



# United States Department of the Interior

OFFICE OF THE SECRETARY

Washington, DC 20240

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RDML Tim Gallaudet, Ph.D., USN Ret.  
Assistant Secretary of Commerce for Oceans and Atmosphere  
and Acting Under Secretary of Commerce for Oceans and Atmosphere  
U.S. Department of Commerce  
Washington, D.C. 20230

Dear Dr. Gallaudet:

We received your request to evaluate the potential expansion of the Flower Garden Banks National Marine Sanctuary pursuant to Section 4(a) of Executive Order 13795, *Implementing an America-First Offshore Energy Strategy* (April 28, 2017).

In the enclosed document, the Bureau of Ocean Energy Management (BOEM) has responded to your request with a completed review of offshore energy and mineral resource potential within the designated area, as well as a review of the potential impacts that the proposed expansion will have on the development of those resources.

If you have any questions, please contact Dr. Walter D. Cruickshank, BOEM Acting Director, at (202) 208-6300 or [Walter.Cruickshank@boem.gov](mailto:Walter.Cruickshank@boem.gov).

Sincerely,

Joseph R. Balash  
Assistant Secretary  
Land and Minerals Management

Enclosure

**BOEM REVIEW OF OFFSHORE ENERGY AND MINERAL RESOURCES**

**POTENTIAL EXPANSION  
OF THE FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY**

**FEBRUARY 21, 2019**

**PUBLIC VERSION**

## EXECUTIVE SUMMARY

The proposed Flower Garden Banks National Marine Sanctuary (FGBNMS) expansion would likely result in a reduction in the Nation's recoverable oil and gas reserves. The existing FGBNMS affects 19 OCS lease blocks, in which there are 4 existing OCS oil and gas leases. The proposed expansion of the FGBNMS would affect 65 additional whole or partial OCS blocks (by incorporation into the FGBNMS and/or by distancing requirements for bottom disturbing activity) and 8 additional OCS oil and gas leases, totaling 84 OCS lease blocks and 12 OCS oil and gas leases affected by the proposed expanded FGBNMS. Some areas included in the proposed FGBNMS expansion are comprised of muddy seafloor, which are areas where the Bureau of Ocean Energy Management (BOEM) can currently permit oil and gas activity. With the proposed FGBNMS expansion, the National Oceanic and Atmospheric Administration (NOAA) would still allow OCS oil and gas leasing, however, OCS oil and gas activity on the muddy seafloor would become more restricted and costly for OCS oil and gas lessees. The restrictions and increased costs for OCS oil- and gas-related activities in an expanded FGBNMS would likely negatively impact the development of oil and gas resources on existing leases, and may negatively impact future lease sales within the FGBNMS. A negative impact on future lease sales would likely lead to a reduction in revenue to the Federal Government.

The following information concerns only the 65 OCS blocks that would be affected by in the FGBNMS if the proposed expansion were approved:

### *Oil and Gas Resources within the Proposed Expansion Boundaries*

- Approximately 0.11 million barrels of oil equivalent (MMBOE) of reserves, 3.86 MMBOE of contingent resources, and 4.50 MMBOE of undiscovered resources

### *Restrictions within the Proposed Expansion Boundaries*

- NOAA would allow leasing in the proposed FGBNMS expansion areas; however, NOAA has restrictions on seafloor disturbance within a National Marine Sanctuary.
  - Restrictions on new oil and gas on-site drilling and structure and pipeline emplacement within the expanded FGBNMS would require lessees to directionally drill from outside the FGBNMS to oil and gas resources within the FGBNMS and to route new pipelines around the expanded FGBNMS, both of which are costly and time consuming.
- Individual United States Environmental Protection Agency's (USEPA) Region 6 National Pollutant Discharge Elimination System (NPDES) permits would need to be obtained for all new oil and gas activities within the expanded FGBNMS. No discharge within the FGBNMS would be permitted under the NPDES general permit, except for those structures installed prior to the designation of the Sanctuary.
  - Individual NPDES permits may be more restrictive than a general NPDES permit and obtaining one may be costly and time consuming.

#### *Leasing Aspects within the Proposed Expansion Boundaries*

- \$97 million in bonus bids have already been received for the leases affected by the proposed FGBNMS expansion areas.
- 8 OCS blocks are currently leased, with 7 existing structures and 45 active wells; 8 additional wells have been approved to drill.
- Lessees might argue that new restrictions on discharge and structure emplacement in the expanded FGBNMS render it uneconomic to recover all resources on existing leases. Unless NOAA and USEPA build in protections for valid existing rights, lessees might pursue claims for breach of contract or takings, leading at minimum to litigation costs for the government.

#### *Additional Cost to Develop Resources within the Proposed Expansion Boundaries*

- If technically and economically feasible, operators could directionally drill to resources within the Sanctuary from locations outside of the Sanctuary.
  - It is estimated to cost \$3.24 million to directionally drill to reserves and contingent resources within the proposed FGBNMS expansion areas.
- New pipelines would need to be routed around the expanded FGBNMS.
  - It is estimated to cost \$0.97 million to route new pipelines around the proposed FGBNMS expansion in order to obtain reserves and contingent resources.
- If operators choose to drill within the expanded FGBNMS, they could apply for individual NPDES permits, which could be costly and time consuming.

