UNITED STATES GOVERNMENT October 5, 2020
MEMORANDUM

To: Public Information
From: Plan Coordinator, OLP, Plans Section (GM 235D)

Subject: Public Information copy of plan

Control #	-	Control R-6955
Type	-	Revised Exploration Plan
Lease(s)	-	OCS-G 09821 Block - 520 Mississippi Canyon Area
Operator	-	BP Exploration & Production Inc.
Description	–	Subsea Wells C, E, F, G, H, and I
Rig Type	-	Drillship

Attached is a copy of the subject plan.

It has been deemed submitted and is under review for approval.

Michelle Griffitt Evans
Plan Coordinator

BP Exploration & Production Inc.

Revised Exploration Plan
Mississippi Canyon Block 520
(OCS-G 09821)

"Herschel Expansion"

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1	08/10/2020		Adalberto Garcia	Elizabeth Komiskey
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Rev	**Date**	**Document Status**	**Custodian/Owner**	**Authority**

AMENDMENT RECORD

Amendment Date	Revision Number	Amender Initials	Amendment
08/10/2020	1	AG	• Updated sec. 1.1 Description of Activities to address NMFS 2020 Biological Opinion. • Updated sec. 1.5 Additional Measures to address NMFS 2020 Biological Opinion. • Updated Section 7 Air Emissions Information to include only Black Hornet rig and include new AQR spreadsheet. • Updated sec. 9.1 Monitoring Systems to address NMFS 2020 Biological Opinion on moonpool monitoring. • Updated sec. 9.2 Incidental Intakes to address NMFS 2020 Biological Opinion. • Updated sec. 9.3 Flower Garden Banks National Marine Sanctuary. • Updated sec. 10.1 Lease Stipulation Information to address NMFS 2020 Biological Opinion. • Updated sec. 12.4 Vicinity Maps to address NMFS 2020 Biological Opinion on avoiding transit routes through the Bryde's Whale area. • Updated sec. 15 Environmental Impact Analysis (EIA) to address NMFS 2020 Biological Opinion. • Updated sec. 16.3 Other Reference Items to reference NMFS 2020 Biological Opinion moonpool monitoring. • Updated Appendix A, Form BOEM-0137, to change start date of proposed activities. • Updated Appendix E, Air Emissions Information – Form BOEM-0138, to include only Black Hornet rig and recalculate new AQR spreadsheet. • Updated Appendix I, EIA, to address NMFS 2020 Biological Opinion.

TABLE OF CONTENTS

1 Plan Contents

1.1 Description of Activities

Under this Revised Exploration Plan, BP Exploration & Production Inc. (BP) proposes to drill and complete up to six wells as part of the NK Herschel Expansion project. Surface and bottom hole locations will be in Mississippi Canyon Block 520. This revised EP is to re-locate surface hole locations C, E, F, G, H and I in MC520 and extend the proposed activities as initially approved in the supplemental EP (S-7916) on January 22, 2019.

BP will not be utilizing pile-driving or installing pipelines in this plan.

OCS Plan Information Forms (Form BOEM-0137) are included in **Appendix A**.

1.2 Location

A map at a scale of 1-in = 2,000-feet on an 8.5-in X 11-in sheet of paper that depicts the surface locations and water depths of the proposed wells is included in **Appendix B**. A bathymetry plat is also included in **Appendix B**.

1.3 Safety and Pollution Prevention Features

Safety and pollution prevention features utilized during drilling operations will include the use of appropriately designed casing and cement programs; appropriate blowout preventers, diverters, and other associated well equipment, appropriate mud monitoring equipment and sufficient mud volumes for well control; and properly trained personnel as described in 30 CFR Part 250, Subparts C, D, E, F, G and O, 30 CFR Part 550, Subparts B and C, and as further described in Notices to Lessees (NTLs). Appropriate fire drills and abandon ship drills will be conducted, and navigational aids, lifesaving equipment, and all other shipboard safety equipment will be installed and maintained as mandated by the U.S. Coast Guard regulations contained in 33 CFR Part 144.

1.4 Storage Tanks and Production Vessels

Information regarding the storage tanks and production vessels located on the drilling rig and support vessels that will store oil, as defined at 30 CFR 254.6 are provided in the tables below. Only those tanks with a capacity of 25 barrels or more are included.

1.4.1 Storage Tanks DP Drillship

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Tank Capacity (m3)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
#1P Fuel Oil	Drillship	4133	657.1	1	4133	38.57
#1S Fuel Oil	Drillship	4133	657.1	1	4133	38.57
#2P Fuel Oil	Drillship	9344	1485.5	1	9344	38.57
#2S Fuel Oil	Drillship	9344	1485.5	1	9344	38.57
#3P Fuel Oil	Drillship	9049	1438.6	1	9049	38.57

#3S Fuel Oil	Drillship	9036	1436.6	1	9036	38.57
#1S FO Settler Tank	Drillship	447	71	1	447	38.57
#2P FO Settler Tank	Drillship	447	71	1	447	38.57
#1 FO Service Tank ER1	Drillship	194	30.8	1	194	38.57
#2 FO Service Tank ER1	Drillship	194	30.8	1	194	38.57
#1 FO Service Tank ER2	Drillship	194	30.8	1	194	38.57
#2 FO Service Tank ER2	Drillship	194	30.8	1	194	38.57
#1 FO Service Tank ER3	Drillship	219	34.8	1	219	38.57
#1 FO Service Tank ER3	Drillship	217	34.5	1	217	38.57
Lube oil Storage	Drillship	465	74	1	465	25.72
Base oil P	Drillship	3603	572.8	1	3603	41.06
Base oil S	Drillship	3607	573.4	1	3607	41.06

