational activities. An overall map of these Marine Protected Areas (MPA's) can be accessed at the National Marine Protected Areas Center's website (National Marine Protected Areas Center, 2010). More detailed information regarding each area, as well as a precise map of each MPA, can be accessed using the online mapping application provided by the National Marine Protected Areas Center (National Marine Protected Areas Center, 2011). The National Oceanic and Atmospheric Administration's ERMA mapping system also provides geographic data for each MPA; ERMA also provides information regarding the extent of the impacts of the *Deepwater Horizon* explosion, oil spill, and response on these sites (USDOC, NOAA, 2010e). Kaplan and Whitman (2008) provides information regarding the economic scale of some of these sites. A discussion of the individual sites in each state, as well as the dependence of the economies of each state on these resources, is presented below.

Florida has the largest coastal recreation economy among the Gulf Coast States. There were approximately 85.9 million visitors to Florida in 2011 (Visit Florida Research, 2012). In 2009, visitors to Florida spent approximately $64 billion statewide (U.S. Travel Association, 2011). One of the primary recreational activities near Florida's Gulf Coast is beach visitation, particularly in the northern Panhandle and in the southern half of the state. As can be seen in **Table 4-14**, USEPA reports 634 beaches in the 22 coastal counties along the Gulf of Mexico. The National Survey on Recreation and the Environment estimates that 22 million people from throughout the United States visit Florida beaches annually; the surveys that form the basis of this estimate were taken from 2005 through 2009. Alpert et al. (2008) estimate that there were 20 million out-of-state visitors and 2.2 million in-state visitors to Florida beaches in 2006. They estimate that beach tourism contributed $24.1 billion to Florida's economy in 2006 and supported approximately 275,000 jobs. Alpert et al. (2005) present a more detailed analysis of the economic impacts of beach tourism in Florida; they also provide information regarding the economic impacts of each beach region in Florida. For example, they estimate that beach visitors in the northwest and southwest beach regions in Florida spent $15.5 billion in 2002.

Florida is also the most economically significant state nationwide in a number of other coastal-related recreation activities. Florida has the largest recreational fishing industry in the United States; additional information on the structure of the recreational fishing industry in Florida and in the other Gulf Coast States can be found in **Chapter 4.1.1.19.1**. The recreational marine industry as a whole generated approximately $18.4 billion in spending and directly or indirectly supported 220,000 jobs in the region; this includes activities such as boating, marinas, fishing, and marine science research (Monterey Bay Aquarium Research Institute, 2008). Finally, Florida's system of State parks provided a direct economic impact of over $900 million (Monterey Bay Aquarium Research Institute, 2008); examples of these include the Gulf Islands National Seashore, St. George Island State Park, the De Soto National Memorial, Big Cypress National Preserve, Apalachicola National Forest, and Everglades National Park. There are also national wildlife refuges along Florida's coast that are used for various recreational activities; examples of these include Aucilla Wildlife Management Area, Cecil M. Webb State Wildlife Management Area, and Steinhatchee Conservation Area.

Tourism and recreation accounted for $9 billion in tourism spending and 157,000 jobs in Alabama in 2010. Approximately 33 percent of spending and 35 percent of recreational employment in Alabama occurs along the Gulf Coast (Alabama Tourism Department, 2011). Mobile County has around 15,000 recreation workers, while Baldwin County has an additional 9,000 workers (U.S. Dept. of Labor, Bureau of Labor Statistics, 2010). Approximately 23 million people visited the State of Alabama as a whole (Alabama Tourism Department, 2011). The coastal areas are particularly dependent on beach recreation and wildlife activities (such as birding). For example, approximately 1 million people participated in wildlife viewing in Alabama in 2006 (USDOI, FWS and USDOC, Census Bureau, 2006). Much of this activity occurs in State parks and refuges; examples of these include Maeher State Park, Gulf State Park, and the Marine Resources Division Laboratory on Dauphin Island.

Visitors to Mississippi spent approximately $5.97 billion in 2011, which helped to support 125,000 leisure/hospitality jobs statewide. Approximately $1.6 billion of this spending and 27,000 of these jobs occur in the Gulf Coast region (U.S. Dept. of Labor, Bureau of Labor Statistics, 2010; Mississippi Development Authority, Tourism Division, 2012). Harrison County has the highest tourism employment in the region, with approximately 19,000 jobs. One of the primary contributors to the Gulf Coast recreation industry in Mississippi is the casino gaming industry, which accounts for approximately 34 percent of recreational employment in the State (Mississippi Development Authority, Tourism Division, 2012). Mississippi had 30 State-licensed casinos as of February 28, 2012; these casinos had revenues of $2.3 billion in 2011. Nine of these casinos are located along the Gulf of Mexico and had revenues of approximately $1.1 billion in 2011. In addition, the Mississippi District of the Gulf Islands National Seashore attracts many visitors due to the pristine, undeveloped nature experience it offers. More information on the Gulf Islands National Seashore can be found through the National Park Service website and through the Draft General Management Plan for the Gulf Islands National Seashore (USDOI, National Park Service, 2011).

Tourists spent $9.5 billion in Louisiana in 2010; the leisure/hospitality industry supported 204,897 jobs in Louisiana in March 2012 (U.S. Dept. of Labor, Bureau of Labor Statistics, 2012a). The EIA parishes with over 10,000 recreation workers are Calcasieu, Lafayette, East Baton Rouge, Jefferson, and Orleans (U.S. Dept. of Labor, Bureau of Labor Statistics, 2010). Jefferson and Orleans Parishes are the largest coastal recreation centers, with much of the tourism activity being driven by the various attractions of the New Orleans area. The recreation activity in these two parishes has been in a state of flux in recent years as they have attempted to recover from Hurricanes Katrina and Rita. For example, recreation employment in Orleans Parish fell from 43,508 in December 2004 to 18,064 in December 2005; it recovered to a level of 37,526 jobs in March 2012 (U.S. Dept. of Labor, Bureau of Labor Statistics, 2012a). The recreational activity in the remaining coastal parishes in Louisiana centers around Cajun culture, wetlands, and wildlife activities. State parks in the coastal zone of Louisiana include Cypremort Point State Park, Palmetto Island State Park, Grand Isle State Park, St. Bernard State Park, and Fontainebleau State Park; a map of these parks can be found at (Louisiana Office of Tourism, 2012). Coastal Louisiana is also characterized by a vast array of wildlife refuges that support a variety of recreational activities; those that are closest to the Gulf of Mexico include Sabine National Wildlife Refuge, Rockefeller State Wildlife Refuge and Game Preserve, Russell Sage Foundation Marsh Island State Wildlife Refuge, Atchafalaya Delta State Wildlife Management Area, Pointe-aux-Chenes Wildlife Management Area, Delta National Wildlife Refuge, Pass a Loutre State Wildlife Management Area, Biloxi State Wildlife Management Area, Breton National Wildlife Refuge, and Bayou Savage National Wildlife Refuge.

Change in Baseline Conditions due to the *Deepwater Horizon* Explosion, Oil Spill, and Response

The previous discussion presents the tourism/recreation baseline prior to the *Deepwater Horizon* explosion and oil spill. This oil spill was a major event that affected the recreation industry in a number of ways. The most direct effects of the spill were on recreational fishing and beach visitation. For example, at the height of its impact, the spill had closed 36.6 percent of recreational fishing areas in the Gulf of Mexico (this occurred on June 2, 2010); as of April 19, 2011, all Federal waters have been reopened to fishing activity (USDOC, NOAA, 2011e). **Chapter 4.1.1.19** contains more information on the impacts of the oil spill on recreational fishing activity. In addition, several beaches between eastern Louisiana and the northeast corner of Florida have experienced either advisories or closures due to the spill (a list of these advisories/closures can be found at Natural Resources Defense Council, 2011). The National Oceanic and Atmospheric Administration's ERMA mapping system provides a graphic representation of the status of shoreline cleanup operations on Gulf Coast beaches. This site categorizes shorelines into the following categories: (1) work required; (2) work in progress; (3) cleaned to Shoreline Treatment Recommendation levels; and (4) verified to be clean. As of January 11, 2011, a fair amount of progress has been made towards cleaning affected shorelines. However, areas such as Bon Secour (Alabama), Gulf Islands National Seashore (Florida), and Barataria Bay (Louisiana) still had a number of areas in which cleanup work is still in progress. The OSAT-2 report (2011) provides a more detailed analysis of the status of cleanup operations in four areas of particular interest: Grand Isle (Louisiana); Petit Bois Island (Mississippi); Bon Secour (Alabama); and Fort Pickens (Florida). The Phase 3 Response Activities Completion Plan was signed in May 2012 (Gulf Coast Incident Management Team, 2012). This plan outlines the final cleanup and disposal plans for the Gulf Coast. These final cleanup activities will comply with the *Deepwater Horizon* Shoreline Clean-up Completion Plan (Unified Command—SCCP Core Group, 2011), which outlines the points at which shoreline cleanup efforts will cease. There will also be some addition cleanup activities in light of oil that was exposed in light of Hurricane Isaac (Associated Press, 2012).

The damage to the aforementioned recreational resources caused a number of immediate impacts to the economies in the Gulf of Mexico. A decrease in tourism to affected areas caused a number of impacts to hotels and other firms in certain areas. A broad summary of the impacts to tourism felt along the Gulf Coast is presented in *The BP Oil Spill and the Gulf Coast Tourism: Assessing the Impact* (U.S. House of Representatives, 2010). This report documents that the effects of the spill on tourism activity were felt in areas beyond those with damage to physical recreational resources. *Press-Register* (2010) provides data on the change in hotel and sales tax receipts for individual Gulf Coast counties/parishes during the summer of 2010 compared with the summer of 2009; Propublica (2011) provides similar data for the 6 months following the *Deepwater Horizon* explosion, oil spill, and response. During the summer of 2010, the spill caused substantial declines in hotel receipts in the following counties: Baldwin, Alabama (33.2% decline); Santa Rosa, Florida (24.8% decline); Okaloosa, Florida (24.1% decline); Walton, Florida (12.3% decline); and Bay, Florida (7.4% decline). However, coastal counties west of Baldwin, Alabama, generally experienced noticeable increases in hotel receipts. This was particularly true in Mobile, Alabama; Jackson, Mississippi; and in the coastal parishes of Louisiana. For example, in Louisiana, St. Mary, Terrebonne, and Lafourche Parishes each reported increases in hotel tax receipts of over 80 percent in the summer of 2010. These effects are likely due to the influx of oil-spill relief workers to these areas in the immediate aftermath of the spill. Overall sales tax receipts in counties from Baldwin, Alabama, eastward also generally fell during 2010, although to a lesser extent than hotel tax receipts. Sales tax receipts in counties west of Baldwin, Alabama, did not show as clear a pattern as did hotel tax receipts. For example, overall sales tax receipts fell by 12.5 percent in Hancock County (Mississippi), receipts were almost unchanged in Harrison County (Mississippi), and receipts increased by 8.3 percent in Orleans Parish (Louisiana). The 6-month data provided by Propublica (2011) suggest that the negative effects of the spill on tourism moderated to some extent towards the end of 2010. For example, in Florida, combined sales and hotel tax receipts during the 6 months following the spill ranged from a fall of 5 percent in Walton County to an increase of 4 percent in Jefferson County.

Data on damage claims through the Gulf Coast Claims Facility provide measures of the extent of the damage from the spill to date. Through May 16, 2011, Florida has had the largest level of damage claims ($1.6 billion), followed by Louisiana ($1.3 billion), Alabama ($750 million), and Mississippi ($350 million). The bulk of the total dollar value of claims in these four states have occurred in the retail, sales, and service industry ($1.4 billion); the food, beverage, and lodging industry ($1.2 billion); the fishing industry ($646 million); and the rental property industry ($469 million). Direct losses in the recreation industry were $88 million, although the losses in the other industries were tourism related.

Data on employment and wages provide another perspective from which to view the impacts of the oil spill on recreation and tourism along the Gulf Coast. **Table 4-15** presents monthly data on total employment in the leisure/hospitality industry during 2010. These data are presented for the same geographic regions as in **Table 4-11**; all employment and wage data were obtained through the U.S. Dept. of Labor, Bureau of Labor Statistics. The definition of the leisure/hospitality industry corresponds to the definition used by the North American Industrial Classification System; this definition includes sub-industries such as entertainment providers, lodging services, and food/beverage services. **Table 4-15** shows that overall employment in the leisure/hospitality industry did not noticeably fall during the months following the *Deepwater Horizon* explosion, oil spill, and response in any geographic region. Indeed, employment in most regions was strikingly stable. The only region with a notable fall in employment was FL-4, although this fall was likely partially seasonally related. **Table 4-16** presents quarterly data on total wages earned by workers during 2009 and 2010 in the leisure hospitality industry for the same geographic regions as were presented in **Table 4-12**. Wages generally exhibited the stability seen in overall employment. Indeed, the only EIA that exhibited a fall in wages from the third quarter of 2009 to the third quarter of 2010 was FL-1, which experienced a decline in wages of 2.3 percent. This overall stability exhibited in recreational employment is likely due to the effects of the spill relief workers and the damage payments received by the affected parties. While this overall stability in employment surely masks some variation in particular industries and regions, it does suggest that, as of yet, the oil spill has not drastically changed the structure of the recreation industry in the Gulf Coast.

For the purposes of discussing the baseline environment, there is an important distinction between those effects that occurred during the spill versus those that will persist in the aftermath of the spill. Although some cleanup operations are ongoing in some areas, the majority of the oil has been removed from the recreational resources along the Gulf Coast. However, the speed at which tourism activity will return to the Gulf Coast remains unclear. Oxford Economics (2010) conducted a study of recent catastrophic events in order to estimate the longer-term economic implications of the *Deepwater Horizon* explosion, oil spill, and response. Analyzing previous oil spills and other catastrophic events, they suggest that it could take 15-36 months for the tourism industry to recover to pre-spill levels. Anecdotal evidence suggests that tourism activity is indeed gradually recovering from the spill; for example, refer to Nelson (2011), National Public Radio (2011), and Stacy (2011). More recent evidence from the USDOC, Bureau of Labor Statistics (2012a) provides further confirmation that, in aggregate, the recreational industries along the Gulf Coast have mostly recovered from the *Deepwater Horizon* oil spill. In particular, recreational employment was higher in December 2011 than in December 2009 in all 13 economic impact areas along the Gulf Coast. However, the impacts of the *Deepwater Horizon* oil spill are difficult to disentangle from the impacts of overall economic conditions. The high unemployment that persists nationwide has likely had a particular impact on tourism activity since people are more likely to cut back on recreation than other more basic necessities.

4.1.1.20.2. Impacts of Routine Events

Background/Introduction

Routine OCS oil and gas activities can affect recreation and tourism in diverse ways. The OCS activities can have direct negative impacts on beach and coastal recreational resources through discharges of marine debris, noise, and visual impairments. There are also possible indirect impacts on local recreational resources from space-use conflicts and from increased economic activity from OCS operations. The unique role that oil platforms can play as artificial reefs should also be accounted for when considering policy actions. Finally, the possible effects of public perceptions on tourism, particularly in light of the *Deepwater Horizon* explosion and oil spill, should be considered. However, while impacts on recreational resources from routine OCS activities can occur from a number of sources, in total they are likely to be reasonably small in scale.

Beaches and other coastal recreational resources are the most vulnerable to routine OCS operations. One concern is the extent to which discharges of marine debris from OCS actions could reach these areas. Debris can noticeably affect the aesthetic value of coastal areas, particularly beaches. This is particularly true given the large amount of marine debris that already exists in some areas. Marine debris originates from OCS operations, sewage treatment plants, recreational and commercial fishing, industrial manufacturing, and various forms of vessel traffic. Adler et al. (2009) present a broad overview of the nature of the marine debris problem. Various government agencies participate in a coordinated effort to combat marine debris; a broad summary of the issues involved and the policy structure with respect to marine debris can be found in the report of the Interagency Marine Debris Coordinating Committee (USDOC, NOAA, 2008b). There is also a national monitoring program in place to track the progression of the marine debris problem in various locations. Ocean Conservancy (2007) describes the structure of the National Marine Debris Monitoring Program; Ocean Conservancy (2011) presents the results from the most recent round of debris monitoring. This study found that Florida had the most debris in the Gulf of Mexico (606,766 pieces of debris were collected); this was followed by Texas (188,364), Alabama

(68,585), Mississippi (47,746), and Louisiana (21,751). McIlgorm et al. (2009) present an economic analysis of the costs of marine debris and of programs designed to minimize debris. This study describes that marine debris has a particular impact on fishing activity, the shipping industry, tourism activity, and on activities related to marine ecosystems. Finally, Barnea et al. (2009) outline some issues regarding debris removal that are unique to the Gulf of Mexico.

The discharge of marine debris is subject to a number of laws and treaties. These include the Marine Debris Research, Prevention, and Reduction Act; the Marine Plastic Pollution Research and Control Act; and the MARPOL-Annex V Treaty. Regulation and enforcement of these laws is conducted by a number of agencies such as the U.S. Environmental Protection Agency, NOAA, and the U.S. Coast Guard. BOEM's policy regarding marine debris prevention is outlined in NTL 2007-G03. This NTL instructs OCS operators to post informational placards that outline the legal consequences and potential ecological harms of discharging marine debris. This NTL also states that OCS workers should complete annual marine debris prevention training; operators are also instructed to develop a certification process for the completion of this training by their workers. These various laws, regulations, and NTL's will likely minimize the potential damage to recreational resources from the discharge of marine debris from OCS operations.

There are also potential negative impacts on beach tourism from vessel noise and from the visibility of OCS infrastructure. While the potential effects of noise on tourism are difficult to quantify, several characteristics of the OCS industry serve to minimize these effects. First, most OCS-related vessel traffic moves between onshore support bases and production areas far offshore. Support bases are located in industrial ports, which are usually distant from recreational use areas. Second, OCS vessel use of approved travel lanes should keep noise fairly transitory and thus unlikely to noticeably impact tourism. The extent to which the visibility of OCS platforms can affect tourism depends primarily on the distance of platforms from shore and on the size of the particular platform. For example, a study by the Mississippi Development Authority found that a 50-ft (15-m) high production platform was identifiable 3 mi (5 km) from shore and a 100-ft (30-m) high production platform was visible 10 mi (16 km) from shore (Collins Center for Public Policy, 2010). All OCS platforms are at least 3 mi (5 km) from shore and most are beyond 10 mi (16 km) from shore. Even if a platform was visible, the scale of its impact on tourism would likely be small unless it interrupted the vision of other important landscape features.

Oil platforms serve unique roles as artificial reefs. Soon after deployment, an oil platform attracts a wide variety of fish species and other organisms to its structure. As a result, some offshore platforms are important components to the recreational fishing industry; oil platforms are also hosts to a large amount of recreational diving activity (Hiett and Milon, 2002). The role of oil rigs as artificial reefs also raises a number of issues during the decommissioning stage of an oil platform's life. Each Gulf Coast State has a mechanism for allowing some oil platforms to remain in place to serve as artificial reefs after oil production has ceased; Dauterive (2000) provides an overview of these programs. McGinnis et al. (2001) also discuss the broader economic implications of decommissioning oil structures. This decommissioning stage has the potential to affect recreational resources in a particular area if a rig is ultimately not maintained for reef purposes or if the rig is moved to a different location. More information regarding the effects of OCS platforms on recreational fishing activity can be found in **Chapter 4.1.1.19.2**.

The OCS oil and gas activity can also affect recreational resources indirectly due to a number of economic factors. First, increased onshore infrastructure necessary to support offshore activities can create space-use conflicts. For example, Brody et al. (2006) present an analysis of space-use conflicts for oil and gas activities off the coast of Texas, although the issues they raise would be generally applicable to OCS activities in the other Gulf Coast States as well. They used a GIS-based framework to identify specific locations where conflicts between oil activities and other concerns (including recreational use) are most acute; they found that recreational-use conflicts tend to be concentrated around some of the major wildlife viewing and beach areas near the larger population areas in Texas. In the EPA, the potential for space-use conflicts would be greatest along coastal Louisiana, particularly near Port Fourchon (Lafourche Parish). **Chapter 4.1.1.22.1** provides more detailed information regarding the ports and other facilities that support OCS activities in the EPA. The vessel traffic near these facilities could cause space-use conflicts with boating and recreational fishing activities. However, even if a space-use conflict was to arise in a particular instance, it is likely that a number of substitute recreational sites would be available. In addition, given the entrenched nature of the OCS oil and gas industry in coastal Louisiana, it is unlikely that any particular OCS action would significantly add to space-use conflicts in this area.

The OCS activities also have the potential to increase or decrease the demand for recreational resources in certain communities. Increased demand for recreational resources has the potential to attract new recreational firms to a community; however, increased demand also has the potential to lessen the enjoyment of a particular resource by some community members. Mason (2010) provides some context on the interdependence of the offshore oil and gas industry with other sectors of the economy of the Gulf of Mexico; for example, they show that accommodation and food service resources have a reasonably high dependence on OCS activities. Wallace et al. (2001) also discuss community level effects of OCS activities on some of the local economies in the Gulf of Mexico; for example, this study presents descriptive evidence regarding concerns some local residents have regarding the impacts of OCS activities on recreational opportunities. However, given the limited scale of an EPA proposed action relative to the existing oil and gas industry, the scale of the indirect economic impacts caused by new leasing activity is likely to be small.

Bounds (2012) provides additional information to consider regarding the impacts of oil and gas activities on tourism. First, this study provides additional information regarding the impact of elevation on the visibility of oil and gas infrastructure. For example, this study estimates that, from an elevation of 13 ft (4 m), which would be representative of some important tourism destinations in Mississippi, a typical drilling rig would be visible 13.9 mi (22.4 km) away. This study also points out some of the negative impacts drilling in Alabama State waters had on tourism on Dauphin Island.

While the *Deepwater Horizon* explosion and oil spill primarily affected the baseline environment and our understanding of the impacts of accidental events, it also raises issues regarding the effects of OCS routine actions on recreation and tourism. Because of the particular sensitivity of tourism activity to public perceptions, concerns over offshore oil operations could potentially cause routine OCS actions to have impacts even in the absence of a future spill. This is particularly the case for recreational resources that require investments in real estate or other long-term fixed assets. For example, CoreLogic (2010) forecasted a loss of up to $3 billion in the 15 most affected coastal counties over 5 years due to the *Deepwater Horizon* explosion and oil spill. (However, since the *Deepwater Horizon* explosion and oil spill turned out to have less severe impacts on beaches than CoreLogic [2010] used in its estimates, the *Deepwater Horizon*'s impacts on property values may be less than CoreLogic [2010] initially forecasted.) It is possible that some of these effects would be magnified if additional OCS activity added to fears of another oil spill. However, given that an EPA proposed action does not substantially change the structure of OCS operations in the Gulf of Mexico, this effect is likely to be relatively small.

Proposed Action Analysis

An EPA proposed action would result in 0-10 producing oil wells, 0-4 producing gas wells, and 0-1 installed production platforms (**Table 3-2**). Marine debris would occasionally be discharged due to OCS operations associated with drilling activities projected to result from an EPA proposed action. However, the various laws, regulations, and NTL's related to the discharge of marine debris are expected to keep these discharges to a low level. An EPA proposed action is expected to result in 144-17,000 service-vessel trips and 0-27 helicopter operations throughout a 40-year period. Service vessels will primarily use established nearshore traffic lanes, and helicopters will usually comply with areal clearance restrictions. These actions tend to distance traffic from major recreational areas. The additional helicopter and vessel traffic would add a low level of noise pollution that would affect beach users. The large distance of an EPA proposed action from shore would minimize the effects of routine activities on recreational resources.

Summary and Conclusion

Routine OCS actions in the EPA can cause disturbances to recreational resources, particularly beaches, through increased levels of noise, debris, and rig visibility. The OCS activities can also change the composition of local economies through changes in employment, land use, and recreation demand. However, the small scale of an EPA proposed action relative to the scale of the existing oil and gas industry suggests that these potential impacts on recreational resources are likely to be minimal.

4.1.1.20.3. Impacts of Accidental Events

Background/Introduction

The recreational resources most vulnerable to an oil spill are the beaches and nature parks along the Gulf Coast. Environmental Sensitivity Indexes (ESI's) provide overall measures of the sensitivity of a particular coastline to a potential oil spill. The ESI's rank coastlines from 1 (least sensitive) to 10 (most sensitive). Marshes and swamps are examples of resources that have ESI's of 10 due to the extreme difficulty of removing oil from these areas. The ESI's for beach areas generally range from 3 to 6, depending on the type of sand and the extent to which gravel is mixed into the beach area. The ESI maps for any coastline along the Gulf of Mexico can be viewed using the National Oceanic and Atmospheric Administration's ERMA mapping system (USDOC, NOAA, 2012d). The ESI maps also provide point indicators for recreational resources. A more detailed map of the nature parks and wildlife refuges in the GOM can be found at the National Marine Protected Area Center (National Marine Protected Area Center, 2010). More information on any particular park can be found using the online, interactive mapping application provided by the National Marine Protected Area Center (National Marine Protected Area Center, 2011).

The effects of an oil spill on a particular beach region would depend on the success of the containment and cleanup operations following an oil spill. The NOAA provides a broad overview of the procedures used to clean oiled beaches (USDOC, NOAA, 2000). Both manual and machine-based techniques can be used to clean oil; the cleaning technique chosen for a particular beach would depend on the nature of the oiling of a particular beach area. The nature of cleanup operations would also depend on whether a particular beach serves as a habitat to particular animal species because removing oil deep below a beach surface may sometimes do more ecological harm than good. As a result, ecological beaches are often only cleaned to a shallow depth, while nonecological ("amenity") beaches are often cleaned more extensively. The cleanup plan for any particular beach is determined by a Shoreline Treatment Recommendation, which is prepared by the relevant State and Federal agencies for a particular spill. An example of a Shoreline Treatment Recommendation following the *Deepwater Horizon* explosion, oil spill, and response for Grande Isle, Louisiana, can be found at RestoreTheGulf.gov (2012b).

Recreational resources such as beaches serve as important bases for certain local economies. Therefore, oiled beach regions may cause economic losses to both individuals and firms in the area of an oiled or closed beach. Parsons and Kang (2007) perform an economic analysis of the costs of hypothetical beach closures along the Texas Gulf Coast. They estimate that the economic costs of beach closures along the Padre Island National Seashore would range from $26,000 to $172,000 per day, depending on the time of year at which the closures would occur. The oil spill off the Tampa Bay, Florida, coast in 1993 is an example of a spill that affected recreational beaches. Damage to these beaches and other recreational resources was determined to cause $2.5 million in damages to the affected parties in the area (Florida Dept. of Environmental Protection, USDOC, NOAA, and USDOI, 1997). Finally, the New Orleans oil spill of 2008, which occurred when an oil tanker collided with a fuel barge on the Mississippi River, demonstrates that a spill may affect different types of recreational activities. Namely, this spill impacted some of the boating and restaurant businesses in its vicinity; it also caused some aesthetic impacts to the experiences of tourists in the region (Tuler et al., 2010).

The *Deepwater Horizon* oil spill was much larger than the previously mentioned spills and is not reasonably expected and not part of an EPA proposed action. As such, it raises issues regarding the impacts of catastrophic oil spills, which are not reasonably expected and not part of an EPA proposed action, on recreation and tourism; these impacts are discussed in **Appendix B**.

Proposed Action Analysis

Figure 3-20 presents the combined probabilities of one or more hypothetical oil spills ≥1,000 bbl both occurring and contacting various beach areas along the Gulf Coast. As can be seen, there is a <0.5 percent chance that a hypothetical oil spill would reach any beach area. **Figures 3-23 and 3-22** present the combined probabilities of one or more oil spills ≥1,000 bbl both occurring and contacting various recreational diving sites along the Gulf Coast. A low- to moderate-sized oil spill would likely result in short-term disruptions to beach-based recreational activity. There could also be impacts to tourism that depends on certain resources; the effects on tourism would be more noticeable in the case of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action (**Appendix B**). As can be seen, for most areas, there is a <0.5 percent chance of these dive sites being impacted by the hypothetical oil spill modeled; the one exception is South Timbalier, for which there is a 0-1 percent chance of being impacted by a hypothetical oil spill within 30 days.

Summary and Conclusion

Spills most likely to result from an EPA proposed action would be small, of short duration, and not likely to impact Gulf Coast recreational resources. The distance of the EPA proposed action from shore makes it quite unlikely that an oil spill would reach resources that are important for recreational activities. However, should an oil spill occur and contact a beach area or other recreational resource, it would cause some minor disruptions during the impact and cleanup phases of the spill. A catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, could have more noticeable effects on recreational resources (**Appendix B**).

4.1.1.20.4. Cumulative Impacts

Background/Introduction

The cumulative impacts to recreational resources would occur through an EPA proposed action, the existing OCS Program, and from the impacts of external events and actions to recreational resources and tourism activity. An EPA proposed action would contribute to a number of aesthetic and space-use issues arising from existing oil and gas programs. The OCS activities can also impact the recreational uses of beaches and wetland areas, which are already being impacted through coastal erosion due to human development, hurricanes, and natural processes. Finally, an EPA proposed action would incrementally add to the risk of an oil spill due to the broader OCS Program.

OCS Oil- and Gas-Related Impacts

Routine OCS activities

An EPA proposed action would contribute to the effects of the existing OCS Program, as well as to the impacts of future lease sales in the EPA, CPA, and WPA. For example, while only 144-17,000 service-vessel trips and 0-27 helicopter operations are projected to arise from an EPA proposed action, 3,310,000-4,382,000 service-vessel trips and 28,710,000-55,605,000 helicopter operations are projected to arise from the entire OCS Program from 2012 through 2051. These and other OCS operations would contribute to the visual, noise, and space-use issues discussed in **Chapter 4.1.1.20.4**. However, given that an EPA proposed action would comprise a very small percentage of OCS activities, its impacts on recreational resources would be minimal.

Oil Spills

An EPA proposed action would contribute incrementally to the likelihood of an oil spill caused by the broader OCS Program. **Table 3-21** presents data on the number and size of oil spills that are expected to arise from an EPA proposed action. However, oil spills could also arise from the OCS industry that is currently in place in the Gulf of Mexico. Thus, the impacts of accidental events on recreational resources, which are discussed in **Chapter 4.1.1.20.3**, should be viewed in light of the incremental increase in the likelihood of an oil spill that would be associated with an EPA proposed action. The impacts of a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, on recreational resources are discussed in **Appendix B**.

Non-OCS Oil- and Gas-Related Impacts

Marine Debris

An EPA proposed action would contribute to some negative aesthetic impacts of the existing OCS Program and State oil and gas programs. First, oil and gas activities would contribute to the marine debris problems experienced by the Gulf Coast, even with mitigations applied. Marine debris can noticeably affect the aesthetic value of coastal areas, particularly beaches. This is particularly true given the high levels of marine debris that already exist in some areas. Marine debris originates from OCS operations, sewage treatment plants, recreational and commercial fishing, industrial manufacturing, cruise ships, and various forms of vessel traffic. Adler et al. (2009) present a broad overview of the nature of the marine debris problem. Various government agencies participate in a coordinated effort to combat marine debris; a broad summary of the issues involved and the policy structure with respect to marine debris can be found in the report of the Interagency Marine Debris Coordinating Committee (USDOC, NOAA, 2008b). There is also a national monitoring program in place to track the progression of the marine debris problem in various locations. Ocean Conservancy (2007) describes the structure of the National Marine Debris Monitoring Program; Ocean Conservancy (2011) presents the results from the most recent round of debris monitoring. This study found that Florida had the most debris in the Gulf of Mexico (606,766 pieces of debris were collected); this was followed by Texas (188,364), Alabama (68,585), Mississippi (47,746), and Louisiana (21,751). McIlgorm et al. (2009) present an economic analysis of the costs of marine debris and of programs designed to minimize debris. This study describes that marine debris has a particular impact on fishing activity, the shipping industry, tourism activity, and on activities related to marine ecosystems. Finally, Barnea et al. (2009) outline some issues regarding debris removal that are unique to the Gulf of Mexico.

The discharge of marine debris is subject to a number of laws and treaties. These include the Marine Debris Research, Prevention, and Reduction Act; the Marine Plastic Pollution Research and Control Act; and the MARPOL-Annex V Treaty. Regulation and enforcement of these laws is conducted by a number of agencies such as the U.S. Environmental Protection Agency, NOAA, and the U.S. Coast Guard. The BSEE policy regarding marine debris prevention is outlined in NTL 2012-BSEE-G01. This NTL instructs OCS operators to post informational placards that outline the legal consequences and potential ecological harms of discharging marine debris. This NTL also states that OCS workers should complete annual marine debris prevention training; operators are also instructed to develop a certification process for the completion of this training by their workers. These various laws, regulations, and NTL's will likely minimize the potential damage to recreational resources from the discharge of marine debris from OCS operations.

Space-Use Conflicts

An EPA proposed action would also contribute to space-use conflicts between recreational activities and the broader OCS Program. Brody et al. (2006) present an analysis of space-use conflicts for oil and gas activities off the coast of Texas, although the issues they raise are generally applicable to OCS activities. They use a GIS-based framework to identify specific locations where conflicts between oil activities and other concerns (including recreational use) are most acute; they find that recreational use conflicts tend to be concentrated around some of the major wildlife viewing and beach areas near the larger population areas in Texas. There would also be the potential for space-use conflicts along coastal Louisiana, particularly near Port Fourchon (Lafourche Parish), due to the high concentration of the OCS industry in this area. **Chapter 4.1.1.22.1** provides more detailed information regarding the ports and other facilities that support OCS activities in the EPA. The vessel traffic near these facilities could cause space-use conflicts with boating and recreational fishing activities. However, even if a space-use conflict was to arise in a particular instance, it is likely that a number of substitute recreational sites would be available. In addition, given the entrenched nature of the OCS oil and gas industry along the Gulf Coast, it is unlikely that any particular OCS action would significantly add to space-use conflicts in this area.

Beach/Wetland Depletion

The OCS Program occurs in an environment in which beach and wetland resources are undergoing depletion due to human development, hurricanes, and natural processes. An overview of coastal erosion threats can be found in *Evaluation of Erosion Hazards* (The Heinz Center, 2000). Government policy towards managing beach erosion can be found at NOAA's Coastal Services Center website (USDOC, NOAA, 2011f). Routine OCS actions can contribute to coastal erosion through channel dredging, pipeline placements, and vessel traffic. Oil spills have the potential to contribute to beach erosion, both due to contaminated sediment and to the potential sediment losses during the cleanup process. A more detailed discussion of the cumulative impacts of OCS actions on coastal beaches and dunes is presented in

Chapter 4.1.1.3.4. Further information on the cumulative impacts of OCS activities on wetlands resources can be found in **Chapter 4.1.1.4.4**.

Impacts due to Economic Factors

The recreational resources along the Gulf Coast will be subject to various impacts arising from economic development. On the one hand, there may be pressures to develop other industries into existing parks and nature resources. However, development may also encourage the development of other recreational resources, such as hotels and restaurants, to accommodate increased tourism and/or local recreation. The projected path of the economy along various areas along the Gulf Coast is discussed in **Chapter 4.1.1.22.4**.

The projected path of the economies along the Gulf Coast will be influenced by national economic trends. Recreational and tourism activity is positively correlated to the state of the overall economy, primarily because higher levels of disposable income encourage consumers to dedicate more money to travel and leisure activities. While the recession officially ended in 2009, the economy has been slow to recover to full capacity; the national unemployment rate was 7.7 percent in November 2012 (USDOC, Bureau of Labor Statistics, 2012b).

Summary and Conclusion

An EPA proposed action would contribute to the aesthetic impacts and the space-use conflicts that arise due to the broader OCS Program. Oil spills could also contribute to the overall degradation of beach and wetland-based recreational resources. The incremental contribution of an EPA proposed action is expected to be minimal in light of all non-OCS-related impacts such as aesthetic impacts (including from other industrial sources), wetland loss, and space-use conflicts, and the impacts from economic factors.

4.1.1.21. Archaeological Resources

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. An EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for archaeological resources can be found in Chapter 4.2.1.22 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.22 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from Chapter 4.2.1.22 of the 2012-2017 WPA/CPA Multisale EIS and Chapter 4.2.1.22 of the WPA 233/CPA 231 Supplemental EIS would be equally applicable for archaeological resources regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for archaeological resources presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for archaeological resources presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and they are hereby incorporated by reference as applicable to the EPA.

Further, a search was conducted for information published on archaeological resources, and various Internet sources were examined to determine any recent information regarding archaeological resources. This new information has been integrated into information presented in this EIS. No new significant information was discovered regarding archaeological resources since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and despite the new information identified and provided below, there remains some incomplete or unavailable information. Refer to **Chapters 4.1.1.21.1.1**, **4.1.1.21.1.3, and 4.1.1.21.2.3** below for a discussion on the incomplete and unavailable information on impacts to archaeological resources.

Archaeological resources are any material remains of human life or activities that are at least 50 years of age and that are of archaeological interest (30 CFR § 250.105 and 30 CFR § 550.105).

The 1966 National Historic Preservation Act (NHPA; Public Law 89-665, as amended by Public Law 96-515; 16 U.S.C. §§ 470 *et seq*.) provides for the establishment of the National Register of Historic Places to include districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture. 106 of the Act requires that Federal agencies with jurisdiction over a proposed Federal project take into account the effect of the undertaking on cultural resources listed, or eligible for listing, on the National Register of Historic Places and afford the State Historic Preservation Office and the Advisory Council on Historic Preservation an opportunity to comment with regard to the undertaking. The National Register of Historic Places' eligibility criteria have been defined by the Secretary of the Interior's Standards for Evaluation (36 CFR part 60). Cultural resources are considered to be National Register of Historic Places eligible if they display the quality of significance in American history, architecture, archaeology, engineering, and culture that is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, workmanship, feeling, and association, and

> **Criterion A:** Are associated with the events that have made a significant contribution to the broad patterns of American history; or
>
> **Criterion B:** Are associated with the lives of persons significant in our past; or
>
> **Criterion C:** Embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
>
> **Criterion D:** Have yielded or may likely yield information important in prehistory or history.

The process of Agency reviews and assessment of the effect of an undertaking on cultural resources is set forth in the implementing regulations formulated by the Advisory Council on Historic Preservation (36 CFR part 800, "Protection of Historic Properties"). Section 101(d)(6)(B) of the 1966 NHPA requires Federal agencies to consult with Indian tribes that attach religious or cultural significance to historic properties. Compliance with 36 CFR § 800.2, which implements the Native American consultation, is conducted by Federal agencies as part of a government-to-government undertaking. The Native American Graves Protection and Repatriation Act implements the protection of Native American human remains, graves, and funerary items. Cultural resources include significant archaeological, historical, or religious sites and structures that are protected under local/State/federal law. Sites or structures may include Native American villages, shipwrecks, gravesites, sites where culturally important events occurred, and paleontological resources such as vertebrate and invertebrate fossils.

To address this requirement, the Archaeological Resources Regulation (30 CFR § 550.194) provides specific authority to each BOEM Regional Director to require archaeological resource surveys, analyses, and reports, under certain circumstances. Surveys are required prior to any exploration or development activities on leases within areas designated as having a high probability for archaeological resources (NTL 2005-G07 and 2011-JOINT-G01). As part of the environmental reviews conducted for postlease activities, available information will be evaluated regarding the potential presence of archaeological resources within the EPA proposed-action area to determine if additional archaeological resource surveys and mitigation are warranted.

Archaeological surveys, where required prior to an operator beginning oil and gas activities on a lease, are expected to be effective at identifying possible archaeological sites. Offshore oil and gas activities resulting from an EPA proposed action could impact an archaeological resource because of incomplete knowledge on the location of these sites in the Gulf. The risk of contact to archaeological resources is greater in instances where archaeological survey data are unavailable. Such an event could result in the disturbance or destruction of important archaeological information. Archaeological surveys, where required, would provide the necessary information to develop avoidance strategies that would reduce the potential for impacts on archaeological resources. Reports of damage to significant cultural resources (i.e., historic shipwrecks) have been confirmed in lease areas >200 m (656 ft) deep where no survey data were available. Although the exact cause of this damage is unknown, it may be linked to postlease, bottom-disturbing activities.

An EPA proposed action has the potential to damage sites or structures through physical disturbance. Archaeological resources could be impacted by the placement of drilling rigs and production systems on the seafloor; pile driving associated with platform emplacement; pipeline placement; dredging of new channels, as well as maintenance dredging of existing channels; anchoring activities; pipeline installation; post-decommissioning trawling clearance; and the masking of archaeological resources from industry-related debris.

For additional information on the archaeological resources, refer to Chapters 4.2.1.22.1.1 and 4.2.1.22.2.1 of the 2012-2017 WPA/CPA Multisale EIS, which are hereby incorporated by reference.

4.1.1.21.1. Historic

4.1.1.21.1.1. Description of the Affected Environment

With the exception of the Ship Shoal Lighthouse structure, historic archaeological resources on the OCS consist primarily of historic shipwrecks. A historic shipwreck is defined as a submerged or buried vessel, at least 50 years old, that has foundered, stranded, or wrecked and that is currently lying on or is embedded in the seafloor. This includes vessels that exist intact or as scattered components on or in the seafloor.

BOEM shipwreck database currently lists four reported shipwrecks within 20 mi (32 km) of the proposed EPA lease sale area (**Table 4-17**). Many of these reported shipwrecks may be considered historic and could be eligible for nomination to the National Register of Historic Places. All of these wrecks are known only through the historical record and, to date, have not been located on the ocean floor. This list should not be considered exhaustive. Regular reporting of shipwrecks did not occur until late in the 19th century, and losses of several classes of vessels, such as small coastal fishing boats, were largely unreported in official records. Historic reports of losses so far offshore are especially rare and unreliable, since often no witnesses survived to report the event. Five possible shipwrecks recently have been located by industry surveys nearby in De Soto Canyon, which is west of the proposed EPA lease sale area. One of these potential historic sites was identified in April 2012 as wire rigging from a 19th-century sailing vessel, likely the remains of a ship dis-masting as a result of a severe storm or hurricane (Warren, 2012). A second of these potential sites was identified in December 2012 as a possible Colonial-era, wood-hulled sailing vessel. In comparison, there have been 27 historic wrecks positively identified in the CPA, over half of which have been found in deepwater blocks in Mississippi Canyon, Green Canyon, and Viosca Knoll. Nearly all of these have been discovered as a result of BOEM-mandated oil industry surveys. The discoveries include two early 19th-century wooden sailing vessels, one lying in nearly 2,700 ft (823 m) of water (Atauz et al., 2006) and the other in 4,000 ft (1,219 m) of water (Ford et al., 2008); seven 19th- or early 20th-century sailing ships; and one 17th- or 18th-century wreck. There are also several World War II casualties located in deep water off the mouth of the Mississippi River (e.g., *Alcoa Puritan, GulfPenn, GulfOil, Halo, Virginia, Robert E. Lee*, and the German submarine U-*166*) (Church et al., 2007). All of these wrecks have been investigated using a remotely operated vehicle from a surface vessel and are in an excellent state of preservation.

Recent research on historic shipping routes suggests that the ultra-deepwater area of the Gulf of Mexico, between 25º and 27.5º N. latitude, was located along the historic Spanish trade route, which therefore increases the probability that a historic shipwreck could be located in this area (Lugo-Fernandez et al., 2007). This route runs through the EPA proposed-action area, and much of this area is not currently identified as requiring an archaeological assessment with the submittal of the EP, DOCD, or DPP. A study to conduct archival research on these historic shipping routes was completed in 2010 (Krivor et al., 2011) and concluded that both Spanish and French vessels were lost in the 16th, 17th, and 18th centuries while transiting the route between Vera Cruz, New Orleans, and Havana.

Wrecks occurring in the deeper water of the EPA proposed-action area also have a moderate to high preservation potential. In the deep water, temperature at the seafloor is extremely cold, which slows the oxidation of ferrous metals. While the cold water at depth would eliminate the wood-eating shipworm *Teredo navalis*, it is clear from recent studies that other marine organisms consume wooden shipwrecks and that microbial organism are at work breaking down steel and iron hulls (Atauz et al., 2006; Church et al., 2007; Church and Warren, 2008; Ford et al., 2008). Due to the high levels of preservation and the decrease in impacts from anthropogenic and meteorological events (e.g., diving, looting, trawling, hurricanes), the potential for recovery of archaeological data is considerably higher for shipwrecks discovered at depth as opposed to those found in nearshore environments.

Aside from acts of war, hurricanes and storms cause the greatest number of shipwrecks in the Gulf. Wrecks occurring as a result of an extremely violent storm are more likely to be scattered over a broad area. The wreckage of the 19th-century steamer *New York*, which was destroyed in a hurricane, lies in 16 m (52 ft) of water off the coast of Texas and has been documented by this Agency (Irion and Anuskiewicz, 1999; Gearhart et al., 2011) as scattered over the ocean floor in a swath over 1,500 ft (457 m) long. Shipwrecks occurring in shallow water nearer to shore are more likely to have been reworked and scattered by subsequent storms than those wrecks occurring at greater depths on the OCS. Historic research indicates that shipwrecks occur less frequently in Federal waters. However, these shipwrecks are likely to be better preserved, less disturbed, and, therefore, more likely to be eligible for nomination to the National Register of Historic Places than are shipwrecks in shallower State waters. Shipwrecks occurring in the water depths encountered in the proposed EPA lease sale area are unlikely to have experienced any effects associated with storm activity.

Although there is incomplete or unavailable information on reasonably foreseeable impacts to historic archaeological resources, BOEM feels that this information is not essential to a reasoned choice among alternatives. The location of many archaeological resources remain unknown, some resources are heavily embedded or buried and therefore protected from many impacts, and archaeological surveys, where required, are expected to be highly effective in identifying resources to allow for protection of the resource during oil and gas activities. Nevertheless, this incomplete or unavailable information is not likely to be available within the timeframe of this EIS. Hundreds of known historic archaeological resources are scattered throughout the Gulf and thousands more may exist, but their locations are unknown to date. The cost of a Gulfwide study would be exorbitant and it could take years before data confirming the presence of additional historic archaeological resources and the status of each could be compiled and analyzed. In place of this incomplete or unavailable information, BOEM's subject-matter experts have included what credibly scientific information is available and applied this information using accepted scientific methodologies.

4.1.1.21.1.2. Impacts of Routine Events

This is a summary of routine events. For additional information on routine events, refer to Chapter 4.2.1.22.1.2 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.22 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

This section discusses the possible effects of routine activities associated with an EPA proposed action on archaeological resources. Routine impact-producing factors associated with an EPA proposed action that could affect historic archaeological resources include the direct physical contact with a shipwreck site, the placement of drilling rigs and production systems on the seafloor, pile driving associated with platform emplacement, pipeline emplacement, dredging of new channels, maintenance dredging of existing channels, anchoring activities, pipeline installation, structure removals and site clearance, and the masking of archaeological resources from industry-related debris.

Proposed Action Analysis

Several OCS-related, impact-producing factors may cause adverse impacts to historic archaeological resources. Offshore development could result in a drilling rig, platform, pipeline, dredging activity, or anchors having an impact on a historic shipwreck. Direct physical contact with a wreck site could destroy fragile ship remains, such as the hull and wooden or ceramic artifacts, and could disturb the site context. The result would be the loss of archaeological data on ship construction, cargo, and the social organization of the vessel's crew, and the concomitant loss of information on maritime culture for the period from which the ship dates. Industry-related impacts have been found to have occurred in areas where remote-sensing surveys had not been previously required (Atauz et al., 2006; Church and Warren, 2008). Remote-sensing surveys of the seafloor using high-resolution sidescan sonar and magnetometers have been found to be an effective means of locating historic submerged properties in order to avoid impacts from the undertaking, in this case oil and gas development activities.

The placement of drilling rigs and production systems has the potential to cause physical impact to prehistoric and/or historic archaeological resources. The area of seafloor disturbance from each of these structures is defined in **Chapter 3.1.1.2**. Pile driving associated with platform emplacement may also cause sediment liquefaction an unknown distance from the piling, disrupting stratigraphy in the area of liquefaction.

According to estimates presented in **Table 3-3**, 10-27 exploration and delineation wells and 0-40 development and production wells would be drilled, and 0-1 production platforms would be installed in support of an EPA proposed action. While the expanded BOEM shipwreck database contains four reported shipwrecks in the entire EPA (**Table 4-17**), this number is believed to represent a fraction of the actual number of ships lost in the EPA. As noted above, recent research on historic shipping routes suggests that the ultra-deepwater area of the Gulf of Mexico, between 25º and 27.5º N. latitude, was located along the historic Spanish trade route, which therefore increases the probability that a historic shipwreck could be located in this area (Lugo-Fernandez et al., 2007). This route runs through the EPA proposed-action area.

There are 175 nine square mile lease blocks available for lease in the proposed EPA lease sale area. None of these blocks fall within the Gulf of Mexico OCS Region's current high-potential areas for historic resources in the EPA. All blocks in the proposed EPA lease sale area are in water depths that preclude a survey with a magnetometer.

The potential of an interaction between rig or platform emplacement and a historic shipwreck is greatly diminished by requisite site surveys. In certain circumstances, BOEM's Regional Director has authority to require certain types of surveys before submission of an EP, DPP, or DOCD, under 30 CFR § 550.194. As part of the environmental reviews conducted for postlease activities, available information will be evaluated regarding the potential presence of archaeological resources within an EPA proposed action to determine if additional archaeological resource surveys and mitigation are warranted.

Pipeline placement has the potential to cause a physical impact to prehistoric and/or historic archaeological resources. Pipelines placed in water depths <200 ft (61 m) must be buried. Burial depths of 3 ft (1 m) are required, with the exception of shipping fairways and anchorage areas, where the requirements are 10 ft (3.1 m) and 15 ft (4.6 m), respectively.

Maintenance dredging in support of activities resulting from an EPA proposed action has the potential to impact historic shipwrecks. Impacts from maintenance dredging can be attributed proportionally to the users of the navigation channels. BOEM estimates that, under an EPA proposed action, <1 percent of the ship traffic is related to OCS use. Therefore, the impact to archaeological sites directly attributable to traffic and maintenance dredging as a result of the OCS Program is negligible. As these shipwrecks are unique historic archaeological resources, maintenance dredging, in general, is responsible for impacts to historic shipwrecks. Proposed action activities represent <1 percent of the usage of the major navigation channels for an EPA proposed action.

Anchoring associated with platform and pipeline emplacement, as well as with service-vessel and shuttle-tanker activities, may also physically impact prehistoric and/or historic archaeological resources. It is assumed that, during pipeline emplacement, an array of eight 20,000-lb anchors is continually repositioned around the pipelaying barge. However, in water depths encountered in the EPA, pipelines would likely be installed using a dynamically positioned lay barge without anchors.

Decommissioning trawling activities in support of structure removals have the potential to impact historic shipwrecks where no archaeological surveys were required in advance of structure placement. This is particularly true of older structures installed before current requirements were in place.

Activities resulting from an EPA proposed action would generate steel structures and debris, which would tend to mask magnetic signatures of significant historic archaeological resources. The task of locating historic resources through an archaeological survey is, therefore, made more difficult as a result of leasing activity.

Explosive seismic charges set off near historic shipwrecks may displace the surrounding sediments and cause loss of archaeological information regarding the context of the site. Furthermore, damage may result to the associated artifact assemblage.

Archaeological surveys, where required, are expected to be effective in reducing the potential for an interaction between an impact-producing activity and a historic resource. The surveys are expected to be most effective in areas where there is only a thin veneer of unconsolidated Holocene sediments. In these areas, shipwreck remains are more likely to be exposed at the seafloor where they can be detected by the sidescan sonar.

Summary and Conclusion

The greatest potential impact to an archaeological resource as a result of an EPA proposed action would result from direct contact between an offshore activity (i.e., platform installation, drilling rig emplacement, dredging, and pipeline emplacement) and a historic site. Archaeological surveys, where required prior to an operator beginning oil and gas activities on a lease, are expected to be effective at identifying possible archaeological sites. The technical requirements of the archaeological resource reports are detailed in NTL 2005-G07, "Archaeological Resource Surveys and Reports." Under 30 CFR § 550.194(c) and 30 CFR § 250.1010(c), lessees are required to notify BOEM and BSEE immediately of the discovery of any potential archaeological resources.

Offshore oil and gas activities resulting from an EPA proposed action could impact an archaeological resource because of incomplete knowledge on the location of these sites in the Gulf. The risk of contact to archaeological resources is greater in instances where archaeological survey data are unavailable. Such an event could result in the disturbance or destruction of important archaeological information. Archaeological surveys, where required, would provide the necessary information to develop avoidance strategies that would reduce the potential for impacts on archaeological resources.

Except for the projected 0-1 new gas processing facilities and 0-1 new pipeline landfalls, an EPA proposed action would require no new onshore oil and gas coastal infrastructure. It is expected that archaeological resources would be protected through the review and approval processes of the various Federal, State, and local agencies involved in permitting onshore activities.

4.1.1.21.1.3. Impacts of Accidental Events

For additional information on accidental events, refer to Chapter 4.2.1.22.1.3 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.22 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

This section discusses the possible effects of accidental events associated with an EPA proposed action on archaeological resources. Impacts to a historic archaeological resource could occur as a result of an accidental oil spill.

Proposed Action Analysis

Impacts from a low-probability, high-volume catastrophic event, which is not reasonably expected and not part of an EPA proposed action, are included in **Appendix B**. A major effect from an oil-spill impact would be visual contamination of a historic coastal site, such as a historic fort or lighthouse. Although such effects may be temporary and reversible, cleaning oil from historic structures is by no means a simple or inexpensive process (e.g., Chin and Church, 2010). The use of dispersants, however, could result in chemical contamination of submerged cultural heritage sites. The effect, if any, of chemical dispersant use at the *Macondo* well site in 2010 on submerged shipwrecks is still not known, although recent studies conducted by the Naval Research Laboratory concluded that hydrocarbon degraders are uniquely susceptible to COREXIT 9500 at environmentally relevant concentrations, while nonhydrocarbon degrading bacteria proliferate, possibly because of dispersant metabolism (Hamdan and Fulmer, 2011). The potential effects of chemical dispersants on microbes hastening the disintegration of shipwrecks are unknown. It is known that there are at least seven historically significant sites within 20 mi (32 km) of the well site. A recent site investigation of corals approximately 7 mi (11 km) from the *Macondo* well site revealed that the corals were impacted by the oiling event. "The proximity of the site to the disaster, the depth of the site, the clear evidence of recent impact, and the uniqueness of the observations all suggest that the impact found is linked to the exposure of this community to either oil, dispersant, extremely depleted oxygen, or some combination of these or other water-borne effects resulting from the spill" (White et al., 2012). The impacted corals are described in **Chapter 4.1.1.10.3**. This has implications for the oiling of shipwreck sites and the microbiological organisms that are consuming these steel-hulled vessels. According to Church et al. (2007, page 205), the observed bioaccumulation of oxidized forms of iron at the site of the *Alcola Puritan*, generated by microbial activity in 2004 (located 12 mi [19 km] from the *Macondo* wellhead), was parallel to the degradation of the remains of the RMS *Titanic*. It is unknown at this time, but it is hypothesized that microbial activity may be accelerated or retarded by compounds and elements associated with the release of millions of gallons of hydrocarbons and dispersants in the water column. At this time, little information is available on the condition of these shipwreck sites and the reaction to the oil spill. Additionally, there is also no information about the impacts of microbial activity on wooden shipwreck sites in deep water. Further study is warranted for both wooden shipwrecks and steel-hulled vessels to properly assess the impacts on these historically significant archaeological resources.

Other impacts that remain unknown at this time include the effect that the oiling of archaeological resources would have on the ability to conduct future chemical and observational analysis on the artifact assemblage. Currently, it is unknown if the release of hydrocarbons or dispersant would impede the analysis that may help interpret and understand archaeological resources.

Although information on the impacts of a potential spill to archaeological resources is incomplete or unavailable at this time and may be relevant to reasonably foreseeable adverse impacts on these resources, the information is not essential to a reasoned choice among alternatives. An oil spill occurring and contacting an archaeological resource is unlikely, given that oil released tends to rise quickly to the surface and that the average size of any spill would be small.

The major impacts to both coastal historic and prehistoric sites from the *Exxon Valdez* spill in Alaska in 1989 were related to cleanup activities such as the construction of helipads, roads, and parking lots and to looting by cleanup crews rather than from the oil itself (Bittner, 1996). As a result, cultural resources were recognized as significant early in the response to the *Deepwater Horizon* explosion and oil spill, and archaeologists were embedded in SCAT's and were consulting with cleanup crews. Although the process took several weeks to fully form, according to Dan Odess, Departmental Archaeologist, historic preservation representatives eventually were stationed at both the Joint Incident Command as well as each Area Command under the general oversight of the National Park Service to coordinate response efforts.

Summary and Conclusion

Accidental events producing oil spills may threaten archaeological resources along the Gulf Coast. Should a spill contact an historic archaeological site, damage might include direct impact from oil-spill cleanup equipment, contamination of materials, and/or looting. Previously unrecorded sites could be impacted by oil-spill cleanup operations on beaches and offshore. It is not very likely for an oil spill to occur and contact submerged, coastal or barrier island historic sites as a result of an EPA proposed action.

The major effect from an oil-spill impact would be visual contamination of a historic coastal site, such as a historic fort or lighthouse. When oil is spilled in offshore areas, much of the oil volatilizes or is dispersed by currents, so it has a low probability of contacting coastal areas. It is expected that any spill cleanup operations would be considered a Federal action for the purposes of Section 106 of the NHPA and would be conducted in such a way as to cause little or no impacts to historic archaeological resources. Recent research suggests the impact of direct contact of oil on historic properties may be long term and not easily reversible without risking damage to fragile historic materials (Chin and Church, 2010).

The potential for spills is low, the effects would generally be localized, and the cleanup efforts would be regulated. An EPA proposed action, therefore, is not expected to result in impacts to historic archaeological sites; however, should such an impact occur, unique or significant archaeological information could be lost, and this impact could be irreversible.

4.1.1.21.1.4. Cumulative Impacts

For additional information on cumulative impacts, refer to Chapter 4.2.1.22.1.4 of the 2012-2017 WPA/CPA Multisale EIS and to Chapter 4.2.1.22 of the WPA 233/CPA 231 Supplemental EIS, which are hereby incorporated by reference.

Background/Information

Of the cumulative scenario activities, those that could potentially impact historic archaeological resources include the following: (1) the OCS Program; (2) State oil and gas activity; (3) maintenance dredging; (4) OCS sand borrowing; (5) artificial rigs-to-reef development; (6) offshore LNG projects; (7) renewable energy and alternative use conversions; (8) commercial fishing; (9) sport diving and commercial treasure hunting, and (10) hurricanes.

OCS Oil- and Gas-Related Impacts

Archaeological surveys, where required prior to an operator beginning oil and gas activities on a lease, are assumed to be highly effective in reducing the potential for an interaction between an impact-producing activity and a historic resource. The surveys are expected to be most effective in areas where there is only a thin veneer of unconsolidated Holocene sediments. In these areas, shipwreck remains are more likely to be exposed at the seafloor where they can be detected by the sidescan sonar as well as the magnetometer. In areas of thicker unconsolidated sediments, shipwreck remains are more likely to be completely buried, with detection relying solely on magnetometer. The water depths expected to be encountered in the proposed EPA lease sale area preclude the use of a towed magnetometer.

According to estimates presented in **Table 3-3**, 10-27 exploration and delineation wells and 0-40 development and production wells would be drilled, and 0-2 production platforms would be installed in support of an EPA proposed action. There are 175 nine-square-mile lease blocks available for lease in the proposed EPA lease sale area. None of these blocks fall within the Gulf of Mexico OCS Region's current high-potential areas for historic resources in the EPA. The potential of an interaction between an MODU or platform emplacement and a historic shipwreck is greatly diminished by requisite site surveys, where required, but it still exists in areas where surveys have not been required in the past. Such an interaction could result in the loss of or damage to significant or unique historic resources.

Table 3-3 indicates that the placement of between 0 and 233 km (0-375 mi) of pipelines is projected in the cumulative activity area. While the required archaeological survey minimizes the chances of impacting a historic shipwreck, there remains a possibility that a wreck could be impacted by pipeline emplacement. Such an interaction could result in the loss of significant or unique historic resources.

The setting of anchors for drilling rigs, platforms, and pipeline lay barges, and anchoring associated with oil and gas service-vessel trips to the OCS have the potential to impact historic wrecks. Archaeological surveys, when required, serve to minimize the chance of impacting historic wrecks; however, these surveys are not infallible and the chance of an impact from future activities does exist. Impacts from anchoring on a historic shipwreck may have occurred. There is also a potential for future impacts from anchoring on a historic shipwreck. Such an interaction could result in the loss of or damage to significant or unique historic resources and the scientific information they contain.

State oil and gas program wells, structures, and pipelines in State waters are not under the jurisdiction of BOEM with respect to the archaeological resource protection requirements of the NHPA. Under the NHPA, other Federal agencies, such as COE, which issues permits associated with pipelines in State waters, are responsible for taking into consideration the effects of activities permitted by such agencies on archaeological resources. Therefore, the impacts that might occur to archaeological resources by pipeline construction originating from OCS-related activity within State waters should be mitigated under the requirements of the NHPA, and the same archaeological surveys for planned pipelines that lead into a landfall or a tie-in to a pipeline in State waters are required. Prior to 1989, it is possible that explosive seismic surveys on the OCS and within State waters could have impacted historic shipwrecks. Explosive seismic charges set near historic shipwrecks could have displaced the vessel's surrounding sediments, acting like a small underwater fault and moving fragile wooden, glass, ceramic, and metal remains out of their initial cultural context. Such an impact would have resulted in the loss of significant or unique archaeological information.

The probabilities of offshore oil spills ≥1,000 bbl occurring from OCS Program activities is presented in **Chapter 3.2.1.5 and Table 3-10**. Oil spills have the potential to impact coastal historic sites directly or indirectly by physical impacts caused by oil-spill cleanup operations. The impacts caused by oil spills to coastal historic archaeological resources are generally short term and reversible. **Table 3-20** presents coastal spills categorized by source. The number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past as long as the level of energy-related commercial and recreational activities remain the same. Should such oil spills contact a historic site, the effects would likely be temporary and reversible. Low-probability, catastrophic spill events, which are not reasonably expected and not part of an EPA proposed action, could also contact coastal historic sites, and the effects of a spill that size would likely result in longer-lasting impacts that take longer to reverse. For additional information on low-probability catastrophic spill events, which is not reasonably expected and not part of an EPA proposed action, refer to **Appendix B**.

The OCS sand borrowing is expected to be an activity on the increase during the OCS cumulative activities period. Approximately 76 million yd^3 of OCS sand is liable to be accessed for coastal restorations over the next 5-10 years from Ship Shoal Blocks 88 and 89 and from South Pelto Blocks 12 and 13, primarily. For these bottom-disturbing activities, a preconstruction archaeological survey is required by BOEM for the borrow site lease. No new disturbance of historic shipwrecks would be expected when the results of predeployment archaeological surveys of sand borrow sites are first examined for sea-bottom anomalies by BOEM so that the proper setback distances can be required that allow potential resources to be avoided.

Non-OCS Oil- and Gas-Related Impacts

Most channel dredging occurs at the entrances to bays, harbors, and ports. These areas have a high potential for historic shipwrecks. The greatest concentrations of historic wrecks are likely associated with these features (Pearson et al., 2003). It is reasonable to assume that significant or unique historic archaeological information has been lost as a result of past channel dredging activity. In many areas, COE requires remote-sensing surveys prior to dredging activities to minimize such impacts. Maintenance dredging takes place in existing, often well-used, and marked seaways and transit corridors within which any historic wrecks would have been already disturbed or their historical context destroyed. Most channel dredging occurs at the entrances to bays, harbors, and ports. These areas have a high potential for historic shipwrecks; the greatest concentrations of historic wrecks are likely associated with these features (Pearson et al., 2003). It is reasonable to assume that significant or unique historic archaeological information has been lost as a result of past channel dredging activity. In many areas, COE requires remote-sensing surveys prior to dredging activities to minimize such impacts. Routine maintenance dredging, as an ongoing activity in well-plied channels, is not likely to result in any new disturbance or disruption to historic wrecks.

Past, present, and future OCS oil and gas exploration and development and commercial trawling would result in the deposition of tons of steel debris on the seafloor. Modern marine debris associated with these activities would tend to mask the magnetic signatures of historic shipwrecks, particularly in areas that were developed prior to requiring archaeological surveys. Such masking of the signatures characteristic of historic shipwrecks may have resulted or may yet result in OCS activities in the cumulative activity area impacting a shipwreck containing significant or unique historic information.

State oil and gas program wells, structures, and pipelines in State waters are not under the jurisdiction of BOEM with respect to the archaeological resource protection requirements of the NHPA. Under the NHPA, other Federal agencies, such as COE, which issues permits associated with pipelines in State waters, are responsible for taking into consideration the effects of activities permitted by such agencies on archaeological resources. Therefore, the impacts that might occur to archaeological resources by pipeline construction originating from OCS-related activity within State waters should be mitigated under the requirements of the NHPA, and the same archaeological surveys for planned pipelines that lead into a landfall or a tie-in to a pipeline in State waters are required. Prior to 1989, it is possible that explosive seismic surveys on the OCS and within State waters could have impacted historic shipwrecks. Explosive seismic charges set near historic shipwrecks could have displaced the vessel’s surrounding sediments, acting like a small underwater fault and moving fragile wooden, glass, ceramic, and metal remains out of their initial cultural context. Such an impact would have resulted in the loss of significant or unique archaeological information.

The Rigs-to-Reefs program, offshore liquefied natural gas projects, and renewable energy projects and alternative use conversions are expected to remain at, respectively, a steady pace of activity, to decrease, and to increase as competing uses of the OCS. A preconstruction archaeological survey is required before bottom-disturbing activities are permitted for artificial reef emplacement (if not reefed on site), deepwater ports for liquefied natural gas facilities, and newly built renewable energy facilities. Alternative-use conversions of existing infrastructure likely would not involve new bottom-disturbing activities, but if called for in applications, a preconstruction survey would be required. No new disturbance of historic shipwrecks would be expected when predeployment archaeological surveys are first examined for sea-bottom anomalies by BOEM, or the permitting agency, so that proper setback distances can be required that allow mitigation potential resources to be avoided.

Commercial fishing trawling activity specifically would only affect the uppermost portions of the sediment column (Garrison et al., 1989) in water depths generally <600 ft (183 m). On many wrecks, the uppermost portions would already be disturbed by natural factors and would contain only artifacts that have lost all original context.

Sport diving, which is generally restricted to water depths <130 ft (40 m), and commercial treasure hunting are significant factors in the loss of historic data from wreck sites. Efforts to educate sport divers and to foster the protection of historic shipwrecks, such as those of the Florida Keys National Marine Sanctuary and the Florida Public Archaeology Network, serve to lessen these potential impacts. While commercial treasure hunters generally impact wrecks with intrinsic monetary value, sport divers may collect souvenirs from all types of wrecks within their diving limits. Since the extent of these activities is unknown, the impact cannot be quantified. A Spanish war vessel, *El Cazador*, was discovered in the CPA; it contained a large amount of silver coins and has been impacted by treasure hunting salvage operations (McLaughlin, 1995). The historic data available from this wreck and from other wrecks that have been impacted by treasure hunters and sport divers represent a localized significant or unique loss of archaeological information.

Hurricanes and tropical storms are normal occurrences in the GOM and along the Gulf Coast. On average, 15-20 hurricanes make landfall along the northern Gulf Coast per decade. Shipwrecks in shallow waters are exposed to a greatly intensified, longshore current during tropical storms (Clausen and Arnold, 1975). Under such conditions, it is highly likely that artifacts (e.g., ceramics and glass) would be dispersed. Some of the original information contained in the site would be lost in this process, but a significant amount of information would also remain. Overall, a significant loss of data from historic sites has probably occurred, and will continue to occur, in the northeastern Gulf from the effects of tropical storms. Some of the data lost have most likely been significant or unique.