#### *Revenue Loss to the Federal Government*

- New restrictions on discharge and bottom-disturbing activities may result in reduced leasing for blocks within an expanded FGBNMS, reducing bonus and royalty potential for the Federal Government.
  - At least \$12 million in future bonus bids could be lost (conservative estimate based on minimum bid amount for unleased blocks) for blocks affected by the proposed FGBNMS expansion areas.
  - From \$8.1 million to \$40.5 million in total potential royalties could be lost for undiscovered resources in the proposed FGBNMS expansion areas.
- With reduced leasing, there may be a reduction in the Nation's available oil and gas reserves because the oil and gas reserves would be stranded.

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## 1.0 INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA), Office of National Marine Sanctuaries has proposed to expand the Flower Garden Banks National Marine Sanctuary (FGBNMS) in the Gulf of Mexico (GOM). This document presents the results of a Bureau of Ocean Energy Management (BOEM) review of the impacts of the proposed expansion areas on offshore energy or mineral resources. As required under Section 4(a) of Executive Order 13795, *Implementing an America-First Offshore Energy Strategy* (April 28, 2017), this document focuses on offshore energy from wind, oil, natural gas, and methane hydrates. BOEM has also included information regarding potential impacts on offshore marine minerals.

### 1.1 BACKGROUND INFORMATION PERTINENT TO THIS CONSULTATION

In its Draft Environmental Impact Statement (EIS), which was published on June 10, 2016, NOAA analyzed five alternatives for the Sanctuary boundaries. The alternatives ranged from a “No Action Alternative” that would maintain the Sanctuary at its current size of approximately 56 mi<sup>2</sup> affecting 19 OCS blocks to an alternative encompassing the largest area expanding the Sanctuary to approximately 935 mi<sup>2</sup> affecting 253 OCS blocks. NOAA’s designated “Preferred Alternative” in the Draft EIS proposed to expand the Sanctuary to approximately 383 mi<sup>2</sup> affecting 105 OCS blocks.

BOEM was a Cooperating Agency on the EIS; and requested that the impacts of Sanctuary expansion on offshore energy be analyzed in the Draft EIS. However, NOAA’s schedule did not allow for the additional analysis and the Draft EIS did not adequately address or analyze the potential impacts of a Sanctuary expansion on offshore energy. Therefore, BOEM conducted its own analysis of the potential impacts to offshore energy in Alternative 3 (NOAA’s preferred alternative) and Alternative 5 (the largest expansion alternative) of the Draft EIS. BOEM provided this analysis to NOAA on November 17, 2016, for use in the Final EIS. BOEM later met with NOAA on February 10, 2017, to discuss the results of BOEM’s analyses. NOAA has not provided a publication date for the Final EIS.

Following the close of the comment period on the Draft EIS, the FGB Sanctuary Advisory Council’s (Council) Boundary Expansion Working Group (BEWG) began an effort to provide a new boundary recommendation to NOAA. On May 9, 2018, the FGB Council voted to accept the BEWG’s expansion recommendation. The recommended boundaries are smaller than NOAA’s Preferred Alternative in their Draft EIS. NOAA then finalized the FGB Council’s proposed boundaries, with a small change for consistency with the current Sanctuary boundaries. The proposed expansion would add approximately 104 mi<sup>2</sup> to the FGBNMS, bringing the total FGBNMS to just over 160 mi<sup>2</sup>. NOAA’s finalization of the FGB Council’s proposed boundaries resulted in final boundaries for the proposed FGBNMS expansion, and allowed initiation of the consultation with BOEM under E.O. 13795. The following analysis was conducted for NOAA’s final FGBNMS proposed expansion boundary.

## 2.0 ANALYSIS

### 2.1 EXISTING FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY

**Figure 1** shows the existing FGBNMS. The Sanctuary is composed of three topographic features: East Flower Garden Bank; West Flower Garden Bank; and Stetson Bank. Currently, there are 17 Outer Continental Shelf (OCS) blocks wholly or partially within the existing FGBNMS. There are 19 OCS blocks affected as a result of BOEM's policy to distance bottom disturbing activity from the FGBNMS. Those blocks are shown in pink in **Figure 1**. In addition, there are currently four active oil and gas leases partially within or affected by the existing FGBNMS boundaries. These active oil and gas leases are outlined in yellow in **Figure 1**. No new oil and gas leasing is permitted within the 17 OCS blocks that are wholly or partially within the FGBNMS, as they have been withdrawn from leasing through a Presidential Memorandum dated July 14, 2008. There are no active renewable energy or marine mineral leases in the existing FGBNMS.