1.4.2 Storage Tanks Support Vessels

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	No. of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
Fuel Oil	Supply Boat (Typical 280-feet)	450	16	7,200 bbls dependent on other cargo carried	31.14

1.5 Additional Measures

In addition to the safety, pollution prevention and early spill detection measures that may be required by applicable regulations, BP will rely on its Operating Management System (OMS) to help deliver safe and reliable operations. OMS is a system of interdependent activities that drive how BP will actually perform work and comply with internal and external standards and regulations. Within OMS, BP has also implemented a Safety Environmental Management System (SEMS), which provides a systematic way to identify risks, potential impacts, and compliance requirements that need to be managed. BP has also presented to the BOEMRE a report entitled *Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned*. This document assesses the capabilities that are now available to respond to oil spills in the GoM. Additionally, the measures described in Appendices A, B, C and J of the NMFS 2020 Biological Opinion [i] will be implemented as applicable to the activities outlined in this document, specifically, with regards to any external hanging equipment that may present potential entanglement hazard for protected species.

2 General Information

2.1 Applications and Permits

The table below provides information on the filing or approval status of the individual and/or site-specific Federal, State and local application approvals or permits, which must be obtained to conduct the proposed activities.

Application / Permit	Issuing Agency	Status
General NPDES Permit	EPA	Existing
Application for Permit to Drill	BSEE – New Orleans District	Pending Submittal
Emergency Evacuation Plan	USCG	Pending Submittal

2.2 Drilling Fluids

A table providing information on the types (including chemical constituents) and amounts of the drilling fluids that are planned to be used to drill the proposed wells is included below:

Drilling Fluids per Well (160-Days)

Type of Drilling Fluid	Estimated Volume of Drilling Fluid to be Used Per Well
Water based (seawater, freshwater, barite)	90,000 bbls
Oil based (diesel, mineral oil)	NA
Synthetic based (internal olefin, ester)	30,000 bbls

2.3 New or Unusual Technology

In accordance with the definition of "new or unusual technology" set forth in 30 CFR § 550.200, exploration activities in Mississippi Canyon Block 520 are evaluating the applicability of Managed Pressure Drilling (MPD) technology to mitigate non-productive events associated with pore pressure / fracture gradient (PPFG) uncertainty.

2.4 Bonding Information

The bonding requirements for the activities proposed in this Exploration Plan are satisfied by an area-wide bond, furnished and maintained according to 30 CFR Part 556, Subpart I, and NTL No. 2015-N04, and to the extent required under 30 CFR 556.901 and National NTL No. 2016-N01.

2.5 Oil Spill Financial Responsibility (OSFR)

BP (Operator No. 02481) has demonstrated oil spill financial responsibility for the facilities proposed in this EP according to 30 CFR Part 553, and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities."

2.6 Deepwater Well Control

BP (Operator No. 02481) has the financial capability to drill a relief well and conduct other emergency well control operations.

2.7 Blowout Scenario

2.7.1 Blowout Scenario

The worst-case discharge of the well proposed in this plan based on analysis is not expected to exceed the worst case discharge of the blowout scenario that was described in the supplemental EP S-7916, which was approved on January 22, 2019.

The blowout scenario assumes that the pipe has been tripped out of the hole when a problem with the wellhead connector develops, resulting in the removal of the BOP stack. Due to the loss of riser margin, the well flows unrestricted. Day 1 worst case discharge (WCD) is 290,000 bopd, shown in the calculation support package submitted in the Proprietary copy of the supplemental EP, S-7916. The maximum duration of the blowout is estimated at 101 days. The rate profile associated with the well blowout over this 101-day results in a potential worst case spill volume estimated at 13.47 mmstbo.

2.7.2 The Potential for the Well to Bridge Over

While bridging is possible due to generally low formation strengths in the Gulf of Mexico, no bridging was assumed in the 'worst case scenario'. The open hole intervals experienced on each well have multiple formations open simultaneously. The modeling of the failure point of the weakest interval includes many variables, and using no bridging yields a maximum flow potential.

2.7.3 The Likelihood for Surface Intervention to Stop the Blowout

The likelihood for above-mudline intervention to stop a blowout is dependent on the failure mechanism. Depending on the circumstances, BP may address a failure of the BOP stack by repairing the control system via ROVs, replacing the BOPs, or adding a BOP on top of the current BOP stack. Failure of the wellhead or casing would be more difficult and require clear access to the well below the failure point in order to run drill pipe and/or tools in the well.

In addition to BP's internal well containment and emergency response planning, BP has contracted resources to assist in the event of a blowout. Further, BP is a member of the Marine Well Containment Company ("MWCC"), currently has access to MWCC's Interim Containment Response System ("ICRS") and will have full access to MWCC's Expanded Containment Response System when it is available.

2.7.4 The Availability and Timing of a Rig to Drill a Relief Well

The table below lists the Mobile Offshore Drilling Units (MODU) that are capable of drilling a relief well. The estimated time to spud is 3 to 10 days, pending requirements to safely secure the current operations of the MODU, required material logistics, mobilization to location, and regulatory approvals. The possibility of drilling a relief well from a neighboring platform or land is not applicable to operations proposed in this Exploration Plan; there is existing infrastructure in the vicinity of Mississippi Canyon Block 520, but none that would impede drilling a relief well.