Summary and Conclusion

Several impact-producing factors may threaten historic archaeological resources, all related to bottom-disturbing activities. An impact could result from contact between a historic shipwreck located on the OCS and OCS Program or State oil and gas activities (i.e., pipeline and platform installations, drilling rig emplacement and operation, dredging, anchoring activities, structure removal, and site clearance). Bottom-disturbing activities on the OCS also include maintenance dredging, sand borrowing, transported artificial reef emplacement, liquefied natural gas facility construction, and renewable energy facility construction. With the exception of maintenance dredging, preconstruction surveys may be required by BOEM or the permitting agency. Impacts resulting from the imperfect knowledge of the location of historic resources may still occur in areas where a high-resolution survey is only required at 984-ft (300-m) survey intervals or not at all. The OCS development prior to requiring archaeological surveys has been documented to have impacted wrecks containing significant or unique historic information. This was amply demonstrated when a pipeline was laid across a previously unknown early 19^{th}-century shipwreck and when an MODU mooring anchor chain cut a shipwreck in half (Atauz et al., 2006; Church and Warren, 2008). In certain circumstances, BOEM's Regional Director may require the preparation of an archaeological report to accompany the EP, DPP, or DOCD, under 30 CFR § 550.194. As part of the environmental reviews conducted for postlease activities, available information will be evaluated regarding the potential presence of archaeological resources within the EPA proposed-action area to determine if additional archaeological resource surveys and mitigation are warranted.

The loss or discard of steel debris associated with oil and gas exploration and development and trawling activities could result in the masking of historic shipwrecks or the identification of false negatives on archaeological surveys (an anomaly that does not appear to be of historical significance, but actually is).

Damage to or loss of significant or unique historic archaeological information from commercial fisheries (trawling) is highly likely in water depths <600 ft (183 m) (Foley, 2010). It is expected that maintenance dredging, commercial bottom trawling, sport-diving and commercial treasure hunting, and hurricanes and tropical storms have impacted and would continue to impact historic period shipwrecks on the shelf where such activities occur.

Development onshore as a result of an EPA proposed action could result in the direct physical contact between a historic site and pipeline trenching. It is assumed that archaeological investigations prior to construction would serve to mitigate these potential impacts. Based on the currently available information, the expected effects of oil spills on historic coastal resources are temporary and reversible.

The effects of the various impact-producing factors discussed in this analysis have likely resulted in the localized loss of significant or unique historic archaeological information. In the case of factors related to OCS Program activities of the past within the cumulative activity area, it is reasonable to assume that most impacts would have occurred prior to 1973 (the date of initial archaeological survey and site-clearance requirements). The incremental contribution of an EPA proposed action is expected to be very small due to the efficacy of remote-sensing surveys and archaeological report, where required. Future OCS Program activities and the bottom-disturbing activities permitted by BOEM and other agencies may require preconstruction archaeological surveys that, when completed, are highly effective in identifying bottom anomalies that could be avoided or investigated before bottom-disturbing activities begin. When surveys are not required, it is impossible to anticipate what might be imbedded in or lying directly on the seafloor, and impacts to these sites are likely to be major in scale. Despite diligence in site-clearance survey reviews, there is still the possibility of an unanticipated interaction between bottom-disturbing activity (i.e., rig emplacement, pipeline trenching, anchoring, and other ancillary activities) and a historic shipwreck.

4.1.1.21.2. Prehistoric

4.1.1.21.2.1. Description of the Affected Environment

Prehistoric archaeological resources on the OCS consist of the remains of areas inhabited or utilized by North America's indigenous peoples, including sites, structures, and objects such as shell middens, earth middens, campsites, kill sites, tool manufacturing areas, ceremonial complexes, and earthworks, during a period when sea level was significantly lower than it is today and when much of the continental shelf was exposed as dry land. Available evidence suggests that sea level in the northern GOM was at least 90 m (295 ft), and possibly as much as 130 m (427 ft), lower than present sea level during the period 20,000-17,000 B.P. (before present) (Nelson and Bray, 1970). Sea level in the northern Gulf reached its present stand around 3,500 B.P. (Pearson et al., 1986). For the past 60 years, it was generally accepted by archaeologists that the earliest humans in North America were the so-called Clovis peoples, named for a lanceolate-shaped, fluted projectile point first found near Clovis, New Mexico. The Clovis culture was thought to have entered the continent by way of Beringia, a land mass connecting Asia to North America exposed during the Last Glacial Maximum and along an ice-free corridor opened between the Cordilleran and Laurentide ice sheets around 13,500 B.P. Today, however, a growing body of evidence has dispelled the "Clovis First" model with discovery of several sites with indisputable pre-Clovis dates in the eastern United States (Goodyear, 2005), Chile (Dillehay, 1989; Meltzer et al., 1997), and central Texas (Waters et al., 2011). The Buttermilk Creek Complex identified by Waters et al. (2011) at the Debra L. Friedkin Site (41BL1239) is nearest to the Gulf of Mexico region and is dated from ~13.2 to 15.5 thousand years ago.

Based on the best evidence currently available, the first Americans arrived on the Gulf Coast in the EPA around 11,500 B.P. (Aten, 1983; Rees, 2010). The sea-level curve for the northern GOM proposed by Coastal Environments, Inc. (CEI) suggests that sea level at 12,000 B.P. would have been approximately 45-60 m (148-197 ft) below the present-day sea level (CEI, 1977 and 1982). On this basis, the continental shelf shoreward of the 45- to 60-m (148- to 197-ft) bathymetric contours has potential for prehistoric sites dating after 12,000 B.P. Because of inherent uncertainties in both the depth of sea level and the entry date of prehistoric man into North America, this Agency adopted the 60-m (197-ft) water depth as the seaward extent for prehistoric site potential in the GOM region. Since water depths in the proposed EPA lease sale area vastly exceed 60 m (197 ft), ranging from around 245 m (800 ft) to 933 m (3,062 ft), there is no potential for the presence of submerged prehistoric archaeological sites within the proposed EPA lease sale area itself.

4.1.1.21.2.2. Impacts of Routine Events

As discussed in Chapter 4.2.1.22.2.2 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference, water depths in the proposed EPA lease sale area considerably exceed the 60-m (197-ft) depth contour that is generally accepted as the seaward limit of the subaerially exposed land mass that would have been available for human habitation when people migrated into the Gulf region around 12,000 B.P. As a result, prehistoric sites would not be expected to be affected by routine offshore development.

Onshore development as a result of an EPA proposed action could result in direct physical contact between construction of new facilities or a pipeline landfall and a previously unidentified prehistoric site. Direct physical contact with a prehistoric site could destroy fragile artifacts or site features and could disturb the site context. The result would be the loss of information on the prehistory of North America and the Gulf Coast region. There are 0-1 new gas processing facilities and 0-1 new pipeline landfalls expected as a result of an EPA proposed action. Furthermore, any facility or pipeline constructed is subject to coastal use requirements and must receive approval from the pertinent Federal agency, State agency, county/parish, and/or community involved. The protection of archaeological resources in these cases is expected to be achieved through the various approval processes involved. There should, therefore, be no impact to onshore prehistoric sites from onshore development related to an EPA proposed action.

4.1.1.21.2.3. Impacts of Accidental Events

As discussed in Chapter 4.2.1.22.2.3 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference, impacts to a prehistoric archaeological resource could occur as a result of an accidental oil spill. Impacts from a low-probability, high-volume catastrophic event, which is not reasonably expected and not part of an EPA proposed action, are included in **Appendix B**. A major effect from an oil spill impact would be contamination of a prehistoric coastal site, such as a shell midden, disturbance as a result of cleanup activities, or looting from the location of the site becoming known after an oil spill.

Other impacts that remain unknown at this time include the effect that the oiling of archaeological resources would have on the ability to conduct future chemical and observational analysis on the artifact assemblage. Currently, it is unknown to what extent the release of hydrocarbons or of dispersant would impede the analysis that may help interpret and understand archaeological resources.

Although information on the impacts of a potential spill to archaeological resources is incomplete or unavailable at this time and may be relevant to reasonably foreseeable adverse impacts on these resources, the information is not essential to a reasoned choice among alternatives. An oil spill occurring and contacting an archaeological resource is unlikely, given that oil released tends to rise quickly to the surface where it can be cleaned up and that the average size of any spill would be small.

The major impacts to coastal prehistoric sites from the *Exxon Valdez* spill in Alaska in 1989 were related to cleanup activities such as the construction of helipads, roads, and parking lots and to looting by cleanup crews rather than from the oil itself (Bittner, 1996). As a result, cultural resources were recognized as significant early in the response to the *Deepwater Horizon* explosion and oil spill, and archaeologists were embedded in SCAT's and were consulting with cleanup crews. Although the process took several weeks to fully form, according to Departmental Archaeologist Dan Odess, historic preservation representatives eventually were stationed at both the Joint Incident Command as well as each Area Command under the general oversight of the National Park Service to coordinate response efforts.

4.1.1.21.2.4. Cumulative Impacts

Of the cumulative scenario activities, those that could potentially impact prehistoric archaeological resources include the following: (1) the OCS Program; (2) State oil and gas activity; (3) maintenance dredging; (4) OCS sand borrowing; (5) artificial rigs-to-reef development; (6) offshore liquefied natural gas projects; (7) renewable energy and alternative use conversions; (8) commercial fishing; (9) sport diving and commercial treasure hunting, and (10) hurricanes. However, as discussed in Chapter 4.2.1.22.2.4 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference, water depths in the proposed EPA lease sale area considerably exceed the 60-m (197-ft) depth contour that is generally accepted as the seaward limit of the subaerially exposed land mass that would have been available for human habitation when people migrated into the Gulf region around 12,000 B.P. As a result, prehistoric sites will not been affected by any of the offshore impact-producing factors identified above.

Onshore and nearshore maintenance dredging in support of activities resulting from an EPA proposed action has the potential to impact prehistoric resources. Impacts from maintenance dredging can be attributed proportionally to the users of the navigation channels. BOEM estimates that, under an EPA proposed action, <1 percent of the ship traffic is related to OCS use. Therefore, the impact to archaeological sites directly attributable to traffic and maintenance dredging as a result of the OCS Program is negligible. Additionally, any such maintenance activities are subject to coastal use requirements and must receive approval from the pertinent Federal agency, State agency, county/parish, and/or community involved. The protection of archaeological resources in these cases is expected to be achieved through the various approval processes involved. There should, therefore, be no impact to onshore prehistoric sites from maintenance dredging related to an EPA proposed action.

4.1.1.22. Human Resources and Land Use

4.1.1.22.1. Land Use and Coastal Infrastructure

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different from the adjacent CPA leased blocks with regard to socioeconomic impacts to land use and onshore coastal infrastructure. An EPA proposed action would be on a smaller scale than a proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for land use and coastal infrastructure can be found in Chapter 4.2.1.23.1 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.23.1 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from these chapters would be equally applicable for land use and coastal infrastructure regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for land use and onshore coastal infrastructure presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for land use and coastal infrastructure. Therefore, as summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS still apply, are applicable, and are hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Additionally, further research was conducted for information published on land use and coastal infrastructure, and various Internet sources were examined to determine any recent information. Sources investigated include the websites of numerous Federal and State agencies such as the U.S. Department of Homeland Security, Federal Emergency Management Agency; U.S. Department of Commerce, Bureau of the Census and NOAA; U.S. Department of Energy, Energy Information Administration; U.S. Department of Transportation, Maritime Administration; U.S. Department of the Interior, Fish and Wildlife Service; RestoreTheGulf.gov website; *Deepwater Horizon* Oil Spill Portal; U.S. Environmental Protection Agency; Louisiana Department of Environmental Quality; Louisiana Recovery Authority; and Louisiana Office of Community Development. Further information was sought from other organizations, contacts with Gulf port authorities, experts with Gulf-based universities, scientific publication databases including JSTOR, as well as recently published journal articles and trade publications such as The Greater LaFourche Port Commission, LA1 Coalition, American Petroleum Institute, The Oil Drum, Rigzone, *The Oil & Gas Journal*, *Offshore Magazine*, *TOLLROADnews*, and *The Energy Journal*. All new relevant information was incorporated into the analyses below. No new significant information was discovered regarding land use and onshore coastal infrastructure since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and despite the new information identified and provided below, there remains some incomplete or unavailable information. Refer to the section below titled "*Deepwater Horizon* Explosion, Oil Spill, and Response" for a discussion of incomplete and unavailable information on the socioeconomic impacts to land use and coastal infrastructure.

Background and Introduction

Oil and gas exploration, production and development activities on the OCS are supported by an expansive onshore infrastructure industry that includes large and small companies providing a wealth of services from construction facilities, service bases, and waste disposal facilities to crew, supply, and product transportation, as well as processing facilities. Analysis of the affected environment covers thirteen different infrastructure categories that support thousands of jobs representing both direct and indirect economic impacts that ripple through the Gulf Coast economy. The OCS-related infrastructure, a long-standing part of these regional economies that developed over the past several decades, is quite mature.

An EPA proposed action would not require additional coastal infrastructure. BOEM makes conservative infrastructure scenario estimates; for this impact analysis, a projection of between 0 and 1 is more likely to be 0 than 1. These scenario estimates have become more conservative in the aftermath of the *Deepwater Horizon* explosion, oil spill, and response and are especially conservative for this EIS given the small size and expected impact of an EPA proposed action. There is a slim chance of 0-1 new gas processing facilities by the end of the 40-year life of an EPA proposed action. BOEM also estimates a possible 0-1 new pipeline landfalls. An EPA proposed action would not alter the current land use of the analysis area (Dismukes, official communication, 2012a). Existing oil and gas infrastructure is expected to be sufficient to handle development associated with an EPA proposed action. Existing solid-waste disposal infrastructure is adequate to support both existing and projected offshore oil and gas drilling and production needs. Minor accidental events such as oil or chemical spills, blowouts, and vessel collisions would have no long-term negative effects on land use. Coastal or nearshore spills, as well as vessel collisions, could have short-term adverse effects on coastal infrastructure, requiring the cleanup of any oil or chemicals spilled. The incremental contribution of an EPA proposed action to the cumulative impacts on land use and coastal infrastructure are expected to be minor. A full catastrophic event analysis of impacts from an event such as the *Deepwater Horizon* explosion and oil spill, which is not reasonably expected and not part of an EPA proposed action, can be found in **Appendix B**.

4.1.1.22.1.1. Description of the Affected Environment

Socioeconomic Analysis Area

BOEM defines the analysis area for potential impacts on population, labor, and employment as that portion of the GOM coastal zone where social and economic well-being (population, labor, and employment) is directly or indirectly affected by the OCS oil and gas industry. Along the Gulf Coast, from the southern tip of Texas to Miami and the Florida Keys, there are 13 BOEM-defined Economic Impact Areas (EIA's) for the Gulf of Mexico region. The counties and parishes that form EIA's are listed in **Table 4-18** and the EIA's are visually illustrated in **Figure 4-15**. BOEM's impact analysis considers the potential impacts in all 13 EIA's regardless of where a proposed action is taking place. Because the vast amount of onshore support for OCS activities in the EPA will not occur in Florida and Alabama, and nearly all of the onshore socioeconomic impacts will occur in other Gulf coast states that have traditionally provided support for offshore activities, BOEM's socioeconomic impact analysis for the EPA includes Louisiana and Mississippi in addition to Alabama and Florida, and where appropriate, Texas is also included.

BOEM has funded an ongoing study to more clearly delineate EIA's by establishing a clear, explicit, empirical rationale to guide and support impact assessments of industry operations and activities. Results of the study will not be received in time to be used in this EIS, but they will be available for modification of BOEM's environmental impact assessment methodology in future EIS's.

Land Use

For an EPA proposed action, the primary region of geographic influence is coastal Louisiana, Mississippi, and Alabama. Oil and gas activities are quite limited in the Florida area. The coastal zone of the northern GOM is not a physically, culturally, or economically homogenous unit (Gramling, 1984). The counties and parishes along the coasts of Louisiana, Mississippi, Alabama, and Florida represent some of the most valuable coastline in the U.S. Not only does it include miles of recreational beaches and the protection of an extended system of barrier islands, but it also has deepwater ports, oil and gas support industries, manufacturing, farming, ranching, and hundreds of thousands of acres of wetlands and protected habitat. These counties and parishes vary in their histories and in the composition and economic activities of their respective local governments.

Figures 4-16 and 4-17 illustrate the analysis area's key infrastructure. Major cities in the analysis area include Lake Charles, Lafayette, Baton Rouge and New Orleans, Louisiana; Pascagoula, Mississippi; Mobile, Alabama and Tampa, Florida. Several international and regional airports are located throughout the analysis area. One major interstate (I-10) traverses the area along the inner margin of the coastal zone, while five interstate highways access the area longitudinally. There are numerous highways into and across the analysis area. The most significant is Louisiana Highway 1 (LA Hwy 1) that provides the only link between Port Fourchon, Louisiana, and the rest of the Nation. Port Fourchon occupies an important position in the critical energy infrastructure of the United States. LA Hwy 1, a two-lane highway, is surrounded by marshland and has been prone to extreme flooding over the years. Port Fourchon is the service base for over 90 percent of OCS deepwater production and serves as a conduit for 15-18 percent of the Nation's entire oil supply (The Greater Lafourche Port Commission, 2011). The area's railroad configuration is similar to the highway system. An extensive maritime industry exists in the analysis area. There is a substantial amount of domestic waterborne commerce in the analysis area and also some foreign maritime traffic. For the year 2009, 8 of the leading 25 U.S. ports ranked by total trade tonnage are located in Louisiana, Mississippi, Alabama, and Florida (American Association of Port Authorities, 2009).

According to the most recent statistics from the U.S. Dept. of Agriculture's Economic Research Service, which classifies counties into economic types that indicate primary land-use patterns, 3 of the 90 counties/parishes in the analysis area are classified as farming dependent, 6 as mining dependent (suggesting the importance of oil and gas development to these local economies), 19 as manufacturing dependent, 24 as government employment centers, 20 as tied to service employment, and 18 as nonspecialized. The Economic Research Service also classifies counties in terms of their status as a retirement destination; 29 of the 90 counties/parishes are considered major retirement destinations (U.S. Dept. of Agriculture, Economic Research Service, 2004). The varied land-use patterns are displayed in **Figure 4-18**.

OCS-Related Coastal Infrastructure

The OCS-related onshore coastal infrastructure is extensive, covers a wide-ranging area, supports OCS development, and consists of thousands of large and small companies. These companies cover every facet of OCS activity, including, but not limited to, platform fabrication, shipbuilding and repair, pipelines, pipe coating, service bases, ports, waste disposal facilities, natural gas storage, gas processing facilities, service vessels, heliports, terminals, refineries, and petrochemical plants. For analysis purposes, these infrastructure types are organized into the following categories: construction facilities; OCS support facilities; transportation; and processing facilities.

Unless otherwise indicated, the following information on OCS-Related Coastal Infrastructure is from BOEM's three OCS Gulf of Mexico Fact Books: (1) *OCS-Related Infrastructure in the Gulf of Mexico Fact Book* (The Louis Berger Group, Inc., 2004); (2) *Fact Book: Offshore Oil and Gas Industry Support Sectors* (Dismukes, 2010); and (3) *OCS-Related Infrastructure Fact Book; Volume I: Post-Hurricane Impact Assessment* (Dismukes, 2011) and (4) *OCS-Related Infrastructure Fact Book; Volume II: Communities in the Gulf of Mexico* (Kaplan, et al., 2011). The major players among OCS-related construction facilities include platform fabrication yards, shipyards, and pipecoating plants and yards.

Construction Facilities

The category, Construction Facilities, includes: platform fabrication yards; shipbuilding and shipyards; and pipecoating plants and yards. Each is summarized briefly in the following sections.

Facilities where platforms (and drilling rigs) are fabricated are called platform fabrication yards. Most platforms are fabricated onshore and then towed to an offshore location for installation. Production operations at fabrication yards include the cutting and welding of steel components and the construction of living quarters and other structures, as well as the assembly of platform components, to support both exploration and production activities.

When an oil and/or gas discovery occurs, an exploratory drilling rig will be either replaced with or converted to a production platform assembled at the site using a barge equipped with heavy lift cranes. Often in deepwater areas, drilling and production occur on the same structure (such as semisubmersibles). **Figure 3-3** illustrates the various types of platforms used in deepwater production and development.

The location of platform fabrication yards is tied to the availability of a navigable channel sufficiently large enough to allow the towing of bulky and long structures, such as offshore drilling and production platforms. Thus, platform fabrication yards are located either directly along the Gulf Coast or inland, along large navigable channels, such as the Intracoastal Waterway. Despite a large number of platform fabrication yards along the Gulf Coast, only a few facilities can handle large-scale fabrication. **Figures 4-16 and 4-17** illustrate the geographic distribution of platform fabrication yards across the EPA analysis area. There are 37 platform fabrication yards in Louisiana, mainly concentrated in Jefferson, Terrebonne, and Iberia Parishes. The remainder of the EPA analysis area only has five platform fabrication yards: four in Mississippi and one in Alabama.

Shipbuilding and Shipyards

There are several kinds of shipyards throughout the Gulf Coast region that build and repair all manner of vessels, many of which are not related to OCS activities. Marine vessels are perhaps the most important means of transporting equipment and personnel from onshore bases and ports to offshore drilling and production structures. Facilities dedicated to constructing and repairing these marine vessels also receive orders from a wide range of industries that can include commercial shipping companies, passenger and cruise companies, ferry companies, petrochemical companies, commercial fishing companies, and towing and tugboat companies. The primary vessels that shipbuilding yards provide to the oil and gas industry are known as offshore service vessels (OSV's), which transport a wide range of personnel and equipment ranging from pipes to wrenches to computers, fuel, and drinking water.

In the EPA, the vast majority of shipyards are located in Louisiana (64), followed by Alabama (18), Florida (14), and Mississippi (9). **Figures 4-16 and 4-17** show the geographic distribution of shipyards across the EPA analysis area. While the Gulf Coast shipbuilding region covers an area between south Texas and the tip of Florida, most shipbuilding facilities are concentrated in a 200-mi (322-km) area between New Orleans and Mobile.

Pipecoating Plants and Yards

Pipecoating plants generally do not manufacture or supply pipe. Pipecoating plants that do not manufacture their own pipe will receive pipe by rail or water at either their plant or pipe yard depending on their inventory capabilities. At the plant, pipes that transport oil and gas are coated on the exterior with metallic, inorganic, and organic materials to protect from corrosion and abrasion. Pipes may also be coated on the inside to protect against corrosion from the fluids being transported or to improve the flow. In addition to corrosion protection, many pipes that will be used offshore are also coated with a layer of concrete to increase the weight of the line to ensure it stays on the seabed.

The levels of activity experienced by pipecoating companies depend on the requirement for new pipeline infrastructure, which is driven by investment in energy supply. The strongest trends in energy supply that affect demand are energy prices, world economic growth, advances in technologies, and future public policy decisions. Much of the pipe coating that takes place is done by companies that also produce the pipes for their own use rather than for sale to other companies. If the coating company is a separate entity, it is often located near a pipe facility.

For a more detailed discussion of the market demand for pipecoating facilities, refer to Chapter 4.1.1.20.1 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference. In the BOEM-defined EIA's, there are 19 OCS-related pipecoating companies. In Louisiana, there are six pipecoating facilities, mainly in Iberia Parish. The remaining EPA locations in the GOM region include Alabama (2 facilities) and Florida (2 facilities). To meet deepwater demand, pipecoating companies have been expanding capacity or building new plants. Over the past several years, to meet deepwater demand, pipecoating companies were expanding capacity or building new plants. In the few months after the *Deepwater Horizon* explosion and oil spill, activity levels dropped temporarily. In the future, as activity gradually increases in the post-*Deepwater Horizon* GOM environment, the demand for pipecoating services should recover and gradually increase, but these demands would most likely be met by expansions at existing facilities, rather than construction of new facilities.

OCS Support Facilities

The category, OCS Support Facilities, includes: service bases and ports; waste disposal facilities; and natural gas storage facilities. Each is summarized briefly in the following sections.

Service Bases/Ports

A service base is a community of businesses that load, store, and supply equipment, supplies, and personnel that are needed at offshore work sites. A service base may also be referred to as a supply base and may be associated with a port. Although a service base may primarily serve the OCS planning area and the EIA in which it is located, it may also provide significant services for the other OCS planning areas and EIA's. An EPA proposed action is not projected to change existing OCS-related service bases or require construction of new service bases. Instead, it would contribute to the use of existing service bases. **Figure 4-19** shows the primary service bases the industry currently uses to service the OCS. These facilities are identified from exploration and development plans received by BOEM. **Table 3-13** lists the OCS-related services bases according to EIA. The ports of Fourchon, Cameron, Venice, and Morgan City, Louisiana, are the primary service bases for Gulf of Mexico mobile rigs. Other major platform service bases in the EPA include Intracoastal City, Louisiana; Pascagoula, Mississippi; Mobile, Alabama, and Panama City, Florida..

Several new trends along the GOM have resulted in changing needs for the offshore and maritime industry. This, in turn, has placed a burden on OCS ports to provide the necessary infrastructure and support facilities in a timely manner to meet growing industry needs. Important energy trends that have developed over the last decade are as follows:

(1) changing exploration and production technology from one based on fixed structures, to one more commonly based on a variety of floating/ship-based type of structures;

(2) increasing deepwater and ultra-deepwater drilling;

(3) changes in OSV specifications (i.e., bigger and deeper);

(4) climate change, storm events, and other environmental concerns (i.e. water usage, changing regulations on emissions such NO_x, SO_2, and ozone requirements);

(5) global competition;

(6) changes in energy prices; and

(7) LNG development.

Increased port activity creates economic benefits in the form of increased employment, economic output, and other value-added benefits such as tax revenue, fees, and royalties. The amount of goods and services transferred at ports has increased over the past decade including materials directly related to offshore oil and gas exploration and production, including increasing equipment, drilling fluids, structures, supplies, and crew transfers. The increase of LNG imports through the GOM also has the potential to increase the demand for goods and services located at ports such as tub and barge services.

As the oil and gas industry has thrived in the GOM, the need increases for a logistical support system that links all phases of the operation and extends beyond the local community. Service bases serve as the hub for intermodal linkages between land-based supply and fabrication centers that provide the equipment, personnel, and supplies to offshore facilities. The necessary onshore support segment includes inland transportation to supply bases, equipment manufacturing, and fabrication. The offshore support involves both waterborne and airborne transportation modes. **Chapter 3.1.1.8** addresses the transportation of personnel, supplies and production between offshore and onshore locations.

Waste Disposal Facilities

A variety of different types of wastes are generated by offshore oil and gas exploration and production activities along the GOM. Some wastes are common to any manufacturing or industrial operation (e.g., garbage, sanitary waste [toilets] and domestic waste [sinks and showers]), while others are unique to the oil and gas industry (e.g., drill fluids and produced water). Most waste must be transported to shore-based facilities for storage and disposal. The different physical and chemical character of these wastes make certain management methods preferable over others. **Table 3-13** shows the waste disposal facilities in the analysis area by state. There are three each in Mississippi and Alabama and two in Florida. The bulk of OCS-related waste disposal facilities (nearly 85%) are located in Texas and

Louisiana. Louisiana (29) supports nearly twice as many as Texas (16). **Figures 4-16 and 4-17** show the geographic distribution of waste disposal facilities across the EPA analysis area.

Natural Gas Storage Facilities

There are three main types of underground natural gas storage facilities: depleted reservoirs in oil and/or gas fields; aquifers; and salt cavern formations. Each type of storage facility has its own physical characteristics that include porosity, permeability, and retention capability. Each type of storage facility also has its own economic characteristics that include capacity development costs, location, deliverability rates, and cycling capability. The Gulf Coast has a mix of depleted reservoir and salt cavern storage. The majority of all salt cavern storage facilities operating in the U.S. are located along the GOM. Gulf Coast salt caverns account for 4.2 percent of total U.S. working gas capacity and 15.5 percent of total U.S. deliverability. In the GOM, Louisiana has seven salt cavern sites with 48 Bcf of working gas capacity, Mississippi has three sites with 32 Bcf of working gas capacity, and Alabama has one site with 7 Bcf of working gas capacity (USDOE, Energy Information Administration, 2007). Not all of these facilities are located within the BOEM-defined EIA's. More specifically, there are 22 underground natural gas storage facilities in the BOEM-defined EIA's. These facilities total 372 Bcf of working gas capacity. **Figures 4-16 and 4-17** show the geographic distribution of natural gas storage facilities across the EPA analysis area.

Transportation

The major forms of OCS crew, supply, and product transportation discussed in the following sections include the following: heliports; OCS support vessels; coastal pipelines/pipeline landfalls/pipeline shore facilities; and coastal barging/barge terminals. As the oil and gas industry continues to evolve so do the requirements of the onshore support network. With advancements in technology, the shoreside supply network continues to be challenged to meet the needs and requirements of the industry. All crew and supplies must be transported between land-based facilities to marine vessels or helicopters and offshore destinations. Likewise, all offshore oil and gas production must be transported onshore in some manner, whether by pipeline or tanker.

Heliports

Heliports are centralized locations where helicopters disembark for offshore service. Helicopters move crew and equipment to offshore areas and serve as one of the primary modes of transporting personnel between service bases and offshore platforms, drilling rigs, derrick barges, and pipeline construction barges. While supply boats are typically used for short-haul service, helicopters are the primary means of transportation for longer distances as well as instances when speed of delivery (equipment and personnel) may be pressing.

Industry consolidation has resulted in a small number of large helicopter service providers. The Gulf is served primarily by three large operators: Bristow Group (formerly Offshore Logistics); PHI, Inc. (formerly Petroleum Helicopters, Inc.); and Seacor (formerly ERA Aviation). These top three providers account for nearly 80 percent of the aircraft available in the Gulf. **Figure 4-19** shows the locations of the major helicopter service providers. Other competitors in this region are smaller, privately-owned entities or subsidiaries of larger companies. These companies include Evergreen, Houston Helicopters, and Rotorcraft Technologies. **Table 3-11** shows the distribution of helicopter hubs across the Gulf Coast States. There are 115 OCS-related heliports across southern Louisiana. Mississippi and Alabama only host four helicopter hubs each. There are no actively utilized OCS-related heliports in Florida, but the infrastructure exists should the demand arise.

OCS Support Vessels

The primary types of OCS support vessels include anchor handling, towing and supply vessel (AHTS), offshore supply vessels (OSV's) and their larger cousins, the marine platform supply vessels (PSV's), as well as crew boats and their related fast support vessels (FSV's). These vessels work solely to provide services to the offshore oil and gas industry, serving primarily exploratory and developmental drilling rigs and production facilities, and to support offshore and subsea maintenance activities. In addition to transporting deck cargo, most of these also transport liquid mud, potable and drilling water, diesel fuel, dry bulk cement and personnel between shore bases and offshore rigs and facilities. A new type of vessel that started working in the GOM in 2011 is the FPSO, mentioned briefly in the platform fabrication section above. The day rate for vessels depend on multiple factors such as contract length, boat type, boat location and especially the supply/demand balance at the time of contract negotiations. Rates may range from $2,000/day for a crew boat in rough economic times, to $40,000/day for an AHTS vessel at the peak of an economic cycle (Barrett, 2008).

Coastal Pipelines/Pipeline Landfalls/Pipeline Shore Facilities

A mature pipeline network exists in the GOM to transport oil and gas production from the OCS to shore. Almost the entirety of Federal OCS production is transported to shore via pipelines, with the exception of a small amount from shallow water that is barged to shore. Most new OCS pipelines connect to existing pipelines offshore. In recent decades, there has been a steady decline in the number of new pipeline construction projects that result in new pipeline landfalls (USDOI, MMS, 2007a). About 250 of the active OCS pipelines cross the Federal/State boundary into State waters. There are nearly 1,900 km (1,181 mi) of OCS pipelines in State waters. Over half of the pipelines in State waters are directly the result of the OCS Program.

Where a pipeline crosses the shoreline is referred to as a pipeline landfall. Gulfwide, about 60 percent of OCS pipelines entering State waters tie into existing pipeline systems and do not result in new pipeline landfalls. About 90 percent of OCS pipeline landfalls are in Louisiana (USDOI, MMS, 2007a). The oldest pipeline systems are also in Louisiana; some date back to the 1950's. There are over 100 active OCS pipelines making landfall, resulting in 200 km (124 mi) of pipelines onshore, with an average of 2 km (1 mi) per pipeline. About 80 percent of the onshore length of OCS pipelines is in Louisiana with the longest resulting in 50 km (31 mi). A small percentage of onshore pipelines in the EIA's are directly the result of the OCS Program.

Over the 10-year period, 1996-2005, there was an average of one new OCS pipeline landfall per year. During this same 10-year period, there were about 2,300 OCS pipelines installed. Of those, only 10 (0.4%) resulted in new pipeline landfalls. The remaining pipelines (99.6%) connected to the existing infrastructure in Federal or State waters (USDOI, MMS, 2007a). Since 2005, there have only been three new pipeline landfalls; all are located in Louisiana. **Table 3-14** shows all pipeline landfalls that have occurred since 1996 (USDOI, BOEMRE, 2011b). **Table 3-11** gives the numerical distribution of pipeline landfalls by state.

Coastal Barging/Barge Terminals

There is a tremendous amount of barging that occurs in the coastal waters of the GOM, and no estimates exist of the volume that is attributable to the OCS industry. Secondary barging of OCS oil often occurs between terminals or from terminals to refineries. Oil that is piped to shore facilities and terminals is often subsequently transported by barge up rivers, through the Gulf Intracoastal Waterway, or along the coast.

Other types of barging operations may occur in connection with OCS operations. Besides barging from platform to shore terminal, a few platform operators choose to barge their oil to other platforms where it is then offloaded to storage tanks and later piped to shore. Barging is used very infrequently as an interim transport system prior to the installation of a pipeline system.

Because the volumes of oil reported to BOEM are determined at the offshore locations prior to barging, the final destination of the oil varies. Therefore, BOEM does not have an exact number of onshore terminals receiving OCS oil production. Several barge terminals located along the Gulf Coast receive State production or imports. Barged OCS production may be taken to any existing barge terminal. BOEM scenario projections do not call for any barging of product as a result of the EPA proposed action. **Figures 4-16 and 4-17** illustrate the distribution of barge terminals across the EPA region. **Table 3-11** gives the numerical distribution of barge terminal facilities by state.

Processing Facilities

The category, Processing Facilities includes: gas processing facilities; liquefied natural gas facilities; refineries; and petrochemical plants. Each of these is described briefly in the following sections.

Gas Processing Facilities

Centrally located to serve different fields, natural gas processing facilities have two main purposes: (1) remove the impurities from the gas; and (2) separate the gas into its useful components for eventual distribution to consumers. After processing, gas is then moved into a pipeline system for transportation to an area where it is sold.

More than half (54%) of the natural gas processing facility capacity in the U.S. is located along the Gulf Coast and is available for supporting Federal offshore production (USDOE, Energy Information Administration, 2011b). Four of the largest capacity natural gas processing and treatment plants are found in Louisiana. **Figures 4-16 and 4-17** illustrate the distribution of gas processing facilities across the EPA region. **Figure 4-20** provides an illustration of the natural gas supply chain. **Table 3-11** gives the numerical distribution of gas processing facilities by state.

There is great variability in efficiency and capacity across the gas processing industry. As explained earlier, our socioeconomic analysis involves onshore impacts of the offshore OCS activities. Because the vast amount of onshore support for OCS activities in the EPA will not occur in Alabama and Florida and because nearly all of the onshore socioeconomic impacts will occur in other Gulf Coast States that have traditionally provided support for offshore activities, BOEM's socioeconomic impact analysis for the EPA is not limited to Alabama and Florida. Some states have processing facilities with higher capacities than those in others. The states incorporated in our EPA socioeconomic analysis (i.e., Louisiana, Mississippi, Alabama, and Florida) account for nearly 30 percent of the Nation's total processing capacity. Together Texas and Louisiana account for 49 percent of the natural gas processed in the United States (USDOE, Energy Information Administration, 2011b).

There has been a substantial decrease in offshore natural gas production, partially as a result of increasing emphasis on onshore shale gas development, which is less expensive to produce and provides larger per-well production opportunities and reserve growth. Also, there has been a trend toward more efficient gas processing facilities with greater processing capacities. In Alabama, Mississippi, and the eastern portion of south Louisiana, plant capacity increased significantly as plant expansions occurred and new larger plants were constructed in response to offshore production. While natural gas production on the OCS shelf (shallow water) has been rapidly declining, deepwater gas production has been increasing, but not quickly enough to make up the difference. Increasing onshore shale gas development, declining offshore gas production, and the increasing efficiency and capacity of existing gas processing facilities are trends that have combined to lower the need for new gas processing facilities along the Gulf Coast. Spare capacity at existing facilities should be sufficient to satisfy new gas production for many years, although there remains a slim chance that a new gas processing facility may be needed by the end of the 40-year life of an EPA proposed action (Dismukes, official communication, 2012a).

Liquefied Natural Gas Facilities

Liquefied natural gas (LNG) is natural gas converted to liquid form by cooling it to a temperature of -256°F (-124°C), the point at which gas becomes liquid. This simple process allows natural gas to be transported from an area of abundance to an area where it is needed. Once the LNG arrives at its destination, it is either stored as a liquid or converted back to natural gas and delivered to end-users. Liquefying gas is not a new process or technology; it is simply a process by which the physical properties of natural gas, primarily methane, are altered in order to transport the commodity from markets where it is abundant to those more limited in supply (Dismukes, 2008).

The LNG "value chain" (**Figure 4-20**) shows the various stages that natural gas is converted to LNG and delivered to end-users. Exploration and production is the first stage of the process. Here, natural gas reserves are developed, wells are drilled, and production is initiated in order to extract the hydrocarbon and transport it locally to a liquefaction facility for super-cooling. Insulated tankers serve as intermediate storage facilities before the gas is transported internationally.

The wide variety of pipeline systems and delivery markets makes the GOM attractive for LNG developers. Numerous large interstate pipelines parallel the Gulf Coast shoreline en-route to downstream markets. This allows LNG projects to tie into multiple interstate pipeline systems, with much shorter pipeline construction needs. The capital cost savings could help to mitigate the potential for Gulf Coast prices to trade at discounts to Louisiana. An LNG regasification facility can take advantage of this diverse pipeline system to move natural gas much like producers do today. Gulf Gateway Energy Bridge was the first operational LNG port in the U.S. It commenced operations in 2005 but it has now been retired from service (Excelerate Energy, 2011). Port Dolphin, located 28 mi (45 km) off the coast of Tampa Bay, Florida, was approved in October 2009, and the license was issued in April 2010 (USDOT, MARAD, 2011). Port Dolphin was designed as a more environmentally friendly closed loop facility. In Pascagoula, Mississippi, Gulf LNG Energy's 5 million tons per year terminal started operations in October 2011. It is located on 40 ac (16 ha) on Bayou Casotte and was also designed as a closed loop facility (Havens, 2009).

Refineries

Refineries vary in size, sophistication, and cost depending on their location, the types of crude they refine, and the products they manufacture. According to the most recent data, there are 148 refineries in the U.S, 137 of which are operable. These refineries range in size from small facilities able to process as little as 2,000 barrels of crude oil per day to those able to process over 550,000 bbl/day. Over one-third (37.23%) of operable U.S. petroleum refineries are located in the Gulf Coast States of Alabama, Louisiana, Mississippi, and Texas. About 30 percent of operable refineries are located in Louisiana and Texas alone. Louisiana has 18 operable refineries with a total capacity of over 3 million barrels per day, representing 18 percent of U.S. operable refining. There are no refineries in the State of Florida. (USDOE, Energy Information Administration, 2011a). **Figures 4-16 and 4-17** illustrate the geographic distribution of refineries across the EPA analysis area. There are only three refineries in Alabama and one in Mississippi. There are no refineries in Florida. **Table 3-11** gives the numerical distribution of refinery facilities by state.

Since 2000, refining capacity has increased by five percent with high utilization (between 90% and 93%), despite the fact that no new greenfield refinery has been constructed since the mid-1970's (the Marathon facility at Garyville, Louisiana, in 1976). Furthermore, cyclical differences between refined product output and demand are increasingly being met with imports from excess capacity in other parts of the world rather than on developing new domestic capacity. Most refineries are part of major, vertically integrated oil companies that are engaged in both upstream and downstream aspects of the petroleum industry. (USDOE, Energy Information Administration, 2011c).

Petrochemical Plants

Petrochemical plants are usually located in areas with close proximity to raw materials (petroleum-based inputs) and multiple transportation routes, including rail, road, and water. In many instances, such as development along the GOM, chemical plants arise because of their close proximity to other plants, which can often be their best customers. It is common for large integrated oil and gas companies that own refineries to have nearby chemical plant affiliates to take advantage of particular waste streams.

Along the GOM, the petrochemical industry is heavily concentrated in coastal south Louisiana and in various counties along the Alabama, Mississippi, and Florida coasts. The majority of petrochemical plants in the EPA are located in Louisiana (66). **Table 3-11** provides the numerical distribution for each state in the analysis area. **Figures 4-16 and 4-17** illustrate the geographical distribution of petrochemical facilities across the EPA analysis area.

Deepwater Horizon Explosion, Oil Spill, and Response

In response to the *Deepwater Horizon* explosion and oil spill, U.S. Dept. of the Interior Secretary Ken Salazar imposed a suspension on all offshore drilling. The initial suspension was modified on May 27, 2010, to allow drilling only in shallow waters <500 ft (152 m) deep (USDOI, Office of Public Affairs, 2010). On October 12, 2010, the last remaining deepwater drilling suspension was lifted, but deepwater drilling did not re-commence immediately and was dependent upon operators fulfilling stringent requirements and BOEM and BSEE approvals. In the months following the *Deepwater Horizon* explosion and oil spill and the declared suspension, companies removed a large portion of their equipment from Port Fourchon, and there was a substantial decrease in helicopter flights and servicing of rigs. Many companies trimmed their budgets by cutting hours and salaries. Support services companies, such as chemical suppliers, and welders, were also negatively affected (Lohr, 2010). The effects of this decreased demand rippled through the various infrastructure categories (e.g., fabrication yard, shipyards, port facilities, pipecoating facilities, gas processing facilities, waste management facilities, etc.) and also affected the oil and gas support sector businesses (e.g., drilling contractors, offshore support vessels, helicopter hubs, mud/drilling fluid/lubricant suppliers, etc.) because the decrease in offshore drilling activity translates into a decrease in demand for services. For example, the impacts of the suspension and permitting delays were experienced at Port Fourchon, where rental rates were cut by 30 percent for several months as an incentive for businesses to stay. This amounted to a $3 million revenue loss for The Greater Lafourche Port Commission. Fourteen months after the *Deepwater Horizon* explosion, businesses operating out of Port Fourchon were collectively operating at about 30 percent capacity compared with pre-*Deepwater Horizon* explosion levels. Activity levels are slowly improving at Port Fourchon and are expected to continue to improve. While production has been ongoing since the *Deepwater Horizon* explosion, the majority of the Port's business is in drilling and exploration activities (Chaisson, official communication, 2011). Because petroleum activities on the OCS and in State waters and coastal areas are driven by market forces, the *Deepwater Horizon* explosion and oil spill and related events are not expected to have long-term consequences on petroleum activities. Hence, these events are not expected to affect land use and infrastructure in the cumulative case.

BOEM will continue to monitor these infrastructure effects as they evolve over time. Although this information on infrastructure effects is evolving and may be relevant to reasonably foreseeable significant impacts to the Gulf economy, this information would not be essential to a reasoned choice among the alternatives because regardless of whether the decisionmaker chooses to hold a lease sale under the action alternatives or chooses the No Action Alternative, there remain many preexisting OCS leases in the EPA that would continue to support the economy. An EPA proposed action would not be expected to, on its own, result in significant impacts. The incomplete or unavailable information, even if available, would not be expected to change these conclusions.

Land use experienced a more immediate but short-term impact, with temporary waste staging areas and decontamination areas that were set up to handle the spill-related waste. Concerns about waste management practices were expressed by government and the public (Barringer, 2010). The USEPA, in consultation with USCG, issued solid-waste management directives to address the issue of contaminated materials, and solid or liquid wastes that were recovered as a result to cleanup operations (USEPA, 2010b and 2010c). Twenty-five waste staging areas were set up across Louisiana, Mississippi, Alabama, and Florida. Six decontamination areas were stationed in Mississippi, Alabama, and Florida. The USEPA visited each staging and decontamination area once per week and each landfill two times per month; their findings were documented on USEPA's website. There were some issues, mainly concerns over leaking receptacles and waste management practices during the immediate aftermath of the spill, but nothing that would appear to cause a long-term impact (USEPA, 2010d).

4.1.1.22.1.2. Impacts of Routine Events

Routine events in the GOM region can produce impacts to land use and coastal infrastructure, some adverse and some beneficial. **Chapter 3.1.2** discusses the coastal impact-producing factors and scenario for onshore infrastructure. The primary region of geographic influence in terms of onshore activity is coastal Louisiana, with a lesser influence on coastal Mississippi, Alabama, and Florida. Few offshore oil and gas activities occur in the Florida area.

Proposed Action Analysis

Impact-producing factors associated with an EPA proposed action that could affect land use and coastal infrastructure include (1) gas processing facilities, (2) pipeline landfalls, (3) service bases, (4) navigation channels, and (5) waste disposal facilities.

Chapter 3.1.2.1 discusses projected new coastal infrastructure that may result from an EPA proposed action, including the potential need for the construction of new facilities and/or the expansion of existing facilities. All onshore infrastructure facilities require permits for construction and operation. BOEM is not the permitting agency for these activities. The permitting agencies for any onshore infrastructure would be the State in which the activity would occur, and/or COE, and/or USEPA. According to the scenario analysis in **Chapter 3.1.2.1.4.2**, the construction of 0-1 new gas processing facilities would be expected to occur near the end of the 40-year life of an EPA proposed action. Most of the projected new pipeline would be offshore and would tie into the existing offshore pipeline infrastructure. According to the scenario analysis, 0-1 new pipeline landfalls would be expected to occur toward the end of the 40-year lifespan of an EPA proposed action. According to these BOEM projections, no other new coastal infrastructure would be expected to result from an EPA proposed action. Given the uncertain environment of the post-*Deepwater Horizon* explosion and oil spill, the application of the scenario revised for an EPA proposed action is very conservative since the likelihood is diminished that any new gas processing facility or pipeline landfall would result from an EPA proposed action. That is, the effect of the drilling suspensions, changes in Federal requirements for drilling safety, and the current pace of permit approvals has depressed existing demand for gas processing facilities and pipeline landfalls; hence, the likelihood of new gas processing facilities or pipeline landfalls has moved closer to zero and farther from one (Dismukes, official communication, 2012a). However, BOEM continues to monitor all resources for changes that are applicable to land use and infrastructure. Maintenance dredging of existing navigation channels is still expected, but no new navigation channels are expected to be dredged as a result of an EPA proposed action. The volume of OCS-generated waste is closely correlated with the level of offshore drilling and production activity. Demand for waste disposal facilities is influenced by the volume of waste generated. At this time, it is unclear how long the current slowdown in activity will continue or how it might affect later years. Until OCS drilling activity recovers, potential for a new waste facility as a result of an EPA proposed action is highly unlikely.

Chapters 4.1.1.24.1.1 and 3.1.2.1.4.2 discuss gas processing facilities and the potential for new facilities and/or expansion at existing facilities. Over the past several years, there has been a substantial decrease in offshore natural gas production, partially as a result of increasing emphasis on onshore shale gas development, which is less expensive to produce and provides larger per well production opportunities and reserve growth. Also, there has been a trend toward more efficient gas processing facilities with greater processing capacities. In Alabama, Mississippi, and the eastern portion of south Louisiana, plant capacity increased significantly as plant expansions occurred and new larger plants were built in response to offshore production (USDOE, Energy Information Administration, 2006). While natural gas production on the OCS shelf (shallow water) has been rapidly declining, deepwater gas production has been increasing, but not quickly enough to make up the difference. Increasing onshore shale gas development, declining offshore gas production, and the increasing efficiency and capacity of existing gas processing facilities are trends that have combined to lower the need for new gas processing facilities along the Gulf Coast. Combined with this, existing facilities that were already operating at about 50 percent of capacity prior to the 2005 hurricane season, are operating at even lower capacity utilization levels now. Spare capacity at existing facilities should be sufficient to satisfy new gas production for many years, although there remains a slim chance that a new gas processing facility may be needed by the end of the 40-year life of an EPA proposed action (Dismukes, official communication, 2012a).

BOEM analyzes the potential for new pipeline landfalls to determine the potential impacts to wetlands and other coastal habitats. In **Chapter 3.1.2.1.6**, BOEM assumes that the majority of new Federal OCS pipelines would connect to the existing infrastructure in Federal and state waters and that very few would result in new pipeline landfalls. Therefore, BOEM projects up to one pipeline landfall per EPA proposed action. Prior to this EIS, the Agency tested this assumption by analyzing past lease sale outcomes (USDOI, MMS, 2007a). This analysis shows that it is generally unlikely that even one landfall would result from an EPA proposed action. A mature pipeline network already exists in the GOM and companies have very strong financial incentives to reduce their costs by designing and utilizing pipeline systems to their fullest extent possible. Companies consider "economies of scale" in pipeline transportation, maximizing the amount of product moved through a constructed pipeline to decrease the long-run, average cost of production. Mitigation costs for any new wetland and environmental impacts, as well as various landowner issues at the landfall point are additional considerations. These are strong incentives to move new production into existing systems and to avoid creating new landfalls (USDOI, MMS, 2007a). This analysis confirms BOEM's assumption that the majority of new pipelines constructed would connect to the existing infrastructure in Federal and state waters and that very few would result in new pipeline landfalls. However, there may be instances where new pipelines would need to be constructed. Location would be a determining factor; if there are no existing pipelines reasonably close and it is more cost effective to construct a pipeline to shore, then there may be a new OCS pipeline landfall. However, the very strong financial incentives to link into the existing, mature pipeline network make this highly unlikely (Dismukes, official communication, 2012a). **Chapters 4.1.1.3 and 4.1.1.4** provide a detailed discussion of coastal barrier beaches and wetlands, respectively, and potential pipeline landfall impacts to those resources.

Chapters 4.1.1.24.1.1 and 3.1.2.1.1 present a description of OCS-related service bases. A service base is a community of businesses that load, store, and supply equipment, supplies, and personnel that are needed at offshore work sites. An EPA proposed action is not projected to change existing OCS-related service bases or require construction of new service bases. Instead, it would contribute to the use of existing service bases. **Figure 4-19** shows the 50 service bases the industry currently uses to service the OCS. These facilities are identified as the primary service bases from plans received by BOEM. The ports of Fourchon, Cameron, Venice, and Morgan City, Louisiana, are the primary service bases for GOM mobile rigs. Major platform service bases in the EPA are Cameron, Fourchon, Intracoastal City, Morgan City, and Venice, Louisiana; Pascagoula, Mississippi; Theodore, Alabama; and Panama City, Florida.

Chapter 3.1.2.1.8 discusses navigation channels along the Gulf Coast. Much of the traffic navigating these channels is unrelated to OCS activity, and the current system of navigation channels in the northern GOM is projected to be adequate for accommodating traffic generated by an EPA proposed action. The Gulf-to-port channels and the Gulf Intracoastal Waterway that support prospective OCS ports are generally deep and wide enough to handle OCS-related traffic and are maintained by regular dredging (**Figure 3-6**). The COE is the responsible Federal agency for the regulation and oversight of navigable waterways. The maintained depths for these waterways are shown in **Table 3-11**. All lease sales contribute to the demand for OSV support; hence, it also contributes to the vessel traffic that moves in and out of support facilities. Therefore, an EPA proposed action is likely to contribute to the continued need for maintenance dredging of existing navigation channels. However, no new navigation channels are expected to be dredged as a result of an EPA proposed action because the existing system of navigation channels is projected to be adequate to allow proper accommodation for vessel traffic that would occur as a result of an EPA proposed action. Maintenance dredging is essential for proper water depths in channels to allow all shipping to move safely through the waterways to ports, services bases, and terminal facilities. Several million cubic yards of sand, gravel, and silt are dredged from waterways and harbors every year. This is a controversial process because it necessarily occurs in or near environmentally sensitive areas such as valuable wetlands, estuaries, and fisheries (Dismukes, 2010). **Chapter 4.1.1.4** provides a discussion of wetlands and the impacts of navigation channel dredging.

Chapters 4.1.1.24.1.1, 3.1.2.1.9, and 3.1.2.2 discuss OCS waste disposal. The scenario analysis concluded that no new solid-waste facilities would be built as a result of a single lease sale. Focused scenario analysis research into onshore waste disposal further supports the conclusion that existing solid-waste disposal infrastructure is adequate to support both existing and projected offshore oil and gas drilling and production needs (Dismukes et al., 2007). The industry trend is toward innovative methods to handle wastes to reduce the potential for environmental impacts; e.g., hydrocarbon recovery/recycling programs, slurry fracture injection, treating wastes for reuse as road base or levee fill, and segregating waste streams to reduce treatment time and improve oil recovery. The volume of OCS waste generated is closely correlated with the level of offshore drilling and production activity (Dismukes, 2010). Before the *Deepwater Horizon* explosion, oil spill, and response, BOEM analyses indicated that there was an abundance of solid-waste capacity in the GOM region and thus highly unlikely that any new waste facilities would be constructed. If any increase in the need for capacity develops, it would probably be met by expansion of existing facilities. However, now it is unclear whether this would remain true, and more research is needed (Dismukes, official communication, 2012a). More recently, due to the drilling suspensions and current pace of permit approvals, there has been some reduction in offshore drilling activity. Given this situation, the demand for waste disposal facilities may not be likely to increase. However, at this time BOEM cannot predict how long this current pace will continue or how long it will take for activity levels to recover. BOEM continues to monitor waste-disposal demands and activity in the post-*Deepwater Horizon* explosion and oil spill environment. **Chapter 4.1.1.24.4.2** provides a discussion of environmental justice issues related to waste disposal facilities.

Summary and Conclusion

The impacts of routine events associated with an EPA proposed action remain somewhat uncertain due to the post-*Deepwater Horizon* explosion and oil spill environment, the effects of the drilling suspension, the changes in Federal requirements for drilling safety, and the current pace of permit approvals. BOEM projects 0-1 new gas processing facilities and 0-1 new pipeline landfalls for an EPA proposed action. However, based on the most current information available, there is only a very slim chance that either would result from an EPA proposed action, and if a new gas processing facility were to result, it would likely occur toward the end of the 40-year analysis period. The likelihood of a new gas processing facility or pipeline landfall is much closer to zero than to one (Dismukes, official communication, 2012a). BOEM anticipates that there would be maintenance dredging of navigation channels and an increase in activity at services bases as a result of an EPA proposed action. If drilling activity recovers post-*Deepwater Horizon* explosion and oil spill and increases, there could be new increased demand for a waste disposal services as a result of an EPA proposed action. Because of the current near-zero estimates for a pipeline landfall and gas processing facility construction, the routine activities associated with an EPA proposed action would have little effect on land use.

As a result of the *Deepwater Horizon* explosion, oil spill, and response, it is too early to determine substantial, long-term changes in routine event impacts to land use and infrastructure. The long-standing, well-established system of onshore support for the oil and gas industry is extensive, mature, and not subject to rapid fluctuations. BOEM anticipates any changes would become apparent over time. Therefore, BOEM recognizes the need to continue monitoring all resources for changes that are applicable for land use and infrastructure. From the information described above, in regard to land use and infrastructure, it does not appear that there would be adverse impacts from routine events associated with an EPA proposed action, especially given the small size and limited impact expected for such an action.

4.1.1.22.1.3. Impacts of Accidental Events

Background/Introduction

Accidental events (impact-producing factors) associated with an EPA proposed action that could affect land use and coastal infrastructure include (1) oil spills, (2) vessel collisions, and (3) chemical/drilling-fluid spills. The *Deepwater Horizon* explosion and oil spill was an accidental event of historic and catastrophic proportion that was not reasonably foreseeable and not part of an EPA proposed action. This spill event was the largest blowout in U.S. history, and the first to occur on the OCS in over 30 years. Such events should be distinguished from accidental events that are smaller in scale and that occur more frequently. **Chapter 3.2.1** provides a detailed discussion of oil spills that have occurred and their frequency. This section is limited to discussion of accidental events that have a higher probability of occurring but with less impact than a catastrophic event, which is not reasonably expected and not part of an EPA proposed action. Detailed analysis of a high-impact, low-probability catastrophic event, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* explosion and oil spill is provided in **Appendix B**.

Proposed Action Analysis

Oil spills may be associated with exploration, production, or transportation activities that result from an EPA proposed action. Detailed risk analyses of offshore oil spills ≥1,000 bbl, <1,000 bbl, and coastal spills associated with an EPA proposed action are provided in **Chapters 3.2.1.4, 3.2.1.5, and 3.2.1.6**. Because oil spilled in the offshore areas normally volatilizes and is dispersed by currents, it has a low probability of contacting coastal areas. Oil spills in coastal and inland waters, such as spills resulting from the operations of offshore supply vessels, pipelines, barges, tanker ships, and ports are more likely to affect BOEM-recognized coastal infrastructure categories. For example, if waterways are closed to traffic, this may result in impacts to upstream and downstream business interests as it impedes the flow of commerce. The probability of a particular number of offshore spills estimated to occur in OCS offshore waters as a result of either facility or pipeline operations related to an EPA proposed action are presented in **Table 3-21**.

Vessel collisions may be associated with exploration, production, or transportation activities that result from an EPA proposed action. **Chapter 3.2.4** provides a detailed discussion of vessel collisions. BOEM's data show that, from 2006 through 2010, there were 107 OCS-related collisions (USDOI, BOEMRE, 2011c). The majority of vessel collisions involve service vessels colliding with platforms or pipeline risers, although sometimes vessels collide with each other. Human error accounted for about half of all reported vessel collisions from 2006 through 2010. These collisions often result in spills of various substances and, while most occur on the OCS far from shore, ones in coastal waters can have consequences to land use and coastal infrastructure. For example, on July 23, 2008, a barge carrying heavy fuel collided with a tanker ship in the Mississippi River at New Orleans, Louisiana. Over several days the barge leaked approximately 419,000 thousands of gallons of fuel. From New Orleans to the south, 85 mi (137 km) of the river were closed to all traffic while cleanup efforts were undertaken, causing a substantial backup of river traffic (USDOC, NOAA, 2008c). On Tuesday July 27, 2010, a dredge vessel ran into a wellhead in the Barataria Waterway. The wellhead leaked a mixture of oil, natural gas, and water into Barataria Bay. A sheen covered more than 6 mi^2 (16 km^2) of water. Over 150 spill-response personnel and 31 boats initially responded to the accident (*Coast Guard News*, 2010). In February, 2012, a tank barge collided with a construction barge in the Mississippi River north of New Orleans, Louisiana, spilling an estimated 6,813 gallons of crude oil from the tank barge. The river was temporarily closed to all traffic for 5 miles. Response crews deployed 4,700 feet of containment boom and retrieved approximately 165 cubic yards of oiled debris (*Coast Guard News*, 2012, *WorkBoat.com*, 2012).

Chemical/drilling-fluid spills may be associated with exploration, production, or transportation activities that result from an EPA proposed action. **Chapter 3.2.1.4** provides a detailed discussion of chemical and drilling-fluid spills. Each year, between 5 and 15 chemical spills are expected to occur; most of these are ≤50 bbl in size. Large spills are much less frequent. For example, from 1964 to 2005, only two chemical spills of ≥1,000 bbl occurred. Even though additional production chemicals are needed in deepwater operations where hydrate formation is a possibility, spill volumes are expected to remain stable because of advances in subsea processing.

With the exception of a catastrophic accidental event, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* explosion and oil spill, the impact of oil spills, vessel collisions, and chemical spills are not likely to last long enough to adversely affect overall land use or coastal infrastructure in the analysis area.

A detailed analysis of a high-impact, low-probability catastrophic event, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* explosion and oil spill may be found in **Appendix B**.

Summary and Conclusion

Accidental events associated with an EPA proposed action would occur at different levels of severity, based in part on the location and size of event. The typical types of accidental events that could affect land use and coastal infrastructure include oil spills, vessel collisions, and chemical/drilling-fluid spills. These may occur anywhere across the spectrum of severity. Typically, accidental events related to OCS activities are generally smaller in scale based on historic experience, and they must be distinguished from low-probability, high-impact catastrophic events, which are not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* explosion and oil spill. Typically, the impact of small-scale oil spills, vessel collisions, and chemical/drilling fluid spills are not likely to last long enough to adversely affect overall land use or coastal infrastructure in the analysis area.

4.1.1.22.1.4. Cumulative Impacts

Background/Introduction

The OCS- and State-related factors consist of prior, current, and future OCS and State lease sales. **Chapter 4.1.1.22.1.1** discusses the socioeconomic analysis area, land use, and OCS-related oil and gas infrastructure associated with the analysis area. The vast majority of this infrastructure also supports oil and gas production in State waters as well as in coastal areas onshore. The cumulative impact analysis is divided into OCS oil- and gas-related impacts and non-OCS oil- and gas-related impacts.

OCS Oil- and Gas-Related Impacts

According to BOEM development scenario analysis, the construction of 0-1 new gas processing facilities would be expected to occur near the end of the 40-year life of an EPA proposed action. Most new pipelines would be offshore and would tie into the existing offshore pipeline infrastructure. According to the scenario analysis, 0-1 new pipeline landfalls would be expected to occur toward the end of the 40-year lifespan of an EPA proposed action. Those projections also call for no new waste disposal facilities due to existing excess capacity along the Gulf Coast. Research based on the analysis of historical data further validated BOEM's past scenario projections of new gas processing facilities and new pipeline landfalls and found its projections to be conservative. BOEM makes conservative infrastructure scenario estimates; a projection of between 0 and 1 is more likely to be 0 than 1. These scenario estimates have become more conservative in the aftermath of the *Deepwater Horizon* explosion and oil spill and are especially conservative given the small size and expected impact of an EPA proposed action (Dismukes, official communication, 2012a).

In the months following the *Deepwater Horizon* explosion and oil spill, much information has been generated regarding the consequences of the oil spill and subsequent drilling suspensions. Because petroleum activities on the OCS and in State waters and coastal areas are driven by market fundamentals, the *Deepwater Horizon* explosion, oil spill, and response and related events are not expected to have long-term consequences on petroleum activities. Hence, these events are not expected to affect land use and infrastructure in the cumulative case. However, because the post-*Deepwater Horizon* environment is dynamic and ever-changing, BOEM is currently conducting ongoing monitoring of post-*Deepwater Horizon* impacts to land use and coastal infrastructure, and BOEM will conduct targeted and peer-reviewed research should this monitoring identify long-term impacts of concern.

Land use in the analysis area will continue to evolve over time. The majority of change is likely to occur from general, regional economic and demographic growth rather than from activities associated with current OCS and/or State offshore petroleum production or future planned OCS or State lease sales. BOEM development scenarios consider demand from both current and future OCS and State leases. While BOEM scenario analysis projects 0-1 new gas processing facilities to result from an EPA proposed action, it is highly unlikely that few (if any) new, greenfield gas processing facilities would actually be constructed along the EPA. Instead, it is likely that any additional natural gas processing capacity that is needed in the industry would be developed at existing facilities through future investments in expansions and/or replacement of depreciated capital equipment.

Over the past several years, there has been a substantial decrease in offshore natural gas production, partially as a result of increasing emphasis on onshore shale gas development, which is less expensive to produce and provides larger per-well production opportunities and reserve growth. Also, there has been a trend toward more efficient gas processing facilities with greater processing capacities (Dismukes, 2011). In Alabama, Mississippi, and the eastern portion of South Louisiana, plant capacity increased significantly as plant expansions occurred and new larger plants were built in response to offshore production (USDOE, Energy Information Administration, 2006). While natural gas production on the OCS shelf (shallow water) has been rapidly declining, deepwater gas production has been increasing, but not quickly enough to make up the difference. Increasing onshore shale gas development, declining offshore gas production, and the increasing efficiency and capacity of existing gas processing facilities are trends that have combined to lower the need for new gas processing facilities along the Gulf Coast. Combined with this, existing facilities that were already operating at about 50 percent of capacity prior to the 2005 hurricane season are now operating at even lower capacity utilization levels now. Spare capacity at existing facilities should be sufficient to satisfy new gas production for many years, although there remains a slim chance that a new gas processing facility may be needed by the end of the 40-year life of an EPA proposed action (Dismukes, official communication, 2012a). Any additions to, or expansions of, current facilities would also support State oil and gas production and, should any occur, the land in the analysis area is sufficient to handle development.

Service base infrastructure supports offshore petroleum-related activities in both OCS and State waters. Any changes to offshore support infrastructure that occurs in the cumulative case are expected to be contained on available land. Service bases are industrial ports and are located in designated industrial parks designed with the intent to accommodate future oil and gas needs. Also, most of these are located in BOEM analysis areas that have strong industrial bases. Shore-based OCS and State servicing is expected to increase mainly in Port Fourchon, Louisiana, and to a lesser degree in the Port of Mobile, Alabama, for the EPA. There is sufficient land designated in commercial and industrial parks and adjacent to the Mobile port area. This would minimize disruption possible from port expansions to current residential and business use patterns. In contrast, while Port Fourchon has land designated for future expansion, the port has a limited amount of waterfront land available and, because of surrounding wetlands, may face capacity constraints in the long term. Port Fourchon serves as the primary support base for over 90 percent of existing deepwater projects (The Greater Lafourche Port Commission, 2012a). In the months following the *Deepwater Horizon* explosion and oil spill and the May 2010 drilling suspension, port tenants were struggling with the drop in exploration drilling. After the drilling suspension was lifted on October 12, 2010, activity levels remained depressed for several months. This was due to more stringent Federal enforcement and industry's efforts to fulfill new safety requirements. More recently, two years after the *Deepwater Horizon* explosion and oil spill, activity levels have been steadily increasing. There has been much interest in leasing at the Port's latest expansion project and there is much optimism about the future with more service vessels being built and increased demand for support services (Chaisson, official communication, 2012). Deepwater exploratory drilling is a huge economic driver for jobs, investments, vessels, etc. at Port Fourchon. Because the economic prospectivity of the GOM has not changed, BOEM expects deepwater activity to continue gradually increasing and to eventually reach pre-*Deepwater Horizon* levels.

The transportation infrastructure surrounding Port Fourchon provides a crucial link between the Port and the rest of the region. LA Hwy 1 is the only highway into and out of Port Fourchon. This two-lane highway is surrounded by marshland and has been prone to extreme flooding over the years, jeopardizing critical access to Port Fourchon, which is the service base the vast majority of OCS deepwater activity. While, in the absence of planned expansions, LA Hwy 1 would not be able to handle future OCS and State activities, a multiphase LA Hwy 1 improvement project is currently underway. On July 8, 2009, the new LA Hwy 1 fixed-span toll bridge over Bayou Lafourche connecting Port Fourchon and Leeville, Louisiana, was opened and marks partial completion of the first phase of improvements to LA Hwy 1 (*TOLLROADnews*, 2009). A large portion of the tolls collected are paid by transportation activities associated with OCS oil- and gas-related activities. In December, 2011, officials opened the newly elevated portion of LA Highway 1 between the Leeville Bridge and Port Fourchon (Louisiana Dept. of Transportation and Development, 2011). There are continuing efforts to secure Federal funding to construct Phase 2 of the project, an elevated highway from the Golden Meadow floodgates to Leeville, Louisiana (LA1 Coalition, 2012). In the past several years, $20 million have been invested in the South Lafourche Leonard Miller Jr. Airport for improvements that include the paving of airport roadways, runway expansion and overlay, installation of fuel tanks, and construction of an extra-large hanger. The runway expansion and overlay have increased the maximum aircraft weight to allow access by 20-passenger jets. In September, 2011, the Federal Aviation Administration granted over $4 million to fund completion of a full parallel taxiway (The Greater Lafourche Port Commission, 2012b). Until limited by surrounding wetlands, BOEM anticipates further expansions at both the airport and Port Fourchon in future years as deepwater exploration activities continue to increase.

If the service base expansion occurs in the cumulative case at the port of Mobile, Alabama, this expansion would occur in areas that are already industrialized and would have little effect on land use and infrastructure. This is also true for Port Fourchon, Louisiana, although, in the cumulative case, expansion of this service base may eventually be constrained by surrounding wetlands. Limited highway access and airport capacity could also constrain service base expansion at Port Fourchon in the cumulative case. However, ongoing and planned improvement projects make this unlikely.

Non-OCS Oil- and Gas-Related Impacts

Many non-OCS-related factors contribute substantially to the cumulative impacts to land use and coastal infrastructure, including the following: housing and other residential developments; the development of private and publically owned recreational facilities; the construction and maintenance of industrial facilities and transportation systems; urbanization; city planning and zoning; changes to public facilities such as water, sewer, educational and health facilities; changes to military bases and reserves; changes in population density; changes in State and Federal land-use regulations; and changes in non-OCS-related demands for water transportation systems and ports.