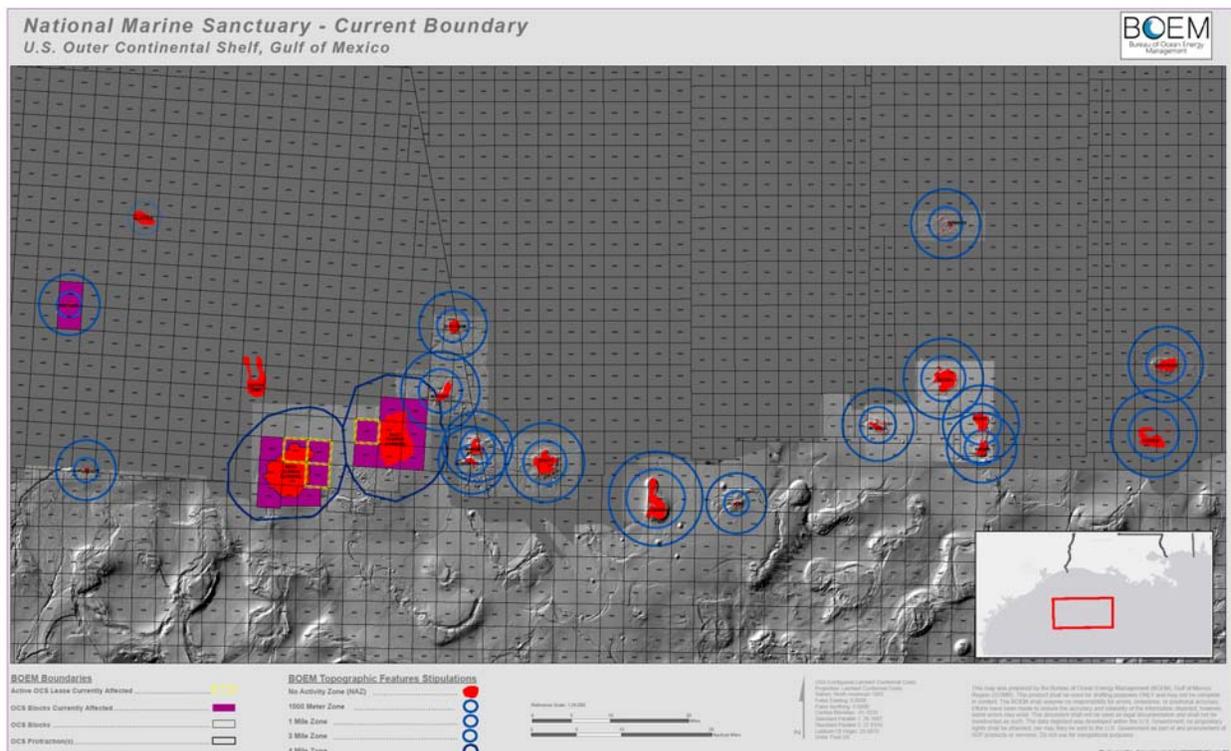


Figure 1. Current Flower Garden Banks National Marine Sanctuary.

### 2.2 PROPOSED EXPANSION OF THE FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY

NOAA is proposing to expand the FGBNMS boundaries to include several additional topographic features in the Gulf of Mexico. The FGBNMS and the proposed expansion areas are located in two BOEM OCS planning areas: the Western Planning Area and Central Planning Area, both of which are in the BOEM Gulf of Mexico OCS region. **Figure 2** shows the outline of the proposed FGBNMS expansion boundary in light blue.

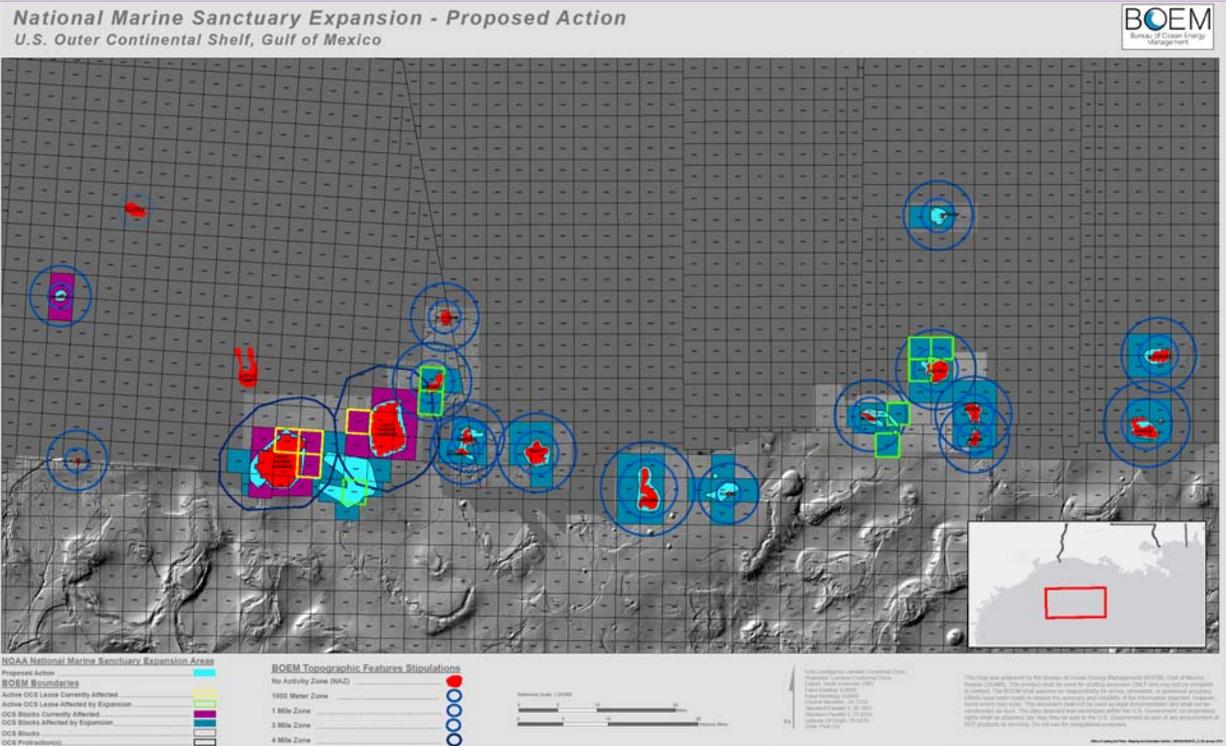


Figure 2. Flower Garden Banks National Marine Sanctuary Proposed Boundary Expansion.