Parameters	West Vela (Main Derrick)	West Auriga (Main Derrick)
Proposed Utility in Response	Relief Well / Wellbore Capping	Wellbore Capping / Relief Well
Current Location	GoM	GoM
Contract Expire Date	11/30/2020	11/30/2020
Rated WD (ft)	10K	10K
Rated TD (ft)	37.5K	37.5K
Rated BOPs (psi)	15K	15K
Derrick Capacity	2.5MM	2.5MM
Moor Type	DP	DP
Relevant Drill Package Limitations	SHDH4 Connector	SHDH4 connector

The estimated time to drill a relief well is: 10 days to mobilize and spud, 56 days from spud to casing shoe above WCD zone, plus 35 days for ranging, intersection, and kill operation--for a total of 101 days.

2.7.5 Measures that Would Enhance the Ability to Prevent a Blowout

Measures employed to prevent a blowout include compliance with applicable regulations (30 CFR Parts 250 and 550) and current NTLs. Additional measures include the following:

1. Volume measurements relative to the well will be monitored at all times during all operations.
2. Flow checks before leaving bottom, after pulling into shoe, and before BHA enters stack.
3. BP representative shall observe well conditions prior to each trip and after well kills or testing.
4. BP representative shall be the only person authorized to initiate opening the well as part or at the conclusion of well control measures.
5. On rig JSA/contingency plan before running any non-shearable tools or pipe through the BOP stack.

6. BP has a 24/7 monitoring center, GWO Monitoring Center (formerly referred to as the 'Houston Monitoring Center (HMC)'), located at BP's Westlake Campus. Through continuous monitoring, onshore staff have the ability to communicate issues they observe on the well with the Wells Superintendent and Wells Engineer, as well as the rig. The rig team can then make corrective actions as necessary.

In addition to the additional measures listed above, BP has adopted the following performance standards:

1. BP will use, and will require its contractors involved in drilling operations to use, subsea blowout preventers (BOPs) equipped with no fewer than two blind shear rams and a casing shear ram on all drilling rigs under contract to BP for deepwater service operating in dynamic position mode. With respect to moored drilling rigs under contract to BP for deepwater drilling service using subsea BOPs, the subsea BOP will be equipped with two shear rams, which will include at least one blind shear ram and either an additional blind shear ram or a casing shear ram.
2. Each time a subsea BOP from a moored or dynamically positioned drilling rig is brought to the surface and testing and maintenance on the BOP are conducted, BP will require that a third party verify that the testing and maintenance of the BOP were performed in accordance with manufacturer recommendations and API Std 53.

2.7.6 Measures that Would Reduce the Likelihood of a Blowout

Measures to reduce the likelihood of a blowout include compliance with applicable regulations (30 CFR Parts 250 and 550) and current NTLs. Additional measures:

1. Minimize any influx events to the wellbore by using the best pore pressure / fracture gradient predictions available, using down-hole tools when appropriate, such as PWD and/or LWD to monitor the wellbore and update pore pressure / fracture gradient predictions;
2. Management of change process is in place for all procedure changes;
3. A Well Control Response Guide is in place; and
   With the integration of the GWO Monitoring Center (formerly referred to as the 'HMC'), BP has staff monitoring wells 24/7. Having a monitoring center away from the rig in a controlled environment gives BP the opportunity to evaluate data real time and communicate issues to the Wells Superintendent and Wells Engineer, as well as the rig.

2.7.7 Measures which Would Enhance the Ability to Conduct Early Intervention

Measures to enhance the ability to conduct early intervention in addition to the regulation and NTL requirements include:

1. Possible relief well locations have been identified and screened for general acceptability. In the event of a blow out or other event necessitating a relief well, data will be collected post-event to ensure that previously-identified relief well locations are still valid, or to assist in determining alternate relief well locations if required;
2. Wellhead equipment and sufficient casing is identified and available for a relief well;
3. A rig(s) is identified and available for a relief well;
4. A Well Control Response Guide is in place; and
5. An Incident Management System (IMS) is in place.

- The BP IMS is comprised of government-approved plans covering various scenarios; Incident Management Teams are trained annually in the Incident Command System, which is a part of the National Incident Management System; BP has access to response capability through various contractors and technical specialists; and to pre-designated facilities, where the teams can provide adequate oversight to the response.

2.7.8 Other Measures

All proposed activities and facilities in this EP will be covered by the GoM Regional OSRP filed by BP America Inc. (Operator No. 21372) under cover letter dated February 14, 2019 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on March 15, 2019. Modifications were made to the approved OSRP under cover letter dated June 20, 2019 and confirmed in compliance by BSEE on July 24, 2019.

3 Geological and Geophysical Information

3.1 Geological Description

A discussion of the geological objectives, including a brief description of the hydrocarbon trapping elements, is included in **Appendix C** in the Proprietary Information copies of this Exploration Plan.

3.2 Structure Contour Maps

Current structure contour maps are included in **Appendix C** in the Proprietary Information copies of this EP.

3.3 Interpreted 2-D and/or 3D Seismic Lines

Migrated and annotated 3-D seismic lines with depth scale within 152 meters (500 feet) of the proposed surface locations are enclosed with the site clearance letters included in **Appendix C** in the Proprietary Information copies of this Exploration Plan.