While the OCSLA is close to 60 years old, humans have been living off of the bays and estuaries of the Gulf Coast for considerably longer. Archeological evidence has established human settlements in northern Louisiana as far back as 3500 Before Common Era (Saunders et al, 2005). Following European settlement, first by the Spanish in Florida during the 16th century and then in Alabama and Louisiana by the French in the 17th century, people began to make greater demands on the landscape (Saunders et al., 2005). Both the French and Spanish crowns required lessors of river frontage property to construct and maintain flood protection levees, impounding the river and interrupting the normal alluvial processes. Coupled with expansive agriculture and urbanization across the Gulf Coast, European and then American settlers contributed to a landscape that mirrors much of the modern world. The OCS-related demands upon coastal infrastructure and land use tend to be geographically concentrated as compared with historic residential settlement within the region. For instance, Port Fourchon is the service base for over

90 percent of OCS deepwater production and serves as a conduit for 15-18 percent of the Nation's entire oil supply (The Greater Lafourche Port Commission, 2011). As one of the most significant footprints within the OCS-related infrastructure corridor, Port Fourchon comprises only 2.7 developed square miles within a close to 46,875-square-mile state. In Louisiana, there are 105 persons per square mile, and in Lafourche Parish (where Port Fourchon is located) there are 90 persons per square mile, both above the national average of 87 persons per square mile (USDOC, Census Bureau, 2010). In Florida, there are on average 350 persons per square mile. More people living in an area typically correlate with greater demand on infrastructure and services. With a larger population comes a larger residential and commercial footprint, along with a greater demand for utilities and infrastructure. More buildings demand additional plumbing and electricity and so on. If there are more cars commuting within regions, then this creates pressure on available infrastructure and typically necessitates the expansion or creation of new infrastructure.

The future of non-OCS oil- and gas-related land use and infrastructure will largely be determined by economic drivers that influence where people settle or re-locate. In Louisiana, for instance, people are moving away from coastal parishes because of coastal land loss, while in Florida, more people are moving to coastal counties, contributing to a 20-percent population rate increase since 1990 (Smith, 2005).

Summary and Conclusion

The coastal infrastructure supporting an EPA proposed action represents only a very small portion of the coastal land and infrastructure throughout the EPA and Gulf of Mexico, and little change is expected to occur due to changing agricultural and extractive (e.g., lumbering, petroleum) uses of onshore land. Many non-OCS-related factors contribute substantially to the cumulative impacts to land use and coastal infrastructure, including the following: housing and other residential developments; the development of private and publically owned recreational facilities; the construction and maintenance of industrial facilities and transportation systems; urbanization; city planning and zoning; changes to public facilities such as water, sewer, educational and health facilities; changes to military bases and reserves; changes in population density; changes in State and Federal land-use regulations; and changes in non-OCS-related demands for water transportation systems and ports. Given the overwhelming contribution of these non-OCS-related factors to the cumulative impacts on land use and coastal infrastructure and the small incremental contribution of an EPA proposed action, the cumulative impacts on land use and coastal infrastructure are also expected to be minor.

Activities relating to the OCS Program and State oil and gas production are expected to minimally affect the current land use of the analysis area because most subareas have strong industrial bases and designated industrial parks to accommodate future growth in oil and gas businesses. BOEM projects 0-1 new gas processing facilities and 0-1 new pipeline landfalls for an EPA proposed action, although this is a conservative estimate and the number is expected to be much closer to zero than to one. If a new gas processing facility or pipeline landfall were to occur, it would likely be toward the end of the 40-year analysis period (Dismukes, official communication, 2012a). There may be increased demand for waste disposal services as a result of an EPA proposed action, but current excess capacity at existing waste disposal facilities should be able to handle any increase. Any service base expansion in the cumulative case would be limited, would occur on lands designated for such purposes, and would have minimal effects on land use and infrastructure. However, in the cumulative case it is possible that Port Fourchon expansions may eventually be constrained by surrounding wetlands. Based on the available information and current BOEM scenario projections, the cumulative impacts on land use and coastal infrastructure from OCS-related activities are expected to be minor. Therefore, the incremental contribution of an EPA proposed action to the cumulative impacts on land use and coastal infrastructure are also expected to be minor.

4.1.1.22.2. Demographics

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different from the adjacent CPA leased blocks with regard to socioeconomic impacts to demographics. An EPA proposed action would be on a smaller scale than a proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for demographics can be found in Chapter 4.2.1.23.2 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.23.2 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from these chapters would be equally applicable for demographics regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for demographics presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for demographics presented. Therefore, as summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS still apply and are applicable, and they are hereby incorporated by reference for proposed EPA Lease Sales 225 and 226. The impact conclusions for demographics presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are hereby incorporated by reference as applicable for proposed EPA Lease Sales 225 and 226.

Additionally, further research was conducted for information published on demographics, and various Internet sources were examined to determine any recent information. This new information has been integrated into information presented in this EIS. No new significant information was discovered regarding demographics since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, information regarding the impacts of the *Deepwater Horizon* explosion, oil spill, and response remains incomplete at this time. Studies regarding demographics concerns in light of the *Deepwater Horizon* explosion, oil spill, and response are only in their infancy, and it may be years before data are available and certainly not within the timeframe contemplated by this NEPA analysis. The NRDA process, which is ongoing, may help to provide information about issues relating to subsistence and other indigenous reliance on natural resources. This information is unavailable and incomplete at this time, regardless of costs. In its place, subject-matter experts have used credible information that is available and applied using accepted socioeconomic methodologies. Although most criteria related to demographics may not be essential to a reasoned choice among alternatives, health impacts may be essential. Nevertheless, long-term health studies are pending and may not be available for use for several years or longer. What credible information is available was applied using accepted methodologies in the health analysis below. BOEM will continue to seek additional information as it becomes available and bases the analysis in Chapter 4.2.1.23.2 in 2012-2017 WPA/CPA Multisale EIS on the best information currently available.

4.1.1.22.2.1. Description of the Affected Environment

BOEM examines demographic and economic impacts over the 40-year life of an EPA proposed action. The methodology BOEM uses to measure employment impacts (and subsequent demographic impacts) recognizes that most of the employment that would be created due a proposed EPA lease sale would not be generated until 4-7 years after the proposed lease sale.

Offshore waters of the WPA, CPA, and EPA lie adjacent to coastal Texas, Louisiana, Mississippi, Alabama, and Florida. The Bureau of Labor Statistics groups sets of counties and parishes into labor market areas (LMA's) on the basis of inter-county commuting patterns. Twenty-three of these LMA's span the Gulf Coast and comprise the 13 BOEM-defined EIA's. **Table 4-18** lists the counties and parishes that comprise the LMA's and EIA's, and **Figure 4-15** illustrates the counties and parishes that comprise the EIA's. The nature of the offshore oil and gas industry is such that the same onshore impact areas are used to examine activities in all planning areas. First, workers commute long distances for rotations offshore that last for 2-3 weeks at a time, and there is great flexibility between where employees live and where they work offshore in the GOM. Second, industry equipment and supplies for offshore projects in both planning areas come from throughout the region. Although the same overall onshore impact areas are used to analyze sales in all planning areas, the levels of economic impacts to the different individual EIA's do vary between planning areas.

Tables 4-19 through 4-31 provide projections of employment, income, wealth, business patterns, and racial composition for individual EIA's; these data were obtained from the 2012 CEDDS data provided by Woods & Poole Economics, Inc. (2011). **Table 4-32** provides projections of the evolution of the total population in all EIA's in future years. These projections assume the continuation of existing social, economic, and technological trends at the time of the forecasts (these projections were made subsequent to the *Deepwater Horizon* explosion, oil spill, and response). In 2011, the total Gulf Coast population was approximately 24.85 million. In 2011, the EIA's with the largest populations were TX-3 (6.32 million), FL-4 (6.26 million), and FL-3 (3.69 million). The EIA's with the smallest populations were LA-1 (349,090), MS-1 (484,980), and LA-2 (591,720). For all EIA's combined, it is expected that the total population will grow at a 1.2 percent rate between 2011 and 2051. The fastest population growth is expected in TX-3 (1.5%) and TX-1 (1.5%); the slowest population growth is expected in LA-4 (0.5%) and MS-1 (0.6%).

The racial and ethnic composition of the analysis area reflects both historical settlement patterns and current economic activities. For example, those areas in Texas where Hispanics are the dominant group (i.e., EIA TX-1 where they represent 82% of the population) were also first settled by people from Mexico. Their descendants remain, many of whom work in farming, tending cattle, or in low-wage industrial jobs. By TX-3, the size of the African-American population increases, and there is a more diversified racial mix, indicating more urban and diverse economic pursuits. In Louisiana, Mississippi, Alabama, and northern Florida (FL-1 and FL-2), African-Americans outnumber Hispanics, reflecting the dominant minority status of African-Americans throughout much of the analysis area. A more detailed discussion of minority populations in the area can be found in **Chapter 4.1.1.22.4.1**.

4.1.1.22.2.2. Impacts of Routine Events

Background/Introduction

The addition of any new human activity, such as oil and gas development resulting from an EPA proposed action, can affect local communities in a variety of ways. Typically, these effects are in the form of people and money, which can translate into changes in local social and economic institutions. Any demographic changes arising from an EPA proposed action are expected to be minimal.

Proposed Action Analysis

Population

Projected population changes reflect the number of people dependent on income from OCS-related employment for their livelihood (i.e., family members of oil and gas workers). The population projections due to a proposed EPA lease sale are calculated by multiplying the employment projections for the lease sale (**Chapter 4.1.1.22.3.2**) by the average household size of 2.59 persons from the 2010 U.S Census. Baseline employment projections for future years are based on Woods & Poole Economics, Inc. (2011). **Table 4-33** presents estimates of the population effects of a proposed EPA lease sale during the peak year at which these effects would occur. For example, in LA-1, the low-case production scenario would lead to an increase in population of 36 people in 2021, which would represent 0.01 percent of the area's population in 2021. The population effects of an EPA proposed action would be slightly greater in Louisiana than in other states. However, an EPA proposed action should not cause population impacts >0.1 percent of the total population in any EIA.

Age

The age distribution of the analysis area as a result of an EPA proposed action is projected to remain virtually unchanged. Given both the low levels of population growth and industrial expansion associated with an EPA proposed action, the age distribution pattern discussed in **Chapter 4.1.1.22.2.1** is expected to continue through the life of an EPA proposed action.

Race and Ethnic Composition

The racial distribution of the analysis area is projected to remain virtually unchanged as a result of an EPA proposed action. The oil and gas industry has been operating in the Gulf Coast region for over 60 years, is well-established, and is completely intermeshed with the local communities and economies.

A single proposed action has negligible, if any, impacts on population trends in general or on racial and ethnic composition in particular. Most of the people who may be employed as a result of a lease sale are already working in the industry. Very few new jobs are created on the basis of a single lease sale, thus changes in population cannot be conclusively tied to a single lease sale. **Chapter 4.1.1.22.4** discusses prior industry trends and efforts to recruit Laotian refugees and Mexican migrant workers. But, given the low levels of employment and population growth and the industrial expansion projected as a result of an EPA proposed action, the racial distribution pattern described above in **Chapter 4.1.1.22.2.1** is expected to continue through the life of an EPA proposed action.

Summary and Conclusion

An EPA proposed action is projected to minimally affect the demography of the analysis area. Population impacts from an EPA proposed action are projected to be minimal for any EIA in the Gulf of Mexico region. The baseline population patterns and distributions, as projected and described in **Chapter 4.1.1.22.2.1**, are expected to remain virtually unchanged as a result of an EPA proposed action.

4.1.1.22.2.3. Impacts of Accidental Events

Background/Introduction

The addition of human activity associated with an oil-spill response may affect local communities in a variety of ways. Accidental events may cause short-term population movements as individuals seek employment related to the event or have their existing employment displaced during the event. Such population movements are relatively small and short term. The economic impacts of an accidental event (**Chapter 4.1.1.24.3.3**) and the impacts on commercial fisheries (**Chapter 4.1.1.20.3**), recreational fishing (**Chapter 4.1.1.21.3**), and tourism and recreation (**Chapter 4.1.1.22.3**) are discussed in detail within their individual sections.

In the case of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, there may be some out-migration from some affected areas in the region if there are substantial long-term employment impacts to the tourism and recreation, fishing, or energy industries in the area. For further discussion on the employment and demographic impacts of a catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, refer to **Appendix B**.

Proposed Action Analysis

Table 3-21 presents data on the probabilities of oil spills ≥1,000 bbl arising from an EPA proposed action. Under the low-resource scenario, there would be no spills ≥1,000 bbl. Under the high-resource scenario, there would be a 7 percent chance of one spill occurring. However, given the likely distance of the oil spill from shore, the demographic impacts from such a spill would likely be minimal.

Summary and Conclusion

Accidental events associated with an EPA proposed action, such as oil or chemical spills, blowouts, and vessel collisions, would likely have minimal effects on the demographic characteristics of the Gulf coastal communities. This is because accidental events typically cause only short-term population movements as individuals seek employment related to the event or have their existing employment displaced during the event. This is particularly true given the low likelihood of spills arising from an EPA proposed action.

4.1.1.22.2.4. Cumulative Impacts

This section considers the combined effects of OCS-related and non-OCS-related factors on demographics in the Gulf of Mexico. The OCS-related factors consist of population and employment from prior, current, and future OCS lease sales. Non-OCS factors include fluctuations in workforce, net migration, relative income, oil and gas activity in State waters, and offshore liquefied natural gas activity. Most approaches to analyzing cumulative effects begin by assembling a list of "other likely projects and actions" that will be included with an EPA proposed action analysis. However, no such list of future projects and actions could be assembled that would be sufficiently current and comprehensive to support a cumulative analysis for all 132 of the coastal counties and parishes in the analysis area over a 40-year period. Instead, this analysis uses the economic and demographic projections from Woods & Poole Economics, Inc. (2011) as a reasonable approximation to define the contributions of other likely projects, actions, and trends to the cumulative case. These projections include population associated with the continuation of current patterns of OCS leasing activity as well as the continuation of trends in other industries important to the region. The same methodology used to project changes to population from routine activities associated with an EPA proposed action is used to examine impacts of the OCS Program in the region.

OCS Oil- and Gas-Related Impacts

The projected impacts to population arising from the OCS Program are calculated by multiplying the employment estimates from the mathematical model MAG-PLAN by estimating the number of members in a typical family. For more information about MAG-PLAN, refer to **Chapter 4.1.1.22.3**. **Table 4-34** presents estimates of the population impacts of the OCS Program under the low-case and high-case scenarios. The OCS Program is projected to have the greatest impacts on population in the following EIA's (the low-case and high-case percentage impacts are in parenthesis): LA-2 (3.5%, 5.5%); LA-3 (2.5%, 3.9%); LA-1 (2.2%, 3.5%); MS-1 (1.6%, 2.6%); TX-3 (1.6%, 2.3%); and AL-1 (1.3%, 2.1%). An EPA proposed action would represent a small fraction of these broader impacts (refer to **Chapter 4.1.1.22.2.2** for more information).

Non-OCS Oil- and Gas-Related Impacts

Tables 4-19-4-31 provide projections of employment, income, wealth, business patterns, and racial composition for individual EIA's; these data were obtained from the 2012 CEDDS data provided by Woods & Poole Economics, Inc. (2011). **Table 4-32** provides projections of the evolution of the total population in all EIA's in future years. These projections assume the continuation of existing social, economic, and technological trends at the time of the forecast. In 2011, the total Gulf Coast population was approximately 24.85 million. In 2011, the EIA' with the largest populations were TX-3 (6.32 million), FL-4 (6.26 million), and FL-3 (3.69 million). The EIA's with the smallest populations were LA-1 (349,090), MS-1 (484,980), and LA-2 (591,720). For all EIA's combined, it is expected that the total population will grow at a 1.2 percent rate between 2011 and 2051. The fastest population growth is expected in TX-3 (1.5%) and TX-1 (1.5%); the slowest population growth is expected in LA-4 (0.5%) and MS-1 (0.6%).

The racial and ethnic composition of the analysis area reflects both historical settlement patterns and current economic activities. For example, those areas in Texas where Hispanics are the dominant group (i.e., EIA TX-1 where they represent 82% of the population) were also first settled by people from Mexico. Their descendants remain, many of whom work in farming, tending cattle, or in low-wage industrial jobs. By TX-3, the size of the African-American population increases, and there is a more diversified racial mix, indicating more urban and diverse economic pursuits. In Louisiana, Mississippi, Alabama, and northern Florida (FL-1 and FL-2), African-Americans outnumber Hispanics, reflecting the dominant minority status of African-Americans throughout much of the analysis area. A more detailed discussion of minority populations in the area can be found in **Chapter 4.1.1.22.4.1**. As discussed in **Chapter 4.1.1.22.2.2**, the impacts of an EPA proposed action to these projected demographic trends are expected to be minimal.

Summary and Conclusion

An EPA proposed action will contribute to the demographic impacts of the overall OCS Program, as well as to broader demographic trends that exist along the Gulf Coast. The demographic impacts of the OCS Program are estimated using the mathematical model MAG-PLAN. The broader demographic trends that exist along the Gulf Coast are based on Woods & Poole Economics, Inc. (2011). Given the small scale of EPA activities, an EPA proposed action's impacts on the demography of the Gulf Coast are expected to be minimal.

4.1.1.22.3. Economic Factors

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different from the adjacent CPA leased blocks with regard to socioeconomic impacts to economic factors. An EPA proposed action would be on a smaller scale than a proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for economic factors can be found in Chapter 4.2.1.23.3 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.23.3 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from these chapters would be equally applicable for economic factors regarding an EPA proposed action. Therefore, as summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS still apply and are applicable for proposed EPA Lease Sales 225 and 226 in the EPA, and they are hereby incorporated by reference.

BOEM has examined the analysis for economic factors presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for economic factors presented. The impact conclusions for economic factors presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are hereby incorporated by reference as applicable for proposed EPA Lease Sales 225 and 226.

Additionally, further research was conducted for information published on economic factors, and various Internet sources were examined to determine any recent information. This new information has been integrated into information presented in this EIS. No new significant information was discovered regarding economic factors since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, information regarding the impacts of the *Deepwater Horizon* explosion, oil spill, and response on the region's economy and employment is still being developed and compiled. However, while this information may be relevant, it would not be essential to a reasoned choice among alternatives for the reasons stated herein and in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. The incremental impact of an EPA proposed action would be small (smaller than either a WPA or CPA lease sale), even in light of how the *Deepwater Horizon* explosion and oil spill changed the economic baseline. The expected incremental effects from an EPA proposed action would occur 3-7 years after an EPA proposed action and would likely occur long after the impacts to the economy from the *Deepwater Horizon* explosion and oil spill have diminished. In any event, the existing data indicate that the *Deepwater Horizon* explosion, oil spill, and response did not cause a significant change to the economic baseline, except potentially in the short term.

4.1.1.22.3.1. Description of the Affected Environment

This chapter presents information on the structure of the economies along the Gulf Coast that could be affected by a proposed EPA lease sale. The first section describes how BOEM defines the areas that could be economically impacted by OCS activities. The first section also describes the economic structure of these areas, as well as how this structure is projected to evolve during the years in which the economic impacts of a lease sale would be most felt. The second section provides additional information regarding the economic significance of the offshore oil and gas industry in the Gulf of Mexico. The final section discusses how the *Deepwater Horizon* explosion, oil spill, and response and the subsequent slowdown in permit issuances have impacted the economies of the Gulf Coast.

Description of Gulf Coast Economies

Offshore waters of the WPA, CPA, and EPA lie adjacent to coastal Texas, Louisiana, Mississippi, Alabama, and Florida. The U.S. Bureau of Labor Statistics groups sets of counties and parishes into LMA's on the basis of inter-county commuting patterns; 23 of these LMA's span the Gulf Coast. BOEM has defined 13 EIA's that are combinations of Gulf Coast LMA's. **Table 4-18** lists the counties and parishes that comprise the LMA's and EIA's, and **Figure 4-15** illustrates the counties and parishes that comprise the EIA's. The nature of the offshore oil and gas industry is such that the same onshore EIA's are used to examine leasing activities in all planning areas. This is because workers commute long distances for rotations offshore that last for 2-3 weeks at a time and because there is great flexibility between where employees live in the region and where they work offshore in the GOM. In addition, industry equipment and supplies for offshore projects in all planning areas come from throughout the region. Although the same overall economic impact areas are used to analyze sales within different planning areas, the levels of economic impacts to the different individual EIA's do vary between planning areas. BOEM examines economic impacts over the 40-year life of an EPA proposed action. Available information that is related to the short-term impacts of the *Deepwater Horizon* explosion and oil spill and the drilling suspension is presented at the end of this section. However, this supplemental information does not change the Woods & Poole Economics, Inc. baseline employment projections used to analyze the impacts of an EPA proposed action and the OCS Program; the projected economic impacts of an EPA proposed action are discussed in **Chapter 4.1.1.22.3.2**, while the projected economic impacts of the total OCS Program are discussed in **Chapter 4.1.1.22.3.4**. The methodology BOEM uses to measure employment impacts (and subsequent demographic impacts) over the 40-year life of a proposed EPA lease sale recognizes that most of the employment that results from a proposed EPA lease sale is not generated until 4-7 years after the lease sale.

Tables 4-19 through 4-31 provide projections of employment, income, wealth, and business patterns for individual EIA's; these data were obtained from the 2012 CEDDS data provided by Woods & Poole Economics, Inc. (2011). The Woods & Poole Wealth Index is a measure of relative wealth, with the U.S. having a value of 100. The Wealth Index is the weighted average of regional income per capita divided by U.S. income per capita (80% of the index), plus the regional proportion of income from dividends/interest/rent divided by the U.S. proportion (10% of the index), plus the U.S. proportion of income from transfers divided by the regional proportion (10% of the index). Thus, relative income per capita is weighted positively for a relatively high proportion of income from dividends, interest, and rent, and negatively for a relatively high proportion of income from transfer payments. In 2010, all EIA's within the GOM analysis area except FL-4 (which had a Wealth Index of 116.5) ranked below the U.S. in terms of the Wealth Index. The next two highest EIA's were LA-4 (94.4) and TX-3 (92.8). The EIA FL-2 ranked the lowest of all EIA's, with an index of 66.7. The Florida EIA's comprise the portion of the analysis area that is least influenced by OCS development. The EIA's, with the next lowest wealth indices are AL-1 (70.9) and MS-1 (74.3). The industrial compositions of the EIA's are similar. In 2010, all of the EIA's had "State and Local Government and Retail Trade" as one of their top five ranking sectors in terms of employment, and all of them except MS-1 had "Health Care and Social Assistance" as one of their top five. "Accommodation and Food Services" is one of the top five sectors for seven of the EIA's (TX-1, LA-1, LA-3, LA-4, MS-1, FL-1, and FL-2).

As part of its economic impact analysis in **Chapters 4.1.1.22.3.2 and 4.1.1.22.3.4**, BOEM uses regional input-output multipliers from the commercial software IMPLAN. A set of multipliers is created for each EIA in the analysis area based on each EIA's unique industry make-up. An assessment of the change in overall economic activity for each EIA is then modeled as a result of the expected changes in economic activity associated with holding a proposed EPA lease sale. **Table 4-35** presents the baseline employment projections used to analyze the impacts of an EPA proposed action and the OCS Program. These baseline projections assume the continuation of existing social, economic, and technological trends at the time of the forecast. TX-3 and FL-4 are the EIA's with the largest number of total jobs, while LA-1 and MS-1 have the smallest number of total jobs. Employment is expected to grow fastest in TX-1 and TX-2, while the slowest employment growth is expected in LA-4 and MS-1.

Economics of the Offshore Oil and Gas Industry

The projected economic impacts of an EPA proposed action and the projected overall OCS Program are discussed in **Chapters 4.1.1.22.3.2 and 4.1.1.22.3.4**. However, this section and the following section discuss the current state of the offshore oil and gas industry.

Quest Offshore (2011) provides a broad overview of the economic impacts of the offshore oil and gas industry in the Gulf of Mexico. In 2009, offshore oil and gas operations in the Gulf of Mexico led to $26.9 billion in direct spending throughout the United States. The majority of this spending occurred in Louisiana ($8.6 billion) and Texas ($8.0 billion). Fifty-three deepwater projects contributed $12.7 billion in spending, while 27 shallow-water projects contributed $14.2 billion in spending. A total of

$17.2 billion was spent on routine operations, while $9.7 billion was spent on equipment and machinery. Quest Offshore (2011) estimates that this spending supported approximately 80,000 jobs directly in the oil and gas industry. Using input-output modeling techniques, they estimated that approximately 285,000 jobs throughout the U.S. economy were supported by offshore oil and gas activities in the Gulf of Mexico. Quest Offshore also found that all of these economic measures of the OCS industry in the Gulf of Mexico fell noticeably in 2010. For example, total spending fell to $26.1 billion, capital investment spending fell to $6.5 billion, and total employment supported by the OCS industry fell to 242,000. However, this study also suggests that the OCS industry could rapidly recover in upcoming years, although this will depend greatly on the degree to which permitting returns to levels experienced prior to the *Deepwater Horizon* explosion, oil spill, and response.

IHS Global Insight (2011) also provides estimates of the economic significance of the offshore oil and gas industry in the Gulf of Mexico. This study estimated that 90,000 direct jobs, 120,000 indirect jobs, and 170,000 induced jobs were supported by the offshore oil and gas industry in the Gulf of Mexico in 2009. The differences between the employment estimates of Quest Offshore (2011) and IHS Global Insight (2011) are likely primarily due to differences in their economic modeling techniques. IHS Global Insight (2011) estimates that the offshore oil and gas industry contributed $19 billion to government revenues (including revenues from Federal taxes, State taxes, and royalty payments). The revenues generated by the OCS Program support a number of important local government functions (such as education) and are particularly important for counties/parishes whose economies depend greatly on the OCS industry (such as Lafourche Parish). This study also provides insights regarding the relative economic significance of activities conducted by independent firms relative to the activities of the large, major oil and gas firms. They estimate that activities conducted by independent firms accounted for 203,000 jobs in 2009, while activities conducted by the major firms accounted for 180,000 jobs. IHS Global Insight (2011) also forecasts that the percentage of jobs supported by independent firms will increase from 53 percent in 2009 to 58 percent by 2020. Mason (2009) provides estimates of the total economic value of all OCS oil and gas resources in each U.S. coastal state. For example, this study estimates that Louisiana has $3.5 trillion and Texas has $1.6 trillion of total resources available to be recovered in future years. This study also provides additional information of some of the benefits that arise from the OCS Program. For example, this study elaborates on the economic stimulus effect of the OCS Program, which is particularly relevant during the period of high unemployment that has existed in recent years.

Deepwater Horizon Explosion, Oil Spill, and Response

The *Deepwater Horizon* explosion, oil spill, and response had various economic effects along the Gulf Coast. Some of the most immediate effects were felt in the tourism and fishing industries. The *Deepwater Horizon* explosion, oil spill, and response led to immediate closures of beach areas and fishing sites along the Gulf Coast. A more detailed discussion of the impacts of the *Deepwater Horizon* explosion, oil spill, and response on these individual industries is presented in **Chapters 4.1.1.18, 4.1.1.19, and 4.1.1.20**. The *Deepwater Horizon* explosion, oil spill, and response also led to a number of impacts to the broader economy. A number of these economic impacts arose due to the deepwater drilling suspension that lasted from July 12, 2010, to October 12, 2010. The suspension had the effect of suspending activity at all 33 rigs developing exploratory wells in deep water. This posed new hardships for hundreds of oil-service companies that supply the steel tubing, engineering services, drilling crews, and marine-supply boats critical to offshore exploration

Greater New Orleans, Inc. (2011) analyzes the economic impacts of the drilling suspension on the economy of Louisiana. This study generally finds that the suspension did not immediately trigger large-scale worker layoffs. Rather, businesses generally chose to retain workers on payroll in the hope that drilling activity would resume following the lifting of the suspension. However, the payroll numbers do not take into account the loss in pay and benefits some workers experienced during the suspension. In addition, the suspension caused a good deal of financial strain to businesses as they depleted savings to cover their costs during the suspension. Finally, this study concludes that this situation was not sustainable and thus, the longer that drilling activity remained low, the more likely it would be that a larger number of layoffs would occur.

Table 4-36 presents monthly data on the overall unemployment rates in the major metropolitan areas along the Gulf Coast during 2010; **Table 4-36** also presents national and State unemployment rates for the same months (U.S. Dept. of Labor, Bureau of Labor Statistics, 2011). These data should provide a sense of the impacts of the *Deepwater Horizon* explosion, oil spill, and response on the overall economies along the Gulf Coast. In general, the unemployment rates in most areas did not dramatically change following the *Deepwater Horizon* explosion, oil spill, and response. Some areas, particularly in Louisiana and Florida, did see modest increases in their unemployment rates. However, since these data are not seasonally adjusted, it is difficult to disentangle the effects of the *Deepwater Horizon* explosion, oil spill, and response from the usual seasonality in the economies along the Gulf Coast.

The economic impacts of the *Deepwater Horizon* explosion, oil spill, and response have been mitigated to some extent by damage claims payments from the Gulf Coast Claims Facility (GCCF). As of March 5, 2012, the GCCF had paid out approximately $6 billion to affected individuals and businesses. The GCCF had paid out $2.48 billion in Florida, $1.74 billion in Louisiana, $982 million in Alabama, $445 million in Mississippi, and $237 million in Texas (Gulf Coast Claims Facility, 2012). However, the GCCF was not accessible to certain classes of workers. For example, damages due to the drilling suspension, as well as other damages that were too indirectly linked to the *Deepwater Horizon* explosion, oil spill, and response were not covered by the GCCF. Shallow-water rig workers were hit particularly hard by the suspension since, unlike their deepwater counterparts, they are ineligible for the $100 million Rig Worker Assistance Fund established by BP and administered by the Baton Rouge Area Foundation. While there was no suspension of shallow-water drilling, permits for shallow-water drilling dropped in the immediate aftermath of the spill as new regulations were put in place and as operators had to adjust to these regulations. Shallow-water drillers' woes are aggravated by the fact that these rigs operate on shorter contracts than do deepwater rigs (and thus often lose their income streams more quickly in light of external events that reduce the demand for drilling activities).

The suspension was lifted on October 12, 2010, and new permits for deepwater drilling have been awarded since. The pace at which industry activity will normalize will largely depend on the pace at which permit issuance occurs. In addition, the offshore industry also continues to face compliance with new regulations and higher insurance costs, and these may potentially lead to lower levels of industry activity than prevailed prior to the *Deepwater Horizon* explosion, oil spill, and response. More information on the regulatory requirements that have arisen following the *Deepwater Horizon* explosion, oil spill, and response can be found in **Chapters 1.3.1 and 1.3.2**. Recent information shows that permitting and exploration activities in the Gulf increased in 2012. Eighty-nine deepwater permits were issued in 2012 (by October 2012); this compares with 76 permits in 2009, 32 permits in 2010, and 38 permits in 2011 (Klimasinska, 2012). As of December 2012, 16 of 18 drillships and 17 of 31 semisubmersibles were actively drilling in the Gulf (Rigzone, 2012). IHS Petrodata's Jackup Day Rate index for the Gulf of Mexico increased from 296 in November 2011 to 388 in November 2012, while jackup utilization increased from 52 percent to 63 percent over the same time period (IHS.com, 2012). Other anecdotal evidence suggests that Gulf exploration and development activity was picking up noticeably in 2012 (Greenberg, 2012).

4.1.1.22.3.2. Impacts of Routine Events

Background/Introduction

An EPA proposed action would have economic impacts on a variety of firms along the OCS industry's supply chain. For example, an EPA proposed action would directly affect firms that are responsible for well drilling, equipment manufacturing, pipeline construction, and servicing OCS activities. The OCS activities would also impact the suppliers to those firms, as well as firms that depend on consumer spending of oil and gas industry workers. In order to estimate the scale of these effects, BOEM has developed the mathematical model MAG-PLAN, which is a two-stage model. The first stage estimates the levels of spending in various industries that arise from a particular scenario for oil and gas exploration and development. These estimates arise from a detailed analysis of the numerous activities that are needed to directly support OCS operations. The second stage estimates the impacts of oil and gas industry spending on the broader economies along the Gulf Coast. First, direct OCS industry spending will support activities further down the supply chain; these are referred to as "indirect" economic impacts. In addition, the incomes of employees along the OCS industry's supply chain will support consumer spending throughout the economy; these are referred to as "induced" economic impacts. These indirect and induced effects are estimated using the widely used economic modeling software IMPLAN. In particular, MAG-PLAN uses IMPLAN "multipliers" to compute how direct OCS spending circulates within the economy and translates into additional indirect and induced economic impacts. The MAG-PLAN has some limitations. For example, its employment estimates are not able to fully take into account the expected progression of the economy in future years. However, MAG-PLAN still provides reasonable estimates of the relative scale of the economic impacts of OCS activities. The initial version of MAG-PLAN is outlined in Manik et al. (2005). BOEM has made a number of adjustments to MAG-PLAN in recent years. For example, BOEM has incorporated the use of a number of new technologies, such as subsea systems and FPSO units, into MAG-PLAN. BOEM has also incorporated additional data regarding onshore support activities into the model. BOEM's estimates of the economic impacts of an EPA proposed action are discussed in the section below.

It is important to consider the scale of the benefits arising from lease sales relative to the potential costs. Information regarding the number of blocks leased and the bids received in previous lease sales is presented in USDOI, BOEM (2012e). A discussion of the procedures that BOEM uses to ensure the Federal Government receives proper returns from lease sales can be found in USDOI, MMS (1999c). Agalliu (2011) presents a comparative analysis of the GOM fiscal system relative to fiscal systems in other countries. This study creates a composite measure of government return and shows that the fiscal systems for the shelf and deepwater areas of the Gulf of Mexico rank favorably relative to fiscal systems in other countries. An economic analysis of the costs and benefits of leasing in the Gulf of Mexico is presented in Section 2.12 of the 2012-2017 Five-Year Program EIS. This analysis found that the benefits of leasing in all planning areas would exceed the costs, although these calculations did not incorporate the costs of a low-probability catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, due to the inherent uncertainty regarding such a spill. More information regarding BOEM's economic analyses, as well as information regarding the economic impacts of catastrophic oil spills, which are not reasonably expected and not part of an EPA proposed action, can be found in USDOI, BOEM (2012f).

Proposed Action Analysis

The MAG-PLAN estimates of the employment impacts of an EPA proposed action are presented in **Tables 4-37 through 4-39**. **Table 4-37** presents the results for a low-case production scenario, while **Tables 4-38** presents results for a high-case production scenario. **Tables 4-37 and 4-38** present data on the average levels of annual employment, the peak-year levels of annual employment, and the total levels of employment expected to arise over the entire 40-year life cycle of OCS operations. **Table 4-37** shows that a low-case production scenario leads to approximately 619 direct jobs, 265 indirect jobs, and 1,039 induced jobs in the Gulf of Mexico during the approximately 40-year life cycle of OCS operations. The vast majority of these jobs would occur in Texas (1,081 jobs) and in Louisiana (457 jobs). There would also be employment effects in Florida (181 jobs), Alabama (116 jobs), and Mississippi (88 jobs). The employment effects of an EPA proposed action would average approximately 49 jobs per year in the Gulf of Mexico under the low-case production scenario and would peak at around 641 jobs. In all EIA's, employment would peak between 2021 and 2023. **Table 4-38** shows that the high-case production scenario would lead to 4,761 direct jobs, 2,306 indirect jobs, and 8,665 induced jobs in the Gulf of Mexico. The employment impacts would average 403 jobs per year under the high-case scenario and would peak at 2,868 jobs. It should be emphasized, however, that a portion of these estimates do not represent "new" jobs; many of these would represent new contracts or orders at existing firms that would essentially keep these firms operating at their existing levels as earlier contracts and orders are completed and filled. Thus, these estimates may overestimate the actual magnitude of new employment effects from an EPA proposed action. **Table 4-39** shows the percent of employment during the peak employment years as a percentage of total employment in each EIA. An EPA proposed action would not have employment impacts >0.1 percent in any EIA along the Gulf Coast.\

The Five-Year Program EIS provides additional information regarding the costs and benefits of leasing in the EPA. BOEM quantifies the economic effects of leasing in all program areas using a set of models. These models take into account the revenue from OCS activities, the private costs of OCS development, the environmental costs of OCS development, the effects of OCS development on energy markets, and the net consumer surplus arising from OCS activities. This analysis yields an estimate of the net benefits to the U.S. arising from a scenario for energy production. This analysis found that leasing in the EPA would result in $6 billion in benefits under a high-production scenario, $2.73 billion in benefits under a mid-range production scenario, and no net benefits under a low-production scenario (since no production takes place under the low-production scenario). This analysis reflects the combined expected production for the two proposed EPA lease sales (i.e., Lease Sales 225 and 226) that are scheduled in the current Five-Year Program. More information regarding this net benefits analysis can be found in USDOI, BOEM (2012f).

Summary and Conclusion

Should an EPA proposed action occur, there would be minimal economic changes in the Texas, Louisiana, Mississippi, Alabama, and Florida EIA's. The employment impacts that would occur would primarily be felt in Texas (primarily in EIA TX-3) and in the coastal areas of Louisiana. An EPA proposed action, irrespective of whether one analyzes the high-case or low-case production scenario, would not cause employment effects >0.1 percent in any EIA along the Gulf Coast.

4.1.1.22.3.3. Impacts of Accidental Events

Background/Introduction

An oil spill can have a number of effects on local economies. The most direct effects are felt in industries that depend on resources that are damaged or rendered unusable for a period of time due to a spill. For example, beach recreation, recreational fishing, and commercial fishing would be vulnerable if beach or fish resources were damaged due to an oil spill. However, for small to medium oil spills, the impacts to these activities would likely be localized and small in scale. More information on the effects of accidental events on these individual resources can be found in **Chapters 4.1.1.18.3, 4.1.11.9.3, and 4.1.1.20.3**. An oil spill could also have economic impacts if it were to impact important transportation routes or affect the operations of certain port facilities. **Chapter 4.1.1.22.1** discusses the various types of infrastructure along the Gulf Coast. However, the likelihood of a single oil spill shutting down an entire waterway or port facility is quite low.

The other economic effects of an oil spill are primarily determined by indirect actions or events that occur along with an oil spill. For example, an oil spill could lead to decreased levels of oil and gas industry operations. These effects would be most felt in coastal Louisiana and in Texas (primarily near EIA TX-3) since these are the primary locations where OCS-related employment is concentrated. Plyer and Campanella (2010) present an analysis of the locations of oil and gas industry workers in Louisiana that were vulnerable to the *Deepwater Horizon* explosion, oil spill, and response. The direct effects of an oil spill on a particular industry would also ripple through that industry's supply chain; consumer spending by employees of these firms would also have impacts to the broader economy. Decreased levels of offshore oil and gas activities could also impact the revenue streams of the various levels of government in the impacted areas. Finally, the response and cleanup operations following an oil spill often have impacts on local economies. For example, 48,200 workers were employed in response activities at the peak of the response effort following the *Deepwater Horizon* explosion and oil spill (RestoreTheGulf.gov, 2011). While the influx of workers to local areas may have a number of positive economic impacts, it may also cause disruptions to the normal functioning of local economies. In addition, the people and equipment that are dedicated to oil-spill-response efforts may detract from some services (such as hospitals, firefighting capability, and emergency services) available to local residents.

The *Deepwater Horizon* explosion, oil spill, and response, though not reasonably expected and not part of an EPA proposed action, also highlighted the economic risks of a catastrophic oil spill. For example, the *Deepwater Horizon* explosion, oil spill, and response highlighted the effects of perceptions on tourism and fishing activities. More information on the impacts of a catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, on economic factors can be found in **Appendix B**. Additional information regarding methods for quantifying the costs of catastrophic oil spills can be found in USDOI, BOEM (2012f).

Proposed Action Analysis

Table 3-21 presents data on the probabilities of oil spills ≥1,000 bbl arising from an EPA proposed action. Under the low-resource scenario, there would be no spills ≥1,000 bbl. Under the high-resource scenario, there would be a 7 percent chance of one spill occurring. However, given the likely distance of the oil spill from shore, the economic impacts from such a spill would likely be minimal.

Summary and Conclusion

An oil spill can cause a number of disruptions to local economies. A number of these effects are due to impacts on industries that depend on damaged resources. However, the impacts of an oil spill may be somewhat broader if firms further along industry supply chains are affected. These effects depend on issues such as the effects of cleanup operations and the responses of policymakers to a spill. However, the impacts of small- to medium-sized spills should be localized and temporary. A catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, along the lines of the *Deepwater Horizon* oil spill would have more noticeable impacts to the economy (**Appendix B**); however, the likelihood of another spill of this scale is quite low.

4.1.1.22.3.4. Cumulative Impacts

Background/Introduction

The cumulative impacts on economic factors will arise from the expected progression of the broader OCS Program, from the expected progression of overall economic activity, from the potential risks of oil spills, and from the potential risks of natural events such as hurricanes.

OCS Oil- and Gas-Related Impacts

An EPA proposed action would contribute to the economic effects of the broader OCS Program. The OCS Program directly affects firms that are responsible for well drilling, equipment manufacturing, pipeline construction, and servicing OCS activities. The OCS activities also impact the suppliers to those firms, as well as firms that depend on consumer spending of oil and gas industry workers. In order to estimate the scale of these effects, BOEM has developed the mathematical model MAG-PLAN, which is a two-stage model. The first stage estimates the levels of spending in various industries that arise from a particular scenario for oil and gas exploration and development. These estimates arise from a detailed analysis of the numerous activities that are needed to directly support OCS operations. The second stage estimates the impacts of oil and gas industry spending on the broader economies along the Gulf Coast. First, direct OCS industry spending will support activities further down the supply chain; these are referred to as “indirect” economic impacts. In addition, the incomes of employees along the OCS industry’s supply chain will support consumer spending throughout the economy; these are referred to as “induced” economic impacts. These indirect and induced effects are estimated using the widely used economic modeling software IMPLAN. In particular, MAG-PLAN uses IMPLAN “multipliers” to compute how direct OCS spending circulates within the economy and translates into additional indirect and induced economic impacts. The MAG-PLAN has some limitations. For example, its employment estimates are not able to fully take into account the expected progression of the economy in future years. However, MAG-PLAN still provides reasonable estimates of the relative scale of the economic impacts of OCS activities. The initial version of MAG-PLAN is outlined in Manik et al. (2005). BOEM has made a number of adjustments to MAG-PLAN in recent years. For example, BOEM has incorporated the use of a number of new technologies, such as subsea systems and FPSO units, into MAG-PLAN. BOEM has also incorporated additional data regarding onshore support activities into the model.

Tables 4-40 and 4-41 present employment data using low-case and high-case estimates for OCS activities in the GOM (more information on the cumulative scenarios can be found in **Chapter 3.1.1**. The peak employment levels in all five Gulf Coast States combined are approximately 140,000 in the low-case scenario and 218,000 in the high-case scenario. The peak employment levels for the entire OCS industry are primarily felt in Louisiana and Texas (primarily in the EIA TX-3). The OCS activities will support 53,000 jobs in TX-3 in the peak employment year according to the low-production scenario and over 78,000 jobs in the high-production scenario. However, as can be seen in **Table 4-42**, the OCS industry will make up a larger fraction of the economy of south Louisiana. For example, in LA-2, under the high-case scenario, the OCS industry will support 3.6 percent of total employment, while in TX-3, the OCS industry will support 1.5 percent of total employment. Employment demand will continue to be met primarily with the existing population and available labor force in most EIA’s. The vast majority of these cumulative employment estimates represent existing jobs from previous OCS Program actions. BOEM does expect some employment will be met through in-migration; however, this level is projected to be small and localized and, thus, BOEM expects the sociocultural impacts from in-migration to be minimal in most EIA's. As discussed in **Chapter 4.1.1.22.3.2**, an EPA proposed action is expected to contribute 0.1 percent or less to the employment level in each of the EIA's.

The Five-Year Program EIS provides additional information regarding the costs and benefits of leasing in the EPA. BOEM quantifies the economic effects of leasing in all program areas using a set of models. These models take into account the revenue from OCS activities, the private costs of OCS development, the environmental costs of OCS development, the effects of OCS development on energy markets, and the net consumer surplus arising from OCS activities. This analysis yields an estimate of the net benefits to the U.S. arising from a scenario for energy production. This analysis found that leasing in the EPA would result in $6 billion in benefits under a high-production scenario, $2.73 billion in benefits under a mid-range production scenario, and no net benefits under a low-production scenario (since no production takes place under the low-production scenario). This analysis reflects the combined expected production for the two proposed EPA lease sales (i.e., Lease Sales 225 and 226) that are scheduled in the current Five-Year Program. More information regarding this net benefits analysis can be found in USDOI, BOEM (2012f).

Oil Spills

An EPA proposed action would contribute to the risk of an oil spill arising from the broader OCS Program. The impacts of low to moderate oil spills are discussed in **Chapter 4.1.1.24.3.3**. The impacts of a low-probability catastrophic oil spill, which is not reasonably expected and not part of an EPA proposed action, are discussed in **Appendix B**. In general, the small scale of an EPA proposed action suggests that it would only slightly increase the likelihood of oil spills.

Non-OCS Oil- and Gas-Related Impacts

Most approaches to analyzing cumulative effects begin by assembling a list of "other likely projects and actions" that would be included with an EPA proposed action for analysis. However, no such list of future projects and actions could be assembled that would be sufficiently current and comprehensive to support a cumulative analysis for all 132 of the coastal counties and parishes in the analysis area over a 40-year period. Instead of an arbitrary assemblage of future possible projects and actions, this analysis employs the economic and demographic projections from Woods & Poole Economics, Inc. (2011) to define the contributions of other likely projects, actions, and trends to the cumulative case. These projections are based on local, regional, and national trend data as well as likely changes to local, regional, and national economic and demographic conditions. Therefore, the projections include employment associated with the continuation of current patterns in OCS leasing activity as well as the continuation of trends in other industries important to the region. **Tables 4-19 through 4-32 and 4-35** provide projections of employment, income, wealth, and business patterns for individual EIA's; these data were obtained from the 2012 CEDDS data provided by Woods & Poole Economics, Inc. (2011). As discussed in the previous section, the OCS industry comprises a modest percentage of the economies of most EIA's.

Hurricanes

The impacts of an EPA proposed action on economic factors should be viewed in light of the ongoing risk of hurricanes in the Gulf of Mexico. Hurricanes can cause short-term impacts to the OCS industry by shutting down production in the immediate vicinity. Hurricanes can also cause disruptions to the functioning of economies and, if severe enough, can cause labor migrations to occur. Finally, hurricanes can cause damage to a number of base resources on which local economies depend.

Summary and Conclusion

The cumulative impacts of an EPA proposed action would be determined by the expected path of the economy and by the expected progression of the OCS industry in upcoming years. The expected path of the overall economy is projected using the data provided by Woods & Poole Economics, Inc. (2011). The expected economic impacts of the OCS industry in upcoming years are estimated using the mathematical model MAG-PLAN. The overall OCS industry comprises a modest percentage of the economies of most EIA's. The cumulative impacts of an EPA proposed action should also be viewed in light of the risks of oil spills from the broader OCS Program and in light of the risks of hurricanes. The cumulative impacts of an EPA proposed action to the economies along the Gulf Coast are expected to be fairly small, primarily due to the small scale of an EPA proposed action.

4.1.1.22.4. Environmental Justice

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different from the adjacent CPA leased blocks with regard to socioeconomic impacts to environmental justice. An EPA proposed action would be on a smaller scale than a proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for environmental justice can be found in Chapter 4.2.1.23.4 of the 2012-2017 WPA/CPA Multisale EIS and in Chapter 4.2.1.23.4 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from these chapters would be equally applicable for environmental justice regarding an EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for environmental justice presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for environmental justice presented. The impact conclusions for environmental justice presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are hereby incorporated by reference as applicable for proposed EPA Lease Sales 225 and 226. Therefore, as summarized below, the analysis and potential impacts detailed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS still apply and are applicable, and they are hereby incorporated by reference for proposed EPA Lease Sales 225 and 226.

Additionally, further research was conducted for information published on environmental justice, and various Internet sources were examined to determine any recent information. This new information has been integrated into information presented in this EIS. No new significant information was discovered regarding environmental justice since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and despite the new information identified and provided below, information regarding the impacts of the *Deepwater Horizon* explosion, oil spill, and response remains incomplete. Studies regarding environmental justice concerns in light of the *Deepwater Horizon* explosion, oil spill, and response are still ongoing, and it may be years before data are available and certainly not within the timeframe contemplated by this NEPA analysis. The NRDA process, which is ongoing, may help to inform issues relating to subsistence and other indigenous reliance on natural resources. However, information related to NRDA is unavailable and unobtainable at this time, regardless of costs. In its place, BOEM's subject-matter experts have used credible information that is available and applied it using accepted socioeconomic methodologies. Although most criteria related to environmental justice may not be essential to a reasoned choice among alternatives, health impacts may be essential. Nevertheless, long-term health studies are pending and may not be available for use for several years or longer. What credible information is available was applied using accepted methodologies. BOEM will continue to seek additional information as it becomes available and bases the previous analysis on the best information currently available.

On February 11, 1994, President Clinton issued Executive Order 12898, titled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which directs Federal agencies to assess whether their actions have disproportionate environmental effects on minority or low income people. These environmental effects encompass human health, social, and economic consequences. In 1997, President Clinton issued Executive Order 13045 titled, "Protection of Children from Environmental Health Risks and Safety Risks" requiring Federal agencies to identify and assess environmental health risks and safety risks of its policies, programs, and activities that may disproportionately affect children. In accordance with NEPA and the Executive Orders, BOEM must provide opportunities for community input during the NEPA process. Minority and low-income communities are provided the same opportunities as other communities to engage in the decisionmaking process. (Refer to **Chapter 5** for a discussion of scoping and community consultation and coordination.)

Environmental justice is a complex issue, and although methodologies have evolved to assess whether an environmental injustice has taken place, this type of analysis still poses particular challenges when considering OCS leasing decisions. First, OCS lease sales occur in Federal waters 3 mi (5 km) or more from shore. Thus, the leaseholds, and the permitted activities of petroleum exploration, extraction, and production that occur on these leaseholds, are distant from human habitation. State offshore oil and gas leasing occurs in waters closer to land were petroleum-related activities are generally viewed as having a greater potential for directly impacting coastal communities. Second, this type of analysis addresses the results of new lease sales. However, the Gulf of Mexico OCS Leasing Program has been ongoing for more than 60 years; it has already leased large areas off Texas, Louisiana, Mississippi, and Alabama and, in this context, new lease sales mean only small, incremental increases in the already substantial operations. In this context, new potential environmental justice impacts are difficult to identify, particularly so because most OCS sale-related consequences that might arise would be onshore, and indirect, and would result from the operations of the extensive infrastructure system that exists to support offshore oil and gas. The upstream support infrastructure system includes platform fabrication yards, shipyards, repair and maintenance yards, onshore service bases, heliports, marinas for crewboats and supply boats, pipecoating companies, and waste management facilities. Downstream infrastructure moves hydrocarbon product to market and includes gas processing facilities, petrochemical plants, transportation corridors, petroleum bulk storage facilities, and gas and petroleum pipelines. This infrastructure system is both widespread and concentrated. Much infrastructure is located in coastal Louisiana, less in coastal Texas, and less still in Mississippi's Jackson County and Alabama's Mobile County. While many fabrication and supply facilities are concentrated around coastal ports, downstream processing is concentrated more in industrial corridors farther inland (The Louis Berger Group, Inc., 2004).

This analysis identifies potential environmental justice impacts that might arise from these support activities, but they are only indirectly influenced by BOEM decisionmaking, and BOEM has no regulatory authority over them. The onshore support activities that result from a BOEM leasing decision occur in the context of a very large and long-established oil industry. For the most part, activities generated by a new proposed lease sale occur where there are already ongoing activities, and the two are virtually indistinguishable from each other or from established land-use patterns. Each industry sector and its associated impacts are often cumulative and occur within a mix of the effects of other sectors in each geographic location. Several of BOEM's past and ongoing studies (e.g., Hemmerling and Colten, 2003) seek to understand the underlying socioeconomic and potential environmental justice implications of OCS activities. Several ongoing studies also seek to understand the short- and long-term impacts of the recent *Deepwater Horizon* explosion, oil spill, and response (e.g., the study "Ethnic Groups and Enclaves Affected by OCS," which was launched on August 1, 2010). Discussion of post-spill mitigation efforts such as fisheries closures; subsistence, economic, and health claims processes; risk assessment protocols for seafood testing; and standards for cleanup worker safety and at-risk populations are provided below. BOEM will continue to seek additional information and bases the following analysis on the best information currently available.

4.1.1.22.4.1. Description of the Affected Environment

The oil and gas exploration and production industry and its associated support sectors are interlinked and widely distributed along the Gulf Coast. Offshore OCS-related industry operations within the EPA will most likely rely on onshore facilities within the CPA, the WPA, or both. As an example, Port Fourchon in Lafourche Parish, Louisiana caters to 90 percent of all deepwater oil production in the GOM and roughly 45 percent of all shallow-water rigs in the Gulf (Loren C. Scott & Associates, 2008). BOEM scenario projects that Port Fourchon will be the primary service base for operations in the EPA. While this analysis focuses on potential impacts within the EPA, the interlinked nature of the offshore industry necessitates a discussion of the CPA and WPA as well. Within the GOM economic impact areas, there are 81 counties/parishes that contain facilities, with five as the median number of facilities. For comparative purposes, counties/parishes with more than five facilities are considered to contain concentrations of facilities. Of the 81 counties/parishes, 39 include more than 5 facilities. These

39 counties/parishes are then divided into three levels of infrastructure concentration: low (6-15 facilities); medium (16-49 facilities); and high (50 or more facilities). The CPA has six high concentration counties/parishes, five of which are located in Louisiana (Jefferson, Plaquemines, Orleans, St. Mary and Calcasieu, Louisiana and one located in Mobile Alabama). Most of the counties/parishes with low and medium concentrations are located in Louisiana and Texas (Kaplan, et al., 2011). Louisiana will be providing the majority of onshore support for an EPA proposed action and thus forms an integral part of our EPA impact analysis.

Onshore activities in support of exploration and production in the GOM (and their potential environmental consequences) are concentrated around support infrastructure such as ports, canals, heliports, repair yards, pipecoating facilities, and gas processing facilities. While the coastal zone of the northern GOM is not a physically, culturally, or economically homogenous area, some Gulf Coast communities warrant an environmental justice lens. BOEM focuses on counties/parishes and census tracts with high or medium concentration of OCS-related infrastructure and defines minority populations as those counties/parishes with a higher percentage of their population that is minority relative to their respective State averages. Because U.S. Census data aggregated at the county/parish level are very broad, this environmental justice analysis also considers population distributions at the smaller, more detailed census tract level to assess relationships between OCS leasing effects and geographic distributions of minority populations.

Environmental justice maps (**Figures 4-21 through 4-28**) display the location of oil-related infrastructure and the distribution of low-income and minority residents across GOM counties and parishes based on U.S. Census data from 2010 and a BOEM-funded study on Gulf Coast OCS infrastructure. Ten counties/parishes are considered to have a high concentration (50 facilities or more) of oil-related infrastructure (**Table 4-43**). Of these 10 counties/parishes, 6 are located in the CPA; of those, 3 have higher minority percentages than their respective State averages, i.e., there are 41 percent minority residents in Mobile County, Alabama; 44 percent minority residents in Jefferson Parish, Louisiana; and 43 percent minority residents in St. Mary Parish, Louisiana. **Figures 4-21 through 4-28** display census tracts overlayed with a map of OCS infrastructure within Louisiana, Mississippi, Alabama and Florida. There are 1,321 census tracts within the EPA economic impact area with minority populations greater than 50 percent, and of these, most are concentrated in urban centers like Mobile, Alabama; New Orleans, Louisiana; and Miami, Florida. Some of these counties/parishes also boast a high density of OCS-related infrastructure. Jefferson Parish, Louisiana, ranks second in terms of concentration of OCS-related infrastructure with 1 petrochemical plant, 46 terminals, 8 ship yards, and 6 platform fabrication facilities among other infrastructure types. Researchers used the 2000 Census and a weighting scheme to identify counties with heavy concentrations of OCS infrastructure identified a dozen areas within Jefferson Parish where African Americans make up more than 75 percent of the population. The analysis found a visual correlation between the concentration of black population and OCS-related infrastructure along the Harvey Canal (Kaplan, et al., 2011).Thirteen counties/parishes in the analysis area are considered to have a medium concentration (16-49 facilities) of oil-related infrastructure. Of these 13 counties/parishes, 10 are located in the EPA; of those, 3 have higher minority populations than the State average, i.e., Hillsborough County in Florida and Orleans and St. James Parishes in Louisiana. However, since an EPA proposed action would not significantly alter this preexisting situation, minority and low-income populations would not sustain disproportionate adverse effects from an EPA proposed action.

Poverty is defined by the Office of Management and Budget's Statistical Policy Directive 14 and the U.S. Census using a set of money income thresholds that vary by family size and composition. The official poverty thresholds do not vary geographically, but they are updated for inflation using the Consumer Price Index (U.S. Census). This analysis uses tract level household income data from the 2009 American Community Survey. Only one parish, St. Mary Parish, out of the six EPA high infrastructure concentration counties/parishes has a higher poverty rate than its respective State poverty rate, with 18 percent of the parish living below the poverty line compared with the State's 17.6 percent average. Four parishes (Iberia, Orleans, St. Bernard, and Vermilion) out of the 10 EPA medium infrastructure concentration counties/parishes had higher poverty rates than their respective State's poverty rate.

Baseline Post Hurricanes and Post-*Deepwater Horizon* Explosion, Oil Spill, and Response

Whether a lease sale occurs within the EPA, CPA, or WPA, the resulting oil and gas exploration and production activities rely on an established network of support and processing facilities and associated labor force that overlaps these planning areas. As a result, a baseline change within the WPA could potentially alter the relative risks of a lease sale in the EPA or CPA. Therefore, where appropriate, this discussion will consider recent baseline changes in the WPA. On August 29, 2005, Hurricane Katrina made landfall on the Gulf Coast between New Orleans, Louisiana, and Mobile, Alabama. Hurricane Katrina had differential impacts on the Gulf Coast population. Approximately half of those displaced lived in New Orleans, Louisiana, where the storm heavily impacted the poor and African Americans (Gabe et. al., 2005). The three states most affected also rank among the poorest according to the 2000 U.S. Census; Mississippi ranked second in its poverty rate, Louisiana third, and Alabama sixth. Approximately one-fifth (21%) of the population most directly affected by the storm was poor, a rate significantly higher than the national rate of 12.4 percent reported in the 2000 Census. While the 2008 hurricane season was particularly active in southeast Texas in the WPA, it also strongly affected CPA baseline conditions. Hurricane Gustav made landfall on September 1, 2008, near Cocodrie, Louisiana (Terrebonne Parish), and continued northwest across the State, resulting in 34 parish disaster declarations, which made these areas eligible for disaster assistance following the storm (USDHS, FEMA, 2008). The affected coastal parishes also have high concentrations of oil-related infrastructure. Damage to Mississippi and Alabama coastal areas was less severe, but the National Weather Service reported 14 confirmed tornadoes from Biloxi, Mississippi, to Mobile, Alabama.

The *Deepwater Horizon* explosion in Mississippi Canyon Block 252 has raised several concerns regarding OCS activities and environmental justice. The Gulf Coast boasts several distinct ethnic, cultural, and low-income groups whose substantial reliance on the area's natural resources of the marshes, barrier islands, and coastal beaches and wetlands can make them particularly vulnerable to the direct and indirect effects of environmental impacts to coastal wetlands, marshes, barrier islands, and beaches. Besides an economic dependence on commercial fishing and oystering, coastal low-income and minority groups may rely heavily on these fisheries and on other traditional subsistence fishing, hunting, trapping, and gathering activities, to augment their diets and household incomes (refer to Hemmerling and Colten, 2003, for an evaluation of environmental justice considerations for south Lafourche Parish). Subsistence uses in these regions are poorly documented. BOEM is currently funding an exploratory study of Gulf Coast subsistence. BOEM's subject-matter experts have utilized available, credible information for this analysis. Although most criteria related to environmental justice may not be essential to a reasoned choice among alternatives, subsistence impacts may be essential. Nevertheless, subsistence research is pending and outcomes will not be available before publication of this EIS. What credible information is available was applied using accepted methodologies. BOEM will continue to seek additional information as it becomes available and bases this analysis on the best information currently available. Even when landloss and destruction caused by recent hurricanes have forced families to relocate, regular commuting has sustained this reliance on the natural resources of the coastal environments. While by no means a complete inventory of the minority, ethnic, and nationality groups that make up this diverse region and that are engaged in natural resource use and/or the petroleum industry, several populations of note have been identified to underscore the potential for environmental justice concerns: African Americans, Cajuns, Chitimacha, Houma, Isleños, Laotians, Mexicans, and Vietnamese.

The *Deepwater Horizon* explosion and oil spill and subsequent fishing closures dealt an immediate blow to many coastal communities and may have longer-term impacts by damaging fish stocks or by undermining the Gulf Coast seafood "brand." At this time, it would be premature to determine whether or not such long-term adverse impacts have or will occur. Further scientific research is ongoing. Members of several minority and low-income groups, including among others African Americans, Cajuns, Houma, and Vietnamese, rely on the commercial seafood industry. For example, an estimated 20,000 Vietnamese fishermen and shrimpers live along the Gulf Coast; by 1990, over 1 in 20 Louisiana fishers and shrimpers had roots in Southeast Asia even though they comprised less than half a percent of the State's workforce (Bankston and Zhou, 1996). As of the spring of 2010, 30-50 percent of all commercial fishers living in the Gulf of Mexico region were Vietnamese Americans, while 80 percent of all Vietnamese Americans in the region were connected to the seafood industry (Mississippi Coalition of Vietnamese American Fisherfolk and Families, 2010). Although not exclusively, African Americans have traditionally comprised much of the fish processing and oyster shucking industries. Shucking houses, particularly, have provided an avenue into the mainstream economy for minority groups (Brassieur et al., 2000). African Americans in lower Plaquemines Parish, where Pointe a la Hache and other black towns such as Davant and Phoenix are found, have worked and subsisted on the natural resources of the regions for generations (The Louisiana Justice Institute, 2010). A representative sample of affidavits submitted to the Gulf Coast Claims Facility (responsible for administrating *Deepwater Horizon* explosion, oil spill, and response claims) indicates that Louisiana commercial fisherfolks customarily take home approximately 5-15 percent of their total catch for subsistence use (United Louisiana Vietnamese American Fisherfolks, 2010).

An Economic and Property Damages Settlement was reached in early 2012 and includes the following types of claims: seafood compensation; business economic loss; individual economic loss; loss of subsistence; vessel physical damage; vessel-of-opportunity charter payment; coastal real property damage; wetlands real property damage; and real property sales loss. A Medical Benefits Settlement was also reached in early 2012 and offers benefits to qualifying people who resided in the United States as of April 16, 2012, who were either "clean-up workers" or who were residents in certain defined beachfront areas and wetlands ("zones") during certain time periods in 2010. On May 2, 2012, the Court granted preliminary approval for the settlement and ordered that the Court-supervised settlement program begin accepting claims on June 4, 2012. For economic and property damages, valid claims will be paid as they are approved. For medical claims, payments and other benefits will be distributed after the final approval of the settlement and any appeals are resolved. The new official court-authorized claims administration website is located at http://www.deepwaterhorizoneconomicsettlement.com/. Persons who filed a claim with the Gulf Coast Claims Facility for losses, such as subsistence, whose claims were rejected, or who have not already accepted a final settlement from BP, may file a new claim with the *Deepwater Horizon* Claims Center (*Deepwater Horizon* Claims Center, 2013).

The *Deepwater Horizon* explosion and oil spill is the third in a series of crises experienced by Louisiana coastal communities since 2005, and the environmental justice concerns from future events must be considered in this context. First, southeast Louisiana is losing coastal land from erosion and subsidence because of both natural processes (e.g., hurricanes) and human activities (e.g., control and diversion projects) (USDOI, GS, 2004). Besides the decreased hurricane and oil-spill protections, rapid landloss and habitat fragmentation has impacted the ability to make a living, and flooding has even caused abandonment of whole communities. The second crises to impact the region includes the 2005/2008 hurricane seasons, consequences of which have been discussed above. While tropical weather is normal, low-income and minority groups may bear a larger burden than the general population. An estimated 4,500 American Indians living on the southeast Louisiana coast lost their possessions to Hurricane Katrina according to State officials and tribal leaders. Cajuns were also impacted by Hurricane Katrina, and especially by Hurricane Rita, whose 20-ft (6-m) storm surges flooded low-lying communities in Cameron, Calcasieu, and other coastal parishes. Close to 90 percent of Louisiana's Vietnamese population lives in seven southern parishes: Orleans, Jefferson, East Baton Rouge, St. Mary, Vermilion, Terrebonne, and Lafourche (Bankston and Zhou, 1996). The New Orleans East Vietnamese community of Village de L'Est was almost entirely flooded by levee failures following Hurricane Katrina. The *Deepwater Horizon* explosion, oil spill, and response followed these hurricanes. Cumulatively, such events can reduce community resiliency and increase vulnerability to future hazards, opening them up to disproportionate affects from future catastrophic events.

Waste Management Related to the *Deepwater Horizon* Explosion, Oil Spill, and Response

The USEPA standards exempt oil and gas exploration and production wastes from Federal hazardous waste regulations. This exemption does not preclude more stringent State and local regulation, and USEPA recognizes that exploration and production wastes could present a human health hazard if not properly managed (USEPA, 2002). However, wastes from oil spills are not exempt, and the *Deepwater Horizon* oil spill has raised the additional environmental justice concern as to whether or not low-income and minority groups have been disproportionately impacted by the disposal of wastes associated with the *Deepwater Horizon* oil spill's containment and response. Disposal procedures involved sorting waste materials into standard "waste stream types" at small, temporary stations and, then, sending each type to existing facilities that were licensed to dispose of them. The location of temporary sorting stations was linked to the location of containment and cleanup operations. Hence, future locations of any sorting stations would be determined by the needs of cleanup operations. However, waste disposal locations were determined by the specializations of existing facilities and by contractual relationships between them and the cleanup and containment firms. Although in the case of the *Deepwater Horizon* oil spill, most cleanup occurred in the Louisiana, Mississippi, and Alabama, but disposal occurred throughout the Gulf Coast states. The requirements of the cleanup operations would likely determine the location of facilities utilized, should a future event occur. **Table 4-44** identifies the *Deepwater Horizon* waste disposal sites that received the greatest percentages of waste, and displays for each site its location, the waste types it received, and in what quantities. This table also shows minority and low-income percentages, as well as the density of populations living within 1 mi (1.6 km) of each site. Argonne National Laboratory reports 46 waste management facilities that traditionally service the oil and gas industry along the GOM, with 18 in Louisiana, 18 in Texas, 5 in Mississippi, 4 in Alabama, and 1 in Florida (Puder and Veil, 2006). However, the waste facilities involved in disposing of *Deepwater Horizon* waste differed some from the list of facilities traditionally receiving oil and gas waste. Two facilities in Florida received a small percentage: a Campbelton, Florida facility received 23.67 percent of the *Deepwater Horizon*'s solid waste collected; a Miami, Florida facility received >0.58 percent of the total *Deepwater Horizon* liquid waste collected. Louisiana received about 82 percent of the *Deepwater Horizon*'s liquid waste recovered; of this, 56 percent was manifested to mud facilities located in Venice, Plaquemines Parish, Louisiana, and in Port Fourchon, Lafourche Parish, Louisiana; it was then transferred to a processing facility in Port Arthur, Texas. The waste remaining after processing was sent to deep well injection landfills located in Fannett and Big Hill, Texas. The sites located in Venice and Port Fourchon, Louisiana, and in Port Arthur, Fannett, and Big Hill, Texas, have low minority populations, but a few of these areas have substantial poverty rates relative to State and county means.

4.1.1.22.4.2. Impacts of Routine Events

Background/Introduction

The analysis of environmental justice is divided into those related to routine operations (below) and those related to oil spills (**Chapter 4.1.1.24.3**). **Chapter 4.1.1.24.4.1** describes the widespread presence of an extensive OCS support system and associated labor force, as well as economic factors related to OCS activities. BOEM estimates that production from an EPA proposed action would be 0-0.071 BBO and 0-0.162 Tcf of gas, which is a marginal decrease from the last EPA proposed action.