The areas proposed for the FGBNMS expansion (light blue, **Figure 2**) have OCS oil and gas potential, as well as current OCS oil- and gas-related activity. There is an estimated 0.11 million barrels of oil equivalent (MMBOE) of reserves, 3.86 MMBOE of contingent resource potential, and 4.50 MMBOE of undiscovered resource potential in the proposed FGBNMS expansion areas. Leasing OCS blocks for the production of these resources provides revenue for the Federal Government. Further details on resource and leasing potential, as well as revenue through bonuses and royalties for the Federal Government, are discussed in Sections 2.2.1.1 (“Potential Leasing Impacts”) and 2.2.1.2 (“Potential Oil and Gas Resource Impacts”) below.

NOAA’s proposed FGBNMS expansion will affect 65 OCS blocks (shown in dark blue in **Figure 2**) by incorporating them wholly or partially into the FGBNMS or by distancing requirements for bottom disturbing activity that BOEM implements through lease stipulations around the FGBNMS and other topographic features that are based on an Essential Fish Habitat (EFH) Programmatic Consultation with NOAA Fisheries. Under the proposed expansion, there would be a total of 84 OCS blocks (19 existing and 65 new) wholly or partially affected by the expanded FGBNMS. Eight of those 65 OCS blocks are currently leased for oil and gas activities. Those 8 active oil and gas leases (outlined in green in **Figure 2**) would be partially incorporated into or affected by the expanded FGBNMS, resulting in a total of 12 active oil and gas leases (4 existing and 8 new) partially within or affected by the FGBNMS. No renewable energy or marine mineral leases would be incorporated into the expanded FGBNMS.

The GOM has a mature oil and gas leasing program and BOEM has been protecting sensitive biological features in the GOM for decades through stipulations attached to leases that require bottom-disturbing activity be distanced from sensitive seafloor features. BOEM stipulations also

require that drill cuttings near sensitive seafloor features be shunted to the seafloor to prevent the smothering of topographic features. Shunting the cuttings to the seafloor, rather than releasing them at the sea surface, deposits the cuttings below the sensitive habitat at the crests of the topographic features. In addition, site-specific seafloor reviews are conducted before permits are issued, and mitigations are applied as conditions of approval to permits to ensure that bottom-disturbing activity is distanced from sensitive seafloor features. As a result of BOEM's protective measures for sensitive seafloor features, BOEM only permits oil and gas activities on muddy or sandy seafloor, and does not allow these activities to occur near sensitive seafloor features.

Through the stipulations and mitigations of BOEM's OCS Oil and Gas Leasing Program, BOEM already protects the biological features proposed for inclusion in the expanded FGBNMS boundaries from bottom-disturbing oil and gas activity. **Figures 1 and 2** show BOEM's No Activity Zones in red, in which no bottom-disturbing activity from oil and gas is permitted. In addition, BOEM places buffers around the No Activity Zones to further distance bottom-disturbing oil and gas activities from these sensitive seafloor features. For many topographic features proposed for inclusion into the FGBNMS, the proposed Sanctuary boundary (light blue) is not much larger than BOEM's existing No Activity Zone (red). There are, however, a few areas where the proposed FGBNMS boundary is noticeably larger than or outside of a BOEM No Activity Zone. There are also a few muddy seafloor areas within the proposed FGBNMS expansion boundaries in which BOEM can currently permit oil and gas bottom-disturbing activities, provided they are sufficiently distanced from sensitive seafloor features.

BOEM conducts site-specific seafloor reviews and applies its Topographic Features Stipulation to every lease within a Topographic Features Stipulation block (i.e., those blocks that intersect the blue circles surrounding the topographic features in **Figures 1 and 2**). BOEM currently conducts these site-specific seafloor reviews in every block in which the proposed FGBNMS could occur. Following a site-specific seafloor review, BOEM may apply mitigations attached as conditions of approval to oil and gas permits that distance oil and gas bottom-disturbing activity from all sensitive benthic features outside of BOEM's No Activity Zones surrounding topographic features. Although BOEM's mitigations and stipulations distance oil and gas bottom-disturbing activity from sensitive seafloor features, BOEM does allow oil and gas bottom-disturbing activities, such as drilling or pipeline emplacement, on muddy seafloor outside of BOEM's protective buffers. If the proposed FGBNMS expansion occurred, these activities would not be permitted on the muddy seafloor of the expanded area due to USEPA restrictions on discharge and Sanctuary restrictions on seafloor structures in a Sanctuary.

The 65 additional OCS blocks (dark blue blocks in **Figure 2**) wholly or partially affected by the proposed expanded FGBNMS would not be excluded or withdrawn from leasing. However, new restrictions on structure and pipeline emplacement, as well as discharges, would be imposed on oil and gas activity within the proposed boundaries of the FGBNMS (light blue features in **Figure 2**) because those areas would be incorporated into the FGBNMS. Further, new pipelines, not associated with current OCS activity in the Sanctuary, would not be permitted to pass through the expanded Sanctuary. Most importantly, bottom-disturbing drilling activity and discharge would no longer be permitted in the expanded Sanctuary due to the United States Environmental Protection Agency's (USEPA) Region 6 National Pollutant Discharge Elimination System (NPDES) general permits.

Permits required for discharge (including shunting of drill cuttings) are covered under a USEPA NPDES general permit. Under the Region 6 NPDES general permit (which covers the area within the proposed expansion boundaries), no discharge is allowed in a National Marine Sanctuary, except for those structures installed prior to the designation of the Sanctuary. This restriction would essentially eliminate new oil and gas on-site drilling, structure placement, and discharge in the expanded FGBNMS. Operators could apply for individual NPDES permits to discharge in the Sanctuary, but this is expected to be costly and time consuming, resulting in reduced leasing.