3.4 Geological Structure Cross-Section Maps

Interpreted geological structure cross-section maps are included in **Appendix C** in the Proprietary Information copies of this Exploration Plan.

3.5 Shallow Hazards Report

In 2018, an Autonomous Unmanned Vehicle (AUV) site survey was conducted in Block 520, Mississippi Canyon and a Geohazards Assessment was prepared by Fugro USA Marine, Inc. (Fugro), entitled "AUV Shallow Geohazards Assessment Assessment, Manuel M51 / Herschel Prospect Area, Block MC 520, Mississippi Canyon, Gulf of Mexico, Fugro Document No. 02.1803-1355-Manuel_M51_Herschel.

A regional shallow hazards report dated March 2005 entitled “3D Geohazard Assessment, Gulf of Mexico – Mississippi Canyon Blocks 338-342, 382-386, 426-431, 470-479, 517-523, 561-567, & 605-608, Na Kika Prospect 3D Geohazard Study” was prepared by Gardline Surveys, Inc., Project No. 6364.

In 1997, a deep-tow site survey was conducted over the Na Kika field, covering all or portions of 59 lease blocks in Mississippi Canyon. A stratigraphic and geologic report was prepared in 1998, entitled “Stratigraphic and Geologic Assessment, Nakika Study Area, Mississippi Canyon Area, Gulf of Mexico, by Geoscience Earth & Marine Services (GEMS), Inc., Project No. 0497-010.

3.6 Shallow Hazards Assessments (Site Clearance Letters)

Shallow hazards assessment (site clearance letters) that evaluate the seafloor and subsurface geologic and manmade features and conditions, for the proposed surface locations in Mississippi Canyon Block 520, Locations C, E, F, G, H and I (2 letters corresponding to two drill centers – F, G, H, and I; C and E) is included in **Appendix C** of this Exploration Plan. Findings from this site clearance letter shows that the proposed drilling locations, and within a 2,000ft radius of those locations, are favorable for drilling operations.

3.7 High Resolution Seismic Lines

Seismic sections through the proposed well locations are included in the shallow hazards assessments (site clearance letters) in **Appendix C** of this Exploration Plan.

3.8 Stratigraphic Column

A generalized biostratigraphic / lithostratigraphic column is included in **Appendix C** in the Proprietary Information copies of this Exploration Plan.

3.9 Time vs. Depth Information

Time vs. Depth information is included in **Appendix C** in the Proprietary Information copies of this Exploration Plan.

4 Hydrogen Sulfide (H_2S) Information

4.1 Concentration

Anticipated H2S concentration is 0 ppm, based on offset well data and producing fields in Mississippi Canyon MC520. H2S is not expected to be encountered during the operations proposed herein.

4.2 Classification

Based on previous drilling, no H_2S is known to occur in the project area. Correlative wells information is included in **Appendix C** of the Proprietary Information copy of the Exploration Plan. BP requests that BOEM confirm the “H2S absent” classification.

4.3 H_2S Contingency Plan

No H_2S is documented in the offset wells in and around the project area, nor in nearby producing fields. Expected temperatures are too low for two of four main sources of H_2S (thermal cracking, thermochemical sulfate reduction), vertical migration distance prevents a third (direct charge), and inadequate sulfate is present for the fourth (bacteria sulfate reduction). Therefore, no H2S contingency plans are needed.

4.4 Modeling Report

No H_2S is documented in the offset wells in and around the project area, nor in nearby producing fields. Expected temperatures are too low for two of four main sources of H_2S (thermal cracking, thermochemical sulfate reduction), vertical migration distance prevents a third (direct charge), and inadequate sulfate is present for the fourth (bacterial sulfate reduction). Therefore, no further model reports are needed.

5 Biological, Physical, and Socioeconomic Information

5.1 Benthic Communities Report

The BOEM requires site-specific surveys and reviews for proposed bottom-disturbing actions in water depths greater than 300-m in order to judge the potential of the region for supporting high density chemosynthetic organisms. NTL No. 2009–G40 formalized the process. BP has conformed to this requirement and has located wells to avoid potential sites for benthic communities during the activities described by this plan.

Mississippi Canyon Block 520 is located in water depths greater than 300-m; At these depths, the potential exists for chemosynthetic communities to be present. Site Clearance Surveys conducted for the proposed project confirm that high density benthic communities are not found in the area. These reports are contained in **Appendix C**.

5.2 Biologically Sensitive Underwater Features and Areas

The proposed activities will be conducted in water depths of approximately 6,380 ft to 6,470 ft. Therefore, requirements of NTL 2009-G39 for biologically sensitive underwater features and areas such as Topographic Features, Live Bottom (low-relief), Live Bottom (Pinnacle Trend) features, and other potentially sensitive biological features when conducting OCS operations in water depths less than 300-m (984-ft) in the Gulf of Mexico do not apply to this plan.

All proposed bottom-disturbing activities in this EP will occur outside of the nearest Topographic Features, "No Activity Zones", Live Bottom (low Relief), and Live Bottom (Pinnacle Trend) Stipulation Blocks described in NTL 2009-G39 and shown on BOEM December 2012 Map: "Biologically Sensitive Areas (< 300-m)".

5.3 Remotely Operated Vehicle (ROV) Monitoring Survey Plan

No longer applicable. NTL 2008-G06 "Remotely Operated Vehicle Surveys in Deepwater" has expired.

5.4 Threatened or Endangered Species, Critical Habitat and Marine Mammal Information

All marine mammals are protected under the Marine Mammal Protection Act (MMPA) and some are also protected under the Endangered Species Act (ESA).