Although a proposed EPA action would be approximately 125 mi (201 km) from Florida's Panhandle region, the majority of socioeconomic impacts would not occur in Florida. Because of Florida's historic opposition to oil and gas development in waters close to Florida and because of the almost complete absence of onshore support service bases in the State, BOEM anticipates that very few OCS-related activities would be staged from Florida. Also, no new pipeline landfalls or other forms of coastal OCS-related infrastructure are projected to be constructed in Florida as a result of an EPA proposed action. Instead, Port Fourchon, Louisiana is expected to serve as the primary service base and is more likely than areas in Florida, Mississippi, or Alabama to experience any population impacts that might result from an EPA proposed action. BOEM does not expect that population and environmental justice effects due to the proposed action would be concentrated in the Florida Panhandle region, first, because most OCS-related jobs are in the fabrication sector and this sector is not strongly present in the Panhandle and, second, because OCS-related employment in general is widespread across the GOM region (i.e., offshore workers do not necessarily live near their place of work) and is not concentrated in the Florida Panhandle region.

Impact-producing factors associated with an EPA proposed action that could affect environmental justice include the following: (1) potential infrastructure changes/ expansions including (a) fabrication yards, (b) support bases, and (c) onshore disposal sites for offshore waste; (2) increased commuter and truck traffic; and (3) employment changes and immigration. Possible changes/expansions/increases to any of these routine impact-producing factors of OCS activities occur in the context of the long-lived State and Federal oil and gas leasing programs and represents small, incremental additions to a robust offshore oil and gas industry. As a result, the impacts from routine events that would be produced by an EPA proposed action due to these factors would also be small and incremental. Particularly in the case of potential social impacts, it is often not possible to separate out the resulting additional impacts from the ongoing effects of the OCS Program because the economic and social conditions are dynamic, and they are influenced by many factors such as employment, consumer demand, interest rates, educational resources, etc. An EPA action has little impact on such factors, the OCS Program contributes to, but does not determine them, and the activities of the OCS Program are affected by economic political factors that influence investment decisions which, one way or another, reverberate through many of the OCS economic impact areas. While individual lease sales have little influence on the factors causing impacts from routine events, the overall OCS leasing program has more and, for this reason, the factors considered in this chapter are explored in more detail in the cumulative analysis (**Chapter 4.1.1.24.4.4**).

Proposed Action Analysis

The Executive Order mandating an environmental justice analysis arose out of cases where minority and/or low-income communities disproportionately bore the environmental risk or direct burdens of industrial development or Federal actions. As discussed in **Chapter 4.1.1.24.4.1**, the OCS Program in the GOM is large and has been ongoing for more than 60 years. While the program is offshore, onshore activities related to it occur within a mix of communities whose economies are linked in various ways and at differing levels to the many OCS-involved industrial sectors. An EPA proposed action is expected to slightly increase employment opportunities in a wide range of businesses along the Gulf Coast. These conditions preclude a prediction of where much of this employment will occur or who will be hired. **Figures 4-21, 4-22, and 4-25 through 4-28** display the location of oil-related infrastructure and the distribution of minority residents across GOM counties/parishes and census tracts based on the U.S. Census from 2010. **Figures 4-23 and 4-24** display the location of oil-related infrastructure and the distribution of low-income households using data from the 2009 Community Survey. As stated in **Chapter 4.1.1.24.4.1**, pockets of concentrations of these populations adjacent to OCS-related infrastructure are in large urban areas where the complexity and dynamism of the economy and labor force preclude a measurable effect. In these urban areas and in many Louisiana and Texas coastal areas as well, much of the OCS-related infrastructure, such as fabrication/shipbuilding yards, pipecoating facilities, and port facilities, is located in industrial areas that are often physically separated from residential areas. In addition, the distribution of low-income and minority populations does not parallel the distribution of industry activity, and as such, effects of an EPA proposed action are not expected to be disproportionate (Kaplan, et al., 2011).

Fabrication/shipbuilding yards and port facilities are major infrastructure types that demonstrate the interlinked nature of OCS activity within the GOM and could pose potential environmental justice risks. As mentioned earlier, Over one-third (28 facilities) of the U.S. major shipbuilding yards are located on the GOM. Of these, most facilities are concentrated in a 200-mi (322-km) area between New Orleans, Louisiana, and Mobile, Alabama. The offshore oil industry relies heavily on specialized port infrastructure that specifically serves the need of the industry. Such activities as repair and maintenance of supply vessels, fabrication yards, and supply bases tend to be located in ports nearest to offshore drilling operations. Thus, the 34 OCS-related service bases in the EPA analysis area are mainly concentrated on the coast of Louisiana, with a handful located in Mississippi, Alabama, and Florida (The Louis Berger Group, Inc., 2004). Since an EPA proposed action would help to maintain ongoing levels of activity rather than expand them, it would not generate new infrastructure demand sufficient to raise siting issues. Also, prior to construction, any new OCS-related onshore facility would first be required to receive approval by relevant Federal, State, county and/or parish, and community governments with jurisdiction. BOEM assumes that any new construction would be approved only if it were consistent with appropriate land-use plans, zoning regulations, and other State/regional/local regulatory mechanisms. For these reasons, this EIS considers infrastructure projections only for the cumulative analysis (**Chapter 4.1.1.24.4.4**).

All material that moves to and from an offshore platform goes through an onshore service base. Although support and transport operations are spread throughout the Gulf Coast, most producing deepwater fields have service bases in southeast Louisiana and much of this goes through Port Fourchon in Lafourche Parish, Louisiana. Port Fourchon has grown extensively in recent decades, in large measure due to its role in servicing the deepwater OCS. The Port underwent a 400-ac (16-ha) expansion in 2008, with planned slip developments in the short-term and expansions of its Northern property in the long-term.

LA Hwy 1 is the primary north-south corridor through Lafourche Parish and is the principal transportation route for trucks entering and exiting Port Fourchon. According to the LA 1 Coalition, a nonprofit corporation working to improve LA Hwy 1, between 1991 and 1996, there were over 5,000 accidents along this largely rural two-lane highway. According to the LA 1 Coalition, LA Hwy 1's fatality rate is double that of similar highways (LA 1 Coalition, 2010). In addition, LA Hwy 1 is the only means of evacuation for thousands of people. Approximately 35,000 people, including 6,000 offshore workers, use LA Hwy 1 for hurricane evacuations (LA 1 Coalition, 2010). According to one study, the average daily traffic along LA Hwy 1 appears to be heavily influenced by the overall level of oil and gas activities and due to increased demand, particularly for deepwater services (Guo et al., 2001). Residents along the highway have expressed concern over LA Hwy 1's adequacy for traffic congestion, desiring improved hurricane evacuation, and emergency medical transportation routes (USDOT, Federal Highway Administration, 2004).

While local governments near the service bases have gained revenue from the increased activity within their jurisdictions, the demands for additional services and facilities resulting from oil and gas operations have sometimes exceeded growth in the revenue stream. A Federal cost share helped support the construction of the Leeville Bridge in 2009, considered the weakest link of the LA Hwy 1 system; the first segment of the improved 18-mi (29-km), two-lane Leeville opened to traffic in July 2011 (Louisiana Dept. of Transportation and Development, 2011). Funding is being secured for the section between Leeville and Golden Meadow with the eventual widening of the entire corridor to four lanes (Offshore Magazine, 2011). Many improvements to the LA Hwy 1 system have been funded and continued growth of Port Fourchon and associated road traffic would add to an increased risk for users of and residents along the highway. As described in **Chapter 4.1.1.24.4.1**, community string settlement patterns in the area (in this case, on high ground along LA Hwy 1 and Bayou Lafourche) mean that all income groups would be affected by any increased traffic. The BOEM-funded study, *Environmental Justice Considerations in Lafourche Parish, Louisiana*, compared the percentage of different minority populations within an affected area with the percentage of that population for the State. Using this method, two minority populations are at greater risk. Hispanics are 1.36 times more likely to live along the transportation corridor, and Native Americans are twice as likely to live along the transportation corridor than anywhere else in the parish (Hemmerling and Colten, 2003). While the majority of OCS-related infrastructure in south Lafourche Parish is near where the Houma Indian population resides, an EPA proposed action would not significantly alter this preexisting situation. Over the last two decades, the area has been experiencing increased truck traffic and its associated effects due to increasing offshore-related activities at Port Fourchon. Since an EPA proposed action would not significantly alter this preexisting situation, minority and low-income populations would not sustain disproportionate adverse effects from an EPA proposed action.

An EPA proposed action usually represents <1 percent of the total current permitted landfill capacity in the GOM economic impact area. BOEM rules require that all waste considered hazardous be transported onshore and disposed of, which lowers the risks to the environment but increases the risk to those people living along the hazardous transportation routes (NTL 2009-G35). The USDOT currently recommends a default isolation distance of one-half mile around any roadway involved in a hazardous chemical fire. Argonne National Laboratory reported that there are 46 waste management facilities that service the oil and gas industry along the GOM, with 18 in Louisiana, 18 in Texas, 5 in Mississippi, 4 in Alabama, and 1 in Florida (Puder and Veil, 2006). **Chapters 4.1.1.24.1 and 3.1.2.2** discuss the limited likelihood of additional waste disposal facilities. Because a relatively small amount of waste results from a single EPA proposed action and because of the difficulty of separating out the relative contribution of all OCS waste from municipal waste in general or distinguishing the effects on nearby communities of OCS waste disposal from the disposal of other waste, this EIS addresses the marginal contribution of an EPA proposed action on waste issues as part of the cumulative analysis (**Chapter 4.1.1.24.4.4**).

Because of Louisiana's extensive oil-related support system (**Chapter 4.1.1.24.1**), the State is likely to experience more employment effects related to an EPA proposed action than are the other coastal states. Refer to **Chapter 4.1.1.24.3** for a discussion of employment projections as a result of an EPA proposed action. As has been the case with several prior proposed actions, Lafourche Parish, Louisiana, is likely to experience the greatest concentration of these benefits. BOEM employment projections can neither estimate the socioeconomic or ethnic composition of new employment nor identify the communities in which that employment would likely occur. Sectors such as the fabrication industry and support industries (e.g., trucking) employ minority workers and provide jobs across a wide range of pay levels and educational/skill requirements (Austin et al., 2002a and 2002b; Donato et al., 1998). Also, evidence suggests that a healthy offshore petroleum industry does indirectly benefit low-income and minority populations. For example, one Agency study in Louisiana found income inequality decreased during the 1970's oil boom and increased with the mid-1980's decline (Tolbert, 1995). Because of the expected concentration of employment effects in Lafourche Parish, it is also the only parish where the additional OCS-related activities and employment may be sufficient to increase stress to its infrastructure. For example, one study found that, because of local labor shortages in the past, employers actively recruited foreign employees including Laotian refugees and Mexican migrant workers. This trend has, in turn, applied pressure on available housing stocks within some GOM coastal communities that exhibited varying degrees of results in incorporating new residents into local communities (Donato, 2004). However, these effects arose during a time of a booming economy and high employment in general. According to BOEM estimates, an EPA proposed action would provide little additional employment growth. Instead, it would have the effect of maintaining current activity and employment levels, which is expected to have beneficial, although limited, direct and indirect employment effects to low-income and minority populations.

While a reevaluation of the baseline conditions pertaining to environmental justice was recently conducted as a result of the recent *Deepwater Horizon* explosion, oil spill, and response, it is yet to be seen how issues like new industry regulations and long-term biological impacts of the spill will affect minority and low-income communities residing along the EPA coast.

Summary and Conclusion

Because of the existing extensive and widespread support system for OCS-related industry and associated labor force, the effects of an EPA proposed action are expected to be widely distributed and to have little impact. This is because a proposed action is not expected to significantly change most of the existing conditions, such as traffic or the amount of infrastructure. Where such change might occur is impossible to predict but, in any case, it would be very limited. Because of Louisiana's extensive oil-related support system, that State is likely to experience more employment effects related to an EPA proposed action than are the other coastal states, and because of the concentration of this system in Lafourche Parish, the parish is likely to experience the greatest benefits from employment benefits and burdens from traffic and infrastructure demand. Impacts related to an EPA proposed action are expected to be economic and to have a limited but positive effect on low-income and minority populations because an EPA proposed action would contribute to the sustainability of current industry and related support services. The OCS-related infrastructure is widely distributed within the impact area, and concentrations of minority and low-income populations are not adjacent to or associated with this infrastructure. Therefore, an EPA proposed action is not expected to have disproportionate adverse environmental or health effects on minority or low-income populations.

4.1.1.22.4.3. Impacts of Accidental Events

Background/Introduction

Impact-producing factors associated with an EPA proposed action that could affect environmental justice include (1) oil spills, (2) vessel collisions, and (3) chemical/drilling-fluid spills. These factors could affect environmental justice through (1) direct exposure to oil, dispersants, degreasers, and other chemicals that can affect human health; (2) decreased access to natural resources due to environmental damages, fisheries closures, or wildlife contamination; and (3) proximity to onshore disposal sites used in support of oil and chemical spill cleanup efforts. The *Deepwater Horizon* oil spill was an accidental event of catastrophic proportions, which is not reasonably expected and not part of an EPA proposed action, and should be distinguished from accidental events that are smaller in scale and occur more frequently. This section is limited to discussion of accidental events that have a higher probability of occurring but with less impact than a catastrophic event. Detailed analysis of a high-impact, low-probability catastrophic event, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* oil spill is provided in **Appendix B**.

Environmental justice impacts that may occur because of an EPA proposed action would not be limited to the geographic boundaries of the EPA. Actions occurring within the EPA may impact environmental justice within the coastal communities associated with the CPA and WPA. Facilities located outside of the coastal areas of the EPA are most like to provide support for offshore activities on the EPA, e.g. coastal support infrastructure in Louisiana such as Port Fourchon. Oil and chemical spills on the EPA may be carried by winds and currents to the coasts of the WPA and CPA. As a result, a discussion of potential accidental events within the EPA addresses potential impacts of accidental events to environmental justice throughout the Gulf of Mexico Region.

Proposed Action Analysis

Potential oil spills including surface spills and underwater well blowouts may be associated with exploration, production, or transportation phases of an EPA proposed action. Detailed risk analysis of offshore oil spills and coastal spills associated with an EPA proposed action is provided in **Chapters 3.2.1.5, 3.2.1.6, and 3.2.1.7**. When oil is spilled in offshore areas, much of the oil volatilizes or is dispersed by currents, so it has a low probability of contacting coastal areas. Low-income and minority populations might be more sensitive to oil spills in coastal waters than the general population because of their dietary reliance on wild coastal resources, their reliance on these resources for other subsistence purposes such as sharing and bartering, their limited flexibility in substituting wild resources with purchased ones, and their likelihood of participating in cleanup efforts and other mitigating activities. Little is known about subsistence along the Gulf Coast, and BOEM is currently funding a study to better document subsistence in the region.

Vessel collisions may be associated with exploration, production, or transportation activities that result from an EPA proposed action and are the most common source of OCS-related spills. **Chapter 3.2.4** provides a detailed discussion of vessel collisions. BOEM data show that, from 2006 through 2010, there were 107 OCS-related collisions (USDOI, BOEMRE, 2011c). The majority of vessel collisions involve service vessels colliding with platforms or pipeline risers, although sometimes vessels collide with each other. These collisions often result in spills of various substances, and while most occur on the OCS far from shore, collisions in coastal waters can have consequence to low-income and minority communities. For example, on July 23, 2008, a barge carrying heavy fuel collided with a tanker in the Mississippi River at New Orleans, Louisiana. Over several days, the barge leaked an estimated 419,000 gallons of fuel. From New Orleans to the south, 85 mi (137 km) of the river were closed to all traffic while cleanup efforts were undertaken, causing a substantial backup of river traffic (USDOC, NOAA, 2008c). Downriver from the collision, cities and parishes that pull drinking water from the river (i.e., Gretna, Algiers, and St. Bernard and Plaquemines Parishes) shut their water intakes out of fear of possible treatment system contamination (Tuler et al., 2010). Not only can these types of events erode public confidence in governmental and corporate institutions, they may compromise municipal services for which low-income communities may be financially unable to find private market substitutions, interfere with people's ability to use natural resources, or even interfere with people's ability to travel to work, as in the case of this spill, which temporarily shut down ferry service between Algiers and downtown New Orleans. These types of events may impact an entire region, but low-income and/or minority groups lacking financial or social resources may be more sensitive and less equipped to cope with the disruption these events pose.

Chemical and drilling-fluid spills may be associated with exploration, production, or transportation activities that result from an EPA proposed action. **Chapter 3.2.5** provides a detailed discussion of chemical and drilling-fluid spills. Each year, between 5 and 15 chemical spills are expected to occur; most of these are ≤50 bbl in size. Large spills are much less frequent. For example, from 1964 to 2005, only two chemical spills of ≥1,000 bbl occurred. Dispersants are of particular concern for human health because, while dispersants are a relatively common product used to clean and control oil spills, they can evaporate from fresh crude and weathered oil and can come ashore as a result of burning oil out at sea. While additional production chemicals are needed in deepwater operations where hydrate formation is a possibility, overall spill volumes are expected to remain stable because of advances in subsea processing.

With the exception of a catastrophic spill event, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* explosion, oil spill, and response, the impacts of oil spills, vessel collisions, and chemical/drilling fluid spills are not likely to be of sufficient duration to have adverse and disproportionate long-term effects for low-income and minority communities in the analysis area. As described earlier, low-income and/or minority groups lacking financial or social resources may be more sensitive and less equipped to cope with the disruption these events pose over the short term, but again, these smaller events should not have disproportionate long-term effects on low-income and minority communities, especially if they occur several miles offshore in the EPA proposed action area.

Summary and Conclusion

Chemical and drilling-fluid spills may be associated with exploration, production, or transportation activities that result from an EPA proposed action. Low-income and minority populations might be more sensitive to oil spills in coastal waters than is the general population because of their dietary reliance on wild coastal resources, their reliance on these resources for other subsistence purposes such as sharing and bartering, their limited flexibility in substituting wild resources with purchased ones, and their likelihood of participating in cleanup efforts and other mitigating activities. With the exception of a catastrophic spill event, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* oil spill, the impacts of oil spills, vessel collisions, and chemical/drilling fluid spills are not likely to be of sufficient duration to have adverse and disproportionate long-term effects for low-income and minority communities in the analysis area.

For the reasons set forth in the analysis above, the kinds of accidental events (smaller, shorter time scale) that are likely to result from an EPA proposed action may affect low-income and/or minority more than the general population, at least in the short term. These higher risk groups may lack the financial or social resources and may be more sensitive and less equipped to cope with the disruption these events pose. These smaller events, however, are not likely to significantly affect minority and low-income communities in the long term. Detailed analysis of a high-impact, low-probability catastrophic event, which is not reasonably expected and not part of an EPA proposed action, such as the *Deepwater Horizon* oil spill is provided in **Appendix B**.

4.1.1.22.4.4. Cumulative Impacts

Background/Introduction

Of all activities in the cumulative scenario, those that could potentially impact environmental justice in the EPA include (1) proposed actions and the OCS Program, (2) State oil and gas activity, (3) existing infrastructure associated with petrochemical processing including refineries and polyvinyl plants, (4) existing waste facilities including landfills, (5) coastal erosion/subsidence, (6) hurricanes, and (7) the lingering impacts of the *Deepwater Horizon* explosion, oil spill, and response. The context in which people may find themselves, and how that context affects their ability to respond to an additional change in the socioeconomic or physical environment, is the heart of an environmental justice analysis. The OCS Program in the GOM is large and has been ongoing for more than 50 years with established infrastructure, resources, and labor pools to accommodate it. That said, low-income and/or minority groups lacking financial, social, or environmental resources or practical alternatives may be more sensitive than other groups to the consequences of an oil spill, such as interruptions to municipal services or fisheries closures, and they may be less equipped to cope with these consequences. In studies on social disaster resiliency, variables such as income inequality can negatively impact a community's ability to respond and recover from a disaster (Norris et al., 2008). Groups may be even less so equipped to respond to these types of events if they are already recovering from an earlier disaster such as a hurricane. On the other hand, Cutter et al. (2008) found that previous disaster experience, defined as the number of paid disaster declarations, positively affected disaster resilience. This cumulative impact analysis examines how incremental additions to an established program from an EPA proposed action may potentially interact with other ongoing impacts along the Gulf Coast. As explained in prior sections, the interlinked nature of the OCS industry requires a discussion of potential impacts throughout all three Gulf of Mexico planning areas—the EPA, CPA, and WPA.

OCS Oil- and Gas-Related Impacts

An EPA proposed action and the OCS Program have the potential to adversely impact low-income, minority, and other environmental justice communities either directly or indirectly from onshore activities conducted in support of OCS exploration, development, and production (for a fuller discussion on potential impacts from routine events and accidental events (**Chapters 4.1.1.22.4.2 and 4.1.1.22.4.3**, respectively). Potential vectors for impacts include increases in onshore activity (such as employment, migration, commuter traffic, and truck traffic), additions to the infrastructure supporting this activity (such as fabrication yards, supply ports, and onshore disposal sites for offshore waste), and additional accidental events such as oil or chemical spills. BOEM estimates that production for an EPA proposed action would be 0-0.071 BBO and 0-0.162 Tcf of gas (**Table-3-1**). **Chapter 4.1.1.22.3.1** describes the widespread and extensive OCS-support system and associated labor force, as well as economic factors related to OCS activities. The widespread nature of the OCS-related infrastructure serves to limit the magnitude of effects that a single EPA proposed action or the overall OCS Program may have on a particular community. Future lease sales would serve mostly to maintain the ongoing activity levels associated with the current OCS Program.

For most of the Gulf Coast, the OCS Program will result in only minor economic changes. Generally, effects will be widely yet thinly distributed across the Gulf Coast and will consist of slight increases in employment and few, if any, increases in population. Some places could experience elevated employment, population, infrastructure, and/or traffic effects because of local concentrations of fabrication and supply operations. Because of Louisiana's extensive oil-related support system, that State is likely to experience more employment effects related to an EPA proposed action than are the other coastal states. Because Lafourche Parish, Louisiana, already services about 90 percent of all deepwater and 45 percent of all shallow-water oil and gas production in the Gulf, it is likely to continue experiencing benefits from the OCS Program (Loren C. Scott & Associates, 2008). Except in Louisiana, the OCS Program is expected to provide little additional employment, although it will serve to maintain current activity levels, which is expected to be beneficial to Gulf region low-income and minority populations generally. Evidence also suggests that a healthy offshore petroleum industry may indirectly benefit low-income and minority populations. One Agency study found income inequality in Louisiana decreased during the oil boom and increased with the decline (Tolbert, 1995).

Environmental justice often concerns infrastructure siting, which may have disproportionate and negative effects on minority and low-income populations. Since OCS lease sales help maintain ongoing levels of activity rather than expand them, no single EPA proposed action generates demand that would require significant new infrastructure. Pipeline shore facilities are small structures such as oil metering stations that are associated with pipeline landfalls. At present, there are 129 OCS-related pipeline landfalls and 53 OCS-related pipeline shore facilities in the GOM region (**Table 3-11**). **Chapter 3.1.2** discusses projected new coastal infrastructure that may result from an EPA proposed action, including the potential need for the construction of new facilities and/or the expansion of existing facilities. Each OCS-related facility that may be constructed onshore must receive approval by the relevant Federal, State, and local agencies. Each onshore pipeline must obtain similar permit approval and concurrence. BOEM assumes that all such approvals would be consistent with appropriate land-use plans, zoning regulations, and other Federal/State/regional/local regulatory mechanisms. Should a conflict occur, BOEM assumes that approval would not be granted or that appropriate mitigating measures would be enforced by the responsible political entities such as the United States Environmental Protection Agency, the Louisiana Department of Natural Resources and the Louisiana Department of Environmental Quality.

As stated in **Chapter 4.1.1.22.4.1**, the region as a whole is not homogenous, but there are several potentially vulnerable ethnic and socioeconomic groups residing throughout OCS Gulf of Mexico economic impact areas, some in enclaves. This Chapter shows that the 10 counties/parishes with high concentrations of oil-related infrastructure (**Table 4-43**) are not generally those with high concentrations of minority and low-income populations and that, in these 10 counties/parishes, many of the low-income and minority populations reside in large urban areas where the complexity and dynamism of the economy and labor force preclude measurable sale-level or programmatic-level OCS effects.

Two local infrastructure issues analyzed in **Chapter 4.1.1.22.4.1** could possibly have related environmental justice concerns: traffic on LA Hwy 1 and the Port Fourchon expansion. This analysis concludes that the minority and low-income populations of Lafourche Parish will share the negative impacts of the OCS Program with the rest of the population. However, most effects are expected to be economic and positive. Improvements to the LA Hwy 1 highway system that connects Port Fourchon with the rest of Louisiana are currently underway, and are expected to alleviate many of the associated issues with the transportation corridor.

While there is a link between a healthy oil industry and indirect economic benefits to all sectors of society, this link may be weaker in some communities and stronger in others such as Lafourche Parish, Louisiana. Even in those areas in which links are strong, the petroleum industry has not been a critical factor in social change except under unusual and limited circumstances. Impacts, including how communities respond to fluctuations in industry activity, vary from one coastal community to the next. Episodes of the rapid expansion or contraction of offshore or onshore oil and gas activity has produced moderate impacts in some communities and only negligible to minor impacts in others. Furthermore, non-OCS activities, such as expansions of the tourism industry or the highway system, also can generate socioeconomic impacts by being a catalyst for in-migration, demographic change, job creation and loss, community development strategies, and overall changes in social institutions (i.e., family, government, politics, education, and religion). This analysis concludes that the contribution of an EPA proposed action to the OCS Program's cumulative environmental justice impacts would be negligible. The analysis also concludes that, overall, OCS programmatic impacts to environmental justice over the next 40 years would likely represent a very small proportion of the cumulative impacts of all activities that affect environmental justice.

Deepwater Horizon *Explosion, Oil Spill, and Response*

While the long-term social impacts of the *Deepwater Horizon* explosion, oil spill, and response are still emerging, anecdotal evidence from media coverage and early survey studies suggest the possibility of trends that might disproportionately affect low-income and minority communities for some time to come. A phone survey conducted soon after the spill by a team of LSU sociologists found that nearly 60 percent of the 925 coastal Louisiana residents interviewed reported being almost constantly worried by the *Deepwater Horizon* explosion and oil spill (Lee and Blanchard, 2010). Studies of residents near past oil spills (such as the *Exxon Valdez* in Prince William Sound, Alaska) have noted impacts to social cohesion and increased distrust in government and other institutions, which contributed to community anxiety (Tuler et al., 2010). The cumulative effects on subsistence availability and wild resource harvest patterns also might be expected and raise the issue of health effects.

While acute health effects from oil-spill events have been studied, the long-term impacts from exposure are unknown (Aguilera et al., 2010; Meo, 2009; Morita et al., 1999). Long-term health surveillance studies of possible long-term health effects from exposure to either the *Deepwater Horizon* oil spill or dispersants, such as the possible bioaccumulation of toxins in tissues and organs, by the National Institutes of Health are ongoing. The potential for the long-term human health effects remain largely unknown. Participants in the *Deepwater Horizon*'s "Vessels of Opportunity" program, which recruited local boat owners (including Cajun, Houma Indian, and Vietnamese fishermen) to assist in cleanup efforts, may be one of the exposed groups. African Americans are thought to have made up a high percentage of the cleanup workforce. In Gulf coastal areas, low-income and minority groups are heavy subsistence users of local seafood. Worker and shoreline monitoring data indicates that the concentrations of oil and dispersants to which low-income and minority communities were exposed are unlikely to result in adverse health effects (U.S. Dept. of Labor, OSHA, 2010; King and Gibbons, 2011). One concern is that heavy subsistence users face higher than expected, and potentially harmful, exposure rates to PAH's from the *Deepwater Horizon* explosion and oil spill. However, fisheries closures may have temporarily limited access to subsistence foods thereby also reducing the potential of oil dispersant exposure, especially since fisheries were not re-opened until testing indicated that the waters were safe for fishing. Extensive seafood testing for PAHs and dispersant compounds found levels that were within the risk assessment protocol established by the USDA, NOAA and the Gulf Coast States (Brown et al., 2011; Dickey, 2012). So far, data from several sources indicate that exposures to *Deepwater Horizon* oil and dispersants were low and isolated and that there was no evidence of substantial onshore exposure to communities (U.S. Dept. of Labor, OSHA, 2010; King and Gibbons, 2011). It should be noted that there is some dispute within the scientific community over the validity of the risk assessment protocol that was used, and concern that the LOCs used by the protocol may have underestimated the risk from seafood contaminants among vulnerable populations such as pregnant women and children (Rotkin-Ellman et al., 2011; Rotkin-Ellman and Soloman, 2012). Future long-term studies may help to resolve the dispute.

The National Institutes of Health's proposed study, known as the Gulf Long-Term Follow-Up (GuLF) Study, should provide a better understanding of the long-term and cumulative health impacts, such as the consequences of working close to a spill and of consuming contaminated seafood. The GuLF Study will monitor oil-spill cleanup workers for 10 years. The National Institute of Environmental Health Sciences announced in November 2012 that over 29,000 cleanup workers and volunteers were enrolled in the GuLF Study. Enrollment was extended through March 1, 2013, to reach the National Institute of Environmental Health Sciences' target goal of 55,000 participants (U.S. Dept. of Health and Human Sciences, National Institute of Environmental Health Sciences, 2012; Mackar, 2012; U.S. Dept. of Health and Human Services, National Institutes of Health, 2013).

Several ongoing studies also seek to understand the short- and long-term impacts of the recent *Deepwater Horizon* explosion, oil spill, and response (e.g., BOEM's study "Ethnic Groups and Enclaves Affected by OCS," which was launched on August 1, 2010). Information regarding the impacts of the *Deepwater Horizon* explosion, oil spill, and response remains incomplete at this time. Studies regarding environmental justice concerns in light of the *Deepwater Horizon* explosion, oil spill, and response are only in their infancy, and it may be years before data are available and certainly not within the timeframe of this NEPA analysis. The NRDA process, which is ongoing, may help to inform issues relating to subsistence and other indigenous reliance on natural resources. This information is unavailable and unobtainable at this time, regardless of costs. In its place, subject-matter experts have used credible information that is available and applied using accepted socioeconomic methodologies. Although most criteria related to environmental justice may not be essential to a reasoned choice among alternatives, health impacts may be essential. Nevertheless, long-term health studies are pending and data and study reports may not be available for several years or longer. What credible information is available was applied using accepted methodologies. BOEM will continue to seek additional information as it becomes available and bases the previous analysis on the best information currently available.

Waste

Based on operator data provided in filed plans, BOEM estimates that there is an average of 2,000 ft^3 (57 m^3) of trash and debris generated per exploration well drilled, 102 ft^3 (3 m^3) of trash and debris generated per development well drilled, and 1,000ft (28 m^3) of trash and debris generated per year per manned platform of its 25-year life (Dismukes et al., 2007). A single EPA proposed action usually represents <1 percent of the total current permitted landfill capacity in the GOM economic impact area. Because of technological improvements in how waste is compacted, landfill capacity has increased. Drilling muds and wastewater streams can be used as landfill cover, and landfills will often accept these materials at a reduced price or even at no charge (The Louis Berger Group, Inc., 2004). The occurrence of hazardous offshore, oil-field waste is minimal and infrequent. Industry representatives contacted for a BOEM study indicated that the need for hazardous storage could occur as infrequently as once in 5 years for a typical offshore facility with drilling and production activities (Dismukes et al., 2007). **Table 4-44** lists existing waste sites and the amount of waste generated by the *Deepwater Horizon* explosion, oil spill, and response that was distributed between Gulf landfills and waste processing facilities. Because of existing excess capacity, no new waste disposal sites are projected for the cumulative case (Dismukes, official communication, 2012a). Therefore, no changes in impacts to minority and low income communities are expected.

Non-OCS Oil- and Gas-Related Impacts

State Oil and Gas

State oil and gas activity has the potential to adversely impact low-income, minority, and other environmental justice communities, either directly or indirectly, from onshore activities conducted in support of State oil and gas exploration, development, and production. Louisiana, Mississippi, and Alabama jurisdiction over mineral resources extends 3 nmi (3.5 mi; 5.6 km) from the shore; Texas and Florida jurisdiction over the seabed extends out 9 nmi (10.4 mi; 16.7 km). While offshore leasing in shallow waters is in general decline, states like Louisiana are attempting to incentivize increased activity closer to the shore. In 2006, the Louisiana Legislature authorized the Louisiana Dept. of Environmental Quality to implement an Expedited Permit Processing Program, which has so far resulted in a 55 percent reduction in coastal permitting time (Louisiana Dept. of Natural Resources, 2009). In November 2010, Louisiana voters passed the Louisiana Natural Resource Severance Tax Amendment, which effectively decreases the amount of taxes retained by the State on the severance of natural resources while it increases what can be collected by the parishes where resources are extracted (State of Louisiana, 2010).

State offshore oil and gas programs pose the same potential issues as does the OCS Program, although since State leases are closer to land, their petroleum-related activities are generally viewed as having greater potential for directly impacting coastal communities. BOEM assumes that sitings of any future facilities associated with State programs would be based on the same economic, logistical, zoning, and permitting considerations that determined past sitings. Revenues from State-water oil programs have produced several positive impacts, and the steady stream of oil exploration and development have produced positive cumulative impacts that include increased funding for infrastructure, higher incomes (that can be used to purchase better equipment for subsistence), better health care, and improved educational facilities. While industrialization generally leads to a shift in community organization and cultural development, the offshore oil and gas industry and its concentrated work schedule has been more accommodating of "traditional" activities, such as trapping and fishing, during their time at home (Luton and Cluck, 2004).

Downstream Activities

Existing onshore infrastructure associated with petrochemical processing including refineries and the production of petroleum-based goods such as polyvinyl plants poses potential health and other related risks to minority and low-income communities. Expectations for new gas processing facilities being built during the period 2012-2051 as a direct result of the OCS Program are dependent on long-term market trends that are not easily predictable over the next 40 years. Existing facilities will experiences equipment switch-outs or upgrades during this time. The marginal contribution of an EPA proposed action does not change the estimate. BOEM cannot predict and does not regulate the siting of future gas processing facilities. BOEM assumes that sitings of any future facilities will be based on the same economic, logistical, zoning, and permitting considerations that determined past sitings and that they will not disproportionately affect minority and low-income populations. An environmental justice study of industrial siting patterns in Jefferson, St. Bernard, and Lafourche Parishes, Louisiana, (Hemmerling and Colten, 2003) found that "people appear to be moving into densely populated, largely industrial areas where the costs of rent are lower. In addition, people tend to be moving into newer housing." This historical analysis revealed little evidence of systematic environmental injustice of various oil-related industries, with the demographic makeup of the communities changing after facilities arrived.

Public Health

The Natural Resources Defense Council and the National Disease Clusters Alliance identify and track disease clusters in the U.S. An unusually large number of people sickened by a disease in a certain place and time is known as a "disease cluster." The underlying causes of a disease cluster can be genetic or environmental and, typically, cannot be definitively established due to limitations in scientific tools applied to small populations. (Natural Resources Defense Council and the National Disease Clusters Alliance, 2011). Because of these limitations, the definition of environmental disease clusters is based on the geographic proximity of an identified hazard and disease or health outcomes of concern regarding exposure to that hazard (Louisiana Center for Environmental Health, 2008). The Natural Resources Defense Council and the National Disease Clusters Alliance identified disease clusters in 13 states, with four clusters in Louisiana located in Mossville in Calcasieu Parish, Amelia in St. Mary Parish, Coteau in Iberville Parish, and New Orleans in Orleans Parish. Calcasieu Parish hosts a large number of companies that produce petroleum-based chemicals. While a wide range of medical problems were identified in Mossville area, a disease cluster has not been confirmed. A cluster of neuroblastoma (a brain cancer) was confirmed for Amelia, which hosted a Marine Shale Processor. There was insufficient data to link a hazardous waste incinerator at the marine shale processor plant, but in 2007 the owners paid the State government a settlement to close and remediate the site. The cluster of childhood leukemia in Coteau have not been clearly linked to environmental factors while a cluster of breast cancer in an urban tract in Orleans has been associated with a landfill for residential and industrial waste closed in 1976, currently a Superfund Site (Natural Resources Defense Council and the National Disease Clusters Alliance, 2011). Three disease clusters in Florida were identified, but they were industrial in nature (Natural Resources Defense Council and the National Disease Clusters Alliance, 2011). Due to the distance of OCS Program activities offshore and because many sites have been closed and remediated, an EPA proposed action would not be expected to affect public health in these communities. These sites are far from a coastline where an OCS oil spill could directly impact these people, but it is not unlikely that members of these communities could participate in cleanup efforts. An environmental justice analysis seeks to identify populations that, through a variety of mechanisms, may become disproportionately impacted by an EPA proposed action and its associated activities. The location of disease clusters suggests that there may be a correlation between downstream oil and gas processing (after any OCS Program-related oil and gas comes ashore) and diminished health in adjacent populations.

Coastal Erosion and Subsidence

Coastal erosion and subsidence in some parts of the southeastern coastal plain serves to amplify the vulnerability of communities, infrastructure, and natural resources to storm-surge flooding (Dalton and

Jones, 2010). Submergence in the Gulf is occurring most rapidly along the Louisiana coast and more slowly in other coastal states. Depending on local geologic conditions, the subsidence rate varies across coastal Louisiana from 3 to over 10 mm/year (0.12 to over 0.39 in/year). Natural drainage patterns along many Texas coast areas have been severely altered by construction of the Gulf Intracoastal Waterway and other channelization projects associated with its development. Saltwater intrusion resulting from river channelization and canal dredging is a major cause of coastal habitat deterioration (Tiner, 1984; National Wetlands Inventory Group, 1985; Cox et al., 1997). Tropical storms are the norm in the Gulf region, but low-income and minority communities may bear a larger burden than the general populations. Native Americans, Vietnamese, Cajun, African American, and other ethnic enclaves have all borne catastrophic losses in recent storm events. An estimated 4,500 Native Americans living on the southeast Louisiana coast lost their possessions to Hurricane Katrina according to State official and tribal leaders. Cajuns were also impacted by Hurricane Katrina, and especially by Hurricane Rita, whose 20-ft (6-m) storm surges flooded low-lying communities in Cameron, Calcasieu, and other coastal parishes. According to a USGS 5-year, post-Katrina survey, wetland loss in Louisiana from all four storms (Hurricanes Katrina, Rita, Gustav, and Ike) totaled 340 mi^2 (881 km^2).

Coastal subsidence, sea-level rise, and erosion can increase community vulnerability to future hazards and also threaten traditional ways of life. Saltwater intrusion reduces productivity and species diversity associated with Louisiana and Texas wetlands and coastal marshes (Stutzenbaker and Weller, 1989; Cox et al., 1997). While users of coastal waters may trend toward the relatively affluent, low-income and minority groups may be more dependent on the resources of the Gulf Coast. Several ethnic minority and low-income groups rely substantially on these resources for food, shelter, clothing, medicine, or other minimum necessities of life (e.g., refer to Hemmerling and Colten, 2003 for an evaluation of environmental justice considerations for south Lafourche Parish).

Coastal Storms

Hurricanes, tropical storms, and other wind-driven tidal or storm events are a fact of life for communities living along the Gulf of Mexico coastal zone. For low-income and minority populations, however, the impacts of coastal storm events can be particularly profound because of factors like limited resources to evacuate or to mitigate hazards. Baseline conditions pertaining to environmental justice were reevaluated in light of recent hurricane activity in the GOM. The intensity and frequency of hurricanes in the Gulf over the last several years has greatly impacted the system of protective barrier islands, beaches, and dunes and associated wetlands along the Gulf Coast. Within the last several years, the Gulf Coast of Texas, Louisiana, Mississippi, Alabama, and to some degree Florida have experienced five major hurricanes (Ivan, Katrina, Rita, Gustav, and Ike). Impacts from future hurricanes and tropical storm events are uncertain. One study found that neighborhoods with higher proportions of renters, households in poverty, and minorities were more likely to have waited to evacuate the urbanized barrier island of Galveston, Texas in advance of Hurricane Ike (Van Zandt et al., 2010). Municipal programs like the New Orleans Office of Homeland Security and Public Safety's City Assisted Evacuation Plan are being implemented to help citizens who want to evacuate during an emergency but lack the capability to self-evacuate (City of New Orleans, n.d.). Hazard mitigation funds available through individual states and FEMA also seek to mitigate potential damage to homes in flood zones throughout the Gulf. While hurricanes and tropical storms are inevitable, lessons learned from Hurricanes Katrina and Rita are shaping local and national policies as well as efforts by nongovernmental organizations to protect low-income, minority, and other vulnerable communities.

Summary and Conclusion

The cumulative impacts of an EPA proposed action would occur within the context of other impact-producing factors on environmental justice, including (1) proposed actions and the OCS Program, (2) State oil and gas activity, (3) existing infrastructure associated with petrochemical processing including refineries and polyvinyl plants, (4) existing waste facilities including landfill, (5) coastal erosion/subsidence, (6) hurricanes, and (7) the lingering impacts of the *Deepwater Horizon* explosion, oil spill, and response.

Because of the presence of an extensive and widespread support system for the OCS and associated labor force, the effects of the cumulative case are expected to be widely distributed and, except in

Louisiana, little felt. In general, the cumulative effects of the OCS Program are expected to be economic and to have a limited but positive effect on low-income and minority populations. In Louisiana, these positive economic effects are expected to be greater. In general, who would be hired and where new infrastructure might be located is impossible to predict. Given the existing distribution of the OCS-related industry and the limited concentrations of minority and low-income peoples, the cumulative OCS Program would not have a disproportionate effect on these populations. Lafourche Parish would experience the most concentrated effects of cumulative impacts. These groups are not expected to be differentially affected because the parish is not heavily low-income or minority and the effects of road traffic and port expansion would not occur in areas of low-income or minority concentration.

To summarize, an EPA proposed action is not expected to have disproportionate high/adverse environmental or health effects on minority or low-income people, and in the GOM coastal area, the contribution of an EPA proposed action and the OCS Program to the cumulative effects of all activities and trends affecting environmental justice issues over the next 40 years is expected to be negligible to minor. The cumulative effects would be concentrated in coastal areas, and particularly Louisiana. Most OCS Program effects are expected to be in the areas of job creation and the stimulation of the economy, and they are expected to make a positive contribution to economic justice. The contribution of the cumulative OCS Program to the cumulative impacts of all factors affecting environmental justice is expected to be minor; therefore, the incremental contribution of an EPA proposed action to the cumulative impacts would also be minor. State offshore leasing programs in Alabama and Louisiana have similar, although more limited effects, due to their smaller scale. Cumulative effects from onshore infrastructure, including waste facilities, is also expected to be minor because existing infrastructure is regulated, because little new infrastructure is expected to result in the cumulative case, and because any new infrastructure would be subject to relevant permitting requirements. Coastal landloss/subsidence, hurricanes, and global warming all raise environmental justice issues, as do the potential long-term effects of the *Deepwater Horizon* explosion, oil spill, and response. The cumulative consequences to environmental justice cannot be determined at this time. Nevertheless, a single OCS lease sale added to existing State and Federal leasing programs and the associated onshore infrastructure would make only minor contributions to these cumulative effects.

4.1.1.23. Species Considered due to U.S. Fish and Wildlife Concerns

Though this EIS pertains to an EPA proposed action, the EPA is not significantly different with regards to habitat, ecological function, and physical and biological resources from the adjacent CPA leased blocks. The EPA proposed action is on a smaller scale than the proposed action analyzed in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference. A detailed description of the affected environment, routine events, accidental events, and cumulative impacts for FWS species considered can be found in Chapter 4.2.1.24 of the 2012-2017 WPA/CPA Multisale and in Chapter 4.2.1.24 of the WPA 233/CPA 231 Supplemental EIS. The analyses and conclusions from these chapters would be equally applicable for regarding the EPA proposed action and are hereby incorporated by reference.

BOEM has examined the analysis for FWS species considered presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS, and based on the summary and additional information presented below, no new significant information was discovered that would alter the impact conclusions for FWS species considered presented. The impact conclusions for FWS species considered presented in the CPA chapters of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS are hereby incorporated by reference as applicable for proposed EPA Lease Sales 225 and 226.

Further, a search was conducted for information published on FWS species considered, and various Internet sources were examined to determine any recent information regarding FWS species considered. Sources investigated included, but were not limited to, journals and scientific articles, Google, Google Scholar, and other Federal and State natural resource management agency websites. All new relevant information was incorporated into the analyses below. No new significant information was discovered regarding FWS species considered since publication of the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS.

As BOEM has previously noted in the 2012-2017 WPA/CPA Multisale EIS and WPA 233/CPA 231 Supplemental EIS and despite the new information identified and provided below, relevant data on the status of populations after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. As data continue to be gathered and impact assessments completed, a better characterization of the full scope of impacts to populations in the GOM from the *Deepwater Horizon* explosion, oil spill, and response will be available. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted methods and approaches. Nevertheless, a complete understanding of the unavailable information is not essential to a reasoned choice among alternatives for this EIS. There are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities. In addition, non-OCS energy-related activities will continue to occur in the EPA irrespective of an EPA proposed action (i.e., habitat loss and competition). The potential for effects from changes to the affected environment (post-*Deepwater Horizon*), routine activities, accidental spills, low-probability catastrophic spills, which are not reasonably expected and not part of an EPA proposed action, and cumulative effects remain whether or not the Proposed Action or No Action alternative is chosen under this EIS.

Background/Introduction

The FWS has explicitly communicated interest in specific species within State boundaries along the Gulf Coast (Table 4-82 of the 2012-2017 WPA/CPA Multisale EIS). The species within Louisiana, Mississippi, Alabama, and Florida have been designated as endangered, threatened, candidate, listed with critical habitat, proposed nonessential experimental population, or distinct vertebrate population. From Table 4-82 of the 2012-2017 WPA/CPA Multisale EIS, the following species and the potential impacts, if applicable, have been discussed elsewhere within the 2012-2017 WPA/CPA Multisale EIS (which is hereby incorporated by reference) and within this EIS: West Indian manatee (Chapter 4.2.1.12 of the 2012-2017 WPA/CPA Multisale EIS and **Chapter 4.1.1.12** of this EIS); green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles (Chapter 4.2.1.13 of the 2012-2017 WPA/CPA Multisale EIS and **Chapter 4.1.1.13** of this EIS); Alabama, Perdido Key, and Choctawhatchee beach mice (Chapter 4.2.1.15 of the 2012-2017 WPA/CPA Multisale EIS and **Chapter 4.1.1.15** of this EIS); red-cockaded woodpecker, Mississippi sandhill crane, piping plover, whooping crane, least tern, and wood stork (Chapter 4.2.1.16 of the 2012-2017 WPA/CPA Multisale EIS and **Chapter 4.1.1.16** of this EIS); and Gulf sturgeon (Chapter 4.2.1.17 of the 2012-2017 WPA/CPA Multisale EIS and **Chapter 4.1.1.17** of this EIS). BOEM has only focused on species within coastal counties because those are the species that could be potentially impacted by oil and gas development activities, including a potential OCS spill.

There are five species that are not listed in Table 4-82 of the 2012-2017 WPA/CPA Multisale EIS and that are specific to Florida and an EPA proposed action. One of these five species, the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) is discussed in detail in **Chapter 4.1.1.16** and not below.

The one mammal species (Florida salt marsh vole [*Microtus pennsylvanicus dukecampbelli*]) is endemic to the central Gulf coast area of Florida (endangered as of January 14, 1991) and is known only from one coastal salt marsh site at Waccasassa Bay in Levy County, Florida, where it appears to exist in low numbers and has a very restricted range (USDOI, FWS, 2008). It appears to be most common in areas vegetated by seashore saltgrass (*Distichlis spicata*). Any natural or human-caused adverse impact to this species could result in its extinction. Major impact-producing factors and potential effects on the Florida salt marsh vole are similar to those discussed for beach mice. Destruction of the habitat due to catastrophic spill and cleanup activities would increase the threat of extinction, but the potential for a catastrophic spill that would substantially affect Florida salt marsh vole habitat is low and is not reasonably expected and not part of an EPA proposed action. The greatest threat to this species is catastrophic weather events causing high water levels.

The one reptile species (American crocodile [*Crocodylus acutus*]) is known to, or is believed to, occur in Broward, Charlotte, Collier, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, and St. Lucie Counties in Florida. The American crocodile is found primarily in mangrove swamps and along low-energy, mangrove-lined bays, creeks, and inland swamps (USDOI, FWS, 1999). Now threatened (October 28, 1975) in Florida populations, critical habitat for the American crocodile includes all land and water as defined in the *Federal Register* notice of September 22, 1977 (*Federal Register*, 1977c). The greatest threat to this species is habitat alteration and human disturbances caused by urban and agricultural development.

The two candidate plant species are the aboriginal prickly-apple (*Harrisia aboriginum*) and Cape Sable thoroughwort (*Chromolaena frustrata*). The aboriginal prickly-apple is known to, or is believed to, occur in Charlotte, Lee, and Sarasota Counties in Florida (USDOI, FWS, 2012a). The aboriginal prickly-apple is a cactus occurring in coastal strand vegetation (relatively low salt-tolerant shrubs and grasses) and tropical coastal hammocks with trees, which includes gumbo limbo (*Bursera simaruba*), wild lime (*Zanthoxylum fagara*), or live oak (*Quercus virginiana*). Aboriginal prickly-apple populations are likely to be on shell mounds created by pre-European local residents or at least on sites with shelly substrates. Plants may be close to but not in the mangrove zone. The Cape Sable thoroughwort is known to, or is believed to, occur in Miami-Dade and Monroe Counties in Florida (USDOI, FWS, 2012b). The Cape Sable thoroughwort is an herb found most commonly in open sun to partial shade at the edges of rockland hammock and in coastal rock barren. Coastal rock barrens are open communities with no tree canopy and a sparse subcanopy of understory hardwoods. The greatest threats to these species are the loss of and/or modification to suitable habitat caused by urban and agricultural development.

Proposed Action Analysis

Adverse impacts due to routine activities resulting from an EPA proposed action are possible but unlikely. Because of the greatly improved handling of waste and trash by industry and because of the annual awareness training required by the marine debris mitigations, the plastics in the ocean are decreasing and the devastating effects on offshore and coastal marine life are minimizing. The routine activities of an EPA proposed action are unlikely to have significant adverse effects on the size and recovery of any above-mentioned species or population in the GOM due to the distance of most activities, the heavy regulation of infrastructure and pipelines, and permitting and siting requirements.

Adverse impacts due to accidental events are also likely to be small. The OSRA model's combined probabilities indicate East and West Louisiana State waters as most likely to be contacted by one or more hypothetical spills ≥1,000 bbl estimated to occur as part of an EPA proposed action (<0.5-1% for 10 and 30 days) (**Figure 3-8**). The highest resource estimate shows an 8 percent probability of one or more hypothetical spills ≥1,000 bbl to occur from platforms, pipelines, and tankers associated with an EPA proposed action (2012-2017) (**Table 3-21**). The most likely cause is from pipelines. Plaquemines Parish, Louisiana, is the only parish or county that has the probability of a hypothetical spill contacting coastline >0.5 percent (0-1% for 10 and 30 days) (**Figure 3-9**).

At this time, there is no known record of a hurricane crossing the path of a large oil spill; the impacts of such have yet to be determined. The experience from Hurricanes Katrina and Rita in 2005 was that the oil released during the storms widely dispersed as far as the surge reached (USDOC, NOAA, 2012e). Due to their reliance on terrestrial habitats to carry out their life-history functions at a considerable distance from the GOM, the activities of an EPA proposed action are unlikely to have significant adverse effects on the size and recovery of any of the above-mentioned species or populations in Louisiana, Mississippi, Alabama, and Florida.

As data continue to be gathered and impact assessments completed, a better characterization of the full scope of impacts to populations in the GOM from the *Deepwater Horizon* explosion, oil spill, and response will be available. Relevant data on the status of populations after the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeline contemplated in this EIS, regardless of the cost or resources needed. In light of the incomplete or unavailable information, BOEM's subject-matter experts have used available scientifically credible evidence in this analysis and applied it using accepted methods and approaches. Nevertheless, a complete understanding of the unavailable information is not essential to a reasoned choice among alternatives for this EIS. There are existing leases in the EPA with either ongoing or the potential for exploration, drilling, and production activities. In addition, non-OCS energy-related activities will continue to occur in the EPA irrespective of an EPA proposed action (i.e., habitat loss and competition). The potential for effects from changes to the affected environment (post-*Deepwater Horizon*), routine activities, accidental spills, low-probability catastrophic spills, which are not reasonably expected and not part of an EPA proposed action, and cumulative effects remains whether or not the No Action or Action alternative is chosen under this EIS.

Summary and Conclusion

Because of the mitigations that may be implemented, routine activities (e.g., operational discharges, noise, and marine debris) related to an EPA proposed action are not expected to have long-term adverse effects on the size and productivity of any of these species (i.e., Florida salt marsh vole, American crocodile, aboriginal prickly-apple, and Cape Sable thoroughwort) or populations in the GOM. Lethal effects could occur from ingestion of accidentally released plastic materials from OCS vessels and facilities. However, there have been no reports to date on such incidences. BOEM employs several measures (e.g., marine debris mitigations) to reduce the potential impacts to any animal from routine activities associated with an EPA proposed action. Accidental blowouts, oil spills, and spill-response activities resulting from an EPA proposed action have the potential to impact small to large areas in the GOM, depending on the magnitude and frequency of accidents, the ability to respond to accidents, the location and date of accidents, and various meteorological and hydrological factors (including tropical storms). The incremental contribution of an EPA proposed action would not be likely to result in a significant incremental impact on the above-mentioned species within the EPA; in comparison, non-OCS-related activities, such as habitat loss and competition, have historically proved to be a greater threat to the above-mentioned species.

In conclusion, within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting the above-mentioned species populations; therefore, an EPA proposed action would be expected to have little or no effect on the above-mentioned species.

4.1.2. Alternative B—No Action

Description of the Alternative

Alternative B is the cancellation of a proposed EPA lease sale. If this alternative is chosen, the opportunity for development of the estimated 0-0.071 BBO and 0-0.162 Tcf of gas that could have resulted from a proposed EPA lease sale would be precluded or postponed. Any potential environmental impacts resulting from a proposed EPA lease sale would not occur or would be postponed to a future lease sale decision. This is also analyzed in the EIS for the Five-Year Program on a nationwide programmatic level.

As noted in Chapter 2, “Alternatives and Deferrals Considered but Not Analyzed in Detail,” an alternative consisting of either deferring blocks in the EPA proposed action area or delaying a proposed EPA lease sale are functionally equivalent to and would result in the same environmental impacts as Alternative B (No Action). Therefore, these alternatives were not analyzed as separate and distinct alternatives in this EIS.

Effects of the Alternative

This Agency published a report that examined previous exploration and development activity scenarios (USDOI, MMS, 2007c). This Agency compared forecasted activity with the actual activity from 14 WPA and 14 CPA lease sales. The report shows that many lease sales contribute to the present level of OCS activity, and any single lease sale accounts for only a small percentage of the total OCS activities. In 2006, leases from 92 different lease sales contributed to Gulf of Mexico production. An average WPA lease sale contributed to 3 percent of oil production and 3 percent of gas production in the WPA, and an average CPA lease sales contributed to 2 percent of oil production and 2 percent of gas production in the CPA. In 2006, leases from 15 different lease sales contributed to the installation of production structures in the Gulf of Mexico. An average WPA lease sale contributed to 6 percent of the installation of production structures in the WPA, and an average CPA lease sale, contributed to 6 percent of the installation of production structures in the CPA. In 2006, leases from 70 different lease sales contributed to wells drilled in the Gulf of Mexico. An average WPA lease sale contributed to 6 percent of wells drilled in the WPA, and an average CPA lease sale contributed to 4 percent of wells drilled in the CPA.

A proposed EPA lease sale would contribute to maintaining the present level of OCS activity in the Gulf of Mexico.

Environmental Impacts

If a proposed EPA lease sale would be cancelled, the resulting development of oil and gas would most likely be postponed to a future sale; therefore, the overall level of OCS activity in the EPA would only be reduced by a small percentage, if any. Therefore, the cancellation of a proposed EPA lease sale would not significantly change the environmental impacts of overall OCS activity in the long term. The environmental impacts expected to result from an EPA proposed action, which is described above, would not occur in the short term, but they would likely be postponed to any future lease sale. BOEM's proposed action balances the needs of the Nation for domestic energy sources and the economic benefits that would be realized through continued oil and gas exploration and development with the environmental impacts of this alternative, when considered in light of the Secretary's imposition of measures to mitigate these impacts and the alternative potential negative impacts of other substitute energy sources.

Economic Impacts

Although environmental impacts may be reduced or postponed by cancelling a lease sale, the economic impacts of cancelling a scheduled lease sale should be given consideration. **Chapter 4.1.1.22.3.2** discusses the potential economic impacts of an EPA proposed action. In the event that a lease sale is cancelled or postponed, there may be impacts to employment along the Gulf Coast, but these are not expected to be significant (e.g., less than 1% of total employment) or long term given the existing OCS infrastructure. Federal, State, and local governments would have to forgo the revenue that would have been received from the lease sale. There could be minor impacts on global energy prices from cancelling a proposed EPA lease sale, along with minor changes in energy consumption patterns that would result from these price changes.

Other factors may minimize or exacerbate the economic impacts of cancelling a proposed lease sale. For example, the longer-term economic impacts of cancelling a lease sale could be minimized if they were offset by a larger lease sale at a later date. The economic impacts may be exacerbated if additional lease sales are cancelled. The OCS industry is dependent on high capital investment costs and there may be long lags between a lease sale and the majority of production activities. Therefore, firms' investment and spending decisions are dependent on their confidence that the OCS Program will be maintained in the future. In addition, while firms in the OCS industry are generally likely to be able to weather the cancellation of a single lease sale, the cancellation of multiple lease sales could lead to broader damage to firms and workers in the industry or decisions to operate in areas other than the Gulf. These economic impacts would be particularly damaging to the coastal counties/parishes in Texas and Louisiana for which the OCS industry as a whole is an important component of their economies.

From a programmatic perspective, cancellation of a Five-Year Program of lease sales in the Gulf of Mexico would have much greater effects in terms of economic impacts, energy strategy, and environmental impacts. For a more detailed discussion of the effects of the cancellation of a Five-Year Program of lease sales in the Gulf of Mexico, refer to Appendix G.1 of the 2012-2017 WPA/CPA Multisale EIS, which is hereby incorporated by reference.

4.2. UNAVOIDABLE ADVERSE IMPACTS OF THE PROPOSED ACTIONS

Unavoidable adverse impacts associated with an EPA proposed action are expected to be primarily short term and localized in nature and are summarized below.

Sensitive Coastal Habitats: If an oil spill were to contact a barrier beach, the removal of beach sand during cleanup activities, if necessary, could result in adverse impacts if the sand is not replaced, and a beach could experience several years of tarballs washing ashore over time, causing an aesthetic impact. If an oil spill contacts coastal wetlands, adverse impacts could be high in localized areas. In more heavily oiled areas, wetland vegetation could experience suppressed productivity for several years; in more lightly oiled areas, wetland vegetation could experience die-back for one season. Epibionts on wetland vegetation and grasses in the tidal zone could be killed, and the productivity of tidal marshes for the vertebrates and invertebrates that use them to spawn and develop could be impaired. Much of the wetland vegetation would recover over time, but some wetland areas could be converted to open water. Unavoidable impacts as a result of pipeline and other related coastal construction are not expected as only 0-1 new pipelines and 0-1 gas processing facilities are projected as a result of an EPA proposed action, and forecasted OCS activity would utilize existing coastal infrastructure. Unavoidable impacts resulting from dredging, wake erosion, and other secondary impacts related to channel use and maintenance could occur, but it would be minimal as a result of an EPA proposed action due to the relatively low vessel traffic forecast. Sand borrowing on the OCS for coastal restorations involves the taking of a quantity of sand from the OCS and depositing it onshore, essentially moving small products of the deltaic system to another location. If sand is left where it is, it would eventually be lost to the deltaic system by redeposition or burial by younger sediments; if transported onshore, it would be lost to burial and submergence caused by subsidence and sea-level rise.

Sensitive Offshore Habitats: Unavoidable adverse impacts could take place if an oil spill and or chronic low-level pollution occurred and contacted sensitive coastal and offshore biological habitats, such as *Sargassum* at the surface; fish, turtles, and marine mammals in the water column; or benthic habitats on the bottom. There could be some adverse impacts on organisms contacted by oil, dispersant chemicals, or emulsions of dispersed oil droplets and dispersant chemicals that, at this time, are not completely understood, particularly in subsurface environments.

Water Quality: Normal offshore operations would have unavoidable effects to varying degrees on the quality of the surrounding water if the proposal is implemented. Drilling, construction, and pipelaying activities would cause an increase in the turbidity of the affected waters for the duration of the activity periods. A turbidity plume would also be created by the discharge of drill cuttings and drilling fluids. This, however, would only affect water quality in the immediate vicinity of the rigs and platforms. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and biochemical oxygen demand in a small area near the discharge point for a short period of time. Accidental spills from platforms and the discharge of produced waters could result in increases of hydrocarbon levels and trace metal concentrations in the water column in the vicinity of the platforms.

Unavoidable, although very minor, impacts to onshore water quality would occur as a result of chronic point- and nonpoint-source discharges such as runoff and effluent discharges from existing onshore infrastructure used in support of lease sale activities. Vessel traffic contributes to the degradation of impacted bodies of water through inputs of chronic oil leakage, treated sanitary and domestic waste, bilge water, and contaminants known to exist in ship paints. Regulatory requirements of the State and Federal water authorities and some local jurisdictions would be applicable to point-source discharges from support facilities such as refineries and marine terminals. Louisiana, Alabama, and Florida have programs in place in accordance with Section 319 of the Clean Water Act, which required states to develop a Non-Point Source Management Plan to reduce and control nonpoint sources of pollution from the various types of land uses that contribute to water quality problems across the United States.

Air Quality: Unavoidable short-term impacts on air quality could occur after large oil spills and blowouts because of evaporation and volatilization of the lighter components of crude oil, combustion from surface burning, and aerial spraying of dispersant chemicals. Mitigation of long-term effects from offshore engine combustion during routine operations would be accomplished through existing regulations and the development of new control emission technology. Short-term effects from spill events are uncontrollable and are likely to be aggravated or mitigated by the time of year the spills take place.

Endangered and Threatened Species: Unavoidable adverse impacts to endangered and threatened species due to activities associated with an EPA proposed action (e.g., seismic surveys, water quality and habitat degradation, helicopter and vessel traffic, oil spills and spill response, and discarded trash and debris) would be primarily sublethal. Lethal impacts to endangered species are not expected to occur. Irreversible loss of individuals that are ESA-listed species may occur after a large oil spill from the acute impact of being oiled or the chronic impact of oil having eliminated, reduced, or rendered suboptimal the food species upon which they were dependent.

Nonendangered and Nonthreatened Marine Mammals: Unavoidable adverse impacts to nonendangered and nonthreatened marine mammals would be those that also affect endangered and threatened marine mammal species. Routine operation impacts (such as seismic surveys, water quality and habitat degradation, helicopter disturbance, vessel collision, and discarded trash and debris) would be negligible or minor to a population, but they could be lethal to individuals as in the case of a vessel collision. A large oil spill would temporarily degrade habitat if spilled oil, dispersant chemicals, or emulsions of dispersed oil droplets and dispersant chemicals contact free-ranging pods or spawning grounds. Lethal impacts to nonendangered and nonthreatened marine mammals are expected to be rare.

Coastal and Marine Birds: Unavoidable adverse impacts from routine operations on coastal birds could result from helicopter and OCS service-vessel traffic, facility lighting, and floating trash and debris. Marine birds could be affected by noise, platform lighting, aircraft disturbances, and trash and debris associated with offshore activities. Cross-Gulf migrating species could be affected by lighted platforms, helicopter and vessel traffic, and floating trash and debris. If a large oil spill occurs and contacts coastal or marine bird habitats, some birds could experience lethal and sublethal impacts from oiling, and birds feeding or resting in the water could be oiled and die. Coastal birds coming into contact with oil may migrate more deeply into marsh habitats, out of reach from spill responders seeking to count them or collect them for rehabilitation. Oil spills and oil-spill cleanup activities could also affect the food species for coastal, marine, and migratory bird species.

Fish Resources and Commercial Fisheries: Unavoidable adverse impacts from routine operations are loss of open ocean or bottom areas desired for fishing by the presence or construction of OCS facilities and pipelines. Loss of gear could occur from bottom obstructions around platforms and subsea production systems. Routine discharges from vessels and platforms are minor given the available area for fish habitat. If a large oil spill occurs, the oil, dispersant chemicals, or emulsions of oil droplets and dispersant chemicals could temporarily displace mobile fish species on a population or local scale. It is unlikely that fishermen would want, or be permitted, to harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species rendering them unmarketable. The depth of the proposed operations and the distance from shore make impacts on offshore fisheries unlikely.

Recreational Beaches: Unavoidable adverse impacts from routine operations may result in the accidental loss overboard of some floatable debris that may eventually come ashore on frequented recreational beaches. Existing regulations prohibit littering of the marine environment with trash. However, offshore oil and gas operations may result in the accidental loss of some floatable debris in the ocean environment. This debris may eventually come ashore on major recreational beaches. A large oil spill could make landfall on recreational beaches, leading to local or regional economic losses and stigma effects, causing potential users to avoid the area after acute impacts have been removed. Some recreational beaches become temporarily soiled by weathered crude oil, and tarballs may come ashore long after stranded oil has been cleaned from shoreline areas.

Economic Activity: Net economic, political, and social benefits accrue from the production of hydrocarbon resources. Once these benefits become routine, unavoidable adverse impacts from routine operations follow trends in supply and demand based on the commodity prices for oil, gas, and refined hydrocarbon products. Declines in oil and gas prices can lead to activity ramp downs by operators until prices rise. A large oil spill would cause temporary increases in economic activity associated with spill-response activity. An increase in economic activity from the response to a large spill could be offset by temporary work stoppages that are associated with spill-cause investigations and would involve a transfer or displacement of demand to different skill sets. Routine operations affected by new regulations that are incremental would not have much effect on the baseline of economic activity; however, temporary work stoppages or the introduction of several new requirements at one time that are costly to implement could cause a drop off of activity as operators adjust to new expectations or use the opportunity to move resources to other basins where they have interests.

Archaeological Resources: Unavoidable adverse impacts from routine operations could lead to the loss of unique or significant archaeological information if unrecognized at the time an area is disturbed. Required archaeological surveys significantly reduce the potential for this loss by identifying potential archaeological sites prior to an interaction occurring, thereby making avoidance or mitigation of impacts possible. A large oil spill could make landfall on or near protected archaeological landmarks to cause temporary aesthetic or cosmetic impacts until the oil is cleaned or degrades.

4.3. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible or irretrievable commitments of resources refer to impacts or losses to resources that cannot be reversed or recovered. An irreversible loss is when a species becomes extinct. No efforts can reverse this event. Irretrievable commitments are those that are lost for a period of time. For example, fishermen would not be able to trawl in the same space as an offshore platform for as long as the platform is there. Once the platform is removed and the site cleared of any debris, fishermen could again trawl the location where the platform used to be.

Wetlands: An irretrievable loss of wetlands and associated biological resources could occur if wetlands are lost due to impacts from oil spills severe enough to cause permanent die-back of vegetation and conversion to open water. No dredging or construction activities in the coastal regions are anticipated as a result of an EPA proposed action. Ongoing natural and anthropogenic processes in the coastal zone, only one of which is OCS-related activity, can result in direct and indirect loss of wetlands. Natural losses as a consequence of the coastal area becoming hydrologically isolated from the Mississippi River that built it, sea-level rise, and subsidence of the delta platform in absence of new sediment added to the delta plain appear to be much more dominant processes impacting coastal wetlands.

Sensitive Nearshore and Offshore Biological Resources: An irreversible loss or degradation of ecological habitat caused by cumulative activity tends to be incremental over the short term. Irretrievable loss may not occur unless or until a critical threshold is reached. It can be difficult or impossible to identify when that threshold is, or would be, reached. Oil spills and chronic low-level pollution can injure and kill organisms at virtually all trophic levels. Mortality of individual organisms can be expected to occur and possibly a reduction or even elimination of a few small or isolated populations.