The eight OCS lease blocks with the bright green outline in **Figure 2** are those blocks that are currently leased for oil and gas activity and that could experience more restrictive conditions as a result of the proposed FGBNMS expansion. For example, within those 8 OCS lease blocks, 20 exploration and development plans have been approved for activities that include the drilling of 53 new wells. Currently, 45 of the wells have been drilled, but 8 have not yet been drilled. Permitted wells located within the proposed FGBNMS expansion areas that are not drilled and their associated structures or pipelines that are not in place at the time of the FGBNMS expansion will not be allowed to proceed as currently permitted due to additional discharge and bottom-disturbing restrictions in the expanded Sanctuary. In addition, there are currently 45 active wells on the 8 leased OCS blocks that have not been permanently abandoned and still have the potential to produce oil and gas. Additional operations on any existing well located within the proposed FGBNMS expansion areas could also experience new restrictions. Although operators could apply for an individual NPDES permit to discharge within the expanded Sanctuary, the process could be costly and time consuming, and there would still be restrictions on bottom-disturbing activities within the Sanctuary. More details on BOEM's active leases within the proposed FGBNMS expansion areas are provided in Section 2.2.1.1 ("Potential Leasing Impacts") below.

Any of the 57 unleased OCS blocks that are wholly or partially affected by the proposed FGBNMS expansion areas (dark blue blocks in **Figure 2**) could experience more restrictive oil and gas activity conditions if they are leased following the expansion of the FGBNMS. This is especially true for muddy seafloor areas within the expanded Sanctuary boundaries where BOEM may permit oil and gas activity, provided it is sufficiently distanced from sensitive seafloor features. This activity would not be permitted in the expanded Sanctuary due to the restrictions on discharge and seafloor structures in the Sanctuary. An individual NPDES permit may be obtained, but there would still be restrictions on bottom-disturbing activities.

If technically and economically feasible, operators could avoid the discharge and pipeline issues within the expanded FGBNMS by directionally drilling from outside the boundaries to oil and gas resources within the Sanctuary. However, there would be additional cost associated with directional drilling and routing new pipelines around the expanded Sanctuary. A further discussion of oil and gas resources in the proposed FGBNMS expansion areas, along with the anticipated additional cost for directional drilling and routing new pipelines around the proposed FGBNMS, are discussed in Section 2.2.1.2 ("Potential Oil and Gas Resource Impacts") below. New restrictions on oil and gas activities within the proposed FGBNMS expansion areas, as well as potential additional costs to obtain oil and gas resources within the proposed FGBNMS boundaries, may result in reduced leasing in the OCS blocks incorporated into the expanded

FGBNMS. Reduced leasing could result in a reduction in the Nation’s available oil and gas reserves.

## 2.2.1 BOEM Review of Potential Offshore Oil and Gas Impacts

### 2.2.1.1 Potential Leasing Impacts

Lessees for the eight currently active oil and gas leases affected by the proposed expansion areas of the FGBNMS might argue that new restrictions on discharge and structure emplacement in the expanded FGBNMS render it uneconomic to recover all resources on existing leases. Unless NOAA and USEPA build in protections for valid existing rights, lessees might pursue claims for breach of contract or takings, leading at minimum to litigation costs for the government. The total amount of bonus collected for these leases is \$97 million. Refer to **Table 1** for a listing of the specific leases and bonus information.

Table 1. Active Lease Information Affected by the Proposed FGBNMS Expansion Areas

Lease Sale No.	Lease Sale Date	Lease Number	Royalty Rate (%)	Rental (\$/acre)	Bonus (\$)	Lease Status	Acreage
25	12/19/1972	G02275	16.67	3.00	7,833,000	UNIT	5000
26	6/19/1973	G02429	16.67	3.00	45,786,240	UNIT	5760
26	6/19/1973	G02433	16.67	3.00	38,077,978	UNIT	5760
113	3/30/1988	G09524	16.67	3.00	1,343,000	UNIT	5000
135	8/21/1991	G13363	16.67	3.00	3,713,131	PROD	5760
152	5/10/1995	G15212	16.67	5.00	373,750	PROD	5000
238	8/20/2014	G35496	18.75	7.00	162,018	PRIMARY	5760
250	3/21/2018	G36201	12.5	7.00	128,500	PRIMARY	5000
<b>Total Bonus: \$97,417,617</b>							
<b>Total Acres: 43,040</b>							

The proposed expansion area also affects 57 unleased OCS blocks that encompass approximately 267,000 acres (**Table 2**). If these 57 unleased OCS blocks become unavailable for leasing, or if operators choose not to lease them based on additional potential oil and gas restrictions within the proposed expanded FGBNMS, there could be a loss of revenue to the Federal Government. One of the forms of revenue is the bonus bid. A bonus bid is the winning highest dollar amount paid at the time of a lease sale. If a minimum bid amount for the unleased acreage is assumed, it would result in potentially \$12 million in lost bonuses collected for the proposed FGBNMS expansion areas (**Table 2**). However, this is a very conservative estimate of potential bonus for unleased area in the proposed FGBNMS expansion areas given that the bonuses collected for currently leased blocks in the proposed FGBNMS expansion areas has totaled \$97 million for only eight blocks (**Table 2**).

Table 2. Leased and Unleased Bonus Information Affected by the Proposed FGBNMS Expansion Areas

	No of Blocks Affected	No. of Blocks Leased	Leased Acreage	No. of Blocks Unleased	Unleased Acreage	Bonus Received for Leased	Potential Bonus on Unleased*
Proposed Expansion Area	65	8	43,040	57	267,000	\$97,000,000	\$12,000,000

\* Bonus calculated using minimum bid amount for unleased blocks.