The Sperm Whale, Giant Manta ray, oceanic whitetip shark and five species of sea turtles are the endangered or threatened species likely to occur in or near the lease area. The West Indian Manatee is thought to be remotely located away from the project area. Most of the Gulf of Mexico manatee population is located in peninsular Florida, but manatees have been seen as far west as Texas during the summer (USFWS, 2001). Critical habitat has been designated in southwest Florida.

The Bryde's whale (*Balaenoptera edeni*) is the only year-round resident baleen whale in the northern Gulf of Mexico. The Bryde's whale is most frequently sighted in the waters over the DeSoto Canyon between the 100 m (328 ft) and 400 m (3,280 ft) isobaths (Rosel et al., 2016; Hayes et al., 2018). Based on the available data, it is possible that Bryde's whales could occur in the project area although unlikely.

The distribution of sperm whales (*Physeter macrocephalus*), in the Gulf of Mexico is correlated with mesoscale physical features such as eddies associated with the Loop Current and may be present throughout the year (Jochens et al., 2008; Davis et al., 2000a). Results of a multi-year tracking study show female sperm whales are typically concentrated along the upper continental slope between the 200- and 1,000-m (656 and 3,280 ft) depth contours (Jochens et al., 2008).

According to the project specific EIA, excluding the endangered/threatened species mentioned above, there are an additional 20 species of marine mammals that may be found in the Gulf of Mexico. This includes dwarf and pygmy sperm whales, 4 species of beaked whales, and 14 species of delphinid whales (dolphins). The most common non-endangered cetaceans in the deepwater environment are small odontocetes such as the pantropical spotted dolphin, spinner dolphin, and bottlenose dolphin.

Endangered or threatened species that may occur in the project area and/or along the northern Gulf Coast are listed below and taken from Table 7 of **Appendix I**.

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Marine Mammals					
Bryde's whale	*Balaenoptera edeni*[a]	E	X	--	None
Sperm whale	*Physeter macrocephalus*	E	X	--	None
West Indian manatee	*Trichechus manatus*[b]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T,E[c]	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); *Sargassum* habitat including most of the central & western Gulf of Mexico.
Green turtle	*Chelonia mydas*	T	X	X	None
Leatherback turtle	*Dermochelys coriacea*	E	X	X	None
Hawksbill turtle	*Eretmochelys imbricata*	E	X	X	None
Kemp's ridley turtle	*Lepidochelys kempii*	E	X	X	None
Birds					
Piping Plover	*Charadrius melodus*	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	*Grus americana*	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Fishes					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	X	--	None
Giant manta ray	*Manta birostris*	T	X	X	None
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Nassau grouper	*Epinephelus striatus*	T	--	X	None
Smalltooth sawfish	*Pristis pectinata*	E	--	X	Southwest Florida
Invertebrates					
Elkhorn coral	*Acropora palmata*	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	*Acropora cervicornis*	T	--	X	Florida Keys and the Dry Tortugas
Pillar coral	*Dendrogyra cylindrus*	T	--	X	None
Rough cactus coral	*Mycetophyllia ferox*	T	--	X	None
Lobed star coral	*Orbicella annularis*	T	--	X	None
Mountainous star coral	*Orbicella faveolata*	T	--	X	None
Boulder star coral	*Orbicella franksi*	T	--	X	None
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	E	--	X	None

E = endangered; T = threatened; X = potentially present; -- = not present.

[a] The Gulf of Mexico DPS of Bryde's whales are protected by the Marine Mammal Protection Act (MMPA). Per 84 FR 15446, NMFS determined the Gulf of Mexico Bryde's whale warranted listing as Endangered under the Endangered Species Act (ESA).

[b] There are two subspecies of West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern Gulf of Mexico to Virginia, and the Antillean manatee (*T. m. manatus*), which ranges from northern Mexico to eastern Brazil. Only the Florida manatee subspecies is likely to be found in the northern Gulf of Mexico. On 30 March 2017, the USFWS announced the West Indian manatee, including the Florida manatee subspecies, was reclassified as threatened.

[c] The loggerhead turtle is composed of nine distinct population segments (DPS). The only DPS that may occur in the project area (Northwest Atlantic DPS) is listed as threatened (76 *Federal Register* [FR] 58868; 22 September 2011).

Five species of sea turtle are known to inhabit the waters of the Gulf of Mexico:

- leatherback sea turtle (*Dermochelys coriacea*)
- green sea turtle (*Chelonia mydas*)
- hawksbill sea turtle (*Eretmochelys imbricata*)
- Kemp's ridley sea turtle (*Lepidochelys kempii*)
- loggerhead sea turtle (*Caretta caretta*)

According to the project specific EIA (Appendix I), Five species of endangered or threatened sea turtles may be found near the lease area. Endangered species include the Loggerhead (*Caretta caretta),* leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) turtles. As of 6 May 2016, the entire North Atlantic DPS of the green turtle (*Chelonia mydas*) is listed as threatened (81 FR 20057). The DPS of loggerhead turtles (*Caretta caretta*) that occurs in the Gulf of Mexico is listed as threatened, although other DPSs are endangered.

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 117 statute miles (188 km) north of the project area. The project area is located 14 miles (23 km) from the designated *Sargassum* critical habitat for loggerhead sea turtles . Additional information can be found in the Environmental Impact Analysis attached as **Appendix I (Figure 3).**

Five species of fish are the other listed threatened or endangered fish species in the Gulf of Mexico.