Threatened and Endangered Species: Irreversible loss of individuals that are protected species may occur after a large oil spill from the acute impact of being oiled or the chronic impact of oil having eliminated, reduced, or rendered suboptimal the food species upon which they were dependent.

Fish Resources and Commercial Fisheries: Irreversible loss of fish and coral resources, including commercial and recreational species, are caused by structural removal using explosives. A single platform more than 125 mi (200 km) from shore is projected as a result of an EPA proposed action, and no structure removal using explosives is expected. Without the structure to serve as habitat area, sessile, attached invertebrates and the fish that live among them is absent. Removing structures eliminates these special and local habitats and the organisms living there, including such valuable species as red snapper. Continued structure removal, regardless of the technique used, would reduce the net benefits to commercial fishing due to the presence of these structures.

Recreational Beaches: Beached litter, debris, oil slicks, and tarballs may result in decreased enjoyment or lost opportunities for enjoyment of coastal recreational resources. However, the very limited nature of an EPA proposed action and the distance from shore will result in minimal opportunity for these impacts. Impacts on recreational beaches from a large oil spill may at the time seem irreversible, but the impacts are generally temporary. Beaches fouled by a large oil spill would be temporarily unavailable to the people who would otherwise frequent them, but only during the period between landfall and cleanup of the oil, followed by an indefinite lag period during which stigma effects recede from public consciousness.

Archaeological Resources: Minimal impacts to archaeological resources are expected as a result of an EPA proposed action due to the distance of the proposed EPA lease sale area relative from the resources. Irreversible loss of a prehistoric or historic archaeological resource can occur if bottom-disturbing activity takes place without the required survey to demonstrate its absence before work proceeds. A resource can be completely destroyed, severely damaged, or the scientific context badly impaired by well drilling, subsea completions, and platform and pipeline installation, or sand borrowing.

Local Employment, Income, and Population: An EPA proposed action could result in the production of certain OCS-related goods and services. The extent that resources would be drawn away from other uses such as the production of goods and services of other types would be undetermined. Steel products, specialized manpower, and capital constitute required resources that may be scarce. Use of these resources for OCS needs means a potential reduced availability of these resources for other non-OCS-related activities. While these resources may be reclaimed over time, their use as a result of an EPA proposed action would constitute an irretrievable commitment of resources at a given point in time. The extent that unemployed labor resources are used to fill new job opportunities would not constitute a cost to society in the form of foregone labor opportunities.

Oil and Gas Development: Leasing of the proposed blocks and the subsequent development and extraction could represent an irreversible and irretrievable commitment of nonrenewable oil and gas resources. The estimated amount of resources to be recovered as a result of a proposed EPA lease sale is 0-0.071BBO and 0-0.162Tcf (**Table 3-1**).

Loss of Human and Animal Life: The OCS oil and gas exploration, development, production, and transportation are carried out under comprehensive, state-of-the-art, enforced regulatory procedures designed to ensure public safety and environmental protection. Nevertheless, some loss of human and animal life is inevitable from unpredictable and unexpected acts of man and nature (e.g., unavoidable accidents, human error and noncompliance, and adverse weather conditions).

Some normal and required operations can result in the destruction of marine life. Although the possibility exists that individual marine mammals, sea turtles, birds, and fish can be injured or killed, there is no expected lasting effect that would lead to a decrease in baseline populations.

4.4. Relationship between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

In this section, the short-term effects and uses of various components of the environment in the vicinity of the proposed EPA lease sale area are related to long-term effects and the maintenance and enhancement of long-term productivity.

Short-Term Use

Short-term refers to the total duration of oil and gas exploration and production activities, whereas long-term refers to an indefinite period beyond the termination of oil and gas production. The specific impacts of an EPA proposed action vary in kind, intensity, and duration according to the activities occurring at any given time. Initial activities, such as seismic surveying and exploration drilling, result in short-term, localized impacts. Development drilling and well workovers occur sporadically throughout the life of an EPA proposed action but also result in short-term, localized impacts. Activities during the production life of a platform may result in chronic impacts over a longer period of time (25-35 years), potentially punctuated by more severe impacts as a result of accidental events. Platform removal is also a short-term activity with localized impacts. The impacts of site clearance may, however, be longer lasting. Over the long term of several decades, natural environmental balances are expected to be restored.

The principal short-term use of the leased areas in the Gulf under an EPA proposed action would be for the production of up to 0-0.071 BBO and 0-0.162 Tcf of natural gas. The cumulative impacts scenario in this EIS extends approximately from 2012 to 2051. The 40-year time period is used because it is the approximate longest life span of activities conducted on an individual lease. The 40 years following a proposed EPA lease sale is the period of time during which the activities and impacting factors that follow as a consequence of a proposed EPA lease sale would be influencing the environment.

The specific impacts of an EPA proposed action vary in kind, intensity, and duration according to the activities occurring at any given time (**Chapter 3**). Initial activities, such as seismic surveying and exploration drilling, result in short-term, localized impacts. Development drilling and well workovers occur sporadically throughout the life of an EPA proposed action but also result in short-term, localized impacts. Platform removal is also a short-term activity with localized impacts, including removal of the habitat for encrusting invertebrates and fish living among them. The OCS activities could temporarily interfere with recreation and tourism in the region in the event of an oil spill contacting popular tourist beaches. The proposed leasing is not projected to result in onshore development and population increases that could cause short-term adverse impacts to local community infrastructure (**Chapter 4.1.1.22.1**). The marine environment is generally expected to remain at or return to its normal long-term productivity levels after the completion of oil and gas production. Many of the effects on physical, biological, and socioeconomic resources discussed in **Chapter 4.1.1** are considered to be short term (being greatest during the construction, exploration, and early production phases). These impacts would be further reduced by the mitigating measures discussed in **Chapters 2.2.2 and 2.3.1.3**.

The OCS development off Louisiana has enhanced recreational and commercial fishing activities, which in turn has stimulated the manufacture and sale of larger private fishing vessels and special fishing and recreational equipment. Commercial enterprises such as charter boats have become heavily dependent on offshore structures for satisfying recreational customers. A proposed EPA lease sale, due to the distance from shore, would not increase these incidental benefits of offshore development. Offshore fishing and diving has gradually increased in the past three decades, and platforms have been the focus of much of that activity. As mineral resources become depleted, platform removals would occur and may result in a decline in these activities. The maintenance of the long-term productivity of these artificial reefs (active rigs), which are attractive to fishermen and divers, is accomplished through the relocation of some platforms by artificial reef development programs (**Appendix A.4**). The ongoing Rigs-to-Reefs program has relocated removed rigs to designated artificial reef building sites (**Appendix A.4**). Although the site-specific losses of artificial reef structure will still occur, the development of these reef sites will, Gulfwide, maintain the long-term productivity associated with standing structures.

Short-term environmental and socioeconomic impacts could result from an EPA proposed action, including possible short-term losses in productivity as a result of oil spills. Long-term, adverse environmental impacts would not be expected because of current regulations and because of the stipulations and mitigations that could be adopted as part of an EPA proposed action. However, some risk of long-term adverse environmental impacts remains due to the potential for accidents. No long-term productivity or environmental gains are expected as a result of an EPA proposed action; the benefits of an EPA proposed action are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas. While no reliable data exist to indicate long-term productivity losses as a result of OCS development, such losses may be possible.

Relationship to Long-Term Productivity

Long-term refers to an indefinite period beyond the termination of oil and gas production. Over a period of time after peak oil production has occurred in the Gulf of Mexico, a gradual easing of the specific impacts caused by oil and gas exploration and production would occur as the productive reservoirs in the Gulf have been discovered and produced, and have become depleted. The Oil Drum (2009) showed a graphic demonstrating that peak oil production in the Gulf occurred in June 2002 at 1.73 MMbbl/day. Whether or not this date is correct can only be known in hindsight and only after a period of years while production continues. At this time, however, the trend is fairly convincing (The Oil Drum, 2009). There is disagreement on what future production trends may be in the Gulf of Mexico after several operators, BP among them, announced discoveries over the last 5 years (*Oil and Gas Journal*, 2009) in the Lower Tertiary in ultra-deepwater (>5,000 ft; 1,524 m) with large projected reserves. These claims are as yet unproven and there are questions as to the difficulties that may be encountered producing these prospects because of their geologic age; burial depth and high-temperature, high-pressure in-situ conditions; lateral continuity of reservoirs; and the challenges of producing from ultra-deepwater water depths.

The Gulf of Mexico's large marine ecosystem is considered a Class II, moderately productive ecosystem (mean phytoplankton primary production 150-300 gChlorophyll a/m^2-yr [The Encyclopedia of Earth, 2008]), based on Sea-viewing Wide Field-of-view Sensor (SeaWiFS) global primary productivity estimates (USDOC, NASA, 2003). After the completion of oil and gas production, a gradual ramp-down to economic conditions without oil and gas activity would be experienced, while the marine environment is generally expected to remain at or return to its normal long-term productivity levels that, in recent years, has been described as stressed (The Encyclopedia of Earth, 2008). The Gulf of Mexico's large marine ecosystem shows signs of ecosystem stress in bays, estuaries, and coastal regions (Birkett and Rapport, 1999). There is shoreline alteration, pollutant discharge, oil and gas development, and nutrient loading. The overall condition for the U.S. section of this large marine ecosystem, according to USEPA's seven primary indicators (Jackson et al., 2000), is good dissolved oxygen, fair water quality, poor coastal wetlands, poor eutrophic condition, and poor sediment, benthos, and fish tissue (The Encyclopedia of Earth, 2008).

To help sustain the long-term productivity of the Gulf of Mexico ecosystem, the OCS Program provides structures to use as site-specific artificial reefs and fish-attracting devices for the benefit of commercial and recreational fishermen and to sport divers and spear fishers. Additionally, the OCS Program continues to improve the knowledge and mitigation practices used in offshore development. Approximately 10 percent of the oil and gas structures removed from the OCS are eventually used for State artificial reef programs.

CHAPTER 5

CONSULTATION AND COORDINATION

5. CONSULTATION AND COORDINATION

5.1. Development of the Proposed Actions

This EIS addresses two proposed oil and gas lease sales in the EPA of the Gulf of Mexico, as scheduled in the Five-Year Program (USDOI, BOEM, 2012a) (**Figure 1-1**). BOEM conducted early coordination with appropriate Federal and State agencies and other concerned parties to discuss and coordinate the prelease process for the proposed lease sales and EIS. Key agencies and organizations included the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (FWS), U.S. Coast Guard (USCG), U.S. Department of Defense (DOD), U.S. Environmental Protection Agency (USEPA), State Governors' offices, and industry groups.

5.2. Notice of Intent to Prepare an EIS and Call for Information

On November 18, 2011, the Call for Information/Notice of Intent to Prepare an EIS (Call/NOI) for the proposed EPA lease sales was published in the *Federal Register*. Additional public notices were distributed via local newspapers, the U.S. Postal Service, and the Internet. The 30-day comment period on the Call closed on December 19, 2011, and the 45-day comment period on the NOI closed on January 3, 2012. Federal, State, and local governments, along with other interested parties, were invited to send written comments to the Gulf of Mexico OCS Region on the scope of the EIS. BOEM received two comment letters and nine emails in response to the NOI. These comments are summarized below in **Chapter 5.3.1**. BOEM received three comment letters in response to the Call. These comments are summarized below in **Chapter 5.3.2**.

5.3. Development of the Draft EIS

Scoping for the Draft EIS was conducted in accordance with Council on Environmental Quality (CEQ) regulations implementing NEPA. Scoping provides those with an interest in the OCS Program an opportunity to provide comments on the proposed actions. In addition, scoping provides BOEM an opportunity to update the Gulf of Mexico OCS Region's environmental and socioeconomic information base. The scoping process officially commenced on March 20, 2012, with the publication of the Notice of Public Scoping in the *Federal Register*. Formal scoping meetings were held in Louisiana, Alabama, and Florida. The dates, times, locations, and public attendance of the scoping meetings for the proposed EPA lease sales were as follows:

Tuesday, April 3, 2012
1:00 p.m. EDT until adjournment
Tallahassee Community College
Tallahassee, Florida
5 registered attendees
3 speakers

Wednesday, April 4, 2012
1:00 p.m. and 6:00 p.m. CDT until adjournment
Wyndham Bay Point Resort
Panama City Beach, Florida
20 registered attendees
8 speakers

Thursday, April 5, 2012
1:00 p.m. CDT until adjournment
Alabama's Delta Resource Center
Spanish Fort, Alabama
9 registered attendees
3 speakers

Monday, April 9, 2012
1:00 p.m. CDT until adjournment
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
New Orleans, Louisiana
3 registered attendees
1 speaker

5.3.1. Summary of Scoping Comments

Comments (both verbal and written) were received from the NOI and five scoping meetings from Federal, State, and local governmental agencies; interest groups; industry; businesses; and the general public on the scope of the EIS, significant issues that should be addressed, alternatives that should be considered, and mitigating measures. All scoping comments received, which were appropriate for a lease sale NEPA document, were considered in the preparation of the Draft EIS. BOEM received two comment letters via mail on the NOI: one letter from the Louisiana Department of Natural Resources and one from the Florida Department of Environmental Protection. The Florida Department of Environmental Protection coordinated State of Florida reviews into one comment submission, i.e., its letter included, as an attachment, a comment letter from the Florida Fish and Wildlife Conservation Commission. BOEM received nine comments via email during the scoping process. Four emails from individuals provided stand-alone comments and five emails were from organizations and attached comment letters. In addition, a total of 15 speakers provided comments at the five scoping meetings. The following is a summary of the comments.

Louisiana Department of Natural Resources (letter dated January 3, 2012)

- The State supports safe and responsible development of natural resources and states that energy production is critical to the U.S. economic recovery and reduces the Nation's dependence on foreign oil. The State wishes to continue its vital role in meeting the energy needs of the Nation and encourages other states to participate more actively as they share in the benefits that this oil and gas production provides.
- The State welcomes proposed EPA Lease Sales 225 and 226 as another positive step in the resumption of offshore energy development in the GOM following the *Deepwater Horizon* explosion, oil spill, and response. The State recognizes that billions of barrels of oil and trillions of cubic feet of natural gas was produced safely prior to the *Deepwater Horizon* explosion and oil spill, and that this event was an anomaly.
- The State believes BOEM must take appropriate action to assist the states in addressing impacts to their coastal resources, communities, and infrastructure that are inherent in these activities.
- The State voiced concerns regarding mitigation for cumulative and secondary impacts to coastal resources as well as concerns regarding modeling and predictive techniques that have been used by BOEM for previous lease sales. The State has voiced these same concerns in the past to the Minerals Management Service and Bureau of Ocean Energy Management, Regulation and Enforcement and feels they remain unaddressed.
- The State urged BOEM to identify the cumulative and secondary impacts resulting from the leasing and development of OCS blocks through the NEPA process and to formulate an appropriate plan for compensatory mitigation.
- According to the State, the Federal Government has taken over $150 billion in profit and has provided very little in return to the wetlands that protect the critical infrastructure that continues to produce these revenues. The State believes that this country must reinvest a significant portion of these revenues to ensure the long-term viability of domestic production and mitigate for prior and ongoing impacts.
- The State believes an aggregate approach to mitigation is necessary to address direct, indirect, and cumulative impacts of all prior and future lease sales. The State identifies BOEM as the appropriate entity to administer this mitigation and this Eastern Planning Area EIS will be an opportunity for BOEM to explore such mitigation strategies.
- The State contends that BOEM must assure a fair and equitable return to Louisiana for impacts suffered within the coastal zone, and this would be best accomplished by considering the aforementioned mitigation measures.

- The State encourages BOEM to revisit many specific predictions made for earlier lease sales and to collect data to determine whether the models and predicative techniques used were accurate. The State is concerned that BOEM may extrapolate particular, favorable findings to encompass all impacts of a lease sale.

Florida Department of Environmental Protection (letter dated December 20, 2011)

- The State voiced concerns about the effects of the OCS oil and gas activities conducted in deepwater habitat on marine and coastal environments and associated sensitive biological resources and critical habitats.
- The State believes that the proposed single EIS for the two proposed EPA lease sales should focus on the differences between the proposed lease sales and on new issues and information and should eliminate redundancy.
- The State believes the EIS resource estimates and scenarios should include a range of estimates and activities expected for each of the proposed lease sales and, if the decision is made to conduct proposed EPA Lease Sale 226 subsequent to the first sale (proposed EPA Lease Sale 225), a separate NEPA review should be conducted.
- The State encourages BOEM to include in the EIS the most recent data available for the descriptions of the affected environment and for the environmental and technological analyses. These data and analyses must be accurate and comprehensive and should include complete characterizations, descriptions, and evaluations of the environmental resources and physical conditions and the proposed activities resulting from the lease sales including location, duration, and alternatives.
- The State requests that a thorough assessment of the potential direct and indirect effects of permitted activities upon environmental, cultural, social, and economic resources, including benthic and coastal habitats, essential fish habitats, fisheries, air and water quality, marine and coastal protected areas, and protected species be included in the EIS.
- According to the State, the EIS should assess cumulative impacts of the proposed activities in combination with other activities in the area, including activities occurring in the CPA. The cumulative, long-term impacts of the *Deepwater Horizon* explosion, oil spill, and response are not yet thoroughly understood.
- The State requests that the effects of accidental discharges, including synthetic-based drilling fluids, be adequately addressed. It is critical to understand how far and where these may migrate since materials entrained in nearshore eddies, currents, or directly in the Loop Current may be carried to Florida's coasts.
- The State believes that assessments of short- and long-term environmental impacts should document emergency response capabilities and worst-case accidental discharges from representative locations; include the most up-to-date spill trajectory model results; include a thorough analysis of the fates and effects of discharges and the potential for bioaccumulation; evaluate the effects of new regulations and requirements on the potential for preventing blowouts; and evaluate new technologies for stopping a spill should a blowout occur.
- The State acknowledges that the EPA is an important military training and testing area and the State does not support activities that could interfere with these activities. The EIS should thoroughly evaluate the potential for OCS activities to conflict with military use in the area.
- According to the State, the EIS should include an evaluation of the State's enforceable policies and how proposed activities affect those policies. The Florida Coastal Management Program can provide updates on program changes, if required.

Florida Fish and Wildlife Conservation Commission Letter (letter dated December 13, 2011)

- The State notes that the EIS should identify federally listed species, analyze potential impacts to them and their designated critical habitat, and address those species listed that have the potential to be affected by projects within its scope (the Florida Fish and Wildlife Conservation Commission attached a list of federally and Florida-listed species).
- According to the State, the analyses should include information and methodologies concerning the construction, operation, and demolition of all structures associated with the leases, including expected increases in support vessel traffic, proposed routes, coastal staging areas, pipeline placement, and the installation and removal of utilities for the life of the structures.
- The State recommends that the EIS identify and analyze the potential impacts to EFH for species such as reef fish and highly migratory species.
- The State believes the resource surveys should identify the natural resources in areas under consideration for leasing in order to develop options for avoidance, minimization, and compensatory mitigation, as well as to plan for oil-spill response activities.
- The State recommends that the EIS should evaluate avoidance, minimization, and compensatory mitigation options towards offsetting potential natural resource impacts.
- The State requests that the EIS should include statistical oceanographic Trajectory Analysis Planner modeling in 2D and possibly 3D for a range of drilling spill scenarios (most probable to worst-case scenario discharges), and the models should include release locations within each lease block under consideration for drilling activity.
- The State recommends that the EIS should include extensive contingency planning for oil/gas leaks that address marine mammals and marine turtles (and their critical habitats), including plans for funding the recovery and rescue of animals as well as the restoration of habitat, the contingency plans should be coordinated with other Federal, State, and local oil-spill contingency planning efforts and should be documented within the EIS using Marine Spatial Planning techniques.

Aries Marine Corporation (email dated April 5, 2012)

- Aries Marine Corporation applauds the continuing efforts of DOI to open up and develop new and critical areas of our offshore for exploration and production of hydrocarbons and encourages DOI, with help from of BOEM, to aggressively and prudently move forward with plans to develop this important asset of America.

Gulf Restoration Network (email dated April 25, 2012)

- The Gulf Restoration Network disapproves of BOEM proposing lease sales in the EPA while impacts associated with the *Deepwater Horizon* explosion, oil spill, and response (ecological and sociological) are still present and being revealed.
- The Gulf Restoration Network believes the threat of a blowout in the EPA must be fully analyzed in the EIS. Spilled oil can have dramatic effects on marine resources, and cleanup efforts such as dispersants could result in negative impacts as well.

- According to the Gulf Restoration Network, BOEM must ensure that its environmental analyses in the Eastern Planning Area EIS will include full consideration of direct, indirect, and cumulative impacts of the proposed EPA lease sales on marine fish managed by State and Federal agencies, the International Commission for the Conservation of Atlantic Tuna, or other intergovernmental organizations; coral reefs, including deepwater corals, and other fragile marine habitats; marine mammals (dolphins and whales and their habitat); sharks; birds (i.e., gulls, pelicans, egrets, herons, piping plover, migratory water fowl, and neotropical song birds) and their habitats; estuarine and/or coastal habitats (i.e., coastal marshes, mangroves, and seagrasses); and deep-sea habitat and organisms, including benthic and demersal organisms.

- The Gulf Restoration Network recommends that BOEM must fully analyze the following in the Eastern Planning Area EIS:

  — existing and potential future impacts of the *Deepwater Horizon* explosion, oil spill, and response, as well as any future oil spills and cleanup or containment efforts, including the use of dispersants at depth and at the surface;

  — the impacts of past, present, and future exploration activities, including but not limited to geological and geophysical exploration activities, such as seismic exploration and the drilling of test holes;

  — the impact of oil and gas development and production activities, including but not limited to drilling activities, transportation, and pipeline construction;

  — the indirect, secondary, and cumulative impacts on the marine environment of all oil and gas exploration and development in the geographic area covered by the proposed EIS, and the cumulative impact analysis must include a review of the overall impacts of the past, present, and future activities, occurring or planned for the Gulf of Mexico; and

  — the indirect, secondary, and cumulative impacts of activities oil and gas development combined with other commercial, industrial, or military activities in the Gulf of Mexico, including but not limited to military shock trials, precision strike weapons testing, marine navigation, commercial and recreational fishing, on the marine environment.

- According to the Gulf Restoration Network, the Eastern Planning Area EIS must include an alternative that considers the following:

  — reduction in impacts to the natural resources of the Gulf of Mexico, including reductions in the potential for oil spills, associated with full implementation of the recommendations of the President's Oil Spill Commission, including but not limited to even more stringent regulation of the oil and gas industry than currently in place;

  — improvement in oil-spill response plans for offshore oil operations;

  — continuing improvements in response technology;

  — increased use of the best available science in BOEM decisionmaking;

  — establishment of a Regional Citizens Advisory Council for the Gulf of Mexico so that the oil and gas industry is held accountable; and

  — enhancement of whistleblower protections for oil rig workers who report violations of the law or reckless behavior by their employers.

- The Gulf Restoration Network believes that BOEM's consideration of mitigation measures should include, but not be limited to, the following:

  — establishing closed areas to protect sensitive habitats or protected species;

— the use of protective measures, such as passive acoustic monitoring during seismic exploration and explosive removal, to reduce impacts to marine mammals and other species; and

— requirements for continuing industry investment in oil-spill response and containment technology to ensure continual improvement in response and containment capability.

American Petroleum Institute (API) (email dated April 27, 2012)

- The API encouraged BOEM to follow the recently updated guidelines from the CEQ on NEPA efficiency and to edit the Draft EIS to reduce or eliminate redundancy and needlessly complex organization. Some previous Bureau of Ocean Energy Management NEPA documents have been challenging to use because of their size and complex organization; this diminishes their usefulness as a decision support tool under NEPA.
- The API expressed disappointment with the decision of the Secretary of the Interior to not consider additional areas in the EPA as part of the 2012-2017 Five-Year Program. The API felt that, if further development of offshore oil and natural gas were considered a priority, the entire EPA should have been included in the proposed Five-Year Program and included in the scope of the Five-Year Program's programmatic EIS.
- The API requested that, since proposed EPA Lease Sales 225 and 226 would be held in essentially the same area as the most recent EPA Lease Sale 224, the alternatives considered and any corresponding mitigation be consistent with alternatives and mitigation measures established for the EPA Lease Sale 224 area.
- The API requested that data from best available, peer-reviewed scientific literature and not speculation should be used when assessing the potential impacts of oil and natural gas activities on the environment; that analyses should use the most current scientific data available; and that limitations in datasets, models, and methodologies for impact assessment should be clearly identified. The API requested that, if there are conflicting sets of data, model results, or methodologies, BOEM should provide an analysis of the strengths and weaknesses of each and the basis for selecting one over another and for including multiple methods in the analysis.
- The API encouraged BOEM to continue reviewing and evaluating the sound peer-reviewed science and to avoid use of unsubstantiated or anecdotal information.
- The API requests that BOEM fully describe the administration regulatory changes made by the Agency following the *Deepwater Horizon* explosion, oil spill, and response and that this section summarizes the intent and requirements of NTL's, new regulations, and enhanced inspection procedures employed by BSEE.

Center for Biological Diversity (email dated May 4, 2012)

- The Center for Biological Diversity believes it is premature to begin NEPA for proposed EPA Lease Sales 225 and 226 as the 2012-2017 Five-Year Program has not been finalized. "BOEM should not be committing agency resources towards lease sale planning before the NEPA and Outer Continental Shelf Lands Act (OCSLA) processes are complete. See *Metcalf v. Daly*, 214 F.3d 1135, 1142 (9th Circ. 2000)."
- The Center for Biological Diversity suggests BOEM should remove the EPA from the Five-Year Program and cancel proposed EPA Lease Sales 225 and 226. The EPA should be removed from the plan due to the fact "the area is directly adjacent to an area subject to Congressional moratoria from oil and gas leasing and any spills would

directly and negatively impact the area under moratorium and frustrate the aim of OCSLA to 'balance the potential for environmental damage with the potential for the discovery of oil and gas' 43 U.S.C. § 1344(a) (3)."

- The Center for Biological Diversity believes the yield from the proposed EPA lease sale area does not warrant the risk and that all issues related to oil impacts, including the catastrophic spill, should be considered in greater detail than in previous Gulf of Mexico NEPA documents.
- The Center for Biological Diversity recommends that the EIS should include a robust analysis of ongoing environmental harm caused by the *Deepwater Horizon* explosion, oil spill, and response, and the proposed EPA lease sales should be postponed until better information is available.
- According to the Center for Biological Diversity, the cumulative analysis should carefully look at climate change impacts, including the stresses of ocean acidification on the ecosystem. The cumulative impacts of climate change and oil activities, including potentially catastrophic oil spills, need to be considered before leasing proceeds in the EPA.
- The Center for Biological Diversity believes the Eastern Planning Area EIS should also include NEPA analysis for seismic surveys within the EPA. BOEM should look carefully at the impact of seismic testing on marine mammals and consider mitigation measures to reduce impacts where possible.

ConocoPhillips (email dated May 4, 2012)

- ConocoPhillips supports the alternative of leasing the approximately 657,905 ac under proposed EPA Lease Sales 225 and 226. ConocoPhillips does not support Alternatives Two, Three, or Four as set forth in the March 20, 2012, *Federal Register* Notice.

Summary of Comments from Four Individuals (emails dated April 3, 4, 5, and 6, 2012)

- One commenter was concerned about the value of military facilities to the local economy. The commenter believed that closing such facilities to make more of the Gulf open for drilling would cause a huge economic impact to the State of Florida. The email also stated that BOEM needs to drill in the Arctic National Wildlife Refuge and build the Keystone pipeline.
- This commenter strongly opposed drilling in the Gulf of Mexico due to the outcome of how BP handled paying claims to those affected along the Gulf Coast. This individual believed the amount of revenue lost in 2010 along the Gulf Coast will never be replaced and, if it happens again, it would put more of our small businesses into bankruptcy. This commenter encouraged the Federal Government to offer incentives to encourage businesses and State and local governments to transition fleets to natural gas.
- This individual was opposed to drilling offshore in this area due to the impact of possible spills on our pristine coast and white sand beaches, which are central to the Florida coast. This individual noted their belief that there are many questions regarding safety and oil-spill response. According to the email, there is not enough oil in this location to risk ruining billions in tourism and destroying the beaches. The commenter noted that the beaches are prime sea turtle nesting grounds. The individual noted their belief that the oil companies do not seem to have changed their safety procedures or manuals. The commenter states "there are many other approved areas to drill and does not support drilling in the EPA."

- Another commenter opined that oil drilling off our own waters is necessary to reduce reliance on foreign oil.

Verbal Comments Received at the Scoping Meetings

(Note: Verbal comments provided by API at the Mobile, Alabama, scoping meeting are the same as those API submitted via email and are summarized above.)

- The entire EPA should have been included in the proposed Five-Year Program and included in the scope of the Five-Year Program's programmatic EIS.
- The Secretary of the Interior should have considered additional areas in the EPA as part of the 2012-2017 Five-Year Program.
- The entire EPA, even those areas currently under Congressional moratoria, should be included in the Five-Year Program and should be analyzed pursuant to NEPA because, in the event circumstances change and the eastern Gulf becomes available in the 2012-2017 Five-Year Program, this area could then be made available for leasing.
- If further development of offshore oil and natural gas were considered a priority, the entire EPA should have been included in the Five-Year Program and included in the Five-Year Program's Programmatic EIS and that the vast majority of the EPA will remain off limits for potential development for too long, even though there are new enhanced requirements in place for drilling, intervention, and response.
- Leasing in the EPA would help to reduce the Nation's dependency on foreign oil in the future.
- Concerns were voiced regarding pelagic fishing and deepwater species across the Gulf of Mexico and regarding the need to perform ocean floor studies prior to opening an area for leasing activities.
- Concerns and strong opposition were voiced for any offshore drilling activities within the military training range east of the military mission line, and it was asked that the military training area east of the military mission line remain off-limits from leasing and resulting drilling activities due to the potential to interfere and impact military testing and training there now and in the future.
- The Bay Defense Alliance and Northwest Florida Defense Coalition, groups that monitor the military training area east of the military mission line, voiced concerns that leases in the proposed EPA lease sale area for proposed EPA Lease Sales 225 and 226 would impair missions that occur in the military training area due to increase service-vessel traffic and helicopter trips in the area.
- Concern was voiced regarding tourist perception of the coastal environment and seafood and that drilling activity in the EPA, which would be closer than the *Macondo* well, may have an impact on coastal tourism and restaurants due to the perception of contaminated seafood much like the impacts incurred to tourism and restaurants following the *Deepwater Horizon* explosion, oil spill, and response.
- Objection was voiced to drilling in the EPA but support was voiced for the continued exploration and development of the well-established OCS oil and gas industry in the CPA.
- Concern was voiced over past and current environmental and sociological impacts from the *Deepwater Horizon* explosion, oil spill, and response and declared that oil and gas wells with the potential to spill and contaminate nearly one-third of the Gulf of Mexico, such as the *Macondo* well did, are weapons of mass destruction and can be used as weapons of mass destruction, especially when operated by foreign companies such as BP.

- The size of the proposed lease sale area is small, the reserves are negligible, and there is no need to be considering these proposed lease sales at the moment when consequences of the most recent spill are unknown. Impacts are still being felt, oil is still washing up on beaches, new data are coming in every day regarding impacts, and oil is not degrading as expected.
- Concerns were raised that there are still negative impacts in 2012 along the panhandle of Florida from the oil washing up on beaches, as well as unexpected levels of human health impacts, and the No Action alternative should be selected. There are concerns about budget cuts to the U.S. Coast Guard and the potential implications that would have to U.S. Coast Guard cleanup and their ability to respond in the event of another catastrophe.
- The No Action alternative should be selected until change in enforcement and safety is evident.
- There is a need to establish a GOM regional citizen advisory committee to assist BOEM in making decisions (like in Alaska).

5.3.2. Summary of Comments Received in Response to the Call

BOEM received three letters in response to the Call: one from the Louisiana Department of Natural Resources, one from ConocoPhillips Company, and one from Statoil USA E&P, Inc. All three letters supported the proposed EPA lease sales. The following is a summary of the comment letters:

Louisiana Department of Natural Resources

- The State of Louisiana has been steadfast in its support of responsible development of our Nation's natural resources to improve energy and economic security and wishes to continue its vital role in meeting the energy needs of the Nation.
- Louisiana welcomes the proposed lease sales in the Gulf of Mexico as a positive step in the resumption of offshore energy development in the Gulf. A return to robust exploration in the Gulf is a cornerstone of economic stability here in Louisiana, as well as nationally, and fosters job growth and economic recovery.
- The State acknowledged that a great deal of oil and gas was produced safely in the Gulf prior to the MC252 oil spill and that the "spill was indeed an anomaly." They also acknowledge the continuing efforts of the Federal Government to increase safety and environmental standards for offshore exploration and drilling. The oil and gas industry's cooperation with the Federal Government and the States as they work together to improve oversight and raise safety standards, while minimizing the regulatory burden, is also recognized.
- Louisiana has long worked with BOEM moderating the tradeoffs between resource management and production, enjoying the economic benefits, including direct and indirect employment, while providing natural resources to the rest of the Nation. However, the State does not believe the burdens of oil and gas development have been shared nationally, despite the national benefits provided. The State requests that BOEM assure a fair and equitable return to Louisiana for the impact suffered within its coastal zone. This goal would be best accomplished by considering important mitigation measures.
- Louisiana regards the safe and responsible exploration of offshore oil and gas resources off all coasts of the U.S. to be in the strategic and economic best interest of the Nation and urges BOEM to take the appropriate action to assist the states in addressing impacts to their coastal resources, communities, and infrastructure that are inherent in these activities.

- Louisiana continues to have concerns regarding mitigations for cumulative and secondary impacts to coastal resources as well as concerns regarding modeling and predictive techniques that have been used by BOEM for previous lease sales. They state that these concerns remain largely unaddressed. The State also continues to urge BOEM to identify the cumulative and secondary impacts resulting from the leasing and development of these OCS blocks through the NEPA process and to formulate an appropriate plan for their compensatory mitigation. Impact-producing activities ensuing from a lease sale occur over an extended period of time. Resulting impacts from lease sales overlap with those occurring from other lease sales, with the result being that it is difficult to distinguish impact from one lease sale to another. An aggregate approach to mitigation is necessary to address direct, indirect, and cumulative impacts of all prior and future lease sales. BOEM is the appropriate entity to administer this.
- Louisiana stated that the development of the upcoming EIS for proposed EPA Lease Sales 225 and 226 will afford an opportunity for BOEM to explore mitigation strategies, to better revisit many of the specific predictions made for earlier lease sales, and collect data to determine whether the models and predictive techniques used were accurate. BOEM has demonstrated that it has made accurate forecasts in some areas but Louisiana has concerns that BOEM may extrapolate particular, favorable, findings to encompass all impacts of a lease sale, including those not under study. They ask that BOEM take particular care during the creation of the EIS to avoid these "pitfalls."

ConocoPhillips Company

- ConocoPhillips supports the two sales in the EPA (Option 1 in the *Proposed Final Outer Continental Shelf Oil & Gas Leasing Program: 2012-2017*) and setting proposed EPA Lease Sale 225 in 2014 and proposed EPA Lease Sale 226 in 2016.
- Although most of the EPA is placed off limits, it is an area of high resource potential, is vitally important to America's energy security, and is relatively close to existing infrastructure. This proximity provides for development in this area to be potentially one of the quickest options to bring new supplies of energy to the American people, reducing the Nation's need for oil imports, lessening a growing dependence on foreign oil and reducing the environmental risks associated with transoceanic oil tankering from sources overseas.
- ConocoPhillips supports annual lease sales in the EPA to provide a predictable series of sales for planning and budgeting purposes. The OCS contains potentially significant, untapped resources of oil and natural gas that are critically important to sustaining our national economic growth and maintaining much-needed jobs in virtually every sector of the economy. ConocoPhillips has significant exploration and development investment budgeted for the OCS in the coming years and their continued commitment to the OCS will largely depend on the extent to which BOEM's Oil and Gas Leasing Program makes high potential areas available for leasing.

Statoil USA E&P Inc.

- Statoil states that the OCS holds the most promise for significant discoveries of hydrocarbons in meeting the Nation's energy needs and that the emerging plays in the EPA are an integral part of that potential. It is important for BOEM to continue to hold EPA lease sales so that these emerging plays can be further accessed, explored, and developed.

- Statoil is keenly interested in the resources potentially available for exploration in the EPA under the 2012-2017 Five-Year Program and would welcome the inclusion of an even greater area in the EPA for leasing in the future.
- Statoil states that another crucial factor to enable efficient exploration and development in the EPA is BOEM issuing leases with 10-year terms. The reasons that a 10-year lease term is necessary for deepwater exploration, and even more so for the EPA, are as follows: (1) the EPA contains emerging plays, so it can take longer to get a prospect drill-ready than in other more established plays; (2) there is not a lot of infrastructure in the area and, especially in light of NTL 2011-N10, companies will need the full 10 years in the EPA to be able to work towards satisfying the requirements to show a commitment to production; and (3) there are additional permitting requirements (e.g., USEPA) for those leases that lie to the east of the 87.5 degree longitudinal line, which take a significant amount of time to satisfy above and beyond the normal permitting requirements of those leases on the rest of the OCS.

5.3.3. Additional Scoping Opportunities

Although the scoping process is formally initiated by the publication of the NOI, scoping efforts and other coordination meetings have proceeded and will continue to proceed throughout the Bureau of Ocean Energy Management's NEPA processes. The Gulf of Mexico OCS Region's Information Transfer Meetings provide an opportunity for BOEM analysts to attend technical presentations related to OCS Program activities and to meet with representatives from Federal, State, and local agencies; industry; BOEM contractors; and academia. Scoping and coordination opportunities were also available during BOEM's requests for information, comments, input, and review of its other NEPA documents, including the following:

- scoping and comments on the proposed 2012-2017 OCS Oil and Gas Leasing Program's Draft Programmatic EIS;
- scoping and comments on the 2012-2017 WPA/CPA Multisale EIS; and
- scoping and comments on the Supplemental EIS for proposed WPA Lease Sale 233 and proposed CPA Lease Sale 231.

5.3.4. Cooperating Agency

According to Part 516 of the DOI Departmental Manual, BOEM must invite eligible governmental entities to participate as cooperating agencies when developing an EIS in accordance with the requirements of NEPA and the CEQ regulations. BOEM must also consider any requests by eligible government entities to participate as a cooperating agency with respect to a particular EIS, and then to either accept or deny such requests.

The NOI, which was published on November 18, 2011, included an invitation to other Federal agencies and State, tribal, and local governments to consider becoming cooperating agencies in the preparation of this EIS. There were no requests from any entities to participate as a cooperating agency on this EIS.

5.4. Distribution of the Draft EIS for Review and Comment

BOEM sent copies of the Draft EIS to the public and private agencies and groups listed below. Local libraries along the Gulf Coast were provided copies of this document; a list of these libraries is available on BOEM's Internet website at http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/nepaprocess.aspx.

Federal Agencies

Congress
- Congressional Budget Office
- House of Representatives
- House Resources Subcommittee on Energy and Mineral Resources
- Senate Committee on Energy and Natural Resources

Department of Commerce
- National Marine Fisheries Service
- National Oceanic and Atmospheric Administration

Department of Defense
- Department of the Air Force
- Department of the Army
- Corps of Engineers
- Department of the Navy
- Naval Mine and ASW Command

Department of Energy
- Strategic Petroleum Reserve PMD

Department of Homeland Security
- Coast Guard

Department of State
- Bureau of Oceans and International Environmental and Scientific Affairs

Department of the Interior
- Bureau of Ocean Energy Management
- Bureau of Safety and Environmental Enforcement
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Office of Environmental Policy and Compliance
- Office of the Solicitor

Department of Transportation
- Office of Pipeline Safety

Environmental Protection Agency
- Region 4
- Region 6

Marine Mammal Commission

National Aeronautics and Space Administration

State and Local Agencies

Alabama
- Governor's Office
- Alabama Highway Department
- Alabama Historical Commission and State Historic Preservation Officer
- Alabama Public Library Service
- Alabama Public Service Commission
- City of Gulf Shores
- City of Mobile
- City of Montgomery
- Department of Conservation and Natural Resources
- Department of Environmental Management
- Geological Survey of Alabama
- Montgomery County
- South Alabama Regional Planning Commission
- State Docks Department
- State Legislature Natural Resources Committee
- State Legislature Oil and Gas Committee
- Town of Dauphin Island

Florida
- Governor's Office
- Bureau of Archaeological Research
- Charlotte County
- Citrus County
- City of Destin
- City of Fort Myers
- City of Fort Walton Beach
- City of Gulf Breeze
- City of Panama City
- City of Pensacola
- City of St. Petersburg
- Collier County
- Department of Agriculture and Consumer Services
- Department of Economic Opportunities
- Department of Environmental Protection
- Department of State Archives, History and Records Management
- Dixie County
- Escambia County
- Florida Coastal Management Program
- Florida Fish and Wildlife Conservation Commission
- Franklin County
- Gulf County
- Hernando County
- Lee County
- Leon County
- Monroe County
- North Central Florida Regional Planning Council
- Office of the Attorney General
- Okaloosa County
- Pasco County
- Santa Rosa County
- Sarasota County
- State Legislature Agriculture and Natural Resources Committee
- Tampa Bay Regional Planning Council
- Walton County

West Florida Regional Planning Council
Withlacoochee Regional Planning Council

Louisiana
- Governor's Office
- Calcasieu Parish
- City of Lake Charles
- City of Morgan City
- City of New Orleans
- Department of Culture, Recreation, and Tourism
- Department of Environmental Quality
- Department of Natural Resources
- Department of Transportation and Development
- Department of Wildlife and Fisheries
- Iberville Parish
- Jefferson Parish
- Lafourche Parish
- Louisiana Geological Survey
- Orleans Parish
- South Lafourche Levee District
- St. Bernard Parish
- St. Charles Parish
- St. John the Baptist Parish
- St. Mary Parish
- St. Tammany Parish
- State House of Representatives, Natural Resources Committee
- State Legislature Natural Resources Committee
- State of Louisiana Library
- Terrebonne Parish
- Town of Grand Isle
- Vermilion Parish

Mississippi
- Governor's Office
- City of Bay St. Louis
- City of Gulfport
- City of Jackson
- City of Pascagoula
- Department of Archives and History
- Department of Environmental Quality
- Department of Marine Resources
- Department of Natural Resources
- Department of Wildlife Conservation
- Hancock County
- Harrison County
- Jackson-George Regional Library System
- Mississippi Development Authority
- State Legislature Oil, Gas, and Other Minerals Committee

Industry

- Acadian Integrated Solutions
- Adams and Reese, LLP
- Air Armament Center
- Alabama Petroleum Council
- American Petroleum Institute
- Applied Technology Research Corporation
- Area Energy LLC
- ASCO U.S.A., LLC
- Associated Press
- Baker Atlas
- Bellwether Group
- Bepco, Inc.
- B-J Services Co
- BP Amoco
- Brigham Oil and Gas L.P.
- C.H. Fenstermaker & Associates, Inc.
- Century Exploration N.O., Inc.
- Chet Morrison Contractors
- Chevron U.S.A. Inc.
- C-K Associates, LLC
- Coastal Environments, Inc.
- Cochrane Technologies, Inc.
- Columbia Gulf Transmission
- Continental Shelf Associates, Inc.
- De Leon & Associates
- Dominion Exploration & Production, Inc.
- Ecological Associates, Inc.
- Ecology and Environment
- Ecosystem Management, Inc.
- El Paso Production
- Energy Partners, Ltd.
- Ensco plc
- EOG Resources, Inc.
- Exxon Mobil Biomedical Sciences
- Exxon Mobil Production Company
- Flash Gas & Oil Southwest, Inc.
- Florida Petroleum Council
- Florida Power and Light
- Florida Propane Gas Association
- Freeport-McMoRan, Inc.
- Fugro Geo Services, Inc.
- Global Industries, Ltd.
- Gulf Environmental Associates
- Gulf of Mexico Newsletter
- Han & Associates, Inc.
- Horizon Marine, Inc.
- Hunt Oil
- Industrial Vehicles International, Inc.
- International Association of Geophysical Contractors
- J. Connor Consultants
- John Chance Land Surveys, Inc.
- L&M Botruc Rental, Inc.
- Lampl Herbert Consultants

Larose Intercoastal Lands, Inc.
Linder Oil Company
Louisiana Oil and Gas Association
Marathon Oil Company
Marine Safety Office
Mid Continent Oil and Gas Association
Midstream Fuel Service
Murphy Exploration & Production
Newfield Exploration Company
Northern Natural Gas Company
NWF Daily News
Offshore Process Services, Inc.
Oil and Gas Property Management, Inc.
Petrobras America, Inc.
Phoenix International Holdings, Inc.
PPG Industries, Inc.
Project Consulting Services
Propane Market Strategy Newsletter
R.B. Falcon Drilling
Safety, Environmental, & Operational Training, Inc.
Science Applications International Corporation
Seneca Resources Corporation
Shell Offshore, Inc.
South Central Industrial Association
Stone Energy Corporation
Strategic Management Services-USA
T. Baker Smith, Inc.
Taylor Energy Company, LLC
Texas Geophysical Company, Inc.
The Houston Exploration Company
The SJI, LLC
The Times-Picayune
Triton Engineering Services Co.
URS Corporation
Vastar Resources, Inc.
W & T Offshore, Inc.
Walk, Haydel & Associates, Inc.
Waring & Associates
Washington Post
WEAR-TV

Special Interest Groups

1000 Friends of Florida
Alabama Oil & Gas Board
Alabama Wildlife Federation
American Cetacean Society
Apalachee Regional Planning Council
Apalachicola Bay and Riverkeepers
Associated Gas Distributors of Florida
Audubon Louisiana Nature Center
Audubon of Florida
Bay County Audubon Society
Capital Region Planning Commission
Center for Marine Conservation
Citizens Assoc. of Bonita Beach
Clean Gulf Associates
Coalition to Restore Coastal Louisiana
Coastal Conservation Association
Concerned Shrimpers of America
Conservancy of Southwest Florida
Earthjustice
Florida Chamber of Commerce
Florida Natural Area Inventory
Florida Natural Gas Association
Florida Propane Gas Association
Florida Public Interest Research Group
Gulf and South Atlantic Fisheries Foundation, Inc.
Gulf Coast Environmental Defense
Gulf Restoration Network
Houma-Terrebonne Chamber of Commerce
Izaak Walton League of America, Inc.
JOC Venture
LA 1 Coalition, Inc.
League of Women Voters of the Pensacola Bay Area
Louisiana Wildlife Federation
Manasota-88
Marine Mammal Commission
Mission Enhancement Office
Mobile Area Chamber of Commerce
Mobile Bay National Estuary Program
Natural Resources Defense Council
Nature Conservancy
Offshore Operators Committee
Organized Fishermen of Florida
Pensacola Archaeological Society
Perdido Key Association
Perdido Key Chamber of Commerce
Population Connection
Portersville Revival Group
Restore or Retreat
Roffers Ocean Fishing Forecast Service
Santa Rosa Sound Coalition
Save the Manatee Club
Sierra Club
South Mobile Communities Association
Southeastern Fisheries Association
The Conservancy
The Conservation Fund
The Daspit Company
The Gulf Restoration Network
The Nature Conservancy

Ports/Docks

Alabama
- Alabama State Port Authority
- Port of Mobile

Florida
- Manatee County Port Authority
- Panama City Port Authority
- Port of Pensacola
- Port St. Joe Port Authority

Louisiana
- Abbeville Harbor and Terminal District
- Greater Baton Rouge Port Commission
- Greater Lafourche Port Commission
- Grand Isle Port Commission
- Lake Charles Harbor and Terminal District
- Plaquemines Port, Harbor and Terminal District
- Port of Baton Rouge
- Port of Iberia District
- Port of New Orleans
- Twin Parish Port Commission
- St. Bernard Port, Harbor and Terminal District
- West Cameron Port Commission

Mississippi
- Greenville Port Commission
- Mississippi State Port Authority
- Port of Gulfport

Educational Institutions/Research Laboratories

- Dauphin Island Sea Laboratory
- Florida A&M University
- Florida Atlantic University
- Florida Institute of Oceanography
- Florida Institute of Technology
- Florida Sea Grant College
- Florida State University
- Foley Elementary School
- Gulf Coast Research Laboratory
- Harbor Branch Oceanography
- Jackson State University
- Louisiana Sea Grant College Program
- Louisiana State University
- Louisiana Tech University
- Louisiana Universities Marine Consortium
- Loyola University
- McNeese State University
- Mississippi State University
- Mississippi-Alabama Sea Grant Consortium
- Mote Marine Laboratory
- Nicholls State University
- Pensacola Junior College
- Tulane University
- University of Alabama
- University of Florida
- University of Miami
- University of New Orleans
- University of South Alabama
- University of South Florida
- University of Southern Mississippi
- University of West Florida

5.5. PUBLIC MEETINGS

In accordance with 30 CFR § 556.26, BOEM scheduled public meetings soliciting comments on the Draft EIS. The meetings provided the Secretary of the Interior with information from interested parties to help in the evaluation of the potential effects of the proposed EPA lease sales. An announcement of the dates, times, and locations of the public meetings was included in the Notice of Availability for the Draft EIS. A copy of the public meeting notices was included with the Draft EIS that was mailed to the parties indicated above, was published in local newspapers, and was posted on BOEM's Internet website at http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/nepaprocess.aspx.

The public meetings were held on the following dates and at the times and locations indicated below:

Tuesday, March 26, 2013
1:00 p.m. EDT
Hilton Garden Inn
Tallahassee Central
1330 Blair Stone Road
Tallahassee, Florida 32301
9 registered attendees
3 speakers

Wednesday, March 27, 2013
1:00 p.m. CDT
Wyndham Bay Point Resort
4114 Jan Cooley Drive
Panama City Beach, Florida 32408
12 registered attendees
2 speakers

Wednesday, March 27, 2013
6:00 p.m. CDT
Wyndham Bay Point Resort
4114 Jan Cooley Drive
Panama City Beach, Florida 32408
4 registered attendees
0 speakers

Thursday, March 28, 2013
1:00 p.m. CDT
Five Rivers—Alabama's Delta Resource Center
30945 Five Rivers Boulevard
Spanish Fort, Alabama 36527
6 registered attendees
2 speakers

Friday, March 29, 2013
1:00 p.m. CDT
Courtyard by Marriott Gulfport Beachfront MS Hotel
1600 East Beach Boulevard
Gulfport, Mississippi 39501
4 registered attendees
1 speakers

Monday, April 1, 2013
1:00 p.m. CDT
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123
3 registered attendees
1 speakers

Tallahassee, Florida, March 26, 2013

Three speakers provided testimony at the public meeting held in Tallahassee, Florida, on March 26, 2013. Kevin Doyle of the Consumer Energy Alliance; Matthew Carter of the Florida Board of Governors; and David Mica of the Florida Petroleum Council, a division of the American Petroleum Institute provided testimony.

Mr. Doyle read a prepared statement that expressed the Consumer Energy Alliance's support for the proposed actions. He also spoke about the socioeconomic benefits to the U.S. of expanded oil and gas exploration.

Dr. Carter stressed our country's growing energy demands and the need to reduce our dependence on foreign sources of oil. He also mentioned the socioeconomic benefits of the proposed actions for the State of Florida.

Mr. Mica stated API's full support for Alternative A – The Proposed Actions. However, he mentioned that, due to our country's increasing energy demands, his organization was disappointed that more of the EPA was not offered for lease. He also said that API would submit written comments.

Panama City Beach, Florida, March 27, 2013, 1:00 p.m.

Two speakers provided testimony at the public meeting held in Panama City Beach, Florida, on March 27, 2013. Kevin Doyle of the Consumer Energy Alliance and Eric Hamilton of the Florida Petroleum Council, a division of the American Petroleum Institute provided testimony.

Mr. Doyle read a shortened version of the prepared statement as was read in Tallahassee that reiterated the Consumer Energy Alliance's support for Alternative A – The Proposed Actions.

Mr. Hamilton read the same prepared statement that was delivered by Mr. David Mica in Tallahassee.

Panama City Beach, Florida, March 27, 2013, 6:00 p.m.

There were no speakers at the public meeting held in Panama City Beach, Florida, on March 27, 2013.

Mobile (Spanish Fort), Alabama, March 28, 2013

Two speakers provided testimony at the public meeting held in Mobile, Alabama, on March 28, 2013. Tom Heffernan of Eglin Air Force Base and Steve Russell of offshorealabama.com provided testimony.

Mr. Heffernan stated that he would like to see the contributions of the military to the *Deepwater Horizon* explosion, oil spill, and response efforts mentioned in the EPA 225/226 EIS.

Mr. Russell expressed his support for the proposed actions and highlighted three benefits: capital expenditures in Mobile; job creations in the local community; and monetary aid to the Federal Government.

Gulfport, Mississippi, March 29, 2013

One speaker provided testimony at the public meeting held in Gulfport, Mississippi, on March 29, 2013. Jack Moody of the Mississippi Development Authority provided testimony.

Mr. Moody expressed his appreciation for BOEM working closely with the State of Mississippi in the management of OCS resources.

New Orleans, Louisiana, April 1, 2013

One speaker provided testimony at the public meeting held in New Orleans, Louisiana, on April 1, 2013. Brent Greenfield of the Consumer Energy Alliance provided testimony.

Mr. Greenfield read a similar prepared statement to the one read by Mr. Kevin Doyle in Tallahassee. In his comment, Mr. Greenfield reiterated the Consumer Energy Alliance's support for Alternative A – The Proposed Actions and highlighted the socioeconomic benefits to the U.S. of expanded oil and gas exploration.

5.6. COASTAL ZONE MANAGEMENT ACT

If a Federal agency's activities or development projects within or outside of the coastal zone will have reasonably foreseeable coastal effects in the coastal zone, then the activity is subject to a Federal Consistency Determination (CD). A consistency review will be performed pursuant to the Coastal Zone Management Act (CZMA) and a CD will be prepared for the affected States prior to a proposed lease sale. To prepare the CD's, BOEM reviews each State's Coastal Management Plan (CMP) and analyzes the potential impacts as outlined in this EIS, new information, and applicable studies as they pertain to the enforceable policies of each CMP. The CZMA requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of the State's federally approved coastal management program (15 CFR part 930 subpart C).

Based on the analyses, BOEM's Director makes an assessment of consistency, which is then sent to each State with the Proposed Notice of Sale. If a State concurs, BOEM can hold the proposed lease sale. The State's concurrence may be presumed when the State does not provide a response within the 60-day review period. If the State objects, it must do the following under the CZMA: (1) indicate how BOEM's presale proposal is inconsistent with their CMP and suggest alternative measures to bring BOEM's proposal into consistency with their CMP; or (2) describe the need for additional information that would allow a determination of consistency. Unlike the consistency process for specific OCS plans and permits, there is no procedure for administrative appeal to the Secretary of Commerce for a Federal CD for presale activities. Either BOEM or the State may request mediation. Mediation is voluntary, and the Department of Commerce would serve as the mediator. Whether there is mediation or not, the final CD is made by DOI, and it is the final administrative action for the presale consistency process. Each Gulf State's CMP is described in **Appendix E**.

5.7. ENDANGERED SPECIES ACT

The Endangered Species Act of 1973 (ESA) (16 U.S.C. 1631 et seq.) establishes a national policy designed to protect and conserve threatened and endangered species and the ecosystems upon which they depend. BOEM and BSEE are currently in ESA consultation with NMFS and FWS to consider all OCS oil and gas activities pursuant to leases issued through 2022, including those in the 2012-2017 Five-Year Program (e.g., EPA Lease Sales 225 and 226), as well as permitted G&G activities. The programmatic consultation will include postlease activities associated with OCS oil and gas activities in the Gulf of Mexico, including G&G and decommissioning activities. This consultation also considers any changes in baseline environmental conditions following the *Deepwater Horizon* explosion, oil spill, and response.

BOEM and BSEE have submitted the Biological Assessment to NMFS for this consultation. BOEM, BSEE, and NMFS have identified a proposed timeline for completion of the consultation as well as identifying major milestones throughout the consultation process. Given the complexities of this programmatic approach, NMFS expects to issue a Biological Opinion in the second half of 2014. BOEM and BSEE have also submitted a Biological Assessment to FWS, and BOEM and BSEE are currently working with FWS on a similar process. BOEM will continue to work with NMFS and FWS to (1) identify timelines for completing this ESA consultation and (2) establish procedures to ensure consideration of any on-the-water activities resulting from new lease sales that may be requested prior to completion of the new consultation (i.e., expanding the current ESA interim process with NMFS to include actions resulting from the 2012-2017 Five-Year Program).

With consultation ongoing, the current BOEM- and BSEE-required minimization measures, mitigation, and monitoring will continue to comply with all Reasonable and Prudent Measures and the Terms and Conditions under these existing consultations, along with implementing the current BOEM- and BSEE-required mitigation, monitoring, and reporting requirements. Based on the most recent and best available information at the time, BOEM and BSEE will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under NEPA, the ESA, and other statutes.

5.8. Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act, Federal agencies are required to consult with NMFS on any action that may result in adverse effects to essential fish habitat (EFH). In March 2000, BOEM consulted with NMFS' Southeast Regional Office in preparing a NMFS regional finding for the GOM, which allows BOEM to incorporate the EFH assessments into NEPA documents.

BOEM and NMFS agreed on procedures for new programmatic EFH consultations beginning with the Five Year Program. BOEM and NMFS also agreed on similar procedures for the EPA, which are being analyzed separately from the EFH consultation prepared for the CPA and WPA sales in the 2012-2017 WPA/CPA Multisale EIS. The "Essential Fish Habitat Assessment" (**Appendix D**) describes the OCS proposed activities, analyzes the effects of the proposed activities on EFH, and identifies proposed mitigating measures. The EFH consultation, which includes proposed EPA Lease Sales 225 and 226, was initiated with the distribution by BOEM and review by NMFS of the EPA 225/226 Draft EIS. While the necessary components of the EFH consultation are complete, there will be ongoing coordination among NMFS, BOEM, and BSEE. The EFH consultation provides for future active coordination among NMFS, BOEM, and BSEE. This coordination includes annual reports from BOEM to NMFS, meetings with Regional staff and discussions of mitigation and relevant topics. All agencies will continue to communicate for the duration of the current Five-Year Program.

5.9. National Historic Preservation Act

In accordance with the National Historic Preservation Act (NHPA) (16 U.S.C. § 470), Federal agencies are required to consider the effect of their undertakings on historic properties. The implementing regulations for Section 106 of the NHPA (16 U.S.C. § 470f), issued by the Advisory Council on Historic Preservation (16 CFR part 800), specify the required review process. BOEM initiated a request for consultation with the Florida State Historic Preservation Office on August 3, 2012, via a formal letter. The letter requested concurrence with a "no effect" determination. A timeline of 30 days was provided and the State responded that it concurred with the "no effect" determination. BOEM will continue to impose mitigating measures, and monitoring and reporting requirements to ensure that historic properties are not affected by the proposed undertakings. BOEM will reinitiate the consultation process with affected parties should such circumstances warrant further consultation.

5.10. Major Differences Between the Draft and Final EIS's

Comments on the EPA 225/226 Draft EIS were received during the public meetings and were also received via written and electronic correspondence. As a result of these comments, changes have been made between the Draft and Final EIS's. Where appropriate, the text in this Final EIS has been revised or expanded to provide clarification on specific issues, as well as to provide updated information. None of the revisions between the Draft and Final EIS's changed the impact conclusions for the physical, environmental, and socioeconomic resources analyzed in this EIS.

5.11. COMMENTS RECEIVED ON THE DRAFT EIS AND BOEM'S RESPONSES

The Notice of Availability and the announcement of public meetings were published in the *Federal Register* on March 1, 2013, were posted on BOEM's Internet website, and were mailed to interested parties. The comment period ended on April 18, 2013. BOEM received 21 distinct comments in response to the Draft EPA 225/226 EIS via letter, email, and the regulations.gov website. The commenters are listed below.

Federal Agencies
- Department of Defense
  - Air Force
- Department of the Interior
  - Fish and Wildlife Service
- Environmental Protection Agency

State Agencies and Representatives
- Florida Department of State
- Florida Department of Agriculture and Consumer Services
- Louisiana Department of Natural Resources

Local Agencies
- No comments were received

Organizations and Associations
- American Petroleum Institute
- Center for Regulatory Effectiveness
- Consumer Energy Alliance (1,311)
- Oceana
- Manufacturers Association of Florida
- Mobile Baykeeper
- Mississippi Energy Institute
- National Ocean Industries Association

Academia
- The University of Miami

Industry
- ConocoPhillips

General Public
- Kelly Anderson
- Mark Sokolow (2)
- Lisa Veiga
- George Livingston
- Stephen Malagodi

Copies of the comments are presented on the subsequent pages. Each comment has been marked for identification purposes. BOEM's responses immediately follow the comment(s). Note: One example was provided from the 1,311 form emails submitted by Members of the Consumer Energy Alliance.

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Received: March 16, 2013
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PUBLIC SUBMISSION

Docket: BOEM-2013-0009
Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0001
Comment from Mark Sokolow, Law Office of Mark Sokolow

Submitter Information

Name: Mark Sokolow
Address:
338 Wedgerock Drive
Webster, TX, 77598
Email: mark@mtsokolow-attorney.com
Organization: Law Office of Mark Sokolow

General Comment

SOKOLOW 1 - 1

COMMENTS ON PROPOSED RULES, REGULATIONS OR AGENCY ACTIONS:

We need to become energy independent as soon as possible. Therefore, please expedite the leasing of our offshore resources. Once a company bids on a lease and it accepted, additional fees should not be required of the company. In other words, do not increase inspection fees after the bids are accepted.

MARK SOKOLOW
ATTORNEY AT LAW
338 Wedgerock
Webster, Texas 77598
http://mtsokolow-attorney.com
mark@mtsokolow-attorney.com

Sokolow 1-1 BOEM notes the request for expedited leasing of offshore resources. BOEM notes, however, that pursuant to a number of laws and policies, BOEM must undertake a number of reviews and consider competing interests as well as potential impacts from leasing decisions prior to offering areas for lease. Such a measured approach is prudent but requires time in preparing leasing decisions. Regarding the request for fee relief, BOEM notes that a discussion on additional inspection fees once bids are accepted is outside the scope of this document; determination of inspection fees is up to BSEE.

PUBLIC SUBMISSION

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Docket: BOEM-2013-0009
Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0002
Comment from Mark Sokolow, Law Office of Mark Sokolow

Submitter Information

Name: Mark Sokolow
Address:
338 Wedgerock Drive
Webster, TX, 77598
Email: mark@mtsokolow-attorney.com
Organization: Law Office of Mark Sokolow

General Comment

COMMENTS ON PROPOSED RULES, REGULATIONS OR AGENCY ACTIONS:

SOKOLOW 2–1

The public meetings will be held in Florida, Louisiana, Mississippi and Alabama. Texas residents are also interested in the oil and gas leases in the Gulf.

Without delaying the issuance of the leases, please immediately schedule a public meeting in Texas.

MARK SOKOLOW
ATTORNEY AT LAW
338 Wedgerock
Webster, Texas 77598
http://mtsokolow-attorney.com
mark@mtsokolow-attorney.com

Sokolow 2-1 BOEM scheduled public meetings within the Gulf Coast States that could potentially be affected by an EPA lease sale. While BOEM welcomed comments on this EIS from everyone interested in the proposed lease sales regardless of their location, it was not within the allotted time or budget to conduct meetings in areas so geographically removed from the proposed EPA lease sale area. BOEM replied with this information via email on March 22, 2013, to Mr. Sokolow in response to his email request received on March 19, 2012.

Page 1 of 1

PUBLIC SUBMISSION

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Docket: BOEM-2013-0009
Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0003
Comment from Stephen Malagodi, -

Submitter Information

Name: Stephen Malagodi
Address:
3191 Leewood Terr
L138
Boca Raton, FL, 33431
Email: smalagodi@gmail.com
Organization: -

General Comment

MALAGODI - 1

No leases, no drilling in the Gulf.
No leases to BP.

Malagodi-1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

MISSISSIPPI ENERGY INSTITUTE

March 28, 2013

Gary D. Goeke
Chief, Environment Assessment Section
Bureau of Ocean Energy Management
1849 C Street, NW
Washington, D.C. 20240

Dear Mr. Goeke:

MEI – 1

The Mississippi Energy Institute wishes to offer our support to the Bureau of Ocean Energy Management's environmental impact statement to make available for lease all un-leased areas within the Eastern Planning Area for energy development. Southern coastal states would benefit considerably from the proposed lease expansion as this effort would create thousands of jobs, generate millions in federal, state, and local revenue, and spur growth in a multitude of businesses that service and supply offshore operations. Additionally, more domestic production would positively impact the U.S. energy trade balance.

Energy-related activity in the Gulf of Mexico and along its coast is a vital part of both the economy and U.S. energy supply. It is also an aide in revitalizing the Mississippi Gulf Coast economy, which has still not fully rebounded from Katrina. Mississippi Department of Employment Security data shows there are approximately 12,181 fewer jobs in the three coastal counties than there were just before Katrina in 2005. An increase in offshore oil and gas activity could support 3,000 new jobs in the state, according to a 2011 study by Quest Offshore Resources, Inc, helping us to bridge the gap.

Nationally, according to a 2010 assessment by IHS Global Insight, the offshore Gulf of Mexico oil and gas industry generated almost $70 billion of economic value and nearly 400,000 jobs in 2009. That same year, the industry provided about $20 billion in revenues to federal, state and local governments through royalties, bonuses and rents. The impact of the proposed expansion would prove to be significant and beneficial to all. Because of the high wages paid in this industry compared to other sectors, these are the types of jobs our economy is starving for.

Given the current state of our economy and the ongoing volatility of oil prices, the federal government should take prudent steps now to ensure a stronger economy and better energy security in the future. Now is the time to open the Gulf and expand the North American energy.

Sincerely,

Patrick Sullivan, President

MISSISSIPPI ENERGY INSTITUTE | 219 N PRESIDENT ST. | JACKSON, MISSISSIPPI 39201 | WWW.MEI.MS

MEI-1 Comment noted. This issue is currently being tracked on BOEM's Mitigation/Program tracking table, which can be accessed at http://www.boem.gov/5-year/2012-2017/Tracking-Table/. This tracking table lists the alternatives, mitigations, temporal and spatial deferrals, and other areal concerns suggested so far through public involvement opportunities during the 2012-2017 Five-Year Program for the OCS, in particular in the Gulf of Mexico and offshore Alaska, that are included in the Leasing Program.

egomeis, BOEM <boemegomeis@boem.gov>

comment on draft EPA Lease Sale 225 & 226 EIS

1 message

Heffernan, Thomas D Mr CIV USAF AFMC 96 TW/XPE
<thomas.heffernan@eglin.af.mil>
To: boemegomeis@boem.gov

Fri, Mar 29, 2013 at 9:57 AM

To reiterate the verbal comment I made at the public hearing yesterday in Spanish Fort (Mobile, AL) on behalf of the 96th Test Wing, the operator of the Eglin Range Complex:

HEFFERNAN - 1

We request that the Spill Response portion of the EIS recognize a lesson learned from the DeepWater Horizon disaster. Shoreside military bases along the northeastern Gulf Coast, in particular Eglin AFB, were called upon to provide substantial support to that effort. Specifically for Eglin, we provided access to several of our test sites on Santa Rosa Island for use as response staging areas. We also were heavily tasked to coordinate with many different components of the response teams with respect to the additional surface and air traffic and demand for radio frequency spectrum in the Eglin test and training airspace overlying the northeastern Gulf. This was done to minimize potential negative impacts to our mission while ensuring response agencies were provided adequate access to the area. Our military mission requirement for this area is well-documented and is forecast to increase in the future. I submit this tragic event established an important precedent of cooperation and should therefore be appropriately captured in the EIS.

As a supplement to my verbal comment: our island Test Sites A-5 was used for staging purposes during DWH. It is rapidly becoming the site of a joint use hotel/resort complex and will likely no longer be available to serve in that capacity. Construction on that site is underway at this time.

thanks
Tom Heffernan
96TW/XPE
850-882-8448

Heffernan-1 Comment noted. BOEM appreciates Eglin Air Force Base's contributions during the *Deepwater Horizon* explosion, oil spill, and response. There have been several efforts to collect and compile lessons learned from the *Deepwater Horizon* explosion, oil spill, and response effort, and this process is ongoing. The most pertinent and substantive findings are already incorporated throughout the EIS as appropriate. Regarding your comment that the location previously used as a staging area will no longer be available, this information was passed along to BSEE's Oil-Spill Response Division so that it can be provided to the USCG for consideration when revising the Area Contingency Plan prepared for your coastal area.