If the potential resource volume within the FGBNMS could be recovered by directionally drilling wells from a surface location outside of the FGBNMS expansion areas, then the economic loss to the Federal Government from a potential reduction in leasing OCS blocks in the expanded FGBNMS may be greatly reduced. However, this would only be applicable if the resource potential under the expanded FGBNMS blocks is allowed to be accessed from areas outside of the Sanctuary and that it is technically and economically feasible to obtain. There would also be additional costs expected for drilling these wells, which would be assumed by the operators. Refer to the “Potential Oil and Gas Resource Impacts” section for additional costs to obtain resources within the proposed expanded FGBNMS.

In addition to the 8 active leases, there are currently 45 active wells that have not been permanently abandoned with a surface location on blocks affected by the proposed FGBNMS expansion areas (**Table 3**). These wells still have the potential to produce oil and gas. The estimated cost to drill these wells using current year data is approximately \$450 million (**Table 3**). There are also seven existing structures with an estimated cost of \$750 million on blocks affected by the proposed FGBNMS expansion areas (**Table 3**). These would be sunk costs for work already conducted on the leases if production is not permitted on these wells on blocks affected by the expanded FGBNMS. Additionally, in the proposed FGBNMS expansion areas, 8 additional wells have been permitted, but have not yet been drilled.

Table 3. Well, Structure, and Cost Information for Possible Oil and Gas Activities Affected by the Proposed FGBNMS Expansion Areas

	Active Wells	Existing Structures	Approved Plan Wells	Remaining Plan Wells	Estimated Cost for Existing Wells	Estimated Cost for Existing Structures
Proposed Expansion Area	45	7	53	8	\$450,000,000	\$750,000,000

### 2.2.1.2 Potential Oil and Gas Resource Impacts

An inventory of oil and gas reserves and contingent resources was performed, and estimates of undiscovered resource potential were developed for the proposed FGBNMS expansion areas. The inventory of oil and gas reserves and contingent resource volumes for the proposed FGBNMS expansion areas was compiled from BOEM’s field study database. Field studies are

developed for every oil and gas field discovered on the Gulf of Mexico OCS by BOEM’s Reserves Inventory Program. Data and information used to estimate undiscovered resource potential were derived from three main sources: (1) existing proprietary oil and gas property appraisal studies; (2) geological and geophysical prospecting studies initiated to review proposed Sanctuary expansion alternatives conducted by this office in 2016; and (3) reserves inventory studies available on select OCS blocks located within the proposed Sanctuary expansion areas. Due to the level of uncertainty associated with undiscovered resource estimates, a range of potential values is presented. **Tables 4-6** show the reserves, contingent resources, and undiscovered resources.

Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria, i.e., they must be discovered, recoverable, commercial, and remaining (as of a given date) based on the development project(s) applied. The total reserves in the proposed FGBNMS expansion areas are approximately 0.11 MMBOE (**Table 4**).

Table 4. Reserves in the Proposed FGBNMS Expansion Areas

<b>Reserves</b>			
<b>Reservoir Class</b>	<b>Oil (bbl)</b>	<b>Gas (Mcf)</b>	<b>BOE</b>
Total Reserves	50,121	327,396	108,377

Contingent resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations by application of development projects, but which are not currently considered to be commercially recoverable due to one or more contingencies. The total contingent resources in the proposed FGBNMS expansion areas are approximately 3.86 MMBOE (**Table 5**).

Table 5. Contingent Resources in the Proposed FGBNMS Expansion Areas

<b>Contingent Resources</b>			
<b>Reservoir Class</b>	<b>Oil (bbl)</b>	<b>Gas (Mcf)</b>	<b>BOE</b>
Total Contingent Resources	89,769	21,206,328	3,863,136

Undiscovered resources are resources postulated, on the basis of geologic knowledge and theory, to exist outside of known fields or accumulations. Included also are resources from undiscovered pools within known fields to the extent that they occur within separate plays. Undiscovered hydrocarbon resource potential exists in the proposed FGBNMS expansion areas both within reservoirs associated with established and proven geologic plays, as well as resources in potential reservoirs that are thought to exist in conceptual geologic plays. The mean total undiscovered resource potential in the proposed FGBNMS expansion areas is approximately 4.50 MMBOE (**Table 6**). The undiscovered resource potential could become

stranded, or unobtainable, if there are restrictions to oil and gas activities within the proposed FGBNMS expansion areas.

Table 6. Undiscovered Resources in the Proposed FGBNMS Expansion Areas

<b>Undiscovered Resources</b>	
<b>Reservoir Class</b>	<b>Mean (BOE)</b>
Total Undiscovered Resources	4,500,000

BOEM developed a methodology to estimate the level of impact that the proposed FGBNMS expansion is expected to have on the development of the potential resources that may exist within the boundaries of the proposed expansion areas. Impact analysis has three components: (1) resource-access impact; (2) private sector opportunity-cost impact; and (3) public sector opportunity-cost impact. The private sector opportunity-cost component is associated with the cost of exploration and development of the resource. The public sector opportunity-cost component is associated with forgone royalty.

Undiscovered oil and gas resources situated on acreage included in the proposed Sanctuary expansion area become stranded when the acreage is no longer available for lease. BOEM’s impact analysis uses the volume of undiscovered oil and gas resources that could potentially remain stranded on acreage as a measure of the level of impact the proposed expansion area may impose on the development of energy resources. There is no impact on resource-access for reserves or contingent resources since these two categories of resources are only applicable to resources on leased acreage. Therefore, resources on leased acreage are not stranded. The measure of impact for the resource-access impact component is expressed in terms of the *volume of undiscovered oil and gas resources* stranded and is reported in barrels of oil equivalent (BOE). The results of the resource-access impact analysis are presented in **Table 7**.