- Smalltooth Sawfish (*Pristis pectinata*)
- Gulf Sturgeon (subspecies *Acipenser oxyrinchus desotoi*)
- Nassau Grouper (*Epinephelus striatus*)
- Giant manta ray (Manta birostris)
- Oceanic whitetip shark (Carcharhinus longimanus)

According to the EIA of Appendix I, the smalltooth sawfish (Pristis pectinata) is remote from the project area and highly unlikely to be affected.

The NMFS and United States Fish and Wildlife Service (USFWS) designated critical habitat for the Gulf sturgeon in fourteen geographic areas from Florida to Louisiana, encompassing spawning rivers and adjacent estuarine areas. Therefore, the Gulf Sturgeon is remote from the project area and highly unlikely to be affected.

Nassau groupers are found within the mainly in the shallow tropical and subtropical waters of eastern Florida, the Florida Keys, Bermuda, the Yucatan Peninsula, and the Caribbean, including the U.S. Virgin Island and Puerto Rico (NOAA, nd). There has been one confirmed sighting of Nassau grouper from the Flower Garden Banks in the Gulf of Mexico at a water depth of 36 m (Foley et al., 2007). Three additional unconfirmed reports (i.e. lacking photographic evidence) of Nassau grouper have also been documented from mooring buoys and the coral cap region of the West Flower Garden flats (Foley et al., 2007).

Oceanic whitetip sharks are found worldwide in offshore waters between approximately 30° N and 35° S latitude and now the species is only occasionally spotted in the GoM.

The giant manta ray is a highly migratory species that is thought to utilize the Flower Garden Banks serves as nursery habitat for aggregations of juvenile giant manta rays. Mature rays have also been observed in the Flower Garden Banks.

Two coastal species of birds that inhabit the GoM are protected under the ESA:

- Piping Plover (*Charadrius melodus*)

- Whooping Crane (*Grus americana*).

Critical overwintering habitat for the Piping plover has been designated in GoM, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida. Whooping crane critical habitat has been designated within the GoM region within the Aransas National Wildlife Refuge in Texas.

Four beach mice species occurring in the GoM are listed as endangered under the ESA and occupy restricted habitats in the mature coastal dunes of Florida and Alabama:

- Alabama beach mouse (*Peromyscus polionotus ammobates*)
- Choctawhatchee beach mouse (*Peromyscus polionotus allophrys*)
- St. Andrew beach mouse (*Peromyscus polionotus peninsularis*)
- Perdido Key Beach mouse (*Peromyscus polionotus trissyllepsis*)

The Florida salt marsh vole (Microtus pennsylvanicus dukecampbelli) is remote from the project area and highly unlikely to be affected.

There are currently six species of corals listed as threatened under the ESA in the Gulf of Mexico:

- elkhorn coral (*Acropora palmata*)
- staghorn coral (*Acropora cervicornis*)
- lobed star coral (*Orbicella annularis)*
- mountainous star coral (*Orbicella faveolata)*
- boulder star coral (*Orbicella franksi)*

The nearest critical habitat is for the elkorn coral has been designated in the Florida Keys.

According to the project specific EIA: "There are no other endangered animals or plants in the Gulf of Mexico that are reasonably likely to be adversely affected by either routine or accidental events."

5.5 Archaeological Report

Mississippi Canyon Area Block 520 has been designated to have an archaeological potential, as described in NTL 2011-JOINT-G01. Therefore, an Archaeological Report is required for activities proposed in this Exploration Plan. The following Archaeological survey and assessment has been performed covering all of MC520 and the proposed well location as referenced under Section 3.5.

Fugro, 2018, AUV Archaeological and Shallow Geohazards Assessment, Manuel M51 / Herschel Prospect Area, Block 420, Mississippi Canyon, Gulf of Mexico, Fugro Document No. 02.1803-1355-Manuel_M51_Herschel, issued to BP America Inc., June, 2018.

Geoscience Earth & Marine Services, Inc. (GEMS), 2009, Archaeological Assessment, Blocks 476-477, 519-521, & 563-565, Mississippi Canyon Area, Gulf of Mexico, GEMS Project No. 1208-1583, issued to BP America Inc., January, 2009.

6 Waste and Discharge Information

6.1 Projected Generated Wastes

A table providing information on the projected solid and liquid wastes likely to be generated by the proposed activities is included in **Appendix D**.

6.2 Projected Ocean Discharges

A table providing information on the projected ocean discharges likely to be generated during the proposed activities is included in **Appendix D.**

7 Air Emissions Information

7.1 Screening Questions

Screening Questions for EP's	Yes	No
Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed exploration activities more than 90% of the amounts calculated using the following formulas: $CT = 3400D^{2/3}$ for CO, and $CT = 33.3D$ for the other air pollutants (where D = distance to shore in miles)?		X
Do your emission calculations include any emission reduction measures or modified emission factors?	X	
Are your proposed exploration activities located east of 87.5° W longitude?		X
Do you expect to encounter H_2S at concentrations greater than 20 parts per million (ppm)?		X
Do you propose to flare or vent natural gas for more than 48 continuous hours, from any proposed well?		X
Do you propose to burn produced hydrocarbon liquids?		X

7.2 Emissions Worksheet

An emission workbook (BOEM Form 0138) showing Plan total emissions associated with the activities proposed in this Exploration Plan document is included in Attachment 1 in **Appendix E**. The proposed total Plan emissions are summarized in the Table below. The proposed Total plan emissions are less than BOEM's emission exemption thresholds and as a result, no further review or controls are required.