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PUBLIC SUBMISSION

Docket: BOEM-2013-0009
Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0004
Comment from Villy Kourafalou, University of Miami

Submitter Information

Name: Villy Kourafalou
Address:
4600 Rickenbacker Cswy.
Miami, FL, 33149
Email: vkourafalou@rsmas.miami.edu
Organization: University of Miami

General Comment

KOURAFALOU – 1

The validity of the scenarios presented in section 3.2 largely depends on the hydrodynamic model that has been used to provide ocean currents and temperatures needed to force the OSRAM and SIMAP models. This is an area of very dynamic currents, with strong variability in space and time. Missing details in ocean currents (especially the variability of eddies and fronts) could greatly influence the outcomes of the OSRAM and SIMAP models. There is hardly any information given on the ocean model used. There is one statement on the forcing of the trajectory modeling: "using winds from a National Data Buoy Center buoy in the northern Gulf, currents from the Princeton Ocean Model, and mean surface water temperatures" (section 3.2.1.4.4). What are the attributes of the specific version of the "Princeton Ocean Model" used and is this the most suitable model to use for the Northern Gulf, especially for deep sea to coastal interactions? Are there peer reviewed publications with this model showing skill around the specific lease areas and toward the adjacent coastal areas that are dominated by the Mississippi River plume? Trajectories approaching the shelf and coastal areas are definitely subject to the highly variable plume circulation, which was found to impact coastal pathways of the Deepwater Horizon spill. Also, what about variability in the wind fields, is one point measurement enough? Are mean temperatures the best representation for the sea surface temperature variability? Why not using time and space varying temperature fields?

Kourafalou-1 Complete details on the, time-dependent physical forcing (including ocean currents, temperature, winds, etc.) used for the OSRA model can be found in the final report at http://www.boem.gov/uploadedFiles/BOEM/Environmental_Stewardship/Environmental_Assessment/Oil_Spill_Modeling/2013_Eastern_OSRA_Report.pdf.

This report includes links to peer-reviewed papers on the Princeton Ocean Model and the numerous BOEM environmental studies specifically focused on applying this model to the Gulf of Mexico, including extensive skill assessments using GOM datasets. In contrast to the thousands of trajectories modeled using OSRA, SIMAP runs to inform weathering estimates were only performed for select hypothetical spills from a specified location, such that some point-specific physical forcing (such as buoy-specified winds) was deemed acceptable.

ConocoPhillips

ConocoPhillips Company
P. O. Box 2197
Houston, Texas 77252-2197

VIA E-MAIL: boemegomeis@BOEM.gov

April 8, 2013

Attention: Gary D. Goeke
Office of Environment (MS 5410)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394.

Subject: Comments on the Draft EIS for Eastern Planning Area Sales 225 and 226

ConocoPhillips Company (ConocoPhillips) is pleased to provide comments on the Draft Environmental Impact Statement (DEIS) for the proposed Eastern Planning Area (EPA) Lease Sales 225 and 226 as scheduled under the proposed 2012-2017 OCS Oil and Gas Leasing Program on which the Bureau of Ocean Energy Management (BOEM) issued a Notice of Availability in Federal Register Volume 78, No 42 on March 4, 2013 (Federal Register Notice).

ConocoPhillips is one of North America's leading energy producers, and one of our primary strategic objectives is to produce more oil and natural gas in the United States. We are a leading producer of natural gas in the United States, the largest producer of oil in Alaska, and among Canada's largest producers of natural gas (much of which flows to the United States). ConocoPhillips conducts exploration activities in 19 countries and produces hydrocarbons in 13 countries, including the United States OCS. ConocoPhillips is known worldwide for its technological expertise in deepwater exploration and production, reservoir management and exploitation and 3-D seismic technology. ConocoPhillips has participated in and plans to continue to participate in multiple wells in the deepwater Gulf of Mexico. In addition, ConocoPhillips is actively acquiring acreage in the Gulf of Mexico having recently exposed more than $99 Million on 106 blocks in the past two OCS Lease Sales, 227 and 229. These and other OCS activities reflect ConocoPhillips' commitment and continued interest in the BOEM's offshore leasing programs.

CONOCO - 1

Relative to the BOEM Regional Director's Note: ConocoPhillips believes that the DEIS addresses the potential impacts of oil and natural gas leasing, exploration, development and production resulting from the proposed EPA Lease Sales 225 and 226 to the marine, coastal and human environments. ConocoPhillips agrees that the DEIS was prepared using the best information that was publicly available at the time the document was prepared.

CONOCO - 2

ConocoPhillips supports Alternative "A" as set forth in the DEIS. Alternative "A" would offer for lease 657,905 acres not currently subject to the Congressionally mandated leasing moratorium in the Eastern

CONOCO - 2

Planning Area under proposed EPA Lease Sales 225 and 226. ConocoPhillips does not support Alternative "B" as set forth in the in the DEIS.

As stated in the DEIS: The cancellation of either EPA Lease Sale 225 or 226 would likely only defer any resulting oil and gas development from such sale to a later date. Therefore, cancellation of EPA Lease Sale 225 or 226 would only reduce the overall level of activity in the EPA by a small percentage, if any. Cancellation of proposed EPA Lease Sale 225 or 226 would however result in adverse direct economic impacts to individual companies and the Federal Government.

Offering for lease the proposed acreage in the Eastern Planning Area has the potential to increase domestic oil and gas resources by 0.071 billion barrels of oil and 0.162 trillion cubic feet of gas. Oil from the EPA would help reduce the Nation's need for oil imports and lessen a growing dependence on foreign oil, and would reduce the environmental risks associated with transoceanic oil tankering from sources overseas.

CONOCO - 3

In addition to the comments herein, ConocoPhillips continues to support the opening of additional acreage in the Eastern Planning area of the Gulf of Mexico as supported by ConocoPhillips' letters dated June 30, 2010 and May 1, 2012 on the Scope of the Environmental Impact Statement for the 2012-2017 OCS Leasing Plan.

Sincerely,

Richard Lunam
Vice President, North America Exploration

CONOCO-1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

CONOCO-2 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

CONOCO-3 Comment noted. This issue is currently being tracked on BOEM's Mitigation/Program tracking table, which can be accessed at http://www.boem.gov/5-year/2012-2017/Tracking-Table/. This tracking table lists the alternatives, mitigations, temporal and spatial deferrals, and other areal concerns suggested so far through public involvement opportunities during the 2012-2017 Five-Year Program for the OCS, in particular in the Gulf of Mexico and offshore Alaska, that are included in the Leasing Program.

BOBBY JINDAL
GOVERNOR

STEPHEN CHUSTZ
INTERIM SECRETARY

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF COASTAL MANAGEMENT

April 9, 2013

Mr. Gary Goeke, Chief
Regional Assessment Section, Office of Environment (GM 623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

RE: Draft Environmental Impact Statement (EIS) for Gulf of Mexico Outer Continental Shelf (OCS) Oil and Gas Lease Sales 225 and 226 in the Eastern Planning Area

Dear Mr. Goeke:

The Louisiana Department of Natural Resources (DNR) has received a copy of the Draft EIS for upcoming Lease Sales 225 and 226 in the Eastern Planning Area (EPA) of the Gulf of Mexico. Two sales are proposed, one each in 2014 and 2016. Previously we commented to you on the Notice of Intent to prepare the subject EIS by letter dated January 3, 2012, and on the Call for Information for same by letter to Mr. Carrol Williams dated December 19, 2011.

Consistent with our previous position, Louisiana supports the safe and responsible development of all of our nation's natural resources and believes doing so is critical to energy and economic security. Oil and natural gas continue to account for most domestic energy consumption. Without a comprehensive national energy policy, our quality of life here at home is more than ever predicated on the energy derived from the Gulf of Mexico.

Furthermore, we believe domestic production is preferable to increased importation of petroleum products. Our nation's offshore resources supply energy to domestic consumers and trade partners, while fostering job growth and economic recovery. DNR supports the full development of the Gulf of Mexico's oil and gas resources and views such as a cornerstone of economic stability here in Louisiana, as well as a vital part of a national energy policy.

LADNR - 1

With restrictions in place throughout most of our OCS waters, Louisiana's role in facilitating growth of energy development in federal waters is both fortuitous and critical to the well-being of the nation. DNR believes it reasonable that the Bureau of Ocean Energy Management (BOEM) do more to assure a fair and equitable return to Louisiana for the impacts suffered in its coastal zone, which as you are aware, has been in crisis for some time. The State wishes to continue its vital role in accommodating growth in the offshore energy sector and encourages other states to likewise participate more actively.

Despite the national benefits provided by our facilitation of offshore development, the burdens have not been shared nationally. Impacts from an earlier era of different values and technology are still felt today.

Post Office Box 44487 • Baton Rouge, Louisiana 70804-4487
617 North Third Street • 10th Floor • Suite 1078 • Baton Rouge, Louisiana 70802
(225) 342-7591 • Fax (225) 342-9439 • http://www.dnr.louisiana.gov

LADNR - 1

across Louisiana's coastal landscape. Revenues produced from the OCS are a significant source of non-tax revenue for the federal government. A system of revenue sharing, to support necessary infrastructure and address damage from previous and ongoing activities, is needed if we are to reconcile the national goal of energy production with protection of Louisiana's future.

As safe and responsible exploration of offshore oil and gas resources is in the strategic and economic best interests of the nation, the BOEM, as steward, must take appropriate action to address the impacts to the state's coastal resources, communities and infrastructure inherent in these activities. We believe BOEM could better balance Louisiana's coastal resource management and production.

LADNR – 2

As we commented before, and most recently in response to the Supplemental Environmental Impact Statement for the Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sales 2012-2017, DNR continues to urge BOEM to identify the cumulative and secondary impacts resulting from the leasing and development of these OCS blocks through the NEPA process, and formulate an appropriate plan for their compensatory mitigation. Impact-producing activities ensuing from a Lease Sale occur over an extended period of time, and overlap with those occurring from other Lease Sales, with the result that it is difficult to distinguish impacts from one Sale to another. We interpret this to mean that an aggregate approach to mitigation is necessary to address direct, indirect, and cumulative impacts of all prior and future lease sales and the BOEM is the appropriate entity to administer this.

We thank the BOEM for allowing us to comment on the draft EIS for Lease Sales 225 and 226 and look forward to partnering on expanded oil and gas development and production in the Gulf of Mexico.

If you should have any questions regarding these comments, please contact Mr. Jeff Harris of the Office of Coastal Management at (225) 342-7949.

Sincerely,

Don Haydel
Acting Administrator
Interagency Affairs/Field Services Division

DH/JDH/cmc

cc: Tershara Matthews, BOEM MS 5412
Brian Cameron, BOEM MS 5412
Project folder C20130051

LADNR-1 Comment noted. This issue is outside of the scope of this EIS. The percentage of OCS royalties shared with the States is mandated by Congress. For example, the Gulf of Mexico Energy Security Act prescribes the proportional sharing of OCS oil and gas royalties with certain Gulf Coast States.

LADNR-2 **Chapters 4.1.1.3 and 4.1.1.4** of this EIS, Chapters 4.1.1.3, 4.1.1.4, 4.2.1.3, and 4.2.1.4 of the WPA 231/CPA 233 Multisale EIS, and Chapters 4.1.1.3, 4.1.1.4, 4.2.1.3, and 4.2.1.4 of the WPA/CPA Supplemental EIS describe the environmental impacts of proposed lease sales on coastal areas, including coastal barrier beaches and wetland resources. Cumulative analyses are also included in order to put the incremental contribution of proposed EPA, CPA, and WPA lease sales in context considering all of the other types of activities (past, present, and reasonably foreseeable) that have the potential to cause impacts, including impacts from other lease sales that are part of the overall OCS Program. BOEM has included in this EIS and the aforementioned EIS's the relevant information related to its cumulative effects analysis, including both the proposed action and all OCS oil and gas program activities in its consideration. As noted in **Chapter 4**, the incremental contribution of an individual lease sale to these impacts is very small. Many of the impacts to environmental and socioeconomic resources that are identified in the cumulative analysis have occurred over many years, much of it prior to the enactment of important laws to protect the environment and prior to the bulk of OCS activities. BOEM includes a robust consideration of potential mitigation in its analysis. Please note, however, that BOEM's authority to require certain types of mitigation is limited to its statutory authority and that BOEM has no or limited authority to provide or mandate compensatory mitigation for possible activities outside the OCS Federal waters with indirect coastal impacts. These activities are regulated by other Federal and State agencies, such as the U.S. Army Corps of Engineers through Rivers and Harbors Act Section 10 and Clean Water Act Section 404 permits and the Louisiana Department of Natural Resources through the Louisiana Coastal Use permits. A decision on what BOEM mitigations may be imposed as part of the lease sale, if the decision is to move forward with the proposed lease sale, will be announced in a Final Notice of Sale and Record of Decision.

FLORIDA DEPARTMENT *of* STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

RECEIVED
APR 10 2013
DEP Office of
Intergovt'l Programs

April 3, 2013

Debby Tucker
Department of Environmental Protection
3900 Commonwealth Boulevard, MS 47
Tallahassee, FL 32399-3000

RE: DHR Project No. 2013-1032/ Received by DHR: March 14, 2013
Draft EIS on Proposed Eastern Planning Area Lease Sales 225 & 226
SAI # FL201303146544

Dear Ms. Tucker:

This office reviewed the referenced draft environmental impact statement to identify issues for possible concerns regarding impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places*, that should be addressed in the final statement. Our review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966* as amended, the National Environmental Policy Act (NEPA), and their implementing regulations.

FLDOS-1

We reviewed the information provided regarding the proposed 5-year leasing program, and note that BOEM is seeking a wide range of information regarding resource assessment of all OCS areas in order to avoid, minimize or mitigate adverse effects on historic properties (specifically historic shipwrecks). Since measures consistent with NEPA and federal consistency requirements are in place for requisite site surveys to locate and evaluate historic sites and properties, and for the avoidance of adverse impacts to significant resources, this agency concurs that the proposed Lease Sales 225 and 226 will have no impact on historic properties.

For any questions concerning our comments, please contact Deena Woodward, Historic Sites Specialist at 850.245.6333, or by electronic mail at deena.woodward@dos.myflorida.com. We appreciate your continued interest in protecting Florida's historic properties.

Sincerely,

Timothy A. Parsons, DSHPO for

Robert F. Bendus, Director
Division of Historical Resources
and State Historic Preservation Officer

DIVISION OF HISTORICAL RESOURCES
R. A. Gray Building • 500 South Bronough Street • Tallahassee, Florida 32399-0250
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Commemorating 500 years of Florida history www.fla500.com

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EGOM Lease Sales 225 and 226
Draft Environmental Impact Statement Comments

General Comments

FLDOS – 2

Marine mammal strandings continue to occur years after the Deepwater Horizon event and some academics attribute them to pollution from Deepwater Horizon. This issue should be more adequately address in the final EIS.

FLDOS – 3

The catastrophic OSRA model does not appear to accurately predict the potential for impact to Florida's panhandle beaches and waters. Based on experience from Deepwater Horizon, we know that the Panhandle of Florida will see impacts.

FLDOS – 4

The DEIS did not adequately address the impact to on shore resources should a storm event (hurricane) occur during a spill event. While the prediction that oil would be stranded inland and buried is correct, the question becomes how you conduct recovery activities when spilled oil found everywhere. For example: How do utility workers repair lines covered in oil and how should homeowners decontaminate their property?

Page Specific Comments

FLDOS – 5

Page 2-27. 2.3.1.2 Recreational Fishing - The discussion at the bottom of this page indicates that there could be short-term, space-use conflicts with **recreational** fishermen. Is recreational fishing expected to occur this far from shore?

FLDOS – 6

Page 3-17. 3.1.1.4. Operational Waste Discharged Offshore - The discussion under this section should address the safe and secure storage of containers on platforms and vessels. The DEP Office of Emergency Response (OER) routinely has to pick up drums of various fluids off the beach that come from offshore platforms or vessels.

FLDOS – 7

Page 3-43. 3.1.2.1.4.1 Refineries - The discussion in the second paragraph notes that "Distillation capacity is projected to rise from the 2008 year-end level of 17.6 MMbbl/day to 16.0 MMbbl/day in 2025……." Either figures are incorrect or capacity is projected to fall.

FLDOS – 8

Page 3-51. 3.2.1.4.4. Fate of Offshore Spills - The state has concerns about the assumptions being used in this section. The calculations on the average spill size and the estimate oil will only persist on the surface for 12 days appears flawed based on experience. This is also confusing since on page 3-52 it is estimated that after 15 days 58% of the spill would have dissipated with 42% washed ashore.

FLDOS – 9

Page 3-56. 3.2.1.6.2. Likelihood of Coastal Spill Contact – while the state agrees that a coastal spill would most likely effect Louisiana, considering the location of the proposed lease area, an accidental release of oil would have a greater chance of being affected by the Loop Current and therefore, have a greater chance of impacting Florida, especially the Florida Keys.

FLDOS – 10

Page 3-61. 3.2.1.8.2. Mechanical Cleanup – Based on the state's experience, a 10% – 30% mechanical recovery rate is optimistic. As pointed out in the next paragraph, rough seas, difficulty in finding recoverable oil, personnel unfamiliar with the equipment, the state of the oil itself and general equipment mechanical problems will all have the impact of reducing the amount recoverable.

FLDOS – 11

Page 4-80. 4.1.1.6.3.2. Summary and Conclusion – the discussion here states that the proposed EPA lease sale area if 155 miles from the closest live bottom. On page 4-72 the discussion notes that the Madison-Swanson Marine Reserve contained high relief live bottom 80 miles from the 224 and 225 lease sale area; Steamboat Lumps Marin Reserve 125 miles away and other low relief live-bottom habitats are also closer than 155 miles. Please correct.

FLDOS – 12

Page B-8. B.2.2.7.1 Shallow Water - EPA Region IV is currently working on an update to the Policy for Dispersant Use in Region IV. While the plan still references pre-approval, dispersants cannot actually be used until consultations with DOI and DOC take place. Additionally, there is no pre-approval for dispersant use in Florida Gulf Coast state waters (nine miles from the shore).

FLDOS – 13

Page B-9. B.2.2.7.3 Vessel Decontamination – This discussion assumes that weather and sea state is cooperative for vessel decontamination. The EIS should discuss alternate plans if it is too rough to decontaminate vessels offshore.

FLDOS – 14

Page B-9 and B-10. B.2.2.8 Severe Weather - Boom would have to be removed if a hurricane threatens the area where it is being used. The EIS should discuss how to accomplish this, especially considering the lengths and amounts used in during Deepwater Horizon incident. If not removed, boom, rope and anchors would damage seagrass and salt marsh communities.

FLDOS – 15

Page 3-60. 3.2.1.8.2 Source Contamination. About mid-way through the first paragraph, the conversion of water depths is incorrect.

FLDOS – 16

Page 5-16. Florida – The "Florida Coastal Zone Management Office" should be corrected to read the Florida Coastal Management Program. The "Department of Community Affairs" no longer exists – many of the function were moved to the Department of Economic Opportunity.

FLDOS – 17

Gary – I still need to get a list of contacts for the distribution of EISs for corrections and updates. Cathy sent me the cc list – which is now correct – but not the DEIS distribution list.

FLDOS-1 Comment noted. Archaeological surveys, where required prior to an operator beginning oil and gas activities on a lease, are expected to be effective at identifying possible archaeological sites. Refer to **Chapter 4.1.1.21** for additional information.

FLDOS-2 BOEM has addressed marine mammal strandings, as noted in **Chapter 4.1.1.12.1** in the section titled "*Deepwater Horizon* Explosion, Oil Spill, and Response," with the best available information. BOEM has noted, consistent with NEPA requirements, where information is missing or incomplete and has applied the information that is available in a conservative manner to minimize the potential for underestimating potential impacts.

FLDOS-3 In contrast to the *Deepwater Horizon* oil spill, which occurred in the CPA, the two OSRA catastrophic launch points used for the proposed EPA lease sale area are located in deeper waters, which resulted in different potential trajectories than for the *Deepwater Horizon*. For the EPA launch points, potential effects on the Florida panhandle are most notable during the Spring season (e.g., **Figure C-3 and Table C-1**), similar to when the *Deepwater Horizon* occurred. For a more direct comparison to the *Deepwater Horizon* launch point, please refer to the OSRA catastrophic runs in Ji et al. (2011). Should a catastrophic spill occur, which is not reasonably expected and not part of an EPA proposed action, from within the proposed EPA lease sale area, potential effects on the Florida panhandle would be more likely to occur at certain times of the year and not in all situations or timelines.

FLDOS-4 Language was added to **Chapter B.2.3.4 of Appendix B** ("Catastrophic Spill Event Analysis").

FLDOS-5 Recreational fishing is unlikely to occur in or near the proposed EPA lease sale area due to its distance from shore. However, there could still be short-term conflicts with recreational fishermen due to related OCS activities (e.g., vessel traffic) closer to shore.

FLDOS-6 The discussion in **Chapter 3.1.1.4**, "Operational Waste Discharged Offshore," does not discuss the safe and secure storage of containers on platforms and vessels because drums of fluids would not be considered operational wastes. Instead, this issue has been addressed in **Chapter 3.1.2.2.4**, "Beach Trash and Debris." Further information can also be found in NTL 2012-BSEE-G01, "Marine Trash and Debris Awareness and Elimination," and the text of this EIS has been updated to reflect the most current NTL.

FLDOS-7 The commenter is correct in that the capacity is projected to fall. The text in the EIS (**Chapter 3.1.2.1.4.1**, "Refineries") has been revised to reflect the latest projections and the appropriate language.

FLDOS-8 Please note that the persistence times described are specifically for how long oil lasts as a cohesive mass at the water surface, as described in the text. The heading for this subsection in **Chapter 3.2.1.4.4**, "Fate of Offshore Spills ≥1,000 bbl," has been changed to "Persistence on Water Surface" for clarification. While the 12- and 23-day persistence times for the summer and winter were the more exact values, we have switched to using the rounded (15- and 25-day) values used in **Tables 3-18 and 3-19** for consistency.

FLDOS-9 Based on the Bureau of Ocean Energy Management's OSRA analyses, spills estimated to occur as part of the scenario are not expected to significantly impact the State of Florida, with a ≤0.5 percent risk of contact for all Florida counties. The physical forcing inputs to the OSRA model statistically account for Loop Current position and associated transported by including many years of hydrodynamic model inputs for the Gulf of Mexico.

Nevertheless, as noted in this EIS, should a spill occur elsewhere or should it catastrophic in nature, which is not reasonably expected and not part of an EPA proposed action, it could impact Florida.

FLDOS-10 The cited value of 10-30 percent of an offshore oil spill quoted in this EIS is for the maximum amount of oil that can be mechanically removed from the water prior to a spill making landfall, and it was taken directly from a document prepared in 1990 for the U.S. Congress, Office of Technology Assessment. This maximum value represents estimates from worldwide spill response efforts. BOEM believes changes to this section are not necessary; however, this EIS also notes in this same section that it was estimated that only 3 percent of the total oil spilled was picked up by mechanical equipment offshore during the *Deepwater Horizon* response which is specific to the GOM.

FLDOS-11 The text was revised in **Chapter 4.1.1.6.2.3**.

FLDOS-12 **Chapter B.2.2.7.1 of Appendix B** was revised to reflect that the State of Florida has rescinded preapproval for the use of dispersants in Florida State waters and to clarify that the RRT IV is in the process of revising their preapproved Dispersant Use Manual.

FLDOS-13 Text was added to **Chapter B.2.2.7.3 of Appendix B** to include additional information on vessel decontamination during spill response.

FLDOS-14 The text was revised in **Chapter B.2.2.8 of Appendix B** to reflect discussions from within this EIS on booming operations and their sensitivity to adverse weather.

As indicated within **Chapter 3.2.1.8**, there are tradeoffs in deciding where and when to place boom because, once deployed, boom is time consuming to tend and to relocate. Due to time constraints prior to a hurricane event, it is, therefore, unlikely that much effort could be expended to move large amounts of deployed boom, particularly given the effort that would be required to move skimming equipment to safer locations inland and to move large numbers of response personnel to safer areas. However, since the conditions for each spill response are unique, these considerations would be examined and a site-specific hurricane response plan developed during the actual spill-response effort by the Unified Command at the beginning of the official hurricane season. Since the Unified Command includes representatives of the affected state(s), the State of Florida would be in a position to voice their opinion regarding the priorities that should be considered should a hurricane event occur during a spill-response event affecting the State of Florida. **Chapter 3.2.1.8** also acknowledges that booming operations are sensitive to wind, wave, and currents, and those sections of boom need to be tethered and secured to keep them from moving. It was further discussed that, during the *Deepwater Horizon* explosion, oil spill, and response, it was discovered that hard boom often did more damage than anticipated in the marsh it was intended to protect after weather conditions ended up stranding the boom back into the marsh.

FLDOS-15 The text in **Chapter 3.2.1.8.2**, “Source Containment,” has been revised.

FLDOS-16 The text in **Chapter 5** has been revised.

FLDOS-17 BOEM has responded directly to this commenter on this matter, which is not related to substantive matters in this EIS.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1875 Century Boulevard
Atlanta, Georgia 30345

In Reply Refer To:
FWS/R4/ES

APR 1 1 2013

Mr. Gary D. Goeke, Chief
Regional Assessment Section
Office of Environment (GM 623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard,
New Orleans, Louisiana 70123-2394

Subject: Review of Draft Environmental Impact Statement for the Proposed Eastern Planning Area Oil and Gas Lease Sales 225 and 226, scheduled for 2014 and 2016

Dear Mr. Goeke:

USFWS-1a

The U. S. Fish and Wildlife Service (Service) has reviewed the subject Draft Environmental Impact Statement (DEIS) for two proposed oil and gas lease sales (225 and 226) in the Gulf of Mexico's Eastern Planning Area, administered by the Bureau of Ocean Energy Management (BOEM). Comment regarding the DEIS are provided below by the Southeast Regional Office in behalf of the Service. This response does not address any section 7 consultation issues that may apply to this action to address those issues. The Service recommends BOEM initiate formal consultation.

The Service has reviewed the DEIS and offers general and specific comments (enclosure). The comments are in accordance with provisions of the National Environmental Policy Act (NEPA) of 1969 (83 Stat. 852; 42 U.S.C. 4321 et seq.), and the Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.).

If you need any additional information, please contact Christine Willis, Regional Energy Coordinator, Southeast Region, at (404) 679-7310.

Sincerely yours,

Roxanna Hinzman
Acting Assistant Regional Director
Ecological Sevices

Enclosure

General and Specific Comments on DEIS

General Comments on DEIS

The DEIS is well-organized and adequately describes the potential impacts of the proposed outer continental shelf (OCS) oil and gas leasing activities within the Eastern Planning Area (EPA) Lease Sales 225 and 226 on fish and wildlife resources under the trusteeship of the U.S. Fish and Wildlife Service (Service). We look forward to continued cooperative endangered species consultation during our review of BOEM's forthcoming Biological Assessment on all existing and future lease sales in the Gulf of Mexico, which would also include an updated baseline following the Deepwater Horizon oil spill.

USFWS – 1b

BOEM should be commended on their efforts specific to the analysis of the Coastal and Marine Birds resources in the DEIS, as the efforts associated with this document appear to be the most comprehensive/extensive review of potential impact producing factors related to offshore oil and gas activities to date. The inclusion of related Tables and Figures in the DEIS and the 2012-2017 OCS Oil and Gas Leasing Program Final Programmatic Environmental Impact Statement (MultiSale FEIS), as well as all the numeric values associated with the Coastal and Marine Birds resources analyses greatly clarify potential effects.

Presently, it appears there is no mitigation or stipulations in place to reduce, minimize, or eliminate the estimated annual loss (Table 4-7 in MultiSale EIS) of migratory birds primarily due to collisions with manmade structures. The Service would like to work with BOEM to reduce migratory bird mortality associated with the proposed action (since there is no provision for "take" under the Migratory Bird Treaty Act). Accordingly, the Service recommends that BOEM review their Memorandum of Understanding with the Service signed in June 2009 (http://www.fws.gov/migratorybirds/Partnerships/MMS-FWS_MBTA_MOU_6-4-09.pdf).

USFWS - 2

The Service respectfully requests clarification of Figures 3-24, 3-25, 3-26, 3-28, 3-29, 3-30, and 3-31, as well as their corresponding figures in Appendix B (e.g., Figures B-9, B-11, B-12, B-13, B-14, B-15, and B-17). Those figures illustrate the oiling probabilities of different bird habitats across the Gulf of Mexico shoreline; however, certain habitats were not included in Louisiana in those figures. No information was provided indicating reasons for those omissions. For example, the Chandeleur Island chain should be included in all figures depicting piping plover habitat, shorebird habitat, waterfowl habitat, diving bird habitat, and habitat for gulls and terns. Similarly, the figure for marsh and wading bird habitat in Louisiana should be the same as the figure for waterfowl habitat in Louisiana, as those guilds' habitats overlap. Lastly, it was unclear whether the term "raptor habitat" was strictly for bald eagles or for all migratory raptors. There is no raptor habitat depicted in Louisiana; however, several species of raptors forage in the coastal marshes and maritime forest habitats along that coast during migration and/or year-round. The subject figures should be revised accordingly, or a description of why certain habitats in Louisiana would not be affected by a spill, should be included in the corresponding sections within the DEIS.

USFWS -3

Climate change is referenced in Volume I of the DEIS 35 times; the Service recommends that BOEM consider incorporation of the recently released National Fish, Wildlife, and Plant Climate Adaptation Strategy (http://www.wildlifeadaptationstrategy.gov/pdf/NFWPCAS-Final.pdf) as additional new information relative to climate change.

Specific Comments on DEIS

USFWS - 4

Table 3-7 of the MultiSale FEIS – Under the column "Mortality associated with windfarms," the upper range of 40,000 should be revised to 440,000 (Manville 2005, 2009).

USFWS - 5

Page xi, Water Quality (Offshore Waters), fifth sentence – "Rare" is used twice in this sentence; please clarify if it is referring to some statistical probability level and provide the probability statistic for such events (e.g., 1 in 50 chance). The phrase "short duration" should also be defined (e.g., days, weeks, months, etc.). Additionally, please clarify whether the probability of oil spills from pipelines increases as a function of pipeline age, and whether the risk of loss of well control or risk of a blowout increases as a function of increasing water depth. The Service recommends that BOEM review Anderson and Labelle 2000, Helm et al. 2008, BSEE 2009, Muehlbachs et al. 2011, NOSC 2011, and Anderson et al. 2012, for additional information regarding clarification on those types of risks.

USFWS - 6

Page 2-25, last three sentences of first partial paragraph – The lack of data or research regarding potential effects of a proposed action should not be considered the same as a long-term monitoring or research program clearly demonstrating no effects. The Service recommends that BOEM revise these sentences to more clearly differentiate between the lack of research and no effects of the offshore oil and gas program. From Russell 2005, we know that at least 200,000 birds are being killed annually primarily due to collisions with manmade structures. Please consider that nocturnal circulation events (NCEs) may result in additional unquantified mortality. The Service recognizes that it is difficult to estimate how many migratory birds are killed in the Gulf of Mexico on an annual basis; therefore, additional consideration or analyses to determine if population-level impacts may be occurring for some of the species involved in NCEs may be warranted. Russell's (2005) study may be beneficial in addressing these uncertainties regarding effects/impacts to migratory birds relative to NCEs and collision-related mortality by species; thus, the Service recommends incorporating those additional data if available. Finally, the Service encourages BOEM to undertake additional research to address such uncertainties relative to impacts to migratory birds for future actions.

USFWS - 7

Page 4-13, concluding paragraph of Section 4.1.1.1.2 – The DEIS states that a typical well site produces an average of 237 to 439 tons of CO_2 emissions per year. BOEM considered that value as ". . . well below the reporting thresholds under the Green House Gas Reporting Rule." The Service recommends that BOEM analyze CO_2 emissions on a cumulative basis (e.g., platform specific or Gulf-wide) for the estimated 40-year platform lifespan relative to the Green House Gas Reporting Rule.

USFWS - 8

Page 4-127, Recent Section 7 Endangered Species Act Consultation, second paragraph, first sentence – Because BOEM included certain minimization measures within their leasing requirements during our consultation for the 2007-2012 MultiSale FEIS, the Service recommends that this sentence be revised to state ". . . the current BOEM- and BSEE-required minimization measures, mitigation, monitoring . . ."

USFWS - 9

Page 4-154, Summary and Conclusion, last two sentences – These sentences should be revised to explain that the main entrance tunnel and escape tube of beach mice burrows are located very close to each other; therefore, both the main entrance and escape tunnel may be crushed or closed by equipment and inadvertently by trained personnel via foot traffic. Depending upon the

USFWS - 9

impact, foot traffic or equipment, the chance of a beach mouse digging out of a closed or crushed burrow could vary.

USFWS - 10

Page 4-157, Section 4.1.1.16, Coastal and Marine Birds, second paragraph, first sentence – This sentence is long and confusing as written and should be revised for clarity. Specifically, "…and there are hereby incorporated by reference as applicable to the EPA" should be revised to replace "there" with "therefore."

USFWS - 11

Page 4-157, Section 4.1.1.16.1, Area Classifications, first paragraph, last sentence – This sentence should be revised to replace "associate" with "associated." The Service commends BOEM for inclusion of Bird Conservation Regions, Important Bird Areas, and National Wildlife Refuges as a means of spatially assessing avian assemblages relative to the OCS Planning Areas and recommends that BOEM retain these for avian resources in future NEPA documents.

USFWS - 12

Page 4-158, Nonendangered and Nonthreatened Species – The Service recommends including those avian species identified by individual state's State Wildlife Action Plans (SWAP) adjacent to the OCS be referenced here (in tabular format). Presently, all states are in the process of revising and updating their individual SWAPs. The list of avian species by state from the 2005 SWAP is as follows: Alabama CWCS - 28 avian species, FL CWCS - 34 avian species (or subspecies), LA CWCS - 60 avian species, MS CWCS - 71 avian species, and TX CWCS - 31 avian species (or subspecies).

USFWS - 13

Page 4-158, Nonendangered and Nontreatened Species, paragraph 5 – This paragraph discusses impacts relative to the assumption that birds (and other highly mobile wildlife and fisheries resources) will relocate to other habitats or non-impacted areas in cases of disturbance, spills, or other offshore oil and gas impacts. The Service recommends that BOEM consider inclusion or written evaluation of the following assumptions for various mobile species and/or how violations of these assumptions might alter conclusions regarding potential effects/impacts for a given impact-producing factor. There is a large body of scientific, peer-reviewed literature available on this topic, and the Service can provide specific references to each of the following assumptions upon request.

1. There is an alternative un-impacted habitat (habitat B) of similar or greater size available to be colonized when the original habitat (habitat A) is impacted.
2. The quality of habitat B is of similar or greater "value" than habitat A. If habitat B is of lower quality, then there would be fitness consequences to colonizing individuals.
3. Habitat B has available space, food, or other resources so that conspecific (density-dependence) or heterospecific density does not constrain colonization.
4. A given species and all individuals regardless of age, sex, body condition, or pair status have the same dispersal abilities and probabilities.
5. There are no barriers to movement.
6. Predator numbers or diversity and predation rate at habitat B will be less than or equal to habitat A, otherwise habitat B operates as a population sink.
7. There is some flexibility relative to often strong fidelity exhibited by some species of birds, and that the alternative habitat is within a species' dispersal abilities and will actually be found and colonized.

USFWS - 14

Page 4-160, Roseate Tern, sentence 6 – This sentence should be revised to state "Migratory information for the Caribbean population is less understood …"

USFWS - 15

Page 4-162, Wood Stork, first full paragraph – Please note that the following new information for the Wood Stork should be incorporated in the DEIS. On December 26, 2012, there was a Notice of Petition and Finding (77 Federal Register 75947-75966) to down-list the continental U.S. breeding population of Wood Storks from endangered to threatened. Subsequently, on January 3, 2013, (78 Federal Register 278-279) a correction was provided.

USFWS - 16

Page 4-165, Red Knot, paragraph 3, sentence 1 – This sentence should be revised to include all coastal states, as red knots have also been recorded in coastal Mississippi and Alabama (refer to E-bird records online (http://ebird.org/ebird/eBirdReports?cmd=Start) and query by this species and by state). In addition, this sentence should also be revised to state "… and Louisiana (barrier headlands and islands across the coast)…"

USFWS - 17

Pages 4-165 and 4-166, Deepwater Horizon Explosion, Oil Spill, and Cleanup an New Baseline Conditions – Analyses of the Deepwater Horizon bird-impact data provided in the DEIS and the MultiSale FEIS are the most comprehensive of any information presently available on the potential long-term impacts to the numerous (n = 104) avian species collected during the post-Deepwater Horizon response. BOEM should be commended on their effort to provide this level of detailed disclosure of impacts post-spill using publicly available information. The DEIS contains some very valuable points on page 4-166 regarding the potential biases associated with oiling rates for certain avian species groups due to small sample sizes, and further, correctly notes that overall the sample represents some unknown fraction of total modeled avian mortality. The Service recommends that this level of analysis be retained until additional scientific literature becomes available regarding modeled estimates of avian mortality. The Service can provide literature on the effects of oil spills on avian resources upon request.

USFWS - 18

Page 4-168, Section 4.1.1.16.2, Impacts of Routine Events, last paragraph – BOEM identifies the four most relevant impact producing factors for coastal and marine birds associated with routine events. The Service suggests that the unknown, but potential negative effects associated with service vessel and helicopter traffic in the near-shore environment be included in that list. The DEIS should address the potential impact of this additional factor, and the Service recommends that studies of these factors be undertaken by BOEM to improve the impact analysis in future NEPA documents. These disturbance factors may result in behavioral changes that could negatively impact realized habitat use and potentially reproductive performance depending on the timing, type, severity, and duration of the disturbance.

USFWS - 19

Page 4-169, Summary and Conclusion, sentence 11 – This sentence implies that using long history of avian impacts (including collision-related mortality) and the lack of data regarding potential impacts from routine activities is justified as a baseline in comparison to the preferred alternative of the proposed action (i.e., H_o = no effects/impacts, the application of the false-null hypothesis as an operational paradigm). There is limited information that indicates unauthorized take of migratory birds is presently occurring at offshore platforms via collision-related mortality and the unknown mortality associated with nocturnal circulation events (NCE). Therefore, the Service recommends that BOEM consider an operational baseline for NEPA analyses using the alternative hypothesis (i.e., H_a = effects/impacts present, but the scope and scale of effects/impacts need to be determined). The use of the alternative hypothesis tends to provide some reasonable assurance of protection to the resource when compared the null hypothesis of no effects/impacts. The Service also recommends that BOEM review their MOU with the Service in light of this observation.

USFWS - 20

Page 4-170, 10 bullets regarding "… low levels of oil …" – The DEIS appropriately identifies multiple potential adverse effects to avian resources (e.g., oil spills and produced waters). The Service requests that BOEM consider incorporating mitigation measures to reduce, minimize, or eliminate effects/impacts to seabirds from "accidental events" (oil spills) and "routine events" (produced waters). In light of BOEM's MOU with the Service, the Service recommends that BOEM consider potential mitigation measures specific to migratory birds, primarily seabirds, to minimize, reduce, or eliminate potential effects of these factors. The Service can provide literature on potential effects of produced waters on avian species upon request.

USFWS - 21

Page 4-171, Proposed Action and Possible Impacts, first full paragraph – The DEIS correctly and appropriately identifies several limitations of the modeling process. The points provided in the DEIS are very beneficial in clarifying Oil Spill Risk Analysis model limitations to the public and reviewers of the DEIS. The Service recommends that BOEM consider incorporating and/or retaining these same points for avian resources in future NEPA documents.

USFWS - 22

Pages 4-175 (last paragraph) and 4-176 (first paragraph), Non-OCS Oil- and Gas-Related Impacts – The DEIS identifies sea-level rise as one of the potential major factors impacting coastal and marine birds related to climate change. The recently released National Fish, Wildlife, and Plant Climate Adaptation Strategy (http://www.wildlifeadaptationstrategy.gov/pdf/NFWPCAS-Final.pdf) can provide additional information, if needed.

Specific Comments regarding Manatees

USFWS - 23

The type of manatee observer training (inshore, nearshore, and offshore) that would be provided for vessel operators and/or designated observers should be described in the DEIS, and training should be updated periodically. A useful site for training has been developed by the Florida Fish and Wildlife Conservation Commission (http://www.youtube.com/watch?v=Xs7zLRtZVOQ).

USFWS - 24

The Service recommends that the following vessel operator best management practices (BMPs) should also be incorporated into the DEIS. In areas where the West Indian Manatee may be present and vessel operation is necessary, the following BMPs should be implemented:

1. Vessel personnel must be informed that it is illegal to intentionally or unintentionally harm, harass, or otherwise "take" a manatee. Personnel shall obey all posted manatee protection speed zones, Federal manatee sanctuary and refuge or park restrictions, and other similar state and local regulations while conducting in-water activities.
2. All vessels shall operate at "no wake/idle" speed at all times while in water where the draft of the vessel provides less than a four-foot clearance from the bottom or where manatees are likely to be present. All vessels shall follow deep-water routes whenever possible. It is recommended that the vessel operator and designated observer wear polarized sunglasses to reduce glare while on the water and to improve visibility while keeping a look out for manatees. The boat should be operated to avoid any manatees that are seen.
3. Do not travel through, land, or stage boats on aquatic vegetation, particularly sea grasses in order to avoid potential collisions with manatees and prop-scarring sea grasses.

USFWS - 24

a. Every attempt shall be made to identify an area to make landfall that does not cross sea grasses.
b. If you must cross sea grass with less than four foot clearance in order to reach the destination, propellers shall be raised to the maximum extent practicable to avoid the vegetation while still safely operating the vessel.

The Service is concerned that acknowledgement of the potential presence of manatees in any of the EPA areas appears under-represented. Therefore, we recommend incorporating the following clarifying language:

USFWS - 25

Page 4-122, Threatened or Endangered Species, sentence 3 – This sentence should be revised to state, "The West Indian manatee (*Trichechus manatus*) typically inhabits only coastal marine, brackish, and freshwater areas…is not expected to be, however could be in the proposed EPA lease sale area." Please also see the recommended revisions/additions to NLT2012-JOINT-G01 and -G02 in the comments below.

USFWS - 26

Page 4-126, Marine Mammal Resources in the EPA, second bullet on this page – This paragraph should be revised to state "They are less common farther west; however, individuals have been increasingly spotted as far as Texas during the summer months (Service 2001; Fertl et al., 2005; Pabody et al., 2009) and should be expected anywhere within the Multisale area when Gulf water temperatures are greater than 68 degrees F. In Alabama, a number of manatees (one to fifteen individuals) are routinely seen in the calm, shallow waters of rivers and sub-embayments of Mobile Bay and the Mobile-Tensaw Delta. However, manatees have been observed in the coastal areas, off barrier islands, and up to 145 kilometers offshore (Pabody et al. 2009; Fertl et al. 2005). Manatees are often sighted in Alabama between mid-April through mid-October, though sightings of manatees have been reported in all months except March (Pabody et al. 2009). Manatees have been sighted in Mississippi and Louisiana typically in estuarine and river mouth habitats including sightings in Lake Pontchartrain, Louisiana, and near barrier islands and offshore of both States (Fertl et al. 2005)."

USFWS - 27

BOEM referenced their NTL 2012-JOINT-G01 and NTL 2012-JOINT-G02 guidance documents within the DEIS as part of the analysis of impacts to marine mammals and sea turtles, therefore, the Service recommends the following revisions and additions to NTL2012-JOINT-G01, under the section titled Vessel Strike Avoidance:

3. "When sea turtles, manatees, or small cetaceans are sighted. . ."
4. "When cetaceans or manatees are sighted while a vessel is underway. . . Avoid excessive speed or abrupt changes in direction until the cetacean or manatee has left the area."
5. "Reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans or manatees are observed … A single cetacean/manatee at the surface may indicate the presence of submerged animals…"

All inshore, near-shore, and offshore manatee sightings in Gulf of Mexico states should be reported to Nicole Adimey (nicole_adimey@fws.gov, 904-731-3079) of the Fish and Wildlife Service. Those sightings located OUTSIDE OF FLORIDA should also be reported to the Dauphin Island Sea Lab's Manatee Sighting Network at http://manatee.disl.org/ or 1-866-493-5803.

USFWS - 28

The Service also recommends the following revisions and additions to NTL2012-JOINT-G02:

Page 1, Background, Paragraph 1, sentence 2 – This sentence should be revised to state "Some marine mammals, such as sperm whale…, West Indian manatee (*Trichechus manatus*), and all sea turtles inhabit the Gulf of Mexico and are protected under the Endangered Species Act (ESA)."

Page 2, Definitions – The Service recommends an additional definition as follows: "Definition 7. Marine mammal(s) denotes all marine mammals in the Gulf of Mexico, whales, dolphins, and manatees."

Pages 5 and 6, Protected Species Observer Program, Reporting – The Service recommends that the following reporting requirement for manatees be included within this section: "All inshore, near-shore, and offshore manatee sightings in Gulf of Mexico states should be reported to Nicole Adimey (nicole_adimey@fws.gov, 904-731-3079) of the Fish and Wildlife Service. Those sightings located OUTSIDE OF FLORIDA should also be reported to the Dauphin Island Sea Lab's Manatee Sighting Network at http://manatee.disl.org/ or 1-866-493-5803."

Specific Comments regarding Sea Turtles

USFWS - 29

The Service recommends that the following point should be clarified in the DEIS: "The Fish and Wildlife Service (Service) and National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Endangered Species Act (ESA). The Service has responsibility for sea turtles (eggs, hatchlings and nesting turtles) on the nesting beaches. NMFS has jurisdiction for sea turtles in the marine environment."

USFWS - 30

In order to incorporate the most recent information regarding the loggerhead sea turtle in the DEIS, the Service recommends that recently published rules for loggerhead sea turtles and their proposed critical habitat be incorporated throughout the DEIS. The loggerhead sea turtle was federally listed as threatened on July 28, 1978 (43 Federal Register 32800) and nine Loggerhead Sea Turtle Distinct Population Segments (DPSs) were identified September 22, 2011, with four DPSs listed as threatened and five DPSs listed as endangered (76 Federal Register 58868). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans; however, for actions in the Gulf of Mexico, refer to the Northwest Atlantic Ocean DPS which is listed as threatened (76 Federal Register 58868). Terrestrial critical habitat for the Northwest Atlantic Ocean DPS of the loggerhead sea turtle was proposed on March 25, 2013 (78 Federal Register 18000). While consultation is required when the action may affect critical habitat, a conference determination is required only when the action is likely to destroy or adversely modify proposed critical habitat. It is recommended that the DEIS consider project effects on terrestrial critical habitat and incorporate minimization measures where appropriate.

USFWS - 31

The Service's Loggerhead Sea Turtle 2008 Recovery Plan reports the following potential effects of oil and gas activities on loggerheads. These potential effects and the need for studies should be acknowledged and incorporated into the DEIS.

USFWS - 31

1. Loggerheads may bioaccumulate heavy metals found in drill muds resulting in debilitation or death. Oil exploration and development on live bottom areas may disrupt foraging grounds by smothering benthic organisms with sediments and drilling muds (Coston-Clements and Hoss 1983).
2. The explosive removal of offshore oil and gas platforms is known to have impacts on loggerheads ranging from capillary damage, disorientation, loss of motor control, and mortality (National Research Council 1996; Viada *et al.* 2008; Klima et al. 1988). Investigate additional techniques, beyond surface-level observers, for determining sea turtle impacts, including physical and behavioral responses, from activities using explosives.
3. The impacts of offshore lighted oil production platforms on loggerheads are not well-documented. Lighted platforms may attract hatchlings, making them more susceptible to predation (de Silva 1982). Neritic juveniles and adults may be attracted by high prey concentrations around the structures, making them more susceptible to ingestion of petroleum products. The Service recommends that BOEM consider adoption of wildlife-friendly lighting on offshore platforms.

General Comments on Appendix B

The Service respectfully requests clarification and a basis of rationale for the following:

US FWS - 32
- Whether or not the spill volume scenarios in Appendix B include/consider representative potential catastrophic volumes generated from historical data (i.e., Ixtoc I and Deepwater Horizon).

US FWS - 33
- Whether or not BOEM and/or the Bureau of Safety and Environmental Enforcement (BSEE) have available data that would further elucidate catastrophic oil spill scenarios.

US FWS - 34
- The rationale upon which the catastrophic oil spill scenario volumes used in this and other NEPA documents was based.

US FWS - 35
- Whether or not the catastrophic oil spill scenarios (volume and duration) developed by BOEM compare to worst-case discharge scenarios provided by individual companies as part of the permitting process.

US FWS - 36
- How realistic (or representative of the available data) are these catastrophic oil spill scenarios?

US FWS - 37

The Service recommends that BOEM use the best available information including data provided by individual companies as part of their permitting process to generate reasonable and realistic catastrophic oil spill scenarios.

Specific Comments on Appendix B

p. B-5, 1st sentence, last paragraph – "…an uncontrolled flow rate of 30,000 bbl per day is assumed for a catastrophic blowout in shallow water." The Service requests that BOEM provide clarification of the following points related to that sentence:

US FWS - 38
- How does this flow rate estimate compare to "worst case discharge" estimates for shallow water submitted by the companies?

US FWS - 39
- Within the potential distribution curve of flow rates in shallow water reservoirs in the Gulf of Mexico, where is this flow rate relative to the overall flow rate distribution?

USFWS-40
- Does BOEM or Bureau of Safety and Environmental Enforcement (BSEE) have any data or analyses, other than that provided, that would further elucidate the potential flow rate distributions available?

p. B-6, 1st sentence, first paragraph – "…an uncontrolled flow rate of 30,000-60,000 bbl per day is assumed for a catastrophic blowout in deep water." The Service requests that BOEM provide clarification of the following points related to that sentence:

- USFWS-41 Why was the published flow rate of 50,000-70,000 from the DWH oil spill as provided in McNutt et al. (2012) not used?
- USFWS-42 Comparison of this flow rate estimate to "worst case discharge" estimates for deepwater submitted by the companies.
- USFWS-43 Does BOEM or BSEE have any data or analyses, other than that provided, that would further elucidate the potential flow rate distributions available?

10

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USFWS-1a BOEM and BSEE reinitiated consultation in 2010 following the *Deepwater Horizon* explosion and spill. Since that time, the consultation's scope has been expanded and now envisions a programmatic approach that will evaluate all ongoing and future oil and gas leasing activities related to all Gulf of Mexico leases awarded through 2022. The consultation will also consider the effects of G&G survey activities, which may be permitted by the action agencies, regardless of whether they occur pre- or postlease. BOEM and BSEE are working with FWS to develop a Biological Assessment for this expanded consultation. BOEM and BSEE will provide FWS with all of the required information necessary to finalize and close out the consultation, which is expected to result in a single Biological Opinion that will supersede all previous consultations with FWS.

USFWS-1b Comment noted. BOEM looks forward to working with FWS, including working on the ongoing ESA consultation.

USFWS-2 The text has been revised in **Chapter 4.1.1.16.3**.

BOEM has reorganized several figures related to birds to clarify information and reduce redundancies among figures. The replacement figures are referenced in **Chapter 4.1.1.16** and are included in the chapter entitled "Figures." These figures are also referenced in **Chapter B.3.1.16 of Appendix B**.

USFWS-3 BOEM's subject-matter experts reviewed the referenced document. BOEM's subject-matter experts must make determinations based on their expertise and experience as to the information that is relevant to potential impacts from an EPA proposed action and that is useful to the decisionmaker. At this time, BOEM's subject-matter experts determined that changes to the EIS were not warranted, but they will consider relevant FWS and NOAA reports and information in future NEPA analyses.

USFWS-4 The number 40,000 is based on Erickson et al. (2001) who used a rate of 2.19 bird fatalities per turbine per year. That number was later cited in Manville (2005). It appears this number was incorrectly cited as 440,000 in Manville (2009). As per a FWS letter dated July 24, 2012, FWS stated 440,000 is not an official number supported by FWS and was merely used for a budgetary exercise. Therefore, BOEM believes the table in this Final EIS remains accurate based on available and reliable scientific data.

USFWS-5 Page xi, "Water Quality (Offshore Waters)" is merely a brief summary of another chapter of this document. For greater detail, please refer to the offshore waters section in **Chapter 4.1.1.2.2.3**, "Impacts of Accidental Events" and the included references.

In terms of pipelines, BOEM has historically calculated oil-spill rates by considering the number of spills per volume of oil handled (e.g., Anderson et al., 2012) in contrast to other exposure variables, such as pipeline age. While there has been no direct study between pipeline age and increased spill rates, Eschenbach et al. (2010) shows a strong correlation between pipeline mile years and spill rates, which indirectly suggests some relationship with pipeline age. Regarding the relationship between loss of well control and water depth, BOEM's analyses of loss of well control in the Five-Year Program EIS (*Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Programmatic Environmental Impact Statement* [USDOI, BOEM, 2012b]) resulted in the following conclusion: "While it has been suggested that there is greater incidence of kick (a precursor to LWC) in deepwater (defined here as >200 m), the frequency for LWC in deepwater is less than shallow water." (Refer to page 4-80 of the Five-Year Program EIS for more details.)

USFWS-6 The text has been revised in **Chapter 2.3.1.2**, "Coastal and Marine Birds"_and in **Chapter 4.1.1.16.2**, "Impacts of Routine Events, Summary and Conclusion."

USFWS-7 In **Table G-2 (Appendix G)**, BOEM shows the total CO_2 emissions for an estimated 40-year period of activity in the EPA proposed action area. The total includes drilling, support vessels, helicopters, platform installation and removal, pipeline installation, production platforms, tankers loading and unloading, and tankers in transit. Please refer to "Greenhouse Gas Reporting" in **Chapter 4.1.1.1.1**.

USFWS-8 The text has been revised in **Chapters 4.1.1.12.1, 4.1.1.13.1, 4.1.1.15.1, and 4.1.1.16.1**.

USFWS-9 The text has been revised in **Chapter 4.1.1.15.2**.

USFWS-10 The text has been revised in **Chapter 4.1.1.16**.

USFWS-11 The text has been revised in **Chapter 4.1.1.16**.

USFWS-12 BOEM's subject-matter experts determined that specific reference to individual avian species listed in the CWCS (Comprehensive Wildlife Conservation Strategy) and State Wildlife Action Plans (SWAPs) would not be useful to the decisionmaker and public. These species are already included in the categories of avian species (e.g., passerine or diving birds), and impacts to these categories have been comprehensively covered in this Final EIS. Little additional useful information on the State-listed avian species, not already discussed in the avian categories identified in this EIS, would be available or useful to the decisionmaker. As such, BOEM's subject-matter experts believe the analysis for avian species remains comprehensive and accurately depicts species and potential impacts.

USFWS-13 BOEM's subject-matter experts have considered USFWS's suggestion to include assumptions for the relocation of various mobile species in cases of disturbance, spills, or other offshore impacts. Although not separately evaluated in this EIS, BOEM's subject-matter experts have implicitly considered as factors the items identified by FWS that BOEM deems relevant with regard to significant impacts (e.g., population level).

As noted in this EIS, a thorough understanding of the ability to utilize alternate habitats varies with species, space, and time. Therefore, BOEM makes no inferences regarding the ability of individual birds or groups to respond to impacts within one habitat and successfully emigrate and colonize novel, undisturbed habitat. The possibilities of emigration were acknowledged as incomplete in this document, as required by NEPA, by the following statement:

> Without a thorough understanding of species' habitat use and preferences, a species' ability to locate and colonize alternative habitat, and the population structure, it is difficult to make inferences regarding the ability of individual birds or groups to successfully emigrate and colonize novel, undisturbed habitat (assuming it is available). Nevertheless, although inferences on individuals' ability to successfully migrate to alternative habitats are difficult, absent a catastrophic event, which is not reasonably expected and not part of the proposed action, population level impacts are not expected.

USFWS-14 The text has been revised in **Chapter 4.1.1.16**.

USFWS-15 The text has been revised in **Chapter 4.1.1.16.1** in the section titled "Wood Stork."

USFWS-16 The text has been revised in **Chapter 4.1.1.16.1** in the section titled “Red Knot.”

USFWS-17 Comment noted. For each NEPA analysis undertaken, BOEM’s subject-matter experts must make a case-by-case determination on information that is relevant and current, and what information is outdated and should be removed. BOEM will continue to consider FWS’s recommendation during each NEPA analysis and to use the best available information deemed relevant and useful to the decisionmaker and public.

USFWS-18 The text has been revised in **Chapter 4.1.1.16.2**.

USFWS-19 Refer to the response to comment USFWS-6. The text has been revised in **Chapters 2.3.1.2 and 4.1.1.16.2**.

USFWS-20 Comment noted. Mitigation measures are considered herein and will also be considered for postlease approvals and permits.

USFWS-21 Comment noted. Refer to the response to comment USFWS-17.

USFWS-22 Comment noted. Refer to the response to comment USFWS-3.

USFWS-23 Comment noted. Refer to the response to comment USFWS-24.

USFWS-24 Comment noted. BOEM is currently engaged in ESA consultation with FWS and NMFS, and potential mitigations to these measures are being considered therein. In addition, for the last several lease sales, BOEM has incorporated into issued leases the Protected Species Stipulation. This stipulation, if required by the ASLM, would require lessees to implement certain protected species mitigations including NTL 2012-JOINT-G01 (“Vessel Strike Avoidance and Injured/Dead Protected Species Reporting”) or any more current mitigations in place at the time of postlease activities, as applicable. BOEM and BSEE continue to implement all reasonable and prudent measures to minimize impacts to protected species including, but not limited to, mitigation measures identified in the above-referenced NTL for vessel strike avoidance.

USFWS-25 The text has been revised in **Chapter 4.1.1.12.1**.

USFWS-26 The text has been revised in **Chapter 4.1.1.12.1** in the section titled “Marine Mammal Resources in the Eastern Planning Area.”

USFWS-27 Refer to the response to comment USFWS-24.

USFWS-28 Refer to the response to comment USFWS-24.

USFWS-29 The text has been revised in **Chapter 4.1.1.13.1**.

USFWS-30 The text has been revised in **Chapter 4.1.1.13.1**.

USFWS-31 Comment noted. More detail is provided in the 2012-2017 WPA/CPA Multisale EIS and WPA 231/CPA 233 Supplemental EIS, which are hereby incorporated by reference.

USFWS-32 As stated in **Chapter B.1.2.2 of Appendix B**, “Impact-Producing Factors and Scenario”:

> A hypothetical, yet feasible, scenario (**Chapter B.2**) was developed to provide a framework for identifying the impacts of an extended oil spill from an uncontrolled blowout. Unless noted, this scenario is based on the large magnitude, blowout-related oil spills that have occurred in the

> Gulf of Mexico, i.e., *Ixtoc I* and *Macondo* well blowouts and spills (discussed in **Chapter B.1.1**). As noted above, because each spill event is unique, its outcome depends on many factors. Therefore, the specific impacts from future spills cannot be predicted based on this scenario.

The term "based on," used in the excerpt above, refers to all components of the two aforementioned spills, including the spill volume scenarios.

Also stated in **Chapter B.2 of Appendix B**,

> For the purposes of this analysis, an event similar to the *Ixtoc I* well blowout and spill that occurred in 1979 in 160-ft (50-m) water depth will be used as the basis for a shallow water spill and an event similar to the Macondo well blowout and spill that occurred in 2010 in the Mississippi Canyon area in 5,000-ft (1,524-m) water depth will be used to represent a deepwater spill.

This is demonstrated in the shallow-water and deepwater spill volume ranges identified in **Chapter B.2.2.3 of Appendix B**.

USFWS-33 BOEM has used and will continue to use the best scientifically credible information and data currently available to determine the catastrophic oil-spill scenarios. The current catastrophic oil-spill scenarios demonstrate a reasonable range of potential impacts and provide a solid foundation for thorough impact analyses of BOEM's analyzed resources. Nevertheless, a catastrophic oil spill is not reasonably expected and is not part of an EPA proposed action.

USFWS-34 As stated in **Chapter B.1.1 of Appendix B** (last two paragraphs):

> Prior to the *Deepwater Horizon* explosion, oil spill, and response, the two largest spills resulting from a loss of well control in U.S. waters of the Gulf of Mexico occurred in 1970 and released 30,000 and 53,000 bbl of oil, respectively (USDOI, BSEE, 2012). These incidents resulted in four human fatalities. Although these incidents occurred only 8-14 miles (mi) (13-26 kilometers [km]) from shore, there was minor shoreline contact with oil (USDOC, NOAA, Office of Response and Restoration, 2010a and 2010b). In 1987, a blowout of the Mexican exploratory oil well, YUM II, resulted in a spill of 58,640 bbl and 75 mi (121 km) of impacted shoreline (USDOC, NOAA, Hazardous Materials Response and Assessment Division, 1992). However, none of these spills met the previously described definitions of a catastrophic event or spill.
>
> A blowout is a more severe loss of well control incident that creates a greater risk of a large oil spill and serious human injury. Two blowouts that resulted in catastrophic spills have occurred in U.S. and Mexican waters of the Gulf of Mexico. On June 3, 1979, the *Ixtoc I* well blowout in shallow water (water depth of 164 feet [ft] [50 meters [m] and 50 mi [80 km] offshore in the Bay of Campeche, Mexico) spilled 3.5 million barrels (MMbbl) of oil in 10 months (USDOC, NOAA, Office of Response and Restoration, 2010c; USDOC, NOAA, Hazardous Materials Response and Assessment Division, 1992; ERCO, 1982). On April 20, 2010, the Macondo well blowout (*Deepwater Horizon* explosion, oil spill, and response) in deep water (4,992 ft; 1,522 m) 48 mi (77 km) offshore in Mississippi Canyon Block 252, released an estimated 4.9 MMbbl of oil until it was capped approximately 3 months later. Due

to being classified as catastrophic, the *Ixtoc I* and *Macondo* well blowouts and spills were utilized to develop the catastrophic spill event scenario in this analysis.

USFWS-35 A worst-case discharge flow rate is not a NEPA criteria. The worst-case discharge flow rates are 24-hr flow rates based on site-specific information and are mandated by the Oil Pollution Act of 1990. The BSEE requires that worst-case discharge information be provided by lessees pursuant to 30 CFR part 254, and the information is used as part of the planning tools for developing a response program to a potential oil spill.

In contrast, NEPA and the CEQ implementing regulations have expressly deleted a requirement for worst-case analysis. Refer to 51 FR 15625 (April 25, 1986) (CEQ deleted requirement for worst-case analysis). Consistent then with current NEPA implementing regulations, BOEM identifies and evaluates reasonably foreseeable impacts in this EIS. To this end, BOEM has considered the potential impacts from a low-probability catastrophic event, even though it is not reasonably expected and is not part of an EPA proposed action, that are supported by credible scientific evidence, are not based on pure conjecture, and are within the rule of reason. BOEM's catastrophic spill effects analysis integrates two approaches, relying on a generalized oil-spill scenario, with regards to location and site-specific geologic characteristics, while identifying site-specific and even time-specific severity factors for individual environmental resources. This allows for an analysis of the full range of reasonably foreseeable impacts. Because the worst-case discharge analysis is designed to identify the greatest 24-hr discharge rate potential of an uncontrolled flow of natural gas and oil into an unobstructed open wellbore, it is not well suited for use in the catastrophic spill scenario. As stated in **Chapter B.1.2 of Appendix B** ("Methodology"), the types of events and spills that would be expected to rise to the level of catastrophic impacts would tend to be larger long duration spills. The 24-hr worst-case discharge rate may be reasonable in the short term (i.e., a few days) but it would not be expected to be seen over the duration of a larger, longer spill. For example, neither the *Ixtoc I* nor *Macondo* wells flowed at an estimated "worst case flow rate" for those well site specifics over the duration of their respective spills. Accordingly, BOEM's analysis combines the two approaches described above but uses a range of flow rates that would be more reasonably expected over the duration of a catastrophic event (refer to **Chapter B.1.2 of Appendix B**). This approach allows for the scientific investigation of a range of possible, although not necessarily probable, consequences of a catastrophic blowout and oil spill in the Gulf of Mexico.

USFWS-36 Refer to the responses to comments USFWS-34 and USFWS-35.

USFWS-37 Refer to the responses to comments USFWS-33 and USFWS-35. Although a catastrophic event is not reasonably expected and is not part of an EPA proposed action, potential impacts from such an event are considered in this EIS. BOEM continues to use the best available scientifically credible information and complies with the requirements of NEPA regarding reasonably foreseeable impacts to be considered.

USFWS-38 Refer to the response to comment USFWS-35.

USFWS-39 Refer to the response to comment USFWS-35. Based on the comment, BOEM is not clear on what "flow rates" FWS is referring to, as there are various types of flow rates (e.g., production, worst-case discharge, and documented spill flow rates). However, to reiterate, site-specific characteristics determine the actual flow rate and duration of a large uncontrolled spill, and while the site-specific characteristics of another spill resulting from a loss of well control would likely vary from *Ixtoc I* and *Macondo*, the estimated catastrophic spill scenario with regards to the cumulative release of oil into the environment would likely not be surpassed. As noted in this EIS, over the duration of their respective spills, neither the *Ixtoc I* nor *Macondo* wells had actual flow rates near their estimated worst-case discharge rates. Therefore, BOEM felt it more useful to the decisionmaker to use a range of flow rates more reasonably expected over the duration of a low-probability large volume, longer range spill of the type to result in catastrophic impacts, even if such a spill itself is not likely to occur.

USFWS-40 Refer to the responses to comments USFWS-33 and USFWS-37.

USFWS-41 BOEM used the volume and spill rates from official estimates published in January 2011 by the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling in *The Amount and Fate of Oil* (Oil Spill Commission, 2011d). McNutt et al. (2011) stated the approximately 50,000-70,000 per day flow rate may not have been sustained over time and estimated a cumulative release comparable to the approximately 5-MMbbl release estimated by the Oil Spill Commission. As such, BOEM continues to use the Oil Spill Commission's official estimates.

USFWS-42 Refer to the response to comment USFWS-35.

USFWS-43 Refer to the responses to comments USFWS-33 and USFWS-37.

April 12, 2013

Mr. Gary D. Goeke
Chief, Regional Assessment Section
Office of Environment (GM 623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Via E-mail to boemegomeis@BOEM.gov

Dear Mr. Goeke:

The American Petroleum Institute (API) offers the following comments on the U.S. Department of Interior Bureau of Ocean Energy Management's (BOEM's) Draft Environmental Impact Statement (DEIS) for two Eastern Planning Area (EPA) Gulf of Mexico (GOM) lease sales scheduled for 2014 & 2016 (also referred to as the 'EPA Lease Sales 225 and 226 DEIS').

The API is a national trade association that represents over 500 members involved in all aspects of the oil and natural gas industry, including exploring for and developing oil and natural gas resources in the GOM– a vital part of our nation's economy and our members remain committed to safely exploring the GOM for additional oil and natural gas resources to improve our nation's energy security.

This EPA Lease Sales 225 and 226 DEIS uses information contained in three previous environmental impact statements. This DEIS tiers from the *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017, Final Programmatic Environmental Impact Statement (Five-Year Program EIS)* (USDOI, BOEM, 2012b) and, due to the close proximity of the proposed EPA lease sale area to the Central Planning Area, incorporates by reference all of the relevant material published in the EISs that were prepared for the nearby or adjacent Western and Central Planning Areas (WPA and CPA): *Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247, Final Environmental Impact Statement (2012-2017 WPA/CPA Multisale EIS) (USDOI, BOEM, 2012c) and Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014; Western Planning Area Lease Sale 233; Central Planning Area Lease Sale 231, Draft Supplemental Environmental Impact Statement (2013-2014 WPA/CPA Supplemental EIS)* (USDOI, BOEM, 2012d). This DEIS also updates the analysis in the *Gulf of Mexico OCS Oil and Gas Lease Sale 224: Eastern Planning Area, Final Supplemental Environmental Impact Statement (OCS EIS/EA MMS 2007-060)*.

BOEM's EPA Lease Sales 225 and 226 DEIS addresses two proposed Federal actions that offer for lease areas on the GOM OCS that may contain substantial reserves of economically recoverable oil and gas resources. The GOM constitutes one of the world's major oil and gas producing areas, and has proved a steady and reliable source of U.S. crude oil and natural gas for more than 50 years. Under the proposed *Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017* (5-Year Program), five annual areawide lease sales are scheduled for the Western Planning Area (WPA) and five annual areawide lease sales are scheduled for the Central Planning Area (CPA). Only two lease sales are proposed in the EPA, which are Lease Sales 225 and 226 in 2014 and 2016, respectively.