Table 7. Resource Access Impact in the Proposed FGBNMS Expansion Areas

<b>Resource Access Impact Analysis</b>	
<b>Reservoir Class</b>	<b>Mean (BOE)</b>
Total Undiscovered Resources	4,500,000

Payments on production from leases, or royalties, can add great revenue to the Federal Treasury. Once production starts on a lease, the government receives a royalty payment. The royalty rate is a percentage of production. The royalty rate is used to calculate the royalty payment, i.e., the dollar amount paid based on the value of the amount of production. The undiscovered resources in the proposed FGBNMS expansion areas have a substantial royalty value.

The government would incur a public sector opportunity-cost if the FGBNMS is expanded. Public sector opportunity-cost impact analysis was conducted by converting natural gas volumes to BOE, calculating the sales value of the total volume of potentially forgone production. Our analyses used a wellhead product sales value of 50 \$US per BOE. The royalty value was

calculated using a product delivery cost estimate of 2 \$US per BOE and a royalty rate of 18.75 %. The sale of the entire volume was assumed to occur in Q4 2018.

Royalty values were calculated for an estimated 20% probability of success (Ps) and 100% Ps for obtaining the undiscovered resource potential. The total potential royalty value for the undiscovered resources within the proposed FGBNMS expansion areas ranges from \$8.1 million to \$40.5 million for the estimated 20% and 100% Ps (**Table 8**).

Table 8. Royalty Value for Undiscovered Resources within the Proposed FGBNMS Expansion Areas

<b>Opportunity Cost Impact Analysis – Public Sector</b>				
<b>Foregone Royalty</b>				
<b>Bank</b>	<b>Volume (BOE) Mean Estimate</b>	<b>Sales Value Wellhead Price = 50 \$US</b>	<b>Opportunity Cost Royalty (\$US) Estimate @ Ps = 1.00</b>	<b>Opportunity Cost Royalty (\$US) Estimate @ Ps = 0.20</b>
Total Volume Sold: Q4 2018 Product Delivery Cost: 2 \$US/BOE	4,500,000	\$225,000,000	\$40,500,000	\$8,100,000

As discussed earlier in this document, restrictions on structure and pipeline emplacement, as well as discharge, within the proposed FGBNMS expansion areas could lead to some oil and gas activities occurring outside of the proposed FGBNMS expansion areas. Additional costs were calculated for drilling wells from surface locations that are outside of the proposed FGBNMS boundaries in order to access reserves and resources located within the proposed FGBNMS expansion boundary. The activity cost information used to conduct the private sector opportunity-cost impact analysis was generated by developing cost estimates for the additional cost associated with relocation of pipelines and wells. The private sector opportunity-cost is incurred by private industry, mainly oil and gas companies and pipeline companies. ArcGIS was used to relocate pipelines that were within the proposed sanctuary areas and calculate the additional pipeline mileage required. Cost estimates were derived for the increased mileage using Questor software. Cost estimates for changes to drilling locations were also developed using Questor software. A measurement of the additional step-out drill-location distance required was determined, followed by a calculation of the additional well depth needed, and then a cost was calculated based on Questor’s drill cost data. In order to develop the reserves and contingent resources within the proposed FGBNMS expansion areas by directional drilling from surface locations outside of the proposed FGBNMS boundaries, it would cost an additional \$3.24 million (**Table 9**).

Table 9. Estimates of Additional Cost to Develop Reserves and Contingent Resources within the Proposed FGBNMS Expansion Areas

<b>Opportunity Cost Impact Analysis – Private Sector</b>			
<b>Reserves and Contingent Resources</b>			
<b>Bank</b>	<b>Opportunity Cost Drilling (\$MM)</b>	<b>Opportunity Cost Pipeline (\$MM)</b>	<b>Opportunity Cost Total (\$MM)</b>
Total	\$3.24	\$0.97	\$4.21

Additional cost associated with rerouting oil and gas pipelines outside the proposed FGBNMS expansion areas were also calculated. During our analyses, there were situations where changes were required to the pipeline installation plan so that oil and gas pipelines remained outside of the proposed Sanctuary expansion areas. In addition, there were also situations where the surface location of exploration and development wells were within the boundaries of the proposed expansion areas. For these cases, the well locations were moved outside of the proposed sanctuary areas, and the measured depth of the well was increased to compensate for the change of location. Cost estimates for pipeline impacts were developed by first using ArcGIS to spatially reroute pipelines outside of the proposed FGBNMS expansion areas and calculate additional pipeline mileage required to avoid proposed FGBNMS expansion areas followed by introducing the increased mileage estimate to cost functions derived using Questor software. In order to obtain the reserves and contingent resources within the proposed FGBNMS expansion areas by rerouting new pipelines around the proposed FGBNMS boundaries, it would cost an additional \$0.97 million (**Table 9**).

**2.2.2 BOEM Review of Potential Offshore Wind Impacts**

Activities prohibited in the FGBNMS include drilling into, dredging, or otherwise altering the seabed of the Sanctuary (except by anchoring); or constructing, placing, or abandoning any structure, material, or other matter on the seabed of the Sanctuary. Because drilling into, dredging, altering, constructing, or abandoning structures on the seabed of the FGBNMS would not be permitted, any OCS block that becomes part of the FGBNMS as a result of expansion would not be available for renewable energy leasing.