BP Exploration & Production In	520	OCS-G 09821	Not Applicable	006, 007, 008				
Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2020	16.05	9.68	9.39	0.23	384.49	11.05	0.00	60.31	0.11
2021	42.08	25.39	24.63	0.61	1008.18	28.99	0.00	158.13	0.29
2022	42.08	25.39	24.63	0.61	1008.18	28.99	0.00	158.13	0.29
Allowable	2287.71			2287.71	2287.71	2287.71		57031.76	

7.3 Emission Reduction Measures

Emission Source	Reduction Control Method	Amount of Reduction (NOx)	Monitoring System
Black Hornet MODU engines	Actual Fuel Usage	1044 TPY	MODU Fuel Usage Logs

NOTE: Attachment 1 provides references for equipment specific data listed in the Project BOEM Form 0138. The assessed ERM values are based on the worst-case emission year 2022.

7.4 Verification of Non-Default Emission Factors

The project BOEM 0138 Form emissions worksheet tabs (EMISSIONS1 through EMISSIONS3) include actual fuel usage rates for MODUs. Actual Fuel consumption for the Black Hornet MODU for the first half of 2019 is provided in Attachment 4 **Appendix E**.

8 Oil Spill Information

8.1 Oil Spill Response Planning

8.1.1 Regional OSRP Information

All proposed activities and facilities in this EP will be covered by the GoM Regional OSRP filed by BP America Inc. (Operator No. 21372) under cover letter dated February 14, 2019 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on March 15, 2019. Modifications were made to the approved OSRP under cover letter dated June 20, 2019 and confirmed in compliance by BSEE on July 24, 2019.

BP has adopted additional performance standards:

a. Provisions to maintain access to a supply of dispersant and fire boom for use in the event of an uncontrolled long-term blowout for the length of time required to drill a relief well;

b. Contingencies for maintaining an ongoing response for the length of time required to drill a relief well;

c. Description of measures and equipment necessary to maximize the effectiveness and efficiency of the response equipment used to recover the discharge on the water's surface, including methods to increase encounter rates;

d. Information regarding remote sensing technology and equipment to be used to track oil slicks, including oil spill detection systems and remote thickness detection systems (e.g., X-band/infrared systems);

e. Information regarding the use of communication systems between response vessels and spotter personnel;

f. Shoreline protection strategy that is consistent with applicable area contingency plans; and

g. For operations using a subsea BOP or a surface BOP on a floating facility, a discussion regarding strategies and plans related to source abatement and control for blowouts from drilling.

8.1.2 Spill Response Sites

Primary Response Equipment Location	Preplanned Staging Location(s)
Pensacola, FL; Tampa, FL; Mobile, AL; Pascagoula, MS; Houma, LA.; Leeville, LA; Morgan City, LA; Lake Charles, LA.; Fort Jackson, LA; Venice, LA; Galveston, TX; Corpus Christi, TX; Ingleside, TX.	Fourchon, LA.

8.1.3 OSRO Information

BP is a member of the Marine Spill Response Corporation (MSRC), Clean Gulf Associates (CGA) and the National Response Corporation and would utilize said Oil Spill Response Organization (OSRO) personnel and equipment in the event of an oil spill at Mississippi Canyon Area Block 520.

8.1.4 Worst-Case Scenario Determination

Category	Regional OSRP Approved March 15, 2019	EP
Type of Activity	Drilling >10 miles	Drilling > 10 miles
Facility Location	MC 778	MC 520 (SL)
Facility Designation	Thunder Horse Well 778-15	MODU Well MC520 005
Distance to Nearest Shoreline	68-miles	68.4 -miles
Volume storage tanks and flowline (total)	50,000-bbls	0-bbls
Volume Lease term pipelines	13,000-bbls	0-bbls
Volume Uncontrolled Blowout (Day 1)	360,000-bbls	290,000-bbls
Total Volume	423,000-bbls	290,000-bbls
Type of Oil(s) – (Crude Oil, Condensate, Diesel)	Crude	Crude
API Gravity(s)	32.0	29.0 °

BP has conducted an analysis of the activities covered by this EP and has concluded that the worst case discharge scenario associated with these activities does not exceed the worst case discharge scenario described in supplemental EP, S-7916. Because the worst case discharge scenario described in supplemental EP S-7916 does not exceed the worst case discharge scenario covered by BPXP's approved OSRP, the activities proposed in this EP also do not supersede the worst-case scenario in BPXP's GoM Regional OSRP filed by BP America Inc. (Operator No. 21372) under cover letter dated February 14, 2019 on behalf of several companies listed in the plan including BP

Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on March 15, 2019. Modifications were made to the approved OSRP under cover letter dated June 20, 2019 and confirmed in compliance by BSEE on July 24, 2019. Pursuant to NTL No. 2008-G04, BP makes the following statement:

Since BP Exploration & Production Inc. has the capability to respond to the worst-case spill scenario included in its regional Oil Spill Response Plan approved on March 15, 2019, and since the worst-case scenario determined for our EP does not replace the worst-case scenario in our regional or sub-regional OSRP, BP certifies that it has the capability to respond, to the maximum extent practicable, to a worst-case discharge, or a substantial threat of such a discharge, resulting from the activities proposed in our EP.