The EPA is a critically important hydrocarbon energy producing area where existing infrastructure and expertise can be used to increase our nation's oil and natural gas resources. Predictable lease sales in this Planning Area are needed to help ensure continued offshore exploration and production in the future since leases sold today will take many years to fully develop. Predictability and certainty in the leasing program helps companies make the long-term decisions required for offshore development and avoids the potential of having years wasted in bringing production to the market.

BOEM's NEPA Analysis

API supports the analysis made by BOEM in the Gulf of Mexico OCS Oil and Gas Lease Sales: 2014 and 2016 Draft Environmental Impact Statement (OCS EIS/EA BOEM 2013-0116). API believes that the detailed analysis provided in the DEIS, along with the other supporting environmental documents and additional assessments being conducted by BOEM, provide a thorough analysis upon which to make decisions related to the two proposed lease sales, new or revised exploration and development plans in the Eastern Planning Area, and future permit applications, without delay. API also supports the use of the Final Environmental Impact Statement for the Western and Central Planning Area lease sales (USDOI, BOEM, 2012c). This document is particularly relevant because it addressed many of the same biological issues as the present DEIS and resulted in a Record of Decision (ROD) in favor of proceeding with lease sales in these areas adjacent to the EPA. API notes that the DEIS contains (by reference) updated information and analyses regarding the 2010 Macondo incident. This new information supports the NEPA process by describing the current environmental baseline conditions in the EPA including the results of numerous new scientific studies. We encourage BOEM to continue reviewing and evaluating the sound, peer-reviewed science in this area and to avoid the use of unsubstantiated or anecdotal information.

API is pleased to see that in the past few years BOEM has addressed many of the issues and concerns noted in our previous comments on GOM OCS NEPA documents, including:

- Draft Programmatic Environmental Impact Statement for the proposed 2012–2017 5-Year Outer Continental Shelf (OCS) Oil and Gas Leasing Program;
- Draft Environmental Impact Statement (DEIS) for five Western Planning Area (WPA) and five Central Planning Area (CPA) Gulf of Mexico (GOM) lease sales scheduled for 2012–2017 (also referred to as the Multisale EIS).
- Draft Supplemental Environmental Impact Statement for the Gulf of Mexico (GOM) Outer Continental Shelf (OCS) Oil and Gas Lease Sales: 2013-2014 for the Western Planning Area (WPA) Lease Sale 233 and the Central Planning Area (CPA) Lease Sale 231;

- Draft Supplemental Environmental Impact Statement (SEIS) for Gulf of Mexico (GOM) Western Planning Area (WPA) Lease Sale 218 in the 2007–2012 Five-year OCS Leasing Program; and
- Draft Supplemental Environmental Impact Statement (SEIS) for Gulf of Mexico (GOM) Central Planning Area (CPA) Lease Sale 216/222 in the 2007–2012 Five-year OCS Leasing Program.

As a result of BOEM's responsiveness to past comments, API's current review of the EPA Lease Sales 225 and 226 DEIS resulted in limited additional comments. API commends BOEM on its thorough assessment of baseline information and analysis of impacts within the NEPA document.

API also acknowledges that BOEM has conducted a detailed Catastrophic Spill Event Analysis at Appendix B of the DEIS to consider the environmental impacts associated with a low probability, high-volume oil spill resulting from loss of well control on the Gulf of Mexico OCS. API believes that this analysis fully meets the agency's obligations under NEPA to provide decision makers with a robust analysis of reasonably foreseeable impacts associated with a low probability oil spill on the OCS. There are also a variety of other factors that contribute to the finding of minimal potential biological impacts. These include distance from sensitive areas, use of advanced technology (e.g., horizontal/directional drilling techniques), more accurate mapping of sensitive bottom habitats, as well as more stringent permitting and mitigation measures applied throughout the oil and gas exploration, development, production and decommissioning cycle.

Tiering Under the National Environmental Policy Act (NEPA)

Since each lease sale proposal and projected activities are very similar each year for each sale area, BOEM is preparing a single EIS for the two EPA lease sales. API supports BOEM's approach of evaluating multiple similar federal actions (i.e. considering multiple lease sales) in a single EIS as provided in the Council on Environmental Quality's (CEQ's) regulations (see 40 CFR 1502.4). API is aware that at the completion of this EIS process, agency decisions will be made only for proposed Lease Sale 225 in the EPA. We understand that an additional NEPA review will be conducted for proposed EPA Lease Sale 226 to address any newly available significant information relevant to that proposed action. API believes that this approach will allow the NEPA reviews of the subsequent lease sales to proceed efficiently by focusing on any new issues or information and avoiding the repetitive issuance of cumbersome draft and final EISs for each sale area. In short, API fully supports BOEM's continued practice of tiering EISs and Environmental Assessments (EISs/EAs) under NEPA.

Alternatives Considered in the SEIS

The EPA Lease Sales 225 and 226 DEIS considers two alternatives for proposed EPA lease sales 225 and 226. API supports Alternative A (the *Proposed Action*) for the proposed EPA lease sales as described below:

- *Alternative A (Preferred Alternative)—The Proposed Action*: This alternative would offer for lease all unleased blocks within the EPA lease sale areas for oil and gas operations.
- *Alternative B—No Action*: This alternative is the cancellation of proposed EPA lease sales.

API-1

API is opposed to *Alternative B* for the EPA lease sales. The analysis in the DEIS does not support the adoption of such a restrictive alternative. Further, BOEM did not analyze the environmental impacts of the substitution of other energy alternatives if *Alternative B* is selected. Since economic demand by consumers is not likely to diminish if these lease sales are not held, other supply alternatives would necessarily become the substitute. Each of these has environmental impacts that could be greater than what was considered under *Alternative A*, such as the importation of foreign sources, which involves increased risk of oil spills, including refined products that are more toxic to the environment. API urges BOEM to adopt *Alternative A* for EPA Lease Sales 225 and 226.

Suggestions for Finalizing the EIS

While API believes that BOEM's EPA Lease Sales 225 and 226 DEIS is well written and supported by references to applicable scientific studies, as with any such endeavor, the document could be made even stronger. To this end, API submits Enclosure 1, *API Comments on the DEIS GOM EPA Lease Sales 2014 and 2016* and Enclosure 2, *Operational/Regulatory Comments on the DEIS for the 2014 & 2016 Gulf of Mexico OCS Lease Sales 225 & 226*. API offers Enclosures 1 and 2 for BOEM's consideration to enhance the final EIS for the two EPA lease sales proposed in the GOM during 2014 and 2016. We also encourage BOEM to urge NOAA to expedite the new Biological Opinion, an important consultative document for the final EIS. Ongoing discussions between BOEM and NMFS to establish procedures for new lease sales have the potential to result in additional precedent-setting regulations with significant and far-reaching cost implications in coming years.

In addition to the comments included in the enclosures, API offers the following additional suggestions for consideration by BOEM.

1. **The Challenge Presented by Having Figures and Tables in Separate Volume:**

API – 2

As in prior comments, API notes that all figures and tables for the DEIS are included in Volume II of the document. API understands the administrative and editorial challenges of integrating the figures and tables in the main document text (from which it is referenced), but notes that the separation results in a fragmentation of information that proves difficult for the reader. The dedicated reviewer of the GOM DEIS must review the document by reading the information contained in Volume I or II while also flipping (or clicking) to Volume II to review the referenced figure or table. While the information is available, it challenges the user to properly connect and make use of two large documents simultaneously.

2. **Discussion of "Incomplete and Unavailable" Information**

API – 3

On several occasions throughout the document, the DEIS discusses the instances in which the information available to BOEM is "incomplete or unavailable" within the meaning of 40 C.F.R.

API – 3

§ 1502.22. Although "numerous" instances are cited, BOEM has determined, after careful analysis, that the currently unavailable information is not essential to a reasoned choice among alternatives. This conclusion is an important one, since both CEQ regulations and case law spell out how an agency must proceed when confronted by information that is not currently available.

The oil and natural gas industry stands ready to invest in safe exploration and development of the GOM. The resources of the GOM remain a vital source of jobs, revenue, energy and economic growth. We believe that these resources can be safely developed, and we ask that BOEM finalize the EPA Lease Sales 225 and 226 DEIS as quickly as possible so that leasing can continue in accordance with Alternative A as proposed in the DEIS.

Sincerely,

Andy Radford
American Petroleum Institute
Sr. Policy Advisor

Comments on the DEIS for the 2014 & 2016 Gulf of Mexico OCS Lease Sales 225 & 226

	NO.	DEIS Section No.	PAGE NO.	COMMENT
API - 4	1	*ES*	*x*	**Scenarios Analyzed** –*The second paragraph provides reference to* **Chapter 4.1** *for information on cumulative analysis. This statement is somewhat misleading. Although subsequent sub-chapters in* **Chapter 4** *have sections that include discussions on cumulative impacts,* **Chapter 4.1** *independently, does not in itself provide information directed at cumulative analyses.*
API - 5	2	*ES*	*xiv*	***Commercial Fisheries*** – *In the first sentence dealing with commercial fisheries, the DEIS states that "fish and shellfish populations have remained healthy in the GOM in spite of OCS activities". First, it is not assured that all users of GOM resources will feel comfortable with BOEM's evaluation of the status of fisheries in the Gulf, and second, the phrase 'in spite of' lends a negative connotation such that BOEM is 'surprised' by this fact. It is felt that a more appropriate phrase would be 'commercial fisheries are compatible with OCS activities' or something similar.*
API - 6	3	*1.5*	*1-15*	*As stated in the text, regarding NTL 2009-G34, there seems to be differences noted in the notification requirements for airgun use (etc.) in GOM. In the second paragraph on this page, it notes that a 30-day advance notification (in writing) is required prior to G&G exploration activities. The next paragraph states very similar notification requirements, but indicates a 15-day advance notification in writing. What is the correct requirement, and can this be restated to be more easily understood? Seems much of this information is redundant and could be rewritten, at least after the advance notification issue is clarified.*
API - 7	4	*1.5*	*1-15*	*For the NTL 2009-G34 notification issue again, the information BOEM provides in the DEIS needs to accurately reflect what the NTL states. Text on Pg 1-15 indicates that "Operators should notify the Gulf of Mexico OCS Region." The actual language in the NTL does not state 'should', but more directly says what an Operator is required to do. Also, seems the redundancy in language used in this section (see Comment #2 above) is due to the fact that the NTL first requires notification such that: "**A G&G exploration** or *development G&G activity* involving the use of an airgun or airgun **array in water depths 200 meters (656 feet) or greater,** or in the Eastern Planning Area (EPA) of the GOM in any water depth."* *Discrepancies in the DEIS regarding NTLs and other specific directives can tend to reduce the public's reliance of the DEIS's evaluation of impacts – these situations should be fixed and avoided in the future.*
API - 8	5	*2.3.1.2*	*2-34*	**Species Considered due to U.S. Fish and Wildlife Service Concerns (Chapter 4.1.1.23)** – *It is unclear why in this DEIS, and in most BOEM NEPA documents, when discussing this issue BOEM fails to include the actual 'species' being discussed later in Chapter 4. The section talks about*

Comment Matrix
ENCLOSURE 1

PAGE 1 OF 2

Comments on the DEIS for the 2014 & 2016 Gulf of Mexico OCS Lease Sales 225 & 226

API – 8				*possible impacts and then provides a conclusion, without ever stating what is being discussed. This approach is very disconcerting to the reader who must at this point go to Chapter 4 and find out what species this text is actually referring to. The overall NEPA process is directed at clear and direct communication of the issues for public review – the approach used for this section fails to meet that standard.*
API – 9	6	*4.1.1.16.1*	*4-159*	*The second paragraph notes that of the 18 avian species,* **12** *occur in the CPA and are considered further... Review of Table 4-5 indicates that there are* ***11*** *avian species noted as occurring in the CPA. Please check to verify which number is correct and fix either the text at this section, or Table 4-5.*
API – 10	7	*4.1.1.17.1*	*4-178*	**Fish Resources –** *The discussion in this section focuses almost specifically on bottom dwelling species. As the two lease areas are in pelagic environments, we would suggest more information be provided on various pelagic fish groups (mackerels, tunas, sharks, etc.), since most exploration and production impacts (at least large spills) would likely affect these type species to a greater degree than demersals.*
API – 11	8	*4.1.1.1.1*	*4-11*	**Greenhouse Gas Reporting** – *please verify that* **Appendix G** *provides information on GHGs addressed by modeling efforts. From our review, none of these compounds are noted in the modeling information provided in* **Appendix G**.
API – 12	9	*4.1.1.13.3*	*4-138*	BOEM should consider listing bacterial ingestion of spilled crude oil in addition to the processes associated with evaporation and weathering.
API – 13	10	*Fig. 4-8*	*Figures-47*	*Figure shows* Proposed Sale Area *as all of WPA and CPA. Correct figure to show EPA addressed by this DEIS.*
API – 14	11	*Fig. 4-10*	*Figures-49*	*Figure needs to show* Proposed Sale Area *portion of EPA addressed by this DEIS.*

Comment Matrix
ENCLOSURE 1

PAGE 2 OF 2

Operational/Regulatory Comments on the DEIS for the 2014 & 2016 Gulf of Mexico OCS Lease Sales 225 & 226

	Section (Page)	DEIS Text	Comment
API - 15	3.1.1.2.2 (Page 3-9)	The scenario for a proposed action assumes that an average exploration well will require 30-45 days to drill. The actual time required for each well depends on a variety of factors, including the depth of the prospect's potential target zone, the complexity of the well design, and the directional offset of the wellbore needed to reach a particular zone. This scenario assumes that the average exploration or delineation well depth will be approximately 3,674 m (12,055 ft) below mudline.	Recent industry experience indicates that the number of days drilling estimate could be as much as 80 to 140, and the average depth in the range of 15,000' to 20,000' below mudline.
API - 16	3.1.1.2.2 (Page 3-9)	The cost of an ultra-deepwater well (>6,000 ft [1,829 m] water depth) can be $30-$50 million or more, without certainty that objectives can be reached. Some recent ultra-deepwater exploration wells in the GOM have been reported to cost upwards of $100 million.	Cost for wells could be $120 – $180 million, and have exceeded $200 million in cost.
API - 17	3.1.1.3.2.1 (Page 3-13)	Semisubmersibles can be operated in a wide range of water depths and disturb about 2-3 hectares (ha) (5-7 ac), depending on their mooring configurations. In water depths >600 m (1,969 ft), dynamically positioned drillships could be used; these drillships disturb only a very small area where the bottom template and wellbore are located, approximately 0.25 ha (0.62 ac). Since the advent of synthetic mooring lines, some drillships may be moored to the bottom. Drillships would affect an area of the bottom similar to that of the semisubmersibles, depending on their mooring array at their water depth.	The DEIS should clarify that currently a very small number of moored rigs are working in the GOM, most semisubmersibles and drillships are dynamically positioned (DP).
API - 18	3.1.1.3.3.1 (Page 3-14 & 3-15)	Most exploration drilling, platform, and pipeline emplacement operations on the OCS require anchors to hold the rig, topside structures, or support vessels in place.	Most rigs used in exploration drilling are DP.
API - 19	3.1.1.3.3.1 (Page 3-14 & 3-15)	**Semisubmersibles** Semisubmersible production structures (semisubmersibles) resemble their drilling rig counterparts and are the most common type of offshore drilling rig (NaturalGas.org, 2010). Semisubmersibles are partially submerged with pontoons that provide buoyancy. Their hull contains pontoons below the waterline and vertical columns that connect to the hull box/deck. The structures keep on station with conventional, catenary or semi-taut, line mooring systems connected to anchors in the seabed. Semisubmersibles can be operated in a wide range of water depths. Floating production systems are suited for deepwater production in depths up to 8,000 ft (26,437 m) (NaturalGas.org, 2010; USDOI, MMS, 2006a; Oynes, 2006).	Most rigs used in exploration drilling are DP.

ENCLOSURE 2

Operational/Regulatory Comments on the DEIS for the 2014 & 2016 Gulf of Mexico OCS Lease Sales 225 & 226

<table>
<tr><td>API – 20</td><td>3.1.1.4.1
(Page 3-18)</td><td>The OBF are used to improve drilling through difficult formations. The base mud for OBF is typically diesel or mineral oil. Mineral oil OBF are more advantageous than diesel because mineral oil is less toxic than diesel. Because these oils often contain toxic materials such as polycyclic aromatic hydrocarbons (PAH's), the discharge of OBF or cuttings wetted with OBF is prohibited. Oil-based drilling fluids are rarely used in deepwater drilling operations and only occasionally on the shelf. The use of OBF is likely to continue to decrease because of the advantages of SBF (Neff et al., 2000).</td><td>These muds are not in use and have been replaced by SBM systems. The DEIS should be changed to address this.</td></tr>
<tr><td>API – 21</td><td>3.2.2
(Page 3-68)</td><td>A BOP is a device with a complex of choke lines and hydraulic rams mounted atop a wellhead designed to close the wellbore with a sharp horizontal motion that may cut through or pinch shut casing and sever tool strings. Depending on how it is configured, a BOP could weigh 250 tons and cost from $25 to $35 million, and higher. The BOP's were invented in the early 1920's and have been instrumental in ending dangerous, costly, and environmentally damaging oil gushers on land and in water. The BOP's have been required for OCS oil and gas operations from the time offshore drilling began in the late 1940's.</td><td>BOPs on new generation drillships with seven ram stacks weigh approximately 375 tons and cost around $35 to $40 million.</td></tr>
<tr><td>API – 22</td><td></td><td>Surface BOP's typically differ from subsea BOP's by the reduced redundancy in the stack. This is in part due to the ease of maintenance and repair to the stack at the surface in comparison to the subsea BOP, which may have to be retrieved for these issues. As there are typically less components, the surface BOP stacks are lighter as a result. The differences in typical configuration between surface BOP's and subsea BOP's are shown below, from the top to the bottom of typical BOP stacks.
<table>
<tr><th>Subsea BOP</th><th>Surface BOP</th></tr>
<tr><td>Upper Annular Preventer</td><td>Annular Preventer</td></tr>
<tr><td>Lower annular Preventer</td><td>NE</td></tr>
<tr><td>Blind Shear Ram</td><td>NE</td></tr>
<tr><td>Upper Pipe Ram</td><td>Upper Pipe Ram</td></tr>
<tr><td>Choke Valves</td><td>Middle Pipe Ram</td></tr>
<tr><td>Middle Pipe Ram</td><td>Choke Valves</td></tr>
<tr><td>Lower Pipe Ram</td><td>Lower Pipe Ram</td></tr>
<tr><td>Subsea Isolation Device</td><td>NE</td></tr>
</table>
NE = no equivalent
Source: MCS Advanced Subsea Engineering (2010, Table 3.2)</td><td>Subsea Isolation Device are not typically used on MODUs (may be used on TLP operations), Blind Shear Rams are required on all surface stacks operating in OCS waters.</td></tr>
<tr><td rowspan="2">API – 23</td><td>3.2.2
(Page 3-70)</td><td>When a unit is deployed on a well site and installed, BOEM requires a pressure-up and hold time test for the ram components without actually actuating the rams in the field.</td><td>The rams are closed on pipe and pressure tested, the highlighted text is incorrect.</td></tr>
<tr><td></td><td>However, BSEE's new, post-Deepwater Horizon explosion, oil spill, and cleanup safety requirements that were put in place on August 22, 2012 (Federal Register,</td><td>The Final Rule issued 8-10-12 revised the highlighted statement found above and</td></tr>
</table>

Operational/Regulatory Comments on the DEIS for the 2014 & 2016 Gulf of Mexico OCS Lease Sales 225 & 226

API – 24

	2012), included several added regulations to improve the safety of well control systems (**Chapter 1.3.2**). These BSEE regulations include the following: (1) seafloor function testing of ROV intervention and deadman systems—30 CFR 250.516(d), 30 CFR 250.616(h), and 30 CFR 250.449(j) and (k); (2) third-party certification that the shear rams will shear drill pipe under maximum anticipated pressure—30 CFR 250.416(e); (3) registered professional engineer certification that the well design is appropriate for expected wellbore conditions—30 CFR 250.420(a); (4) use of dual mechanical barriers for the final casing string—30 CFR 250.420(b); (5) negative pressure testing of individual casing strings—30 CFR 250.423(c); and (6) retrieval and testing of a BOP after a shear ram has been activated in a well control situation—30 CFR 250.451(i).	therefore this statement in the DEIS should be corrected. See text below which was taken from the final rule: ***"Revises requirements from the IFR on the installation of dual mechanical barriers in addition to cement for the final casing string (or liner if it is the final string), to prevent flow in the event of a failure in the cement. The Final Rule provides that, for the final casing string (or liner if it is the final string), an operator must install one mechanical barrier in addition to cement, to prevent flow in the event of a failure in the cement. The final rule also clarifies that float valves are not mechanical barriers."***

3

ENCLOSURE 2

API-1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

API-2 Comment noted. Due to the challenges and complexities in incorporating such a large amount of technical data, charts, and figures into such a comprehensive EIS, BOEM determined that these technical data were better suited to an appendix and ultimately easier for the decisionmaker and public to refer to in a separate volume rather than to interrupt the flow of the qualitative analysis and narrative in the main body of this EIS.

API-3 Comment noted.

API-4 The text has been revised in the **Summary**.

API-5 The text has been revised in **Chapter 4.1.1.18.4**.

API-6 Comment noted, but the discussion in these paragraphs explains the notice requirements for specified activities.

Pursuant to regulations at 30 CFR § 550.208(a), lessees or operators must notify BOEM's Regional Supervisor in writing at least 30 calendar days before they conduct any ancillary geological and geophysical (G&G) exploration or development G&G activity. Furthermore, BOEM's Regional Supervisor may require them to provide a written notice at least 15 calendar days before you conduct any other ancillary activity (30 CFR § 550.208(b)). Pursuant to these regulations, the NTL provides guidance and clarification on the procedures for conducting ancillary activities in BOEM's Gulf of Mexico OCS Region.

API-7 The text has been revised in **Chapter 1.5** in the section titled "Geological and Geophysical Activities."

API-8 The text has been revised to add the species names in **Chapters 2 and 4**.

API-9 The text has been revised in **Chapter 4.1.1.16.1**.

API-10 The text has been revised in **Chapter 4.1.1.17.1**.

API-11 The text has been revised in **Chapter 4.1.1.17.1**.

Greenhouse gas emissions are estimated and included in **Table G-4** (**Appendix G**). Refer to the section "Greenhouse Gas Reporting" in **Chapter 4.1.1.1.1**.

API-12 The text has been revised, and a reference to **Chapter 3.2.1.4.4** was included to direct the reader to additional information on oil weathering, which includes biodegradation.

API-13 The figure was corrected to emphasize the proposed EPA lease sale area.

API-14 The figure was edited to show the proposed EPA lease sale area.

API-15 The text has been revised in **Chapter 3.1.1.2.2**. BOEM's data demonstrate a typical exploration well (i.e., those wells that represent approximately 50% of all exploration wells drilled in water depths >1,000 ft [305 m]) would have average total depths between 15,000 and 23,000 ft (4,572 and 7,010 m) and take approximately 30-120 days (mean of 60 days) to complete the well and reach those total depths. As noted in this EIS, the actual time and cost required for each well depends on a variety of factors, including the depth of the prospect's potential target zone, the complexity of the well design, and the directional offset of the wellbore needed to reach a particular zone.

API-16 The text has been revised in **Chapter 3.1.1.2.2**. BOEM's data suggest a typical exploration well (i.e., those wells that represent approximately 50% of all exploration wells drilled in water depths >1,000 ft [305 m]) cost could range anywhere from $40 million to $150 million, with some even approaching $200 million and more. As noted in this EIS, the actual time and cost required for each well depends on a variety of factors, including the depth of the prospect's potential target zone, the complexity of the well design, and the directional offset of the wellbore needed to reach a particular zone.

API-17 The text has been revised in **Chapter 3.1.1.3.2.1** to reflect that the majority of exploration activities utilize dynamic positioning.

API-18 The text has been revised in **Chapter 3.1.1.3.3.1** to reflect that the majority of exploration activities utilize dynamic positioning.

API-19 The text has been revised in **Chapter 3.1.1.3.3.2** in the section titled "Semisubmersibles" to reflect that the majority of exploration activities utilize dynamic positioning.

API-20 Since an operator may still choose to use OBF's, as their use is not prohibited, BOEM continues to acknowledge the possibility of their use in this EIS. The document does analyze both OBF and SBM, but it does note that the use of OBF's is a rarity.

API-21 The text has been revised from "250 tons" to "375 tons" and from "$25 to $35 million" to "$35 to $40 million" (The page number in this EIS is now page 3-70).

API-22 The text in this EIS, **Chapter 3.2.2** in the section titled "Blowout Preventers," has been corrected. The table was no long necessary because, upon updating the information, the technical differences in subsea and surface BOP's was less apparent.

API-23 The text in this EIS has been revised to clarify that the statement is describing the practice before the final rule went into effect before 2012. This sentence was retained because it is describing information that was used in the referenced study.

API-24 The text in this EIS has been updated and revised to reference the new rule in **Chapter 1.3.2**.

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April 14, 2013

Mr. Gary D. Goeke, Chief
Regional Assessment Section
Office of Environment (GM 632E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Blvd.
News Orleans, LA 70123

Dear Mr. Goeke:

The Manufacturers Association of Florida supports the creation of a business-friendly climate that will enable Florida's manufacturing industry to fully realize its potential to bring more high-wage jobs and revenue to our state.

Florida is a state driven by small business and more than 60 percent of our manufacturers are small businesses. As the cost of doing business continues to rise, the blossoming growth of Florida's manufacturing industry, including our small manufacturers, could be stifled. To continue on our path toward economic recovery, we must do all that we can to maintain a climate in which businesses can thrive.

One way to do that is to help lower the costs that discourage new businesses from developing and prevent existing businesses from growing and expanding. Energy costs – electric bills, fuel for vehicle fleets, the power needed to run manufacturing equipment and the costs of transporting goods and products – all have a huge impact on businesses.

We have an opportunity to help gets those costs under control by increasing our domestic energy supplies.

MAF – 1

With respect to the Draft EPA 225/226 EIS, we support Alternative A and ask that you approve the two proposed oil and gas lease sales in the Gulf of Mexico's Eastern Planning Area. If approved, these leases offer opportunities for more domestic oil and natural gas exploration – a process that must begin now if we are to increase potential supplies in the future.

MAF – 2

Additionally, as you look toward the next Five-Year Plan, I ask that you consider opening up additional areas for lease. Please help Florida's manufacturers stay in business and grow by increasing domestic supplies of fuel and getting energy costs under control.

Thank you for the opportunity to provide comment on the Draft EIS.

Sincerely,

Nancy Stephens
Nancy Stephens
Executive Director

MAF -1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

MAF-2 This comment is outside the scope of this decision and this EIS. Nevertheless, the issue is currently being tracked on BOEM's Mitigation/Program tracking table, which can be accessed at http://www.boem.gov/5-year/2012-2017/Tracking-Table/. This tracking table lists the alternatives, mitigations, temporal and spatial deferrals, and other areal concerns suggested so far through public involvement opportunities during the 2012-2017 Five-Year Program for the OCS, in particular in the Gulf of Mexico and offshore Alaska, that are included in the Leasing Program.

Comments by the Center for Regulatory Effectiveness ("CRE") on Bureau of Ocean Energy Management's ("BOEM") Draft Environmental Impact Statement ("DEIS"), for the Gulf of Mexico ("GOM"), Outer Continental Shelf ("OCS"), Eastern Planning Area ("EPA") Lease Sales 225 and 226, http://www.gpo.gov/fdsys/pkg/FR-2013-03-04/pdf/2013-04963.pdf. Comments filed electronically at www.regulations.gov, ID BOEM-2013-0009-0001, and at boemegomeis@BOEM.gov, on April 15, 2013

I. EXECUTIVE SUMMARY

CRE recommends that BOEM's preferred alternative be selected. CRE also believes that additional areas in the EPA should be part of the 2012-2017 Five-Year OCS Lease Sale Program.

The DEIS suggests that BOEM is considering expanding the current long-standing 500 meter exclusion zone for GOM seismic. There is no need to expand the exclusion zone or otherwise regulate GOM oil and gas seismic more stringently. BOEM has repeatedly and correctly pointed out that current regulation under JOINT NTL No. 2012-G02 ("NTL") is adequate. This NTL requires a 500 meter exclusion zone. The record does not support any expansion of the exclusion zone or any more stringent regulation of GOM seismic than is provided by the NTL.

Any expansion of the exclusion zone or any otherwise more stringent regulation of GOM seismic would require a new Notice to Lessees, a new Protected Species Stipulation, a new Information Collection Request ("ICR"), and Office of Management and Budget ("OMB") review and approval.

Any federal regulation of GOM seismic has to meet Information Quality Act ("IQA") standards.

BOEM should allow public comment on draft Biological Assessments and on draft Biological Opinions ("BiOps").

II. CRE SUPPORTS BOEM'S PREFERRED ALTERNATIVE

The DEIS states at page ix:

> "*Alternative A (Preferred Alternative)—The Proposed Action*: This alternative would offer for lease all unleased blocks within the proposed EPA lease sale area for oil and gas operations. The proposed EPA lease sale area covers approximately 657,905 acres and includes those blocks previously included in the EPA Lease Sale 224 Area and a triangular-shaped area south of this area bordered by the CPA boundary on the west and

the Military Mission Line (86°41′ W. longitude) on the east. The area is south of eastern Alabama and western Florida; the nearest point of land is 125 miles (201 kilometers) northwest in Louisiana. As of February 2013, approximately 465,200 acres of the proposed EPA lease sale area are currently unleased. The estimated amount of natural resources projected to be developed as a result of a proposed EPA lease sale is 0-0.071 billion barrels of oil (BBO) and 0-0.162 trillion cubic feet (Tcf) of gas."

CRE – 1

CRE recommends that BOEM select this alternative.

CRE – 2

CRE also recommends believes that additional areas in the EPA be made part of the 2012-2017 Five-Year OCS Lease Sale Program. Further development of offshore oil and natural gas should be a federal Government priority.

III. NO NEED AND NO BASIS FOR MORE STRINGENT SEISMIC REGULATION IN THE GOM

CRE – 3

For years, BOEM and the National Marine Fisheries Service ("NMFS") have used a 500 meter exclusion zone to regulate oil and gas seismic in the GOM.[1]

The DEIS suggests that BOEM is considering expanding the exclusion zone ("***the 180-dB radii***") for GOM seismic:

> "Recent work by Tolstoy et al. (2009) in the Gulf of Mexico suggests that, for deep water (~1,600 m; 5,249 ft), ***the 180-dB radii would occur at less than 1 km*** (0.6 mi) from the source; while in shallow waters (~50 m; 164 ft), ***the 180-dB radii would be considerably larger*** (e.g., ~1.1 km; 0.7 mi). The 180 dB re $_{1}$μPa-m level is an estimate of the threshold of sound energy that may cause hearing damage in cetaceans (U.S. Dept. of the Navy, 2001). Until further studies are completed, NMFS continues to use this estimated threshold."[2]

There is no need to expand the exclusion zone or otherwise regulate GOM oil and gas seismic more stringently. BOEM has repeatedly and correctly pointed out that current regulation under the NTL is adequate. For example the DEIS states:

> "NTL 2012-JOINT-G02, 'Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program,' minimizes the potential of harm from seismic operations to marine mammals. These mitigations include onboard observers, airgun shut-downs

---

[1] This regulation is implemented in part through JOINT NTL No. 2012-G02, Effective Date: January 1, 2012, Notice to Lessees and Operators ("NTL") of Federal Oil, Gas, and Sulphur Leases in the OCS, Gulf of Mexico OCS Region, Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program, page 1, available at http://www.bsee.gov/Regulations-and-Guidance/Notices-to-Lessees-and-Operators.aspx .

[2] DEIS, Page 3-25 (emphasis added). The DEIS is available online at http://boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/nepaprocess.aspx .

CRE – 3

> for whales in the exclusion zone, ramp-up procedures, and the use of a minimum sound source. Therefore, no significant cumulative impacts to marine mammals would be expected as a result of the proposed exploration activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other ongoing activities in the area. Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations."[3]

The DEIS correctly emphasizes the adequacy of the current regulatory scheme for GOM seismic. This regulatory scheme relies on the NTL and on the Protected Species Stipulation in leases, which requires compliance with the NTL:

> "The lessee and its operators, personnel, and subcontractors, while undertaking activities authorized under this lease, must implement and comply with the specific mitigation measures outlined in…NTL No. 2012-JOINT-G02 (Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program)…."[4]

The DEIS correctly points out that the Protective Species Stipulation, which requires compliance with the NTL's 500 meter exclusion zone, "provide[s] protection by ensuring the animals remain a safe distance from the operations or the activity ceases":

> "Effectiveness of the Lease Stipulation
> The Protected Species Stipulation has been used on leases since 2001, and the resource agencies with the primary responsibility for the protection of the species [e.g., NMFS and FWS] helped to create it. The stipulation minimizes certain activities and stops others when those actions have the potential to impact marine mammals or sea turtles. These avoidance criteria provide protection by ensuring the animals remain a safe distance from the operations or the activity ceases."[5]

The Government has repeatedly and consistently emphasized that the current and historical regulatory scheme, which relies on a 500 meter exclusion zone, adequately protects marine mammals during GOM oil and gas seismic. For example, BOEM recently stated in anther GOM environmental impact statement that

> "… NTL 2012-JOINT-G02, 'Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program,' minimizes the potential of harm from seismic operations to marine mammals. These mitigations include onboard observers, airgun shut-downs for whales in the exclusion zone, ramp-up procedures, and the use of a minimum sound source. Therefore, no significant cumulative impacts to marine mammals would be expected as a result of the proposed exploration activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other ongoing activities in the area. Within the [GOM] WPA, there is a long-standing

[3] DEIS. Page 2-22

[4] *E.g.*, Lease Stipulations, Consolidated Central Gulf of Mexico Planning Area, Oil and Gas Lease Sale 216/222, Final Notice of Sale, Stipulation No. 8 – Protected Species.

[5] DEIS, Page 2-35.

CRE – 3

and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations. Therefore, in light of the above analysis for a WPA proposed action and its impacts, the incremental effect of a WPA proposed action on marine mammal populations is not expected to be significant when compared with non-OCS energy-related activities."

***

"Although there will always be some level of incomplete information on the effects from routine activities under a [GOM] CPA proposed action on marine mammals, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects. Also, routine activities will be ongoing in the CPA proposed action area as a result of active leases and related activities. As of May 2012, there are 4,377 active leases in the CPA. Within the CPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that routine activities from the preexisting OCS Program are significantly impacting marine mammal populations."[6]

The National Academy of Sciences/National Research Council has agreed with the Department of Interior that "there are no documented or known population-level effects due to sound," and has concluded with regard to the entire OCS that "[T]here have been no known instances of injury, mortality, or population level effects on marine mammals from seismic exposure…."[7]

NMFS agrees that "to date, there is no evidence that serious injury, death, or stranding by marine mammals can occur from exposure to airgun pulses, even in the case of large airgun arrays."[8]

In sum, the record does not contain any reason or basis for changing the Government's regulation of GOM seismic.

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[6] Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247; Final Environmental Impact Statement; Volume I , page 4-215; Volume II , page 4-710; available online at http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/nepaprocess.aspx . BOEM reiterated these conclusions in its Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014, Western Planning Area Lease Sale 233, Central Planning Area Lease Sale 231 ; Final Supplemental Environmental Impact Statement; BOEM Gulf of Mexico OCS Region, pages 4-30 and 4-130, available online at http://www.boem.gov/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2013/BOEM%202013-0118.pdf .

[7] See, *e.g.*, Outer Continental Shelf Oil & Gas Leasing Program, 2007-2012 Programmatic Environmental Impact Statement, page V-64 (MMS April 2007), available online at http://www.boem.gov/Oil-and-Gas-Energy-Program/Leasing/Five-Year-Program/2007-2012-Draft-Environmental-Impact-Statement.aspx .

[8] 75 FR 49759, 49795 (Aug. 13, 2010), available online at http://edocket.access.gpo.gov/2010/2010-19962.htm

CRE – 3

In particular,

● the record does not include any evidence of harm from GOM seismic in compliance with current and long-standing regulation;

● the record does not discuss what if any benefits would result from more stringent regulation; and

● the record does not discuss the costs and other burdens to the industry from more stringent regulation.

CRE has prepared a Memorandum entitled "The State of Seismic Regulation in the Gulf of Mexico," which discusses in detail the Government's long-standing and successful reliance on the NTL and the 500 meter exclusion zone. This memorandum is incorporated by reference into these CRE comments on the DEIS. [9]

IV. MORE STRINGENT SEISMIC REGULATION IN THE GOM WOULD REQUIRE A NEW NTL, A NEW PROTECTED SPECIES STIPULATION, NEW ICR REVIEW, AND OMB APPROVAL

CRE – 4

BOEM would have to revise the NTLs and the Protected Species Stipulation before BOEM could change the exclusion zone or otherwise regulate oil and gas seismic in the GOM more stringently. We know of no such public-notice-and-comment proceeding that is currently ongoing or planned.

In addition, BOEM would need a new ICR that has been reviewed and approved by OMB under the Paperwork Reduction Act ("PRA"). OMB-approved ICRs are necessary for the agencies' regulation of offshore seismic because that regulation depends in large part on the monitoring and compliance reports sent by operators to federal agencies.

Before it split into BOEM and BSEE, BOEMRE responded to CRE's comments on BOEMRE's seismic regulation ICR 1010–0151. BOEMRE's response stated that BOEMRE would need and request a new ICR if it ever intends to regulate offshore seismic activities in a manner more burdensome than required at the time it responded to the comments. BOEMRE's response defines the burden and scope of seismic information collection authorized by ICR 1010–0151, which was approved by OMB after and based on BOEMRE's response to CRE.

BSEE subsequently asked OMB to approve a new seismic regulation ICR which, according to BSEE "does not change the burden hours or make any other modifications to what was previously approved [under ICR 1010–0151], other than to remove the collections under the

[9] This Memorandum is available online at http://www.thecre.com/forum13/wp-content/uploads/2013/03/State_of_Marine_Sound_Regulation1.pdf, and it is incorporated by reference herein.

CRE – 4

purview of BOEM" in order to accommodate the split of regulations from the Bureau of Ocean Energy Management, Regulation and Enforcement ("BOEMRE") to BOEM and BSEE." [10]

BSEE's ICR Supporting Statement to OMB for this new seismic ICR reads in part as follows:

> "Another commenter [CRE] requested that we [BSEE] should state that we are not submitting any ICRs for seismic regulations that are more stringent than current regulations, including NTL 2007-G02.
>
> We believe that this comment is not germane to current BSEE regulatory requirements because when BOEMRE split into the new bureaus of BOEM and BSEE, the regulatory requirements pertaining to seismic requirements are now under BOEM purview. Nonetheless, we agree with BOEM's response that the public will be given the opportunity to comment on modifications made to any information collections as a result of changes to NTL 2007-G02 and 30 CFR 250, subpart B regulations. BOEM's actual reply was:
>
> *Response: For the renewal of this ICR, we are not requesting anything more stringent than in current NTL 2007-G02 and 30 CFR 250, subpart B regulations, which are covered under OMB Control Number 1010-0151. We have no plans, at this time, to change the content of or the resultant burdens imposed by NTL 2007-G02. Therefore, BOEMRE should move forward with the required information collection to ensure compliance with OMB deadlines. If the lawsuit settlement or resulting decree requires changes to the NTL and/or DOI regulations, information collection coordination and OMB approval will occur before any NTL is reissued or regulations are promulgated.*[11]

OMB's approval of this BSEE ICR states:

> *Terms of Clearance: The public will be given the opportunity to comment on substantive modifications made to any information collections as a result of changes to NTL 2007-G02 and 30 CFR 250, subpart B regulations.*[12]

Consequently, any "substantive modifications" to the NTLs would have to be preceded by public notice and comment as well as OMB review and approval, and may not be approved by OMB.

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[10] 77 FR 58858 (Sept. 24, 2012), available online at http://www.gpo.gov/fdsys/pkg/FR-2012-09-24/html/2012-23386.htm .

[11] Click on Supporting Statement A at http://www.reginfo.gov/public/do/PRAViewDocument?ref_nbr=201202-1014-004 , and read BSEE's response to Question 8 in the Supporting Statement.

[12] Available online at http://www.reginfo.gov/public/do/PRAViewICR?ref_nbr=201202-1014-004 . There are no substantive differences between NTL 2007-G02 and its successor NTL 2012-JOINT-G02.

V. REGULATION OF GOM SEISMIC HAS TO MEET IQA STANDARDS

CRE – 5

The Information Quality Act ("IQA") requires that NMFS, BOEM, BSEE and most other U.S. federal agencies meet specified quality standards before they make scientific or other information publicly available. This statutory requirement means that the agencies must ensure that all scientific information they use or rely on meets the IQA standards. These quality standards are implemented first by Government-wide guidelines developed and published by OMB. The IQA requires that the other federal government agencies develop and publish their own, agency-specify quality guidelines. The agency-specific guidelines must be approved by OMB and must be consistent with OMB's Government-wide guidelines.[13]

OMB will review any ICR for more stringent GOM seismic regulation to determine whether the ICR complies with IQA Guidelines. For example, the U.S. Department of Commerce, which includes NMFS, has Department-wide procedures for developing and submitting ICRs. These procedures state in part:

> "**What is required for an information collection request**?
>
> Form OMB 83-I, Paperwork Reduction Act Submission, is used to request OMB clearance for an information collection from the public. The package, including the collection instrument, instructions, and all attachments, is prepared by the operating unit….The submission package must include:
>
> ***
>
> • A Supporting Statement that includes narrative information explaining the purpose, scope, and benefits(s) of the collection.
>
> • The Supporting Statement must include an explicit reference to the operating unit's information quality guidelines, as required by the Data Quality Act (addressed in question 2 of Supporting Statement)."[14]

OMB's guidance to the federal agencies clearly states that ICRs must meet IQA requirements in order to be approved:

> "In this light, we note that each agency is already required to demonstrate the practical utility of a proposed collection of information in its PRA submission, i.e., for draft information collections designed to gather information that the agency plans to disseminate. Thus, we think it important that each agency should declare in its [IQA] guidelines that it will demonstrate in its PRA clearance packages that each such draft information collection will result in information

[13] Supporting citations for this discussion, and a more detailed discussion, are available beginning at page 4 of the document at http://thecre.com/pdf/20051228.pdf . The IQA is often referred to as the Data Quality Act ("DQA"), and these two acronyms will be used interchangeably in these comments.
[14] Available online at http://ocio.os.doc.gov/ITPolicyandPrograms/Information_Collection/dev01_003742 .

CRE – 5

> that will be collected, maintained, and used in a way consistent with the OMB and agency information quality standards. It is important that we make use of the PRA clearance process to help improve the quality of information that agencies collect and disseminate. Thus, OMB will approve only those information collections that are likely to obtain data that will comply with the OMB and agency information quality guidelines."[15]

OMB further explains that "if an agency, as an institution, disseminates information prepared by an outside party in a manner that reasonably suggests that the agency agrees with the information, this appearance of having the information represent agency views makes agency dissemination of the information subject to these [IQA] guidelines."[16]

NMFS acknowledges that both the OMB Government-wide and NMFS' own IQA guidelines apply to outside or third-party information if NMFS uses or relies on that information.[17]

In sum, any change in the existing U.S. regulation of GOM seismic would be reviewed by OMB for their compliance with the IQA. So would the ICRs necessary for any such changes.

VI. BOEM SHOULD ALLOW PUBLIC COMMENT ON DRAFT BIOLOGICAL ASSESSMENTS AND ON DRAFT BiOps

CRE – 6

The DEIS says this about the ESA consultation process for this lease sale:

> "5.5. ENDANGERED SPECIES ACT
> The Endangered Species Act of 1973 (ESA) (16 U.S.C. 1631 et seq.), as amended (43 U.S.C. 1331et seq.), establishes a national policy designed to protect and conserve threatened and endangered species and the ecosystems upon which they depend. BOEM is currently undergoing an ESA consultation with NMFS and FWS to consider future lease sales over a 10-year period, including those in the 2012-2017 Five-Year Program (e.g., CPA Lease Sale 227). This consultation also considers any changes in baseline environmental conditions following the *Deepwater Horizon* explosion, oil spill, and cleanup. BOEM is finalizing the Biological Assessment (BA) for this consultation, which underwent significant changes resulting from extensive information requests following the NMFS's May 31 Draft Biological Assessment review. We expect to send the Final Biological Assessment to NMFS in Spring 2013 and a separate Final Biological Assessment to FWS shortly afterward. BOEM will then work with NMFS and FWS to (1) identify timelines for completing this ESA consultation and (2) establish procedures to ensure consideration of any on-the-water activities resulting from new lease sales that may be requested prior to completion of the new consultation (i.e., expanding the current

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[15] John D. Graham, *Memorandum for the President's Management Council*, p. 12, June 10, 2002, available at http://www.whitehouse.gov/sites/default/files/omb/assets/omb/inforeg/iqg_comments.pdf .
[16] Page 8454 of OMB's Federal Register notice available online at http://www.whitehouse.gov/sites/default/files/omb/assets/omb/fedreg/reproducible2.pdf.
[17] See, *e.g.*, NMFS' letter available online at http://thecre.com/pdf/NOAA-IWC_Letter.pdf .

CRE - 6

ESA interim process with NMFS to include actions resulting from the 2012-2017 Five-Year Program)."[18]

There should be an opportunity for public comment on any BOEM Biological Assessment and on any NMFS Biological Opinion ("BiOp"). NMFS usually does not allow public comment on its BiOps. Consequently, we ask BOEM to provide an opportunity for public comment on any draft BOEM Biological Assessments--and on any draft BiOps that BOEM receives from NMFS-- regarding regulation of GOM oil and gas. We note that the U.S. Environmental Protection Agency ("USEPA") has established a public comment process for its ESA pesticide consultations including draft NMFS BiOps.[19]

We thank you for the opportunity to submit these comments, and look forward to the Agency's response.

The Center for Regulatory Effectiveness

[18] DEIS, page 5-14.
[19] The USEPA posts draft BiOps and other ESA consultation documents for comment at http://www.epa.gov/espp /.

CRE-1 Comment noted.

CRE-2 Comment noted. This issue is currently being tracked on BOEM's Mitigation/Program tracking table, which can be accessed at http://www.boem.gov/5-year/2012-2017/Tracking-Table/. This tracking table lists the alternatives, mitigations, temporal and spatial deferrals, and other areal concerns suggested so far through public involvement opportunities during the 2012-2017 Five-Year Program for the OCS, in particular in the Gulf of Mexico and offshore Alaska, that are included in the Leasing Program.

CRE-3 Comment noted.

CRE-4 Comment noted. The status and suggestions for BSEE regulations and NTL's are outside of the scope of these proposed actions and EIS. There are existing processes for regulatory changes and the promulgation of NTL's that are currently in use. BOEM, however, notes that the Protected Species Stipulation, should it be applied to leases that may result from an EPA proposed action, would require compliance with the most current requirements for protecting species in place at the time of any request for permits or approvals.

CRE-5 Comment noted. Refer to the response to comment CRE-4.

CRE-6 Comment noted. The Biological Assessment has already been provided to NMFS. The preparation of a Biological Opinion or Opinions is under the auspices of other statutes and within the purview of NMFS and FWS. Although related to an EPA proposed action, they are undertaken under other statutory frameworks and are not part of the NEPA process and generally are outside of the scope of this EIS. These consultation processes remain ongoing. Although there will not be public comment on BOEM's Biological Assessments or Biological Opinions, many of NMFS's Biological Opinions can be found at the following website: http://www.nmfs.noaa.gov/pr/consultation/opinions.htm. Any decision on whether to make draft Biological Opinions available to the public will be made jointly between BOEM and NMFS and FWS.

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April 15, 2013

Gary D. Goeke
Chief, Regional Assessment Section
Office of Environment (GM 623E)
Bureau of Ocean Energy Management, Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

RE: Comments on the EPA 225/226 Draft Environmental Impact Statement (EIS)

Dear Mr. Goeke:

On behalf of Consumer Energy Alliance (CEA), I would like to echo our support for the Bureau of Ocean Energy Management's preferred alternative to lease all un-leased areas within these tracks for oil and natural gas development. CEA further concurs with the findings that Lease Sales 225 and 226 in the Eastern Planning Area will not pose significant environment impact if existing regulatory measures are responsibly followed, and we encourage the federal government to move forward expeditiously to expand oil and natural gas leasing in the Eastern Gulf of Mexico.

CEA - 1

CEA is a non-profit, non-partisan organization committed to working with elected leaders, affected stakeholders and consumers to help create sound energy policy and maintain stable energy prices. As part of a balanced energy policy, CEA advocates for expanded domestic production and use of all energy resources, including traditional hydrocarbon resources, nuclear energy, renewable sources, and energy efficiency and conservation, as a means to provide price stability for consumers. CEA has more than 210 affiliated companies and organizations, including energy suppliers and producers, manufacturers, farmers, small businesses and community organizations, as well as a nationwide network of almost 300,000 consumer-advocates.

Expanded leasing and the associated increased offshore oil and gas production bolsters U.S. energy security and generates significant economic opportunity. These lease sales will create thousands of American jobs, generate millions in federal, state, and local revenue, and spur growth in a multitude of businesses that service and supply offshore operations. According to a 2010 assessment by IHS Global Insight, the offshore Gulf of Mexico oil and gas industry generated almost $70 billion of economic value and nearly 400,000 jobs in 2009. That same year, the industry provided about $20 billion in revenues to federal, state, and local governments through royalties, bonuses, and rents. Further expansion of access, particularly in new offshore areas including the Eastern Planning Area that are currently off-limits, could boost these economic impacts dramatically. Wood Mackenzie estimates that oil and natural gas development in the Eastern Gulf of Mexico could create 100,000 new jobs in Florida alone.

Fortunately, industry and regulators have set forth a responsible path forward that minimizes the risk of offshore development. As the EIS reviews, several measures have been developed and implemented following the *Deepwater Horizon* spill in 2010 – measures which mean operators in the Eastern Planning Area can develop our nation's abundant resources in a safe, environmentally sound manner.

In closing, CEA urges the BOEM to finalize the EIS swiftly and execute these lease sales. Now is the time to open the Gulf and expand the North American energy revolution. Given the current state of our economy and the ongoing volatility of oil prices, the federal government must take prudent steps now to ensure a stronger economy and better energy security in the future.

Sincerely,

David Holt
President

CEA-1 Comment noted. In the event BOEM moves forward with a lease sale in the EPA, it will be announced in a Record of Decision and the Final Notice of Sale. The issue of expanded leasing is currently being tracked on BOEM's Mitigation/Program tracking table, which can be accessed at http://www.boem.gov/5-year/2012-2017/Tracking-Table/. This tracking table lists the alternatives, mitigations, temporal and spatial deferrals, and other areal concerns suggested so far through public involvement opportunities during the 2012-2017 Five-Year Program for the OCS, in particular in the Gulf of Mexico and offshore Alaska, that are included in the Leasing Program.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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April 15, 2013

Mr. Gary D. Goeke
Chief, Environmental Assessment Section
Leasing and Environment (MS 5410)
Bureau of Ocean Energy Management (BOEM)
1201 Elmwood Park Boulevard
New Orleans, LA 70133-2394

Subject: EPA NEPA Review Comments on BOEM's DEIS for "Gulf of Mexico Outer Continental Shelf (OCS) Oil and Gas Lease Sales: 2014-2016 Eastern Planning Area Lease Sales 225 and 226" CEQ #20130048

Dear Mr. Goeke:

The U.S. Environmental Protection Agency (EPA) has reviewed the subject Bureau of Ocean Energy Management (BOEM) Draft Supplemental Environmental Impact Statement (DSEIS) in accordance with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. It is our understanding that BOEM proposes lease sales in the Gulf of Mexico (GOM) Outer Continental Shelf (OCS) for lease blocks in the Eastern Planning Area. The proposed action covers lease sales of blocks 225 and 226 in the Eastern Planning Area.

The EPA has participated in several recent NEPA reviews for BOEM actions, including reviews of the Draft Programmatic Environmental Impact Statement (PEIS) for the proposed 2012-2017 Outer Continental Shelf Oil and Gas Leasing Program and other EISs for lease sales in the CPA and WPA of the GOM OCS Region.

Based on our analysis of the above referenced proposed action, EPA rates this DEIS as **"EC-2" i.e., EPA has "Environmental Concerns and Request Additional Information"** in the Final EIS (FEIS). The EPA's rating system criteria can be found online at: http://www.epa.gov/oecaerth/nepa/comments/ratings.html. Our primary concerns associated with the proposed actions are related to potential impacts to air, coastal ecosystems, wetlands, mitigation, and impacts to environmental justice populations. Detailed comments are enclosed with this letter which more clearly identifies our concerns and comments. We request that the FEIS include specific responses to our comments.

EPA appreciates the opportunity to review the DEIS. Should BOEM have questions regarding our comments, please feel free to contact Dan Holliman of my staff at 404/562-9531 or holliman.daniel@epa.gov.

Sincerely,

Heinz J. Mueller
Chief, NEPA Program Office
Office Environmental Accountability

Attachment: Detailed Comments

U.S. EPA DETAILED COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) FOR THE U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF OCEAN ENERGY MANAGEMENT (BOEM) GULF OF MEXICO OUTER CONTINENTAL SHELF (OCS) OIL AND GAS LEASE SALES: 2014-2016 EASTERN PLANNING AREA LEASE SALES 225 & 226

BACKGROUND:
The Draft Environmental Impact Statement (DEIS) was prepared by the U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM), Gulf of Mexico (GOM) Outer Continental Shelf (OCS) Region for lease areas in the Eastern Planning Area. A total of 2 lease sales are being proposed; blocks 225 and 226. EPA understands that the proposed lease sale for 225 is tentatively scheduled for 2014 and the proposed lease sale for 226 is tentatively scheduled for 2016. This EIS tiers from several previous BOEM EISs; the Five-Year Programmatic, the 2012-2017 WPA/CPA Multisale EIS, and other recent WPA/CPA EISs. EPA has provided review comments on all previous BOEM EISs in accordance with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act.

ALTERNATIVES PROPOSED:
Alternatives for Proposed Eastern Planning Area Lease Sales 225 and 226[1]
Alternative A—The Proposed Action: This is BOEM's preferred alternative. This alternative would offer for lease all unleased blocks within the proposed Eastern Planning Area lease sale area for oil and gas operations (**Figure 2-1**).

The proposed Eastern Planning Area lease sale area covers approximately 657,905 ac and includes those blocks previously included in the Eastern Planning Area Lease Sale 224 Area and a triangular-shaped area south of this area bordered by the CPA boundary on the west and the Military Mission Line (86°41′ W. longitude) on the east. The area is south of eastern Alabama and western Florida; the nearest point of land is 125 mi (201 km) northwest in Louisiana. As of February 2013, approximately 465,200 ac of the proposed Eastern Planning Area lease sale area are currently unleased. The estimated amount of natural resources projected to be developed as a result of a proposed Eastern Planning Area lease sale is 0 0.071 BBO and 0-0.162 Tcf of gas.

Alternative B—No Action: This alternative is the cancellation of a proposed Eastern Planning Area lease sale. If this alternative is chosen, the opportunity for development of the estimated 0-0.071 BBO and 0-0.162 Tcf of gas that could have resulted from a proposed Eastern Planning Area lease sale would be precluded or postponed. Any potential environmental impacts resulting from a proposed Eastern Planning Area lease sale would not occur or would be postponed to a future lease sale decision. This is also analyzed in the EIS for the Five-Year Program on a nationwide programmatic level.

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[1] Alternatives section cited directly from p. 2-4 in DEIS

EPA COMMENTS:

ALTERNATIVES
EPA understands that the BOEM NEPA analysis for lease sales 225 and 226 only analyzes two alternatives, Alternative A – the proposed action and Alternative B – the No Action alternative. Typically, BOEM includes additional alternatives in their NEPA documents, including an alternative that defers blocks based on the proximity or presence of biologically sensitive features or for other programmatic reasons. EPA understands that BOEM has determined that such alternatives are not reasonable for this proposed lease sale in the Eastern Planning Area because there are no known blocks to exclude due to proximity to or presence of biologically sensitive features and due to the fact that the proposed lease sale area is such a small area for leasing in relation to typical BOEM lease sales.[2] EPA finds BOEM's strategy on limiting the alternatives reasonable considering that scoping did not identify any additional reasonable alternatives. EPA assumes that a more detailed site specific analysis is forthcoming at the lease block level, as the lease sale process proceeds. EPA also assumes that this site specific analysis would identify the presence of biologically sensitive features, and if these areas are identified, appropriate mitigation measures would be implemented.

AIR
The EPA is responsible for ensuring compliance with the National Ambient Air Quality Standards (NAAQS) in the Gulf States of Texas, Louisiana, Mississippi, Alabama and Florida. In addition, EPA Region 4 is responsible for implementing and enforcing Clean Air Act (CAA) requirements for OCS sources offshore the state seaward boundaries of all areas of the Gulf of Mexico (GOM) east of 87'30" (*see* CAA section 328). Pursuant to the CAA and applicable federal regulations (see 40 CFR 55), OCS activities, such as exploratory drilling operations and production platforms are subject to the EPA requirements to obtain air quality preconstruction and operating permits.

Section 4.1.1.1 (including Appendix G – Air Quality)

USEPA - 1

- Section 4 and Appendix G identify and quantify, respectively, the pollutants released from this proposed action.

  Recommendation:
  EPA recommends that these sections also discuss potential impacts from hazardous air pollutants (HAPs) that may be released.

USEPA - 2

- Section 4.1.1.1 Air Quality indicates that BOEM examined the analysis of air quality presented in the Central Planning Area (CPA) chapters of the 2012-2017WPA/CPA Multi-sale EIS and the 2013-2014 WPA/CPA Supplemental EIS (WPA/CPA Supplemental EIS) with consideration of the additional information provided in this Draft

[2] Summarized from p. 2-4 – Section 2.2

USEPA - 2

EIS for Gulf of Mexico OCS Oil and Gas Proposed Eastern Planning Area Lease Sales 225 and 226, and found no new significant information that would alter the impact conclusions for air quality presented in the CPA chapters of these documents. BOEM thereby incorporated by reference these previous EIS studies as applicable to the Eastern Planning Area for the proposed Lease Sales 225 and 226. In addition to stating the CPA air quality impact conclusions provided in the previous EIS documents are applicable to the Eastern Planning Area, review of the air quality impact portions of this current DEIS confirms that, BOEM used the same procedures, information, and modeling techniques that were used in the in WPA/CPA EIS documents that were incorporated by reference.

- EPA Region 4 reviewed the previous EIS documents for the WPA and CPA and provided substantial review comments associated with the air quality impact analyses and conclusions. The incorporation of these previous EIS documents as applicable to the Eastern Planning Area and apparent use of these same procedures, information, and modeling techniques in this DEIS, make our previously provided review comments applicable to this proposed action. Therefore, we note that our previously provided comments and recommendations are applicable to the Eastern Planning Area DEIS.

Recommendation:
EPA would be pleased to review and discuss these comments and recommendations with the BOEM in the context of the DEIS and proposed action.

Section 4.1.1.1.1 <u>Description of the Affected Environment</u>

USEPA - 3

- Page 4-8 discusses the FWS concern that the SO_2 increments for the Chassahowitzka Wilderness Area have been exceeded and indicates that "the proposed activity takes place outside of the Eastern Planning Area's PSD Class I areas and should not affect the increment." Page 4-8.

- Although activities in the Eastern Planning Area take place outside of the Class I area, they may affect the air quality onshore. Class I area analyses are not limited to facilities within the Class I area, but rather, look at impacts upon the Class I area. It is not clear from this discussion if the proposed activity will affect the Class I increment, nor can this reasonably be determined for this location without modeling. Given that Appendix G states that the impacts to the Chassahowitzka National Wildlife Refuge were not modeled, (in addition the impact to St. Marks and Bradwell Bay Class I areas) page G-4,

Recommendation:
EPA recommends that the DEIS not infer that any proposed activity will not impact the referenced Class I areas.

USEPA - 4

Section 4.1.1.1.2 General Conformity

- This section includes a discussion on General Conformity indicating that it applies to emissions within nonattainment areas and only to OCS related emissions that occur within state waters.[3]

  Recommendation:
  EPA recommends that this discussion be revised to more accurately reflect that General Conformity also applies to maintenance areas and to areas with 25 miles of the state's seaward boundary. In the case of Florida, this would mean out to 38 nautical miles from shore.

Section 4.1.1.1.2 Background /Introduction

USEPA - 5

- Carbon monoxide (CO), particulate matter (PM), particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$) emissions are not discussed in this section, but are generated from routine events in the Eastern Planning Area. PM in particular is a pollutant of significant concern for Class I area impacts, including visibility impairment, as well as human health effects, and can be transported from the Eastern Planning Area to shore.

  Recommendation:
  EPA recommends that PM emissions be included in the discussion of routine impacts.

USEPA - 6

- This section contains a lengthy description on flaring; however, impacts from other routine events are not described. In addition to flaring, an OCS source will engage in a range of activities associated with drilling that will also emit pollutants.

  Recommendation:
  EPA recommends that this section discuss these routine events. In addition, EPA recommends that monitoring and mitigation measures should be discussed from all such activities that the source will engage in, including emerging control technologies that could reduce emissions.

USEPA - 7

WETLANDS AND COASTAL AREAS
It is projected in the DEIS that a small length of onshore pipelines will be needed, no new onshore facilities, and minimal contribution to the need for maintenance dredging for the proposed action, thus, BOEM projects impacts to wetlands to be minimal.[4] EPA remains

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[3] see page 4-11 of DEIS
[4] p. xi of the DEIS

USEPA - 7

concerned about the potential for cumulative impacts on near shore wetlands and coastal areas. Coastal wetland systems are very sensitive systems that are increasingly stressed from all types of anthropogenic activities (coastal development, maintenance dredging of channels, oil spills, etc) in addition to natural events (hurricanes). In addition, stresses on these systems are predicted to increase with climate change and sea level rise.

Recommendation:
EPA recommends that BOEM better quantify in the FEIS historical wetland losses for coastal areas in the Eastern Planning Area and the current status of these systems. Even though BOEM predicts minimal impacts associated with this proposed action on wetlands and coastal systems in the Eastern Planning Area, the historical cumulative impacts on these systems have been significant and should be disclosed.

USEPA - 8

ENVIRONMENTAL JUSTICE
The federal action proposed under this DEIS has the potential to impact EJ communities negatively and positively. The potential negative impacts on EJ communities involve oil spills that negatively impact communities that rely on commercial and recreational fishing, oystering, and subsistence fishing. Other negative impacts are associated with the oil-related infrastructure and its impact on minority and low-income communities. The infrastructure support system for oil- and gas-related industries in the GOM is highly developed, widespread, and has operated for decades within a heterogeneous GOM population. The potential positive impacts associated with the proposed action include increases in economic activity and job creation in these same communities. EPA supports the efforts made by BOEM to conduct subsistence research in an effort to document the potential impact on these communities.

Recommendation:
EPA recommends BOEM include discussion of mitigation efforts in the FEIS that addresses impacts to these communities relating to subsistence fishing and oystering in the event of an oil spill. EPA also recommends that BOEM better define in the FEIS how minority and low-income communities that may be impacted by the proposed action have had opportunities to engage in the decision making process.

USEPA - 9

MITIGATION
EPA understands that BOEM projects that four lease stipulations will be proposed for this lease sale; the Protected Species Stipulation, Military Areas Stipulation, the Evacuation Stipulation, and the Coordination Stipulation. These stipulations will be described in the Final Notice of Sale and will be added to the lease terms and are enforceable as part of the lease.

It would be appropriate to include commitments to fully mitigate and/or compensate for all unavoidable losses of coastal resources, as well as for the physical, chemical, and biological functions and ecological services they provide. EPA understands that stipulations or mitigation

USEPA - 9

requirements to be included in the lease sale will be described in the Record of Decision (ROD) for that lease sale.[5]

Recommendation:
If not already included in lease sale RODs, EPA recommends including a statement of policy requiring that all leaseholders avoid, minimize, and fully mitigate unavoidable losses.

USEPA - 10

CONSULTATION AND COORDINATION
Chapter 1 under the section titled "Measures to Enhance Transparency and Effectiveness in the Leasing and Tiering Process" BOEM provides a description of a process that will improve the public's ability to comment and provide information in the prelease sale planning process. EPA commends BOEM's efforts to enhance the public's opportunities in the permitting and NEPA process.

Chapter 5 provides a description of how the proposed actions were noticed to the public, tribes, and other agencies. EPA appreciates that BOEM included comments received from industry representatives and NGOs.

Recommendation:
EPA recommends that the FEIS include specific responses to comments received on the DEIS. EPA also recommends that BOEM's responses to comments be included in a specific section of the FEIS.

Region 4 Contacts:
Dan Holliman – Region 4 NEPA Program Office – Holliman.Daniel@epa.gov
Kelly Fortin – Region 4 Air Division – Fortin.Kelly@epa.gov
Karrie-Jo Shell – Region 4 Water Protection Division (NPDES) – Shell.Karrie-Jo@epa.gov
Rosemary Hall – Region 4 Water Protection Division (Wetlands) – Hall.Rosemary@epa.gov

[5] p. 2-5 of the DEIS

USEPA-1 The OCSLA mandates that the Secretary of the Interior promulgate and administer regulations that comply with the National Ambient Air Quality Standards (NAAQS) pursuant to the Clean Air Act (42 U.S.C. 7401 *et seq.*) and to the extent that authorized activities significantly affect the air quality of any State. The EIS language has been expanded to identify the hazardous air pollutants that could be expected to result from routine and accidental events, most notably H_2S in crude, which varies greatly by formation, and certain volatile organic compounds like benzene that may be released during accidental events. There is limited data currently available on the cumulative size of hazardous air pollutants likely to be emitted from OCS oil and gas activities. The hazardous air pollutants emissions are not likely to be significant or to significantly affect onshore air quality. Even lacking direct emissions data, it is not essential to a reasoned choice among alternatives due to the size of projected activities and the distance of the EPA proposed action area and most OCS-related oil and gas activities to shore.

USEPA-2 We are aware of USEPA's previously submitted comments and concerns and did consider them in this EIS. Although we are incorporating background information from the prior EIS's, the emissions estimates and modeling done for the EPA in this EIS is stand alone and does not incorporate from the prior EIS's. As requested by USEPA for the previous EIS documents for the WPA and CPA, BOEM provided a table showing the BOEM modeled impacts in comparison to USEPA's Significance Impact Levels (SIL's) and NAAQS. As shown in **Appendix G** (**Table G-4**), BOEM's modeled impacts were below the U.S. Environmental Protection Agency's SIL's for all criteria pollutants in the Class I area. BOEM's modeled impacts in the Class II area for 1-hour NO_x exceeds the proposed (but not final) U.S. Environmental Protection Agency's SIL but is below the NAAQS. Refer also to the response to comment USEPA-1 regarding the OCSLA's mandate for air quality compliance. The OCSLA mandates that the Secretary of the Interior promulgate and administer regulations that comply with NAAQS pursuant to the Clean Air Act (42 U.S.C. 7401 *et seq.*) and to the extent that authorized activities significantly affect the air quality of any State. For purposes of this EIS, based on the foregoing and in **Appendix G**, BOEM has determined activities related to an EPA proposed action will not significantly affect the air quality of the coastal states.

USEPA-3 The text has been clarified in **Chapter 4.1.1.1.1**. BOEM appreciates USEPA's comments; however, BOEM did not infer the proposed activity "will not" impact the referenced Class I area. BOEM believes that the proposed activity "should not" significantly affect the referenced areas.

USEPA-4 The text has been revised in **Chapter 4.1.1.1.1**.

USEPA-5 BOEM appreciate USEPA's response and is including a discussion of PM emissions in **Chapter 4.1.1.1.2**, "Impacts of Routine Events."

USEPA-6 Text has been added to **Chapter 4.1.1.1.2**.

Please note that BSEE performs monitoring of OCS oil and gas activities and verifies compliance with mitigation measures. There are various emerging technologies that could, in the future, be used during drilling and production to reduce emissions. A discussion of emerging control technologies is premature at the lease sale stage other than to note that BOEM and BSEE may consider their application for postlease activities and that they may be analyzed during the NEPA reviews at that stage.