Very little is known about the renewable energy resource potential of the Gulf of Mexico OCS. Based on earlier studies conducted by the National Renewable Energy Laboratory (NREL) in Colorado, the greatest renewable energy resource potential was found in wind energy regimes located in the Western Planning Area off south Texas (Musial et al., 2016).

**Figure 3** shows the wind speed potential in the GOM. The wind speed potential in the areas near the FGBNMS and proposed expansion areas is approximately 7.00-8.00 meters per second (m/s) (15-18 miles per hour [mph]). This is near the low end of wind speed potential for the United States; therefore, BOEM would not expect interest for offshore wind leasing in the area of the current or expanded FGBNMS.

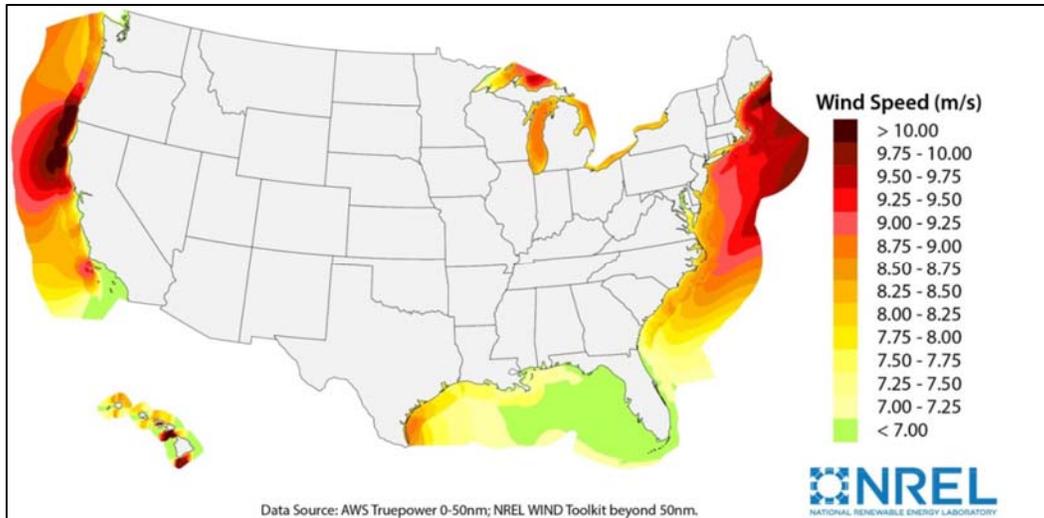


Figure 3. Offshore Wind Resource Data (Musial et al., 2016).

In 2017, NREL began exploring the feasibility of offshore renewable energy in the GOM in a study commissioned by BOEM. The study includes the Western and Central Planning Areas. Together with BOEM and its partners, NREL will select the most viable renewable energy technology in the GOM and perform more detailed economic and site-specific analysis to determine the cost and feasibility of a defined technology scenario. If the FGBNMS were to be expanded and wind energy potential were discovered, wind energy projects would not be permitted in the proposed FGBNMS expansion areas because drilling into, dredging, altering, constructing, or abandoning structures on the seabed are prohibited activities in the FGBNMS. Currently, however, it is unlikely that any large-scale wind energy facility would be built in an expanded FGBNMS, which is in an area that lacks wind resources and an area distant from shore, which presents electrical transmission challenges.

### 2.2.2.1 Alternate Use Impacts

The Gulf of Mexico Alliance has secured funding for conceptual development and a possible feasibility study to consider the use and re-purposing of decommissioned oil and gas platforms for scientific research and monitoring. The purpose of this study is to provide a general overview of the approval process for the alternative use of existing oil and gas platforms. The Gulf of Mexico Alliance has been in discussions with Chevron USA Inc. (Chevron) for the use of re-purposing the Garden Banks Block 189 platform, which is located less than 10 miles from the FGBNMS. Chevron's lease G06358 terminated in June 2016. Chevron submitted a decommissioning application and reef-in-place proposal for the existing platform in September 2015. The Artificial Reef Permit area was approved by U.S. Army Corp of Engineers; however, during the decommissioning review and approval process, BOEM requested additional information from Chevron to provide an archaeological survey for all areas proposed with bottom disturbances, including anchors and site clearance, as well as the proposed reefing location. This application has not moved forward since November 2015.

### **2.2.3 BOEM Review of Potential Offshore Marine Minerals Impacts**

The area of the proposed FGBNMS expansion is too far offshore for BOEM’s marine mineral resources. BOEM does not have any sand borrow sites that far offshore.

### **2.2.4 BOEM Review of Potential Methane Hydrates Impacts**

BOEM has assessed the potential for methane hydrate resources in the proposed expansion areas of the FGBNMS. Due to the shallow-water depth of the proposed expansion areas, the formation of methane hydrate in the subsurface is unlikely. Therefore, BOEM finds that the mean volume of in-place and technically recoverable methane hydrate resources in the proposed expansion areas is zero. The potential impact on the development of methane hydrate resources in the area of the FGBNMS’s proposed expansion would be negligible.

## **3.0 REFERENCES**

Musial, W., D. Heimiller, P. Beiter, G. Scott, and C. Draxl. 2016. 2016 Offshore Wind Energy Resource Assessment for the United States. National Renewable Energy Laboratory, Golden, CO. Contract No. DE-AC36-08GO28308. Prepared under Task No. WE15.5C01. Technical Report NREL/TP-5000-66599. xi + 76 pp.