Wellbore data, geologic data, reservoir data, and fluid data used in modeling and making the WCD determination are provided in **Appendix F** in the Proprietary Information copies of the supplemental EP S-7916.

8.2 Oil Spill Response Discussion

A detailed discussion of a response to an oil spill at Mississippi Canyon Area Block 520 is included in **Appendix G.** This Appendix addresses topics such as resource identification, release modeling, response technologies, and source containment / control.

9 Environmental Monitoring and Mitigation Measures

9.1 Monitoring Systems

In addition to rig control engineered systems, operational personnel have been instructed to check for pollution frequently during their tour of duty and, if pollution is spotted, to identify and shut-off the source and make immediate notifications as per instructions provided in Section 8 of BP's certified OSRP. In accordance with the measures described in Appendices A, B, C and J of the NMFS 2020 Biological Opinion [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020)], a person onboard the vessel(s) will visually monitor the moonpool(s) using a remote camera system. Logs will be kept for each shift documenting the observed presence/absence of marine animals in the moonpool(s). If a protected species is observed in the moonpool(s), required reporting to the appropriate agencies will be made.

Also, in accordance with the provisions of Title 30 CFR § 250.713(g) and NTL 2009-G02 "Deepwater Ocean Current Monitoring on Floating Facilities" dated January 27, 2009, the MODU will be equipped with an Acoustic Doppler Current Profile (ADCP) current monitoring system onboard to allow continuous monitoring and gathering of ocean current data on a real-time basis in the upper 1000 meters.

9.2 Incidental Takes

Mitigation measures described in Appendices A, B, C and J of the NMFS 2020 Biological Opinion [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020)] will be implemented to the extent they are applicable to the activities outlined in this plan. Monitoring activities are conducted by personnel on vessels to prevent accidental loss of materials overboard, and to report sightings of injured/dead protected species. Reporting of dead/injured protected species is addressed in

Annex 2 of BP's "Incident Notification and Investigation Procedure - Attachment 1". Additionally, to mitigate against incidental takes, activities will be conducted in adherence to BSEE NTL 2015-G03 "Marine Trash and Debris Awareness Training and Elimination"; BOEM NTL 2016-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting" and BOEM NTL 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program", as necessary. As required by BSEE NTL 2015-G03, BP submits an annual certification letter for its Marine Debris Awareness Training Process. The marine debris awareness training is required annually by the BSEE and is identified by "BP's Gulf of Mexico (GoM) Environmental Training Matrix" and "BP's GoM Health, Safety, and Environmental (HSE) Training Needs Assessment", both of which are located on BP's GoM HSE website.

Further mitigation measures can be found throughout the supporting EIA found in Appendix I.

9.3 Flower Garden Banks National Marine Sanctuary

All proposed activities will occur outside of the Protective Zones of the Flower Garden Banks National Marine Sanctuary boundaries.

10 Lease Stipulations

Oil and gas exploration activities on the OCS are sometimes subject to mitigations in the form of lease stipulations.

10.1 Lease Stipulation Information

Lease Stipulation for Protected Species

Mitigation measures described in Appendices A, B, C and J of the NMFS 2020 Biological Opinion [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020)] will be implemented to the extent they are applicable to the activities outlined in this plan. Additionally, all activities will be conducted in adherence to NTL 2015-G03 "Marine Trash and Debris Awareness Training and Elimination"; BOEM NTL 2016-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting" and BOEM NTL 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program", as necessary. Mitigation to prevent takes varies based on the activity underway and it can include worker training on waste management and trash and debris containment procedures to avoid accidental loss overboard and its potential impact on protected species, and training on reporting of dead/injured protected species addressed in BP's Incident Notification and Investigation Procedure.

11 Related Facilities and Operations Information

11.1 Produced Liquid Hydrocarbons Transportation Vessels

There are no well tests proposed in this Exploration Plan.

12 Support Vessels and Aircraft Information

12.1 General

Type	Maximum Fuel Tank Storage Capacity	Maximum No. in Area at Any Time	Trip Frequency or Duration
Helicopter	760-gals	1	7 / week
Crew Boats	1,000-bbls	1	2 / week
Supply Boats	5,000-bbls	1	4 / week

12.2 Diesel Oil Supply Vessels

Size of Fuel Supply Vessel	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel will Take
240-feet to 312-feet	50,000-gallons (boat fuel) 150-K to 250-K gallons of transferable fuel (rig fuel)	Weekly / as needed	From the shorebase in Fourchon, LA, to Mississippi Canyon Area Block 520

12.3 Solid and Liquid Wastes Transportation & Disposal

A table providing information on the transportation of solid and liquid wastes and the onshore facilities used for disposal of solid and liquid wastes generated by the proposed activities is included in Table 2 found in **Appendix D**.

12.4 Vicinity Map

A vicinity map depicting the location of the proposed activities relative to the shoreline, the distance of the proposed activities from the shoreline, and the primary route(s) of the support vessels and aircraft when traveling between the onshore support facilities and the project areas is included in **Appendix B.** In accordance with Appendices A, B, C, and J of the NMFS 2020 Biological Opinion [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020)], transit routes will avoid the Bryde's Whale area. As outlined in the table below, vessels will transit from shorebases in Louisiana to the blocks where activities will occur under this plan.

13 Onshore Support Facilities Information

13.1 General

The onshore support base for the proposed operations will be in Fourchon, Louisiana. Mississippi Canyon Area Block 520 is located approximately