USEPA-7 The text has been revised to better quantify historical impacts to wetland and coastal systems for Florida. Refer to **Chapters 4.1.1.3.1, 4.1.1.3.4, and 4.1.1.4.1**.

Louisiana, Alabama, and Mississippi coastal areas, which are inshore of the CPA, were described in Chapters 4.2.1.3.1 and 4.2.1.4.1 of the 2012-2017 WPA/CPA Multisale EIS, which are incorporated by reference.

USEPA-8 The two parts of the recommendation under "Environmental Justice" are noted, and additional text has been added to **Chapter 4.1.1.22.4**.

Regarding the first part of the recommendation:

BOEM's analysis considers direct and indirect impacts from accidental events such as oil spills, which may occur as a result of OCS activities subsequent to proposed EPA Lease Sale 225. Also, for a low-probability catastrophic oil spill, which is not reasonably expected and is not part of the proposed action, this EIS does include discussion of mitigation efforts that occurred as a result of the *Deepwater Horizon* explosion, oil spill, and response and predicts that similar efforts may result if another event such as that were to occur.

Regarding the second part of the recommendation:

Minority and low-income communities have had substantial opportunities, as did all stakeholders, to engage in the decisionmaking process. BOEM makes official public announcements, such as the "Call for Information/Notice of Intent to Prepare an EIS," and also announces and holds public scoping meetings that are open to all persons and provides for a public comment period on draft NEPA documents. These announcements are published in numerous local newspapers, on the Internet, and via the U.S. Postal Service, in addition to formal publication in the *Federal Register* (refer to **Chapter 5**).

USEPA-9 Comment noted. If the decision is made to proceed with a proposed EPA lease sale, the decision and terms of the lease sale will be announced in a Record of Decision and the Final Notice of Sale.

USEPA-10 BOEM has always and will continue to provide comments on the Draft EIS's and BOEM's responses will be in every published Final EIS. These comments and responses are always included in a specific comment and response section of the Final EIS's. Regarding oil and gas lease sale EIS's, the comments and responses for the draft EIS are always included specifically in **Chapter 5**, coupled with applicable related changes to the substantive discussions throughout the body of the EIS.

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PUBLIC SUBMISSION

Docket: BOEM-2013-0009
Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0005
Comment from Jillian Fleiger, FL Division of Aquaculture

Submitter Information

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Organization: FL Division of Aquaculture
Government Agency Type: State
Government Agency: Florida Department of Agriculture and Consumer Services

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General Comment

See attached file(s)

Attachments

US DOI BOEM EPA_Lease_Sales_225_226_April2013

DIVISION OF AQUACULTURE
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MAGNOLIA CENTER, SUITE 501
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FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES
COMMISSIONER ADAM H. PUTNAM

Please Respond to:

Division of Aquaculture
Shellfish Environmental Assessment Section
Western Gulf Coast District Office
4408 Delwood Lane
Panama City Beach, FL 32408
Phone: 850-236-2200

April 15, 2013

Gary D. Goeke
U.S. Department of the Interior
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
(MS 5410)
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

RE: Comments on 2014-2016 Draft Environmental Impact Statement proposed lease sales of Eastern Planning Area 225 and 226.

Applicant: US Dept of the Interior, Bureau of Ocean Energy Management.

The Eastern Planning area in this Draft Environmental Impact Statement is located approximately 100 miles or more southwest of the nearest Florida shellfish harvesting area which is the Pensacola Bay shellfish harvesting area (#02), Escambia and Santa Rosa Counties. The following comments by the Division are based solely on shellfish classification and management for public health.

According to the document, 2 lease sales are planned in the eastern planning area for the potential of future oil and gas exploration.

If the project is completed as proposed, it will not result in the reclassification or closure of shellfish harvesting areas in Florida. Adverse impacts are not expected because the proposed project is located a sufficient distance away from shellfish resources.

FDACS – 1

As a safety measure, please include the Division of Aquaculture in the oil spill response plan contact list to be notified if significant oil, chemical, or fuel spill occurs. Upon such notice, we would invoke our emergency procedures to close shellfish areas to harvesting if necessary.

Thank you for the opportunity to comment. Please call if you need additional information.

Sincerely,

Jill Fleiger

Environmental Specialist II

cc: Chris Knight

Escambia County file

FDACS-1 Thank you for your review of the Draft EIS and recent comment. At this time, there is a single point of contact notification protocol established by the State of Florida. Consistent with BSEE and Oil Pollution Act implementing regulations (refer to 30 CFR part 254 and 40 CFR part 300), in the event of a discharge, the operators would contact the Florida State Watch Office/State Warning Point directly, and from there, the State of Florida would notify the appropriate offices and personnel. These notification points are required to be specified in the Oil-Spill Response Plans (OSRP's) in order for the plans to be approved by BSEE. Additionally, the OSRP's are required to be consistent with the Regional Contingency Plan from the Regional Response Team (RRT) (in this case, RRT IV) and appropriate Area Contingency Plans (ACP's). These plans also contain the required notification information. The ACP's are created by each of the U.S. Coast Guard Captains of the Ports throughout the GOM. The Division of Aquaculture, a Division within the Department of Agriculture and Consumer Services, should contact the Florida State Watch Office directly to ensure you are on the State's contact list and to provide information for what types of events you would need to be contacted.

NATIONAL
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April 16, 2013

Mr. Gary D. Goeke
Chief, Regional Assessment Section
Office of Environment (GM 623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394.

RE: Draft Environmental Impact Statement for Proposed Lease Sales 225 and 226 in the Eastern Planning Areas

Dear Mr. Goeke:

The National Ocean Industries Association (NOIA) appreciates the opportunity to respond to your request for comments on the draft environmental impact statement (DEIS) for proposed lease sales in the Central and Western Planning Areas.

NOIA is the only national trade association representing all segments of the offshore energy industry. The NOIA membership comprises nearly 300 companies engaged in activities ranging from producing to drilling, engineering to marine and air transport, offshore construction to equipment manufacture and supply, shipyards to communications, and geophysical surveying to diving operations. The draft environmental impact statement for the proposed lease sales is, therefore, of particular importance to NOIA.

The energy resources of the Outer Continental Shelf (OCS) are a vital component of the nation's energy portfolio, and NOIA has long advocated for the opening of more of these lands to responsible exploration and development. Despite the President's "all of the above" energy policy, we note that most increases in domestic oil and natural gas production come from private land.

NOIA - 1

NOIA and its member companies strongly support Alternative A in the DEIS. Proceeding with Lease Sales 225 and 226 would be an important step toward making available additional offshore acreage for exploration and production. This is acreage that was once held off-limits and we strongly support any endeavor that makes new offshore lands available. At present, nearly 85% of the OCS is off-limits for even consideration. The offshore industry has been innovative in its exploration of the 15% of offshore lands that

NOIA Comments on DEIS for Lease Sales 225 and 226
April 16, 2013
Page 2

are open to development, teaching an important lesson: the more we look, the more we find. To date, more than five times the amount estimated to be in the ground in 1983 has been produced, and another 5 times that amount is estimated to still be undiscovered. Who knows how much oil and natural gas lays off our shores in areas where exploration is disallowed? The industry has the ability to safely and economically produce the mineral resources in these deepwater tracts, bringing them to market where they will enable economic growth, support jobs and generate revenue for the Federal treasury.

Additionally, the acreage in Lease Sales 225 and 226 was made available originally as part of the 2006 Gulf of Mexico Energy Security Act, so a portion of the revenue generated from the eventual production there will be shared directly with the coastal states that need it most. NOIA supports the push by the states to make claim to a percentage of the revenue generated from activities undertaken off their shores. The revenues generated from the eventual production of these tracts will be a welcome addition to the states' bottom lines.

NOIA - 2

Making the acreage available to be leased is only one step, however. The process for leasing and permitting exploration and production must move forward efficiently and steadily. To this end, the completion of this Environmental Impact Statement is critical to allow for NEPA review and approval. We urge BOEM to complete the necessary reviews with all haste to ensure that the lease sales and subsequent permitting are done in a timely manner.

NOIA strongly encourages the expeditious completion of this Environmental Impact Statement and compliance with the schedule set out in the proposed Five-Year Program. We call upon BOEM to move forward with these lease sales. To not do so would be to deny the American people a fair return on the resources held in trust for them. With so many of our offshore natural gas and oil resources eliminated from consideration for leasing by the government, these sales are vital to the nation. If you have any questions or need additional information, please feel free to contact me at (202) 347-6900.

Sincerely,

Michael Kearns
Vice President, Government Relations

NOIA-1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

NOIA-2 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision. As required by NEPA, BOEM will step through the appropriate environmental processes and adhere to appropriate timeframes to provide a complete picture for the decisionmaker and public of the potential significant impacts for each decision point.

MOBILE BAYKEEPER®

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April 16, 2013

Mr. Gary D. Goeke
Chief, Regional Assessment Section
Office of Environment (MS5410)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Retion
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

RE: Comments on the EPA 225/226 Draft EIS

Dear Mr. Goeke:

Mobile Baykeeper is a 16-year-old nonprofit organization with the mission of providing citizens a means to protect the beauty, health and heritage of the Mobile Bay watershed, Alabama's waterways and coastal communities. We are writing to express our thoughts pertaining to the draft environmental impact statement for the proposed oil and gas lease sales in the Eastern Planning Area in the Gulf of Mexico.

In the comments submitted by Mobile Baykeeper in March 2011, January and February 2012, related to the Notice of Intent to put forth a Programmatic EIS for Oil and Gas Leases, we recommended that in preparing the EIS that the recommendations of the Oil Spill Commission be incorporated, long term impacts from the Oil Disaster in the Gulf of Mexico to the Gulf Coast be adequately evaluated, and the need for a citizens advisory committee to be utilized in the creation of the Programmatic EIS. We acknowledge that those recommendations have been considered, with long term Oil Disaster impact consideration noted throughout the document as well as Oil Spill Commission guidance incorporated. While the citizens advisory committee was not formed, we acknowledged the seeking of input from stakeholders and the opportunities to provide feedback and comment.

We have seen a worst-case scenario in oil and gas exploration in the form of the BP Deepwater Horizon Oil Disaster and we were shown that the oil and gas industry was ill prepared to address such an occurrence. We acknowledge the Bureau's inclusion of new information (and any subsequent requirements) related to spill response and drilling safety included through the promulgation of regulations, notices to lessees and operators, and site-specific mitigations identified in NEPA analyses at the lease sale and project levels. The incorporation of additional regulations and guidance is vital to ensuring safe operations of oil and gas extraction in the Gulf of Mexico.

MOBILEBAYKEEPER - 1

Mobile Baykeeper asserted in our previous letters that it is essential to understand the full cost of the BP Deepwater Horizon Oil Spill to the Gulf of Mexico, Gulf Coast states, and the nation as a significant and precedent setting event when considering extending offshore drilling leases. Catastrophic events such as this, though statistically rare, are possible and have been proven to be environmentally and economically devastating to the Gulf Coast. In our review of the draft EIS, we noted the potential employment impacts of the the proposed lease sales in the Eastern Planning area. The proposed action was noted to potentially have "only minor economic changes in the Louisiana, Mississippi, Alabama and Floredia." It is further explained that "an EPA proposed action is expected to generate less than a 1 percent increase in employment in any of the economic impact areas." In comparison, the recreation and tourist industries employ roughly 1,000,000 people across the Gulf Coast. While we understand the oil and gas leasing program's importance in ensuring adequate energy resources for the nation, it is important to recognize the oil and gas industry's potential to impact the health other industries, as was clearly displayed by the 2010 Deepwater Horizon Event.

We urge BOEM to not forget the hard lessons learned from the BP Deepwater Horizon Oil Disaster when deciding the future of offshore drilling in U.S. Coastal waters. We reiterate that the environmental, economic, and human impacts to the Gulf Coast and its millions of residents created by the massive release of oil into the Gulf of Mexico linger to this day and will continue to negatively impact our communities for many years to come. While a single event, the potential for huge impacts from oil and gas spills to the Gulf Coast is an inherent risk with oil and gas exploration and extraction.

We thank the Department of the Interior's Bureau of Ocean Energy Management for the opportunity to share our thoughts and recommendations on the draft environmental impact statement for proposed Eastern Planning Area lease sales. Please feel free to contact us for any additional information as presented in these comments.

Thank you in advance for consideration of these comments.

Sincerely,

Donna Jordan

Donna Jordan
Program Director

MOBILEBAYKEEPER-1 BOEM has quantified the employment effects of leasing in the EPA using the model MAG-PLAN. BOEM has also elaborated on the net benefits analysis of the Five-Year Program EIS (USDOI, BOEM, 2121b) for the *Proposed Final Outer Continental Shelf Oil & Gas Leasing Program: 2012-2017* (Five-Year Program) (USDOI, BOEM, 2012a). That analysis quantifies the net economic effects of leasing in the EPA. As noted in the cumulative impacts analyses and catastrophic event analysis in **Appendix B**, BOEM has attempted to provide a complete picture for the decisionmaker and public of the potential significant impacts from an EPA proposed action, including employment impacts.

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Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0007
Comment from Kelly Anderson, Self

Submitter Information

Name: Kelly Anderson
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161 Old Beach Rd.
Santa Rosa Beach, FL, 32459
Email: Kelly@AndersonSolutions.com
Organization: Self

General Comment

ANDERSON - 1

Please choose Alternative B – No Action!

As a resident of Walton County Florida I am opposed to the Proposed Eastern Planning Area Lease Sales 225 and 226 for oil and gas operations. Drilling in state or federal waters off the coast of Florida makes no economic sense. Why would our government choose to put Florida's $65 billion tourism industry at risk? The BP Oil spill polluted our coastal waters in ways that are still being measured. And it came very close to permanently ruining our local economy. There is no logical reason to increase the number of existing leases near Florida.

ANDERSON - 2

Gary Goeke of BOEM has been quoted saying that the public meeting held in Panama City on March 28, 2013 was not well attended because the proposed site is "so far offshore". Not true. That meeting was not well attended because it was held during the middle of our "spring break" season. If Mr. Goeke lived here, in an area with a tourism-based economy, he would know better. It was the equivalent of scheduling a public meeting in New Orleans on Fat Tuesday. We can't even get into the grocery store during this time, much less drive across town for a meeting.

But that does not mean that the residents of Florida's Gulf Coast are indifferent to proposed oil and gas operations in our waters. We are adamantly opposed.

ANDERSON-1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

ANDERSON-2 Comment noted. BOEM strives, while currently working within comment schedules prescribed by statute or regulation and within budgetary restraints, to offer meetings at appropriate times and places to ensure full public involvement. Nevertheless, even apart from the scheduled public meetings, the public is afforded several opportunities to provide input on EIS development, including through the submission of written comments. BOEM encourages the public to submit comments in person or in writing, and considers all such comments in the development and finalization of the EIS.

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Docket: BOEM-2013-0009
Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0009
Comment from George Livingston, Walton County Resident

Submitter Information

Name: George Livingston
Address:
83 Sky High Dune Drive
Santa Rosa Beach, FL, 32459
Email: LivingstonBuz@gmail.com
Organization: Walton County Resident

General Comment

LIVINGSTON - 1

In light of the Deepwater Horizon disaster I urge you to forego additional oil and gas leases in the Eastern Gulf of Mexico.

LIVINGSTON-1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

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Docket: BOEM-2013-0009
Gulf of Mexico (GOM), Outer Continental Shelf (OCS), Eastern Planning Area (EPA) Lease Sale 225 and 226, Oil and Gas Lease Sales

Comment On: BOEM-2013-0009-0001
Oil and Gas Lease Sales: Gulf of Mexico, Outer Continental Shelf, Eastern Planning Area Lease Sale 225 and 226

Document: BOEM-2013-0009-DRAFT-0008
Comment from lisa veiga, Resident

Submitter Information

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188 allen loop dr
santa rosa beach, FL, 32459
Email: redrckr@gmail.com
Organization: Resident

General Comment

VEIGA - 1

What are we doing. We do NOT need to provide oil and gas leases off the coast of Alabama and Florida. I am completely against this for many reasons.

VEIGA -2

The fact that the meeting was held middle of the week and during spring break in FL demonstrates that this is a political push without the residents of this area having a voice.

VEIGA-1 Comment noted. This EIS is not a decision document; BOEM will make a decision on the EPA proposed actions. If the decision is to hold a lease sale, it will be announced in a Final Notice of Sale and Record of Decision.

VEIGA-2 Comment noted. BOEM strives, while currently working within comment schedules prescribed by statute or regulation and within budgetary restraints, to offer meetings at appropriate times and places to ensure a full public involvement. Nevertheless, even apart from the scheduled public meetings, the public is afforded several opportunities to provide input on EIS development, including through the submission of written comments. BOEM encourages the public to submit comments in person or in writing, and considers all such comments in the development and finalization of the EIS.

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April 18, 2013

By E-filing

Gary D. Goeke
Chief, Regional Assessment Section
Office of the Environment (GM 623E)
Bureau of Ocean Energy Management
1201 Elmwood Park Boulevard
New Orleans, LA 70123

RE: Gulf of Mexico Eastern Planning Area Oil and Gas Lease Sales 225 and 226 – Draft Environmental Impact Statement [Docket No. BOEM-2013-0009]

Dear Mr. Goeke,

We appreciate the opportunity to comment on the Draft Environmental Impact Statement ("Draft EIS") for the Gulf of Mexico Eastern Planning Area ("EPA") Oil and Gas Lease Sales 225 and 226. Because these lease sales are the first scheduled sales in the EPA since both the Deepwater Horizon incident and the passing of the 2006 Gulf of Mexico Energy Security Act ("GOMESA"), it is critical that the Bureau of Ocean Energy Management ("BOEM") use this document to take a hard look at the scope and extent of the environmental impacts that may result from the government's offshore leasing program in the EPA. However, BOEM has not taken this responsibility seriously and the Draft EIS fails to sufficiently analyze the environmental impacts that would result from the proposed action.

In this letter, we highlight the most significant of our concerns. Specifically, the Draft EIS:

- Fails to consider a full spectrum of reasonable alternatives to the proposed action;
- Fails to properly balance the potential economic benefits of the proposed action against the potential adverse impact on the environment.
- Mishandles relevant spill data and fails to include important information from the Deepwater Horizon spill;
- Fails to adequately consider the persistent shortcomings in the regulation and safety of offshore oil and gas drilling; and
- Does not attempt to establish the appropriate environmental sensitivity analyses that show the comprehensive impact of the proposed action.

BOEM should reconsider its approach to these problems in the Final EIS and revise the document accordingly prior to issuing a record of decision. Left uncorrected, the Final EIS violates the agency's basic obligation under the National Environmental Policy Act ("NEPA") to provide an accurate and complete presentation of environmental impacts. In addition, beyond identifying flaws in the Draft EIS, the following comments provide the basis for improving future NEPA documents. The necessary improvements identified in this letter would enable BOEM to strengthen its statistical analyses to better assess the risk of large oil spills and demonstrate a greater commitment to scientific transparency and public dialogue.

I. THE DRAFT EIS FAILS TO CONSIDER A FULL SPECTRUM OF REASONABLE AND FEASIBLE ALTERNATIVES TO THE PROPOSED ACTION.

OCEANA - 1

Analysis of alternative actions is the "heart of the environmental impact statement."[1] Furthermore, NEPA requires that the No Action Alternative consider a case in which "the proposed activity would not take place."[2] BOEM's discussion in the Draft EIS centers on cancelling just one EPA lease sale, and thus the current No Action Alternative fails this NEPA requirement, as it describes a scenario in which only part of the proposed action would not take place. Because this No Action Alternative includes cancelling only one of the two EPA lease sales, it cannot capture the environmental benefits of taking no action.

OCEANA - 2

Furthermore, BOEM's analysis of the purported No Action Alternative is fundamentally flawed in that the Draft EIS states that "If a proposed EPA lease sale would be canceled, the resulting development of oil and gas would most likely be postponed to a future lease sale; therefore, the overall level of OCS activity in the EPA would only be reduced by a small percentage."[3] On this logic, BOEM concludes that the No Action Alternative does not have notably greater environmental benefits than the proposed action. Yet BOEM fails to recognize that a "no action alternative in an EIS is meaningless if it assumes the existence of the very plan being proposed."[4]

OCEANA - 3

In equating the cancellation of one of the EPA lease sales with a mere postponement of the sale, BOEM disregards the importance of timing in determining the magnitude of an environmental impact. According to BOEM's reasoning, the ultimate effect of an impact from offshore drilling will be the same regardless of when that impact occurs. That is not plausible; simultaneous impacts may have a greater effect than consecutive impacts, and consecutive impacts may have a greater effect than staggered impacts. BOEM cannot fairly conclude that lease sales that happen now, as part of the proposed action, and lease sales that happen in the future, will have equivalent impacts on the ecosystem. By including in its analysis an assumption that identical lease sales will occur in the future, BOEM's analysis of the No Action Alternative is not parallel

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[1] 40 C.F.R. § 1502.14.

[2] Council on Environmental Quality. Appendix B: Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. 46 Fed. Reg. 18,026, 18,034. 23 Mar. 1981. Question 3.

[3] Draft EIS at 2-36.

[4] *Friends of Yosemite Valley v. Scarlett*, 439 F. Supp. 2d 1074, 1105 (E.D. Cal. 2006), affirmed at 520 F.3d 1024 (9th Cir. 2008).

OCEANA - 3

with its analysis of the proposed action. The purpose of a No Action Alternative is to serve as "a benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives."[5] In the Draft EIS, the purported No Action Alternatives do not serve as a comparative benchmark, because BOEM irrationally considers future lease sales only in connection with the No Action Alternative. Selectively including future events, as BOEM does here, leads to a skewed analysis.

OCEANA - 4

As the prior discussion shows, the Draft EIS violates NEPA by failing to consider two reasonable and feasible alternatives that would greatly alter the relative environmental impact and cost benefit balance of the proposed action. In the Final EIS, BOEM must include a true No Action Alternative that proposes the cancellation of both lease sales in the EPA and does not assume an identical lease sale would take place shortly thereafter in analyzing the environmental benefits of that action relative to the proposed action.

II. THE DRAFT EIS FAILS TO PROPERLY BALANCE THE POTENTIAL ECONOMIC BENEFITS OF THE PROPOSED ACTION AGAINST THE POTENTIAL ADVERSE IMPACT ON THE ENVIRONMENT.

A. The Draft EIS Ignores the Heightened Blowout Risk from Deepwater Drilling

OCEANA - 5

In light of the Deepwater Horizon event, and the increasing number of leases being purchased and developed in deepwater areas of the Gulf, the possibility of well blowouts – particularly in deepwater – is a critical consideration in evaluating the environmental impacts of the EPA lease sales. As demonstrated in Table 3-2, BOEM anticipates that up to 17 development and production wells will be drilled in the EPA, all of which would occur in water depths exceeding 800 feet.[6] Alarmingly, the risks of deepwater blowouts are serious and increasing. This fact is well-supported by recent statistical data; blowouts are a serious risk, that risk has been greater, in recent years, and the risk is particularly acute in deepwater.[7] These concerns cannot be left unaddressed in an EIS for a planning area that anticipates several deepwater leases.
The data in Table 2-3 of the Multisale Final EIS abundantly demonstrates the fact that blowout risks in deepwater are severe and increasing.[8] For example:[9]

- Between 1992 and 2006, there were 6 blowouts in water ≥500 feet (with 3,139 wells drilled); in the most recent period from 2007 to 2011, there were 8 blowouts in the same water depth (with 593 wells drilled). There have been more deepwater blowout events in the past five years than in the previous fifteen years, with only one-fifth as many wells

[5] Council on Environmental Quality. Appendix B: Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. 46 Fed. Reg. 18,026, 18,034. 23 Mar. 1981. Question 3.
[6] See Draft EIS tbl 3-2, at Tables-4.
[7] See Multisale FEIS tbl. 2-3, at Tables-13.
[8] *Id.*
[9] *Id.*

OCEANA - 5

drilled. The rate of blowouts per deepwater wells drilled in the past five years has been 1.35%, nearly six times higher than the preceding fifteen years (0.24%).

- The percentage of blowouts occurring in deepwater (≥ 500 feet) was 11% in the period from 1971 to 1991, 16% in the period from 1992 to 2006, and 25% in the period from 2007 to 2011. The percentage of blowouts attributable to deepwater drilling has increased over time, and in the last five years has increased by nearly 10%.
- The number of ultra-deepwater (≥ 1000 feet) wells drilled per blowout was 499 in the period from 1992 to 2006, and 74 in the period from 2007 to 2011. Blowouts in ultra-deepwater have been nearly seven times more likely in the past five years than in the preceding fifteen years, and for the first time the blowout rate at this water depth is higher than the average.

Yet the Draft EIS fails to adequately address the risk of deepwater blowouts, which is a vital discussion for a planning area that is anticipated to have exclusively deepwater wells. In the Final EIS, BOEM must address this shortcoming by acknowledging the above critically important points and integrating them into their analysis of weighing the benefits of the proposed action against the environmental risks.

B. The Draft EIS Acknowledges that the Economic Benefits of the Proposed Action are Minimal

OCSLA requires that outer continental shelf leasing programs be "conducted in a manner which considers economic, social, and environmental values of the renewable and nonrenewable resources contained in the outer Continental Shelf."[10] This includes considerations of 1) the "equitable sharing of developmental benefits and environmental risks among the various regions;" 2) the "location of [leasing] with respect to, and the relative needs of, regional and national energy markets;" and 3) the receipt of fair market value for the lands leased, among other considerations.[11]

OCEANA - 6

The Draft EIS acknowledges that the proposed action would cause "minimal economic changes" to the Gulf region, and "irrespective of whether one analyzes the high-case or low-case production scenario, would not cause employment effects >0.1% in any [economic impact area] along the Gulf Coast."[12] Notwithstanding the minimal developmental benefit that the Gulf region would see from the proposed action, the region bears the brunt of the environmental risks that "can cause a number of disruptions to local economies."[13] In violation of OCSLA, the Draft EIS does not include a quantitative analysis of whether or not this minimal economic benefit could outweigh the environmental risks to the region.

The Draft EIS also fails to take a hard look at whether the proposed action is ultimately beneficial at a national level. In its Programmatic EIS for the 2012-2017 Five Year Plan, BOEM estimates that a total of 2.7 to 5.4 billion barrels of oil, and 12 to 24 trillion cubic feet of natural

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[10] 43 U.S.C. § 1344(a)(1).
[11] 43 U.S.C. § 1344(a)(2)(B),(C), (a)(4).
[12] See Draft EIS at 2-32.
[13] *Id.*

OCEANA - 6

gas are potentially available from the Gulf.[14] However, the current Draft EIS for Lease Sales 225 and 226 estimate that either sale will produce only 0-0.071 billion barrels of oil or 0-0.162 trillion cubic feet of natural gas.[15] Given these estimates, then, at most the proposed EPA lease sales would offer no more than 2.7% of the oil and 1.4% of the natural gas potentially available in the Gulf. The Draft EIS does not seriously discuss why the location of leasing in the Eastern Gulf, specifically, is necessary to meet the needs of regional and national energy markets.

III. THE DRAFT EIS MISHANDLES RELEVANT SPILL DATA AND FAILS TO INCLUDE IMPORTANT INFORMATION FROM THE DEEPWATER HORIZON SPILL.

OCEANA - 7

The Draft EIS mishandles relevant data by not including in its analysis important spill data that is already available to BOEM. BOEM also failed to provide source data or details on the scientific methods and approaches that were used in the Draft EIS's analysis concerning oil spill risks. More specifically, the Draft EIS trivializes the effects of the Deepwater Horizon disaster by irrationally omitting from the oil spill risk analysis the largest spill size category, ≥ 10,000 barrels ("bbl"), under which the Deepwater Horizon disaster would fall, even though the spill size category was included in analyses for prior EISs. In recent years, BOEM has replaced the traditional ≥1,000 bbl and ≥10,000 bbl spill size categories, found in all of BOEM's prior analyses, with a single ≥1,000 bbl spill size group. This leads to an estimated median spill size that is misleadingly small. This approach is disingenuous and unsupportable. By lumping together the large spill size categories to yield a smaller overall median volume, BOEM completely mishandles the value of the Deepwater Horizon incident as a statistical data point, obscures the magnitude of that spill, and downplays the implications of similar catastrophic spills that might occur in the future.

Only the Draft EIS's Table 3-10 includes the appropriate ≥10,000 bbl spill size category.[16] However, BOEM again presents the data in a misleading manner. Instead of returning to the ≥1,000 bbl and ≥10,000 bbl size categories used in past studies, BOEM not only added the ≥10,000 bbl category back in, but also created a third, "Catastrophic" size category, with a membership of one: the Deepwater Horizon event. The new "Catastrophic" category contains no data about spill rates and no estimates of the number of "Catastrophic" spills expected from the proposed action – despite the fact that the stated purpose of Table 3-10 is to estimate expected spills from the proposed action.[17] Because the Deepwater Horizon spill has been moved out of the ≥10,000 bbl category where it belongs, that category now has a membership of zero. That conveniently allows BOEM to include no value for an estimated median spill size in the ≥10,000 bbl category. The solution to avoid this misleading approach is obvious: include the Deepwater Horizon event in the ≥10,000 bbl category where it belongs.

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[14] See Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017 Final Programmatic Environmental Impact Statement Programmatic EIS at 4-497.
[15] See Draft EIS at 1-4.
[16] See Draft EIS tbl 3-10, at Tables-11.
[17] *Id.*

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Furthermore, Table 3-2, which lists the number of oil spills per year and the total volume of oil spilled into the Gulf of Mexico, only does so for the years 2001-2009, despite BOEM obviously having more recent data. Omitting information on probabilities for oil spills ≥ 10,000 bbl occurring in the EPA and completely ignoring the data on Deepwater Horizon in the Draft EIS's tables and analysis undermines the environmental review process by misrepresenting the risk of large oil spills. BOEM must address this shortcoming in the Final EIS and include further post-Deepwater Horizon analysis and information that is currently available.

IV. THE DRAFT EIS FAILS TO ADEQUATELY CONSIDER THE PERSISTENT SHORTCOMINGS IN THE REGULATION AND SAFETY OF OFFSHORE OIL AND GAS DRILLING.

Since the Deepwater Horizon spill, BOEM and the Bureau of Safety and Environmental Enforcement ("BSEE") have promulgated new regulations in an attempt to make offshore drilling safer. Some of these new regulations are discussed at length in Section 1.3.2 of the Draft EIS. Oceana supports and applauds ongoing efforts to make offshore drilling safer, but we have identified numerous problems in the regulations of the offshore industry in our report *False Sense of Safety*.[18] These problems fall into two categories: shortcomings in the new safety measures implemented since the Deepwater Horizon spill; and persistent overarching problems in the regulation of offshore activities, such as insufficient inspection and oversight capabilities and inadequate penalties for violations. As a result, BOEM and BSEE have failed to make offshore drilling substantially safer since the Deepwater Horizon disaster.

OCEANA - 9

The Draft EIS does not acknowledge any potential shortcomings in the regulation of offshore oil and gas activities, despite its lengthy discussion of newly implemented regulations and their purported positive effect on offshore safety. This imbalanced discussion violates NEPA guidelines as well as the Department of the Interior's ("DOI") new scientific integrity policy.[19] NEPA requires an EIS to "provide full and fair discussion of environmental impacts."[20] While the new safety regulations themselves are not environmental impacts, they directly affect the impact analysis and hence affect BOEM's discussion of the new regulations. A discussion of environmental impacts that is predicated upon an imbalanced, unsubstantiated and incomplete set of factors that drive those impacts will itself be imbalanced, unsubstantiated and incomplete. Thus, it is crucial for a full and fair discussion of environmental impacts that the discussion of new regulations (and other factors influencing environmental impacts) be full and fair as well, which they are not. An objective analysis of the weaknesses and insufficiencies in the regulations is called for here.

DOI's new scientific integrity policy similarly demands a more balanced discussion of the new safety regulations. The policy requires science to be communicated "clearly, honestly,

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[18] *False Sense of Safety*, Oceana's report on persistent shortcomings in the regulation of offshore drilling, is available online at http://www.oceana.org/safetyreport.

[19] U.S. Department of the Interior. "Integrity of Scientific and Scholarly Activities." *Departmental Manual*. Series 5, Part 305, Chapter 3.

[20] 40 C.F.R. § 1502.1.

OCEANA - 9

objectively, thoroughly, [and] accurately."[21] As previously explained, the current communication of the new safety measures, and consequently the risks and effects of oil spills and other impact factors, is not balanced or objective. This directly violates the DOI's new scientific integrity policy. This Draft EIS provides an ideal and timely opportunity for BOEM to demonstrate its commitment to transparency and clarity in its scientific communications, but the Draft EIS has failed to meet that promise.

In order to comply with NEPA and to satisfy the Department of the Interior's scientific integrity policy, the Multisale Final EIS must present a more balanced discussion of new regulations and other safety measures implemented since the Deepwater Horizon spill. To do so, the Final EIS should discuss persistent safety concerns in offshore drilling that have not yet been addressed, as well as shortcomings in the new regulations. It also should present detailed analyses to support its claim that the new regulations and other measures have improved offshore safety.

V. THE DRAFT EIS DOES NOT ATTEMPT TO ESTABLISH THE APPROPRIATE ENVIRONMENTAL SENSITIVITY ANALYSES THAT SHOW THE COMPREHENSIVE IMPACTS OF THE PROPOSED ACTION.

OCEANA - 10

The Draft EIS makes several misleading claims about the impacts of the Deepwater Horizon spill and contains out of date analysis that fails to acknowledge the risks of expanded offshore oil and gas drilling that were brought to light by this disaster. NEPA requires that an EIS provides "a full and fair discussion of environmental impacts" and that its "[environmental] information must be of high quality."[22] Thus, if BOEM does not update its analysis of offshore drilling risks and correct its misleading claims about the Deepwater Horizon spill in the Final EIS, it will be in violation of NEPA.

OCEANA - 11

The ecological baseline of the Gulf of Mexico has changed due to the Deepwater Horizon spill and the Draft EIS must fully address these impacts, especially for protected and endangered species such as sea turtles, marine mammals and migratory birds as well as commercially important species.[23] Instead, the Draft EIS utilizes only a small amount of the information that has been published outside of the Natural Resources Damage Assessment ("NRDA") process, which is not an adequate measure of the impacts of Deepwater Horizon. This modeling framework is being coupled to climate, biophysical and economic models to help consider climate change impacts, monitoring schemes and multiple use management.

OCEANA-12

Instead, BOEM must follow through with the legally required formal consultation process in order to adequately address the long-term impacts to marine resources.

OCEANA-13

Overall, there are few attempts to project or scale stranding and carcass data acquired by the National Marine Fisheries Service ("NFMS") and Fish and Wildlife Service ("FWS") in order to

[21] *Id.*

[22] 40 C.F.R. § 1502.1.

[23] Clement, T.P., Hayworth, J.S., and V. Mulabagal. Comparison of the chemical signatures of tar mat samples deposited by Tropical Storm Lee in September 2011 with oil mousse samples collected in June 2010. Auburn University. 20 Sept.

estimate the true long-term effects of the Deepwater Horizon spill on populations of marine animals. Furthermore, there are no projections about the persistence of polycyclic aromatic hydrocarbons ("PAHs") in deep sea plumes and sediments, which is relevant in that it results in continued, longer-term exposure and potentially ongoing impacts. Explaining the extent of contamination that was created by the Deepwater Horizon spill is necessary because past studies have shown that the presence of PAHs at levels even as low as 1 part per billion present chronic threats to marine species such as fish larvae.[24]

OCEANA-14

OCEANA-15

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The Draft EIS for the Gulf of Mexico EPA suffers from serious flaws and omissions that must be addressed in the Final EIS in order to comply with NEPA and OCSLA. Based on the Draft EIS, it appears that BOEM has not learned from the Deepwater Horizon spill or the many decades of impacts on the Gulf of Mexico, and that the agency is continuing to prioritize oil and gas development over environmental and human protection rather than balancing these considerations as required by OCSLA. Such a path will lead to another human and environmental tragedy in the Gulf.

The Final EIS offers BOEM an opportunity to fundamentally change course and reassess its prioritization of oil and gas development over environmental protection. In so doing, BOEM should address the omissions and flaws discussed above, adequately consider alternatives, and ultimately select an alternative that does not simply continue failed policies that have led to tragedies and massive environmental degradation in the Gulf of Mexico. Such an alternative may involve the development of renewable energy. We appreciate the opportunity to submit comments on this important document, and we look forward to reviewing the Final EIS.

Sincerely,

Leah Scull
Energy Analyst
Oceana

[24] Marty, G.D. et al., (1997). Ascites, premature emergence, increased gonadal cell apoptosis, and cytochrome P4501A induction in pink salmon larvae continuously exposed to oil-contaminated gravel during development. Canadian Journal of Zoology, 1997, 75:(6) 989-1007, 10.1139/z97-120.

OCEANA-1 The OCSLA requires a staged decisionmaking process, beginning with the Five-Year Program, continuing through individual lease sales under the Five-Year Program, and ultimately to individual postlease activities requiring a permit or approval. At the lease sale stage of the OCSLA process, BOEM typically evaluates all lease sales in one or more GOM planning areas under the Five-Year Program in a multisale EIS. As stated in **Chapters 1 and 2**, the multisale approach discusses both Federal actions, i.e., two oil and gas lease sales in the EPA, as scheduled under the 2012-2017 Five-Year Program (refer to **Chapter 1.1**, paragraph 3, and **Chapter 2.1**, paragraph 4). The multisale EIS approach is intended to focus the NEPA/EIS process on the staged OCSLA process for decisionmaking, including the proposed lease sales, and any new issues and information identified since a prior stage. It also lessens duplication and saves resources. Though two proposed EPA lease sales (i.e, Lease Sales 225 and 226) are encompassed in the 2012-2017 Five-Year Program, the impact analyses within this Eastern Planning Area EIS specifically address resource impacts associated with holding one proposed lease sale, i.e., proposed EPA Lease Sale 225. Therefore, the No Action alternative associated with the analyzed Federal proposed action is the cancellation or delay of a single proposed lease sale, i.e., proposed EPA Lease Sale 225. A separate decision point and new NEPA analysis (e.g., a Determination of NEPA Adequacy, Supplemental EIS, or EA, as applicable) will be undertaken for proposed EPA Lease Sale 226 and will include any potential differences or updates in the proposed action and new information available at that time.

OCEANA-2 The text within **Chapter 2.3.2.2** has been revised to provide clarification of the No Action alternative.

If a single proposed EPA lease sale (e.g., Lease Sale 225) would be canceled, under the OCS Lands Act, BOEM would be required to consider any proposed lease sales remaining in the current Five-Year Program, if applicable, or proposed as part of a future Five-Year Program. Therefore, a decision to cancel one lease sale will not alter future decision points for lease sales in the EPA, required by OCSLA. The decision point is at the individual proposed action or lease sale stage. Selection of the No Action alternative for the single proposed action, i.e., proposed EPA Lease Sale 225, would result in avoiding the drilling of 3-12 exploration wells, the drilling of up to 17 development and production wells, the installation of up to 82 km (51 mi) of pipeline, 144-17,000 service-vessel trips, up to 27 helicopter trips, and the recovery of 0-0.071 BBO of oil and 0-0.162 Tcf of gas over a 40-year period. By selecting the No Action alternative and avoiding those activities associated with proposed EPA Lease Sale 225, those potential impacts related to proposed EPA Lease Sale 225 would be avoided; however, please be advised that a decision to cancel a single proposed lease sale would not preclude activity related to past lease sales nor decisions on future lease sales. There are a number of currently leased blocks within the proposed lease sale area with proposed plans, and BOEM anticipates another decision point for the proposed lease sale (e.g., proposed EPA Lease Sale 226) in 2016, which is proposed as part of the 2012-2017 Five-Year Program. Should the No Action alternative be selected, in the interim, industry may explore and develop their existing portfolio of leaseholds subject to the terms of those leases and any conditions of approval for plans or permits. Individual or a series of decisions on lease sales in a given planning area may influence industry's decisionmaking or strategy to develop existing leases. In this context, the No Action alternative does not explicitly presume an identical proposal or one only delayed into the future. As noted above, under the OCS Lands Act, BOEM would be required to consider any proposed lease sales remaining in the current Five-Year Program, if applicable, or proposed as part of a future Five-Year Program. As such, each lease sale will have its own decision point.

OCEANA-3 The text in **Chapter 2.3.2.2** has been revised to provide clarification of the No Action alternative.

There are decision points at each individual proposed action or lease sale stage, as required by OCSLA through development of the Five-Year Program. Therefore, a decision to cancel one lease sale will not alter future decision points for any remaining proposed lease sales in the EPA under a Five-Year Program. Each decision is based on relevant and the most up-to-date NEPA analyses that are conducted with time-specific considerations (i.e., recently published information, recent economic trends, etc.). Following the decision on a single proposed action, i.e., a single proposed lease sale, an additional NEPA review (e.g., a determination of NEPA adequacy, an EA or, if determined necessary, a supplemental EIS) will be conducted in the year prior to a subsequent proposed lease sale (e.g., proposed EPA Lease Sale 226) to address any relevant significant new information that was made available since the publication of the previous NEPA document (e.g., the EPA 225/226 EIS).

If a single proposed EPA lease sale (e.g., proposed EPA Lease Sale 225) would be canceled, under the OCS Lands Act, BOEM would be required to consider any proposed lease sales remaining in the current Five-Year Program, if applicable, or proposed as part of a future Five-Year Program. Therefore, a decision to cancel one lease sale will not alter future decision points for lease sales in the EPA, as required by OCSLA.

OCEANA-4 Refer to the responses to comments OCEANA-1, OCEANA-2, and OCEANA-3.

OCEANA-5 Effective July 17, 2006, this Agency revised its regulations expanding the definition of loss of well control and requiring incident reporting for a broader array of incidents. The number of loss of well control incidents reported in 2006 and after were affected by these regulatory changes; in fact, there is a notable trend in loss of well occurrence per wells drilled after 2006, which is generally attributed to this change.

BOEM continues to use the best scientifically credible information and data currently available to address the risk of blowouts in both shallow water and deep water. For additional information, please refer to Chapter 4.3.3, "Risk of a Low-Probability, Catastrophic Discharge Event" and more specifically to Chapter 4.3.3.2.1, "Loss of Well Control Occurrence" of the Five-Year Program EIS, from which this EIS tiers.

In general, the riskier wells include wildcat wells (first well into formation), offset wells (wells drilled near another well that encountered drilling trouble zones or past well control problems), and extended or ultra-deep drilling into high temperature/high pressure formations (Society of Petroleum Engineers, 2011). Deepwater and ultra-deepwater wells do require complex infrastructure, planning, and execution to construct; therefore, facilities and volume of production tend to get larger with distance from shore and water depth (Shultz, 1999). The complex nature of the formations, combined with the drilling depths in high-pressure/high-temperature conditions required to reach the target zones, presents a challenge to drilling engineers (Close et al., 2008). This challenge is highlighted in the greater number of casing strings required to drill to target depth, which in turn creates the challenge in achieving good cement isolation in a tight tolerance annuli (Close et al., 2008; Chatar et al., 2010). Despite such challenges, over 2,300 deepwater development boreholes and approximately 2,600 deepwater exploration boreholes have been drilled (if deep water is considered >500 ft [152 m]). [Note: Some deepwater wells will not flow without stimulation too.] Of these, the *Macondo* well is the only exploration well to involve a blowout and large oil spill. No spills have occurred for deepwater development wells.

OCEANA-6 BOEM has quantified the employment effects of leasing in the EPA using the model MAG-PLAN. BOEM has also elaborated on the net benefits analysis of the 2012-2017 Five-Year Program EIS (USDOI, BOEM, 2012b) for the *Proposed Final Outer Continental Shelf Oil & Gas Leasing Program: 2012-2017* (Five-Year Program) (USDOI, BOEM, 2012a). As requested by the commenter, this analysis in the Five-Year

Program EIS quantifies the net economic effects of leasing in the EPA and is incorporated by reference into this EIS. Please note that this EIS is not a decision document. This EIS includes the relevant analyses on potentially significant impacts and benefits reasonably foreseeable as a result of an EPA proposed action, in compliance with the mandates of NEPA. Although this EIS is required by NEPA, ultimately the decisionmaker will balance the analyses presented in these NEPA documents among all factors mandated by OCSLA in deciding whether or not to hold a proposed lease sale.

OCEANA-7 Oceana has expressed concern over the exclusion of the *Deepwater Horizon* oil spill from the calculation of the median spill size for the ≥10,000-bbl spill size category and has further alleged that doing so is disingenuous and unsupportable. While the *Deepwater Horizon* oil spill is included in the spill rate calculations for the ≥1,000-bbl categories, BOEM determined that including it in the median spill size for the ≥1,000-bbl category would be misleading but has included a footnote (2) on **Table 3-10** explaining what the value would be if not included. Nevertheless, a median spill size calculation requires at least three data points, and as noted on **Table 3-10**, the only data point for the ≥10,000-bbl category is the *Deepwater Horizon* oil spill. As such, a median spill size could not be calculated for the ≥10,000-bbl and catastrophic spill event category and footnotes (3 and 5) have been added for further clarification.

On the contrary, by including this event in the more appropriate catastrophic spill event category, which is not reasonably expected and not part of an EPA proposed action, BOEM seeks to bring greater resolution to the actual spill rate for an event of this spill size category.

OCEANA-8 The text has been revised in **Chapter 3.1.1.7.4.1**.

BOEM believes the commenter is referring to **Table 3-9**, “Annual Summary of Number and Total Volume of Oil Spilled into the Gulf of Mexico, 2001-2011,” not **Table 3-2**, “Offshore Scenario Information Related to a Typical Sale in the Eastern Planning Area for the Years 2012-2051,” as described in the comment letter. **Table 3-9** was compiled using all OCS spills reported to USCG, not just those related to OCS oil and gas activities. The USCG has since updated their data on reported spills through 2011. BOEM has updated **Table 3-9** to include information through 2011.

OCEANA-9 BOEM and BSEE have implemented rigorous regulatory requirements both before and after the *Deepwater Horizon* explosion, oil spill, and response in 2010. These regulations mandate extensive safety measures and risk reduction strategies by industry including, but not limited to, implementing redundancies in safety technologies. At the time that these regulations were adopted, BOEM and BSEE conducted NEPA analyses and solicited and considered extensive public comments. Although at the present time, BOEM believes that these regulations are effective in reducing risks from OCS oil and gas activities, nevertheless, BOEM acknowledges that there is no end point for safety, and as new technologies and information are available, BOEM will continue to consider potential regulatory changes and additional safety standards as deemed appropriate. BOEM, in cooperation with BSEE, will also continue to analyze current operations and activities to inform the continued development of these and other regulations and safety standards.

BOEM believes that its discussion in this EIS of the new safety regulations fairly characterizes these requirements. Nevertheless, BOEM acknowledges that, even with the stringent standards, risk is not wholly eliminated. For example, **Table 3-10** acknowledges that, even with application of these standards, certain small spills (<500 bbl) may be reasonably foreseeable. A catastrophic spill, which is not reasonably expected and not part of an EPA proposed action, and the regulatory changes implemented post-*Deepwater Horizon* would be expected to reduce this potential further.

OCEANA-10 Refer to the responses to comments OCEANA-5 and OCEANA-14. BOEM has updated its analysis with best available scientific information and has fairly characterized the *Deepwater Horizon* explosion, oil spill, and response and its impacts, while noting another catastrophic event is not reasonably expected and not part of an EPA proposed action. In addition, BOEM acknowledges the potential impacts of a catastrophic event, which is not reasonably expected and not part of an EPA proposed action, in **Appendix B**. This approach is consistent with the requirements of NEPA.

OCEANA-11 As is required by the NEPA process, BOEM used the best available relevant, scientific information including, but not limited to, peer-reviewed articles as well as direct communication with scientists involved in ongoing research to identify preliminary data and conclusions. A majority of the NRDA data have not been released to the public. BOEM's subject-matter experts have used the best available scientific information that is available, identified where gaps in information have occurred, and, based on their expertise and experience, determined whether it was essential to a reasoned choice among alternatives and if so whether the information could be obtained. As noted above, as NRDA data are being compiled and studied by other agencies subject to the NRDA process and related confidentiality protocols, it is not within BOEM's ability to obtain this information, regardless of cost. To do so would unnecessarily duplicate other Federal agencies' studies and costs, and in addition, certain statutes mandate specific agencies have sole jurisdiction over research and data collection (e.g., the Marine Mammal Protection Act gives NMFS sole jurisdiction over marine mammal strandings and tissue collection). Available scientific data have been used in its place where appropriate.

OCEANA-12 BOEM is conducting formal consultations for ESA and EFH as stated in this EIS. Refer to **Chapter 5.7** for the status of these consultations.

OCEANA-13 BOEM acknowledges the limitations in drawing conclusions from raw numbers on strandings, when additional causal data have not been released to the public. Accounting for these limitations, BOEM notes the following in **Chapter 4.1.1.12.1** in the section titled "*Deepwater Horizon* Explosion, Oil Spill, and Response":

Due to known low-detection rates of carcasses, it is possible that the number of deaths of marine mammals is underestimated (Williams et al., 2011a). It is also important to note that evaluations have not yet confirmed the cause of death, and it is possible that many, some, or no carcasses were related to the oil spill resulting from the *Deepwater Horizon* explosion. These stranding numbers are significantly greater than reported in past years, though it should be further noted that stranding coverage (i.e., effort in collecting strategies) has increased considerably due to the *Deepwater Horizon* explosion and oil spill.

OCEANA-14 Polycyclic aromatic hydrocarbons (PAH's) in the oil released during the *Deepwater Horizon* explosion, as well as results of sediment and water sampling, are discussed in the **Chapter 4.1.1.2.1.1 and 4.1.1.2.2.1**, "Description of the Affected Environment," for both coastal and offshore water quality, respectively. The characteristics of OCS oil, as well as the properties and persistence of oil by component group, are also discussed in **Chapter 3.2.1.2**, "Characteristics of OCS Oil," which incorporates by reference **Table 3-7**, "Properties and Persistence of Oil by Component Group" of the WPA 233/CPA 231 Supplemental EIS to further clarify this topic.

OCEANA-15 Comment noted. Regarding the statement, "Explaining the extent of contamination that was created by the *Deepwater Horizon* Spill is necessary . . .," BOEM has included available information on water and sediment sampling done after the *Deepwater Horizon* explosion and oil spill, but extensive Gulfwide information is not available either historically or since the spill. BOEM also acknowledges that remnants of oil and other contaminants from the *Deepwater Horizon* explosion, oil spill, and response may still be present in the environment and may be resuspended into the water column or may be transported due to natural or anthropogenic disturbances (e.g., hurricanes and OCS bottom disturbance activities). Also, the past study (Marty et al., 1997) used in the comment as an example to discuss and demonstrate the effects of PAH's on marine species and fish larvae is a study that explored the effects of continuous exposure to oil-contaminated gravel on salmon. This does not easily extrapolate to the Gulf of Mexico since the area discussed in the study is cold water and the sediment type is gravel. Further, fish larvae and many marine species in the Gulf of Mexico are generally not in the sediment but in the water column. And as noted above, the water column is not showing continued contamination from the *Deepwater Horizon* explosion and oil spill based on post-event sampling.

Chapter 6

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6. REFERENCES CITED

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CHAPTER 7

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CHAPTER 8

GLOSSARY

8. GLOSSARY

Acute—Sudden, short term, severe, critical, crucial, intense, but usually of short duration.

Anaerobic—Capable of growing in the absence of molecular oxygen.

Annular preventer—A component of the pressure control system in the BOP that forms a seal in the annular space around any object in the wellbore or upon itself, enabling well control operations to commence.

Anthropogenic—Coming from human sources, relating to the effect of humankind on nature.

API gravity—A standard adopted by the American Petroleum Institute for expressing the specific weight of oil.

Aromatic—Class of organic compounds containing benzene rings or benzenoid structures.

Attainment area—An area that is shown by monitored data or by air-quality modeling calculations to be in compliance with primary and secondary ambient air quality standards established by USEPA.

Barrel (bbl)—A volumetric unit used in the petroleum industry; equivalent to 42 U.S. gallons or 158.99 liters.

Benthic—On or in the bottom of the sea.

Biological Opinion—The FWS or NMFS evaluation of the impact of a proposed action on endangered and threatened species, in response to formal consultation under Section 7 of the Endangered Species Act.

Block—A geographical area portrayed on official BOEM protraction diagrams or leasing maps that contains approximately 2,331 ha (9 mi^2).

Blowout—An uncontrolled flow of fluids below the mudline from appurtenances on a wellhead or from a wellbore.

Blowout preventer (BOP)—One of several valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and drill pipe or in open hole (i.e., hole with no drill pipe) during drilling completion operations. Blowout preventers on jackup or platform rigs are located at the water's surface; on floating offshore rigs, BOP's are located on the seafloor.

Bottom kill—A wild well-control procedure involving the intersection of an uncontrolled well with a relief well for the purpose of pumping heavy mud or cement into the wild well to stanch the flow of oil or gas (the well-control strategy for the Macondo spill deployed in mid-July 2010 that resulted in the successful capping of the well).

Cetacean—Aquatic mammal of the order Cetacea, such as whales, dolphins, and porpoises.

Chemosynthetic—Organisms that obtain their energy from the oxidation of various inorganic compounds rather than from light (photosynthetic).

Coastal waters—Waters within the geographical areas defined by each State's Coastal Zone Management Program.

Coastal wetlands—forested and nonforested habitats, mangroves, and marsh islands exposed to tidal activity. These areas directly contribute to the high biological productivity of coastal waters by input of detritus and nutrients, by providing nursery and feeding areas for shellfish and finfish, and by serving as habitat for birds and other animals.

Coastal zone—The coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder) strongly influenced by each other and in proximity to the shorelines of several coastal states; the zone includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches, and it extends seaward to the outer limit of the United States territorial sea. The zone extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters. Excluded from the coastal zone are lands the use of which is by law subject to the discretion of or which is held in trust by the Federal Government, its officers, or agents. See also State coastal zone boundaries.

Completion—Conversion of a development well or an exploration well into a production well.

Condensate—Liquid hydrocarbons produced with natural gas; they are separated from the gas by cooling and various other means. Condensates generally have an API gravity of 50^{o}-120^{o}.

Continental margin—The ocean floor that lies between the shoreline and the abyssal ocean floor, includes the continental shelf, continental slope, and continental rise.

Continental shelf—General term used by geologists to refer to the continental margin province that lies between the shoreline and the abrupt change in slope called the shelf edge, which generally occurs in the Gulf of Mexico at about the 200-m (656-ft) water depth. The continental shelf is characterized by a gentle slope (about 0.1^{o}). This is different from the juridical term used in Article 76 of the Convention on the Law of the Sea (see the definition of Outer Continental Shelf).

Continental slope—The continental margin province that lies between the continental shelf and continental rise, characterized by a steep slope (about 3^{o}-6^{o}).

Critical habitat—Specific areas essential to the conservation of a protected species and that may require special management considerations or protection.

Crude oil—Petroleum in its natural state as it emerges from a well or after it passes through a gas-oil separator, but before refining or distillation. An oily, flammable, bituminous liquid that is essentially a complex mixture of hydrocarbons of different types with small amounts of other substances.

Delineation well—A well that is drilled for the purpose of determining the size and/or volume of an oil or gas reservoir.

Demersal—Living at or near the bottom of the sea.

Development—Activities that take place following discovery of economically recoverable mineral resources, including geophysical surveying, drilling, platform construction, operation of onshore support facilities, and other activities that are for the purpose of ultimately producing the resources.

Development and Production Plan (DPP)—A document that must be prepared by the operator and submitted to BOEM for approval before any development and production activities are conducted on a lease or unit in any OCS area other than the western Gulf of Mexico.

Development Operations Coordination Document (DOCD)—A document that must be prepared by the operator and submitted to BOEM for approval before any development or production activities are conducted on a lease in the western Gulf of Mexico.

Development well—A well drilled to a known producing formation to extract oil or gas; a production well; distinguished from a wildcat or exploration well and from an offset well.

Direct employment—Consists of those workers involved the primary industries of oil and gas exploration, development, and production operations (Standard Industrial Classification Code 13—Oil and Gas Extraction).

Discharge—Something that is emitted; flow rate of a fluid at a given instant expressed as volume per unit of time.

Dispersant—A suite of chemicals and solvents used to break up an oil slick into small droplets, which increases the surface area of the oil and hastens the processes of weathering and microbial degradation.

Dispersion—A suspension of finely divided particles in a medium.

Drilling mud—A mixture of clay, water or refined oil, and chemical additives pumped continuously downhole through the drill pipe and drill bit, and back up the annulus between the pipe and the walls of the borehole to a surface pit or tank. The mud lubricates and cools the drill bit, lubricates the drill pipe as it turns in the wellbore, carries rock cuttings to the surface, serves to keep the hole from crumbling or collapsing, and provides the weight or hydrostatic head to prevent extraneous fluids from entering the well bore and to downhole pressures; also called drilling fluid.

Economically recoverable resources—An assessment of hydrocarbon potential that takes into account the physical and technological constraints on production and the influence of costs of exploration and development and market price on industry investment in OCS exploration and production.

Effluent—The liquid waste of sewage and industrial processing.

Effluent limitations—Any restriction established by a State or the USEPA on quantities, rates, and concentrations of chemical, physical, biological, and other constituents discharged from point sources into U.S. waters, including schedules of compliance.

Epifaunal—Animals living on the surface of hard substrate.

Essential habitat—Specific areas crucial to the conservation of a species and that may necessitate special considerations.

Estuary—Coastal semienclosed body of water that has a free connection with the open sea and where freshwater meets and mixes with seawater.

Eutrophication—Enrichment of nutrients in the water column by natural or artificial methods accompanied by an increase of respiration, which may create an oxygen deficiency.

Exclusive Economic Zone (EEZ)—The maritime region extending 200 nmi (230 mi; 370 km) from the baseline of the territorial sea, in which the United States has exclusive rights and jurisdiction over living and nonliving natural resources.

Exploration Plan (EP)—A plan that must be prepared by the operator and submitted to BOEM for approval before any exploration or delineation drilling is conducted on a lease.

Exploration well—A well drilled in unproven or semi-proven territory to determining whether economic quantities of oil or natural gas deposit are present.

False crawls—Refers to when a female sea turtle crawls up on the beach to nest (perhaps) but does not and returns to the sea without laying eggs.

Field—An accumulation, pool, or group of pools of hydrocarbons in the subsurface. A hydrocarbon field consists of a reservoir in a shape that will trap hydrocarbons and that is covered by an impermeable, sealing rock.

Floating production, storage, and offloading (FPSO) system—A tank vessel used as a production and storage base; produced oil is stored in the hull and periodically offloaded to a shuttle tanker for transport to shore.

Gathering lines—A pipeline system used to bring oil or gas production from a number of separate wells or production facilities to a central trunk pipeline, storage facility, or processing terminal.

Geochemical—Of or relating to the science dealing with the chemical composition of and the actual or possible chemical changes in the crust of the earth.

Geophysical survey—A method of exploration in which geophysical properties and relationships are measured remotely by one or more geophysical methods.

Habitat—A specific type of environment that is occupied by an organism, a population, or a community.

Hermatypic coral—Reef-building corals that produce hard, calcium carbonate skeletons and that possess symbiotic, unicellular algae within their tissues.

Harassment—An intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, feeding or sheltering.

Hydrocarbons—Any of a large class of organic compounds containing primarily carbon and hydrogen. Hydrocarbon compounds are divided into two broad classes: aromatic and aliphatics. They occur primarily in petroleum, natural gas, coal, and bitumens.

Hypoxia—Depressed levels of dissolved oxygen in water, usually resulting in decreased metabolism.

Incidental take—Takings that result from, but are not the purpose of, carrying out an otherwise lawful activity (e.g., fishing) conducted by a Federal agency or applicant (see Taking).

Indirect employment—Secondary or supporting oil- and gas-related industries, such as the processing of crude oil and gas in refineries, natural gas plants, and petrochemical plants.

Induced employment—Tertiary industries that are created or supported by the expenditures of employees in the primary or secondary industries (direct and indirect employment), including consumer goods and services such as food, clothing, housing, and entertainment.

Infrastructure—The facilities associated with oil and gas development, e.g., refineries, gas processing plants, etc.

Jack-up rig—A barge-like, floating platform with legs at each corner that can be lowered to the sea bottom to raise the platform above the water.

Kick—A deviation or imbalance, typically sudden or unexpected, between the downward pressure exerted by the drilling fluid and the upward pressure of in-situ formation fluids or gases.

Landfall—The site where a marine pipeline comes to shore.

Lease—Authorization that is issued under Section 8 or maintained under Section 6 of the Outer Continental Shelf Lands Act and that authorizes exploration for, and development and production of, minerals.

Lease sale—The competitive auction of leases granting companies or individuals the right to explore for and develop certain minerals under specified conditions and periods of time.

Lease term—The initial period for oil and gas leases, usually a period of 5, 8, or 10 years depending on water depth or potentially adverse conditions.

Lessee—A party authorized by a lease, or an approved assignment thereof, to explore for and develop and produce the leased deposits in accordance with regulations at 30 CFR 250 and 30 CFR 550.

Lower marine riser package—The head assembly of a subsurface well at the point where the riser connects to a blowout preventer.

Macondo**—**Prospect name given by BP to the Mississippi Canyon Block 252 exploration well that the *Deepwater Horizon* rig was drilling when a blowout occurred on April 20, 2010.

***Macondo* spill—**The name given to the oil spill that resulted from the explosion and sinking of the *Deepwater Horizon* rig from the period between April 24, 2010, when search and recovery vessels on site reported oil at the sea surface, and September 19, 2010, when the uncontrolled flow from the Macondo well was capped.

Marshes—Persistent, emergent, nonforested wetlands characterized by predominantly cordgrasses, rushes, and cattails.

Military warning area—An area established by the U.S. Department of Defense within which military activities take place.

Minerals—As used in this document, minerals include oil, gas, sulphur, and associated resources, and all other minerals authorized by an Act of Congress to be produced from public lands as defined in Section 103 of the Federal Land Policy and Management Act of 1976.

Naturally occurring radioactive materials (NORM)—naturally occurring material that emits low levels of radioactivity, originating from processes not associated with the recovery of radioactive material. The radionuclides of concern in NORM are Radium-226, Radium-228, and other isotopes in the radioactive decay chains of uranium and thorium.

Nepheloid—A layer of water near the bottom that contains significant amounts of suspended sediment.

Nonattainment area—An area that is shown by monitoring data or by air-quality modeling calculations to exceed primary or secondary ambient air quality standards established by USEPA.

Nonhazardous oil-field wastes (NOW)—Wastes generated by exploration, development, or production of crude oil or natural gas that are exempt from hazardous waste regulation under the Resource Conservation and Recovery Act (*Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes,* dated June 29, 1988, 53 FR 25446; July 6, 1988). These wastes may contain hazardous substances.

Offloading—Unloading liquid cargo, crude oil, or refined petroleum products.

Operational discharge—Any incidental pumping, pouring, emitting, emptying, or dumping of wastes generated during routine offshore drilling and production activities.

Operator—An individual, partnership, firm, or corporation having control or management of operations on a leased area or portion thereof. The operator may be a lessee, designated agent of the lessee, or holder of operating rights under an approved operating agreement.

Organic matter—Material derived from living plants or animals.

Outer Continental Shelf (OCS)—All submerged lands that comprise the continental margin adjacent to the United States and seaward of State offshore lands.

Pelagic—Of or pertaining to the open sea; associated with open water beyond the direct influence of coastal systems.

Plankton—Passively floating or weakly motile aquatic plants (phytoplankton) and animals (zooplankton).

Platform—A steel or concrete structure from which offshore development wells are drilled.

Play—A prospective subsurface area for hydrocarbon accumulation that is characterized by a particular structural style or depositional relationship.

Primary production—Organic material produced by photosynthetic or chemosynthetic organisms.

Produced water—Total water discharged from the oil and gas extraction process; production water or production brine.

Production—Activities that take place after the successful completion of any means for the extraction of resources, including bringing the resource to the surface, transferring the produced resource to shore, monitoring operations, and drilling additional wells or workovers.

Province—A spatial entity with common geologic attributes. A province may include a single dominant structural element such as a basin or a fold belt, or a number of contiguous related elements.

Ram—The main component of a blowout preventer designed to shear casing and tools in a wellbore or to seal an empty wellbore. A blind shear ram accomplishes the former and a blind ram the latter.

Recoverable reserves—The portion of the identified hydrocarbon or mineral resource that can be economically extracted under current technological constraints.

Recoverable resource estimate—An assessment of hydrocarbon or mineral resources that takes into account the fact that physical and technological constraints dictate that only a portion of resources can be brought to the surface.

Recreational beaches—Frequently visited, sandy areas along the Gulf of Mexico shorefront that support multiple recreational activities at the land-water interface. Included are National Seashores, State Park and Recreational Areas, county and local parks, urban beachfronts, and private resorts.

Refining—Fractional distillation of petroleum, usually followed by other processing (e.g., cracking).

Relief—The difference in elevation between the high and low points of a surface.

Reserves—Proved oil or gas resources.

Rig—A structure used for drilling an oil or gas well.

Riser insertion tube tool—A "straw" and gasket assembly improvised during the Macondo spill response that was designed to siphon oil and gas from the broken riser of the *Deepwater Horizon* rig lying on the sea bottom (an early recovery strategy for the Macondo spill in May 2010).

Royalty—A share of the minerals produced from a lease paid in either money or "in-kind" to the landowner by the lessee.

Saltwater intrusion—Saltwater invading a body of freshwater.

Sciaenids—Fishes belonging to the croaker family (Sciaenidae).

Seagrass beds—More or less continuous mats of submerged, rooted, marine, flowering vascular plants occurring in shallow tropical and temperate waters. Seagrass beds provide habitat, including breeding and feeding grounds, for adults and/or juveniles of many of the economically important shellfish and finfish.

Sediment—Material that has been transported and deposited by water, wind, glacier, precipitation, or gravity; a mass of deposited material.

Seeps (hydrocarbon)—Gas or oil that reaches the surface along bedding planes, fractures, unconformities, or fault planes.

Sensitive area—An area containing species, populations, communities, or assemblages of living resources, that is susceptible to damage from normal OCS-related activities. Damage includes interference with established ecological relationships.

Shear ram—The component in a BOP that cuts, or shears, through the drill pipe and forms a seal against well pressure. Shear rams are used in floating offshore drilling operations to provide a quick method of moving the rig away from the hole when there is no time to trip the drill stem out of the hole.

Shoreline Cleanup and Assessment Team—The on-the-scene responders for post-spill shoreline protection who established priorities, standardized procedures, and terminology.

Spill of National Significance—Designation by the USEPA Administrator under 40 CFR 300.323 for discharges occurring in the inland zone and the Commandant of the U.S. Coast Guard for discharges occurring in the coastal zone, authorizing the appointment of a National Incident Commander for spill-response activity.

State coastal zone boundary—The State coastal zone boundaries for each CZMA-affected State are defined at http://coastalmanagement.noaa.gov/mystate/docs/StateCZBoundaries.pdf.

Structure—Any OCS facility that extends from the seafloor to above the waterline; in petroleum geology, any arrangement of rocks that may hold an accumulation of oil or gas.

Subarea—A discrete analysis area.

Subsea isolation device—An emergency disconnection and reconnection assembly for the riser at the seafloor.

Supply vessel—A boat that ferries food, water, fuel, and drilling supplies and equipment to an offshore rig or platform and returns to land with refuse that cannot be disposed of at sea.

Taking—To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any endangered or threatened species, or to attempt to engage in any such conduct (including actions that induce stress, adversely impact critical habitat, or result in adverse secondary or cumulative impacts). Harassments are the most common form of taking associated with OCS Program activities.

Tension-leg platform (TLP)—A production structure that consists of a buoyant platform tethered to concrete pilings on the seafloor with flexible cable.

Total dissolved solids—The total amount of solids that are dissolved in water.

Total suspended particulate matter—The total amount of suspended solids in water.

Total suspended solids—The total amount of suspended solids in water.

Trunkline—A large-diameter pipeline receiving oil or gas from many smaller tributary gathering lines that serve a large area; common-carrier line; main line.

Turbidity—Reduced water clarity due to the presence of suspended matter.

Volatile organic compound (VOC)—Any organic compound that is emitted to the atmosphere as a vapor.

Water test areas—Areas within the eastern Gulf where U.S. Department of Defense research, development, and testing of military planes, ships, and weaponry take place.

Weathering (of oil)—The aging of oil due to its exposure to the atmosphere, causing marked alterations in its physical and chemical makeup.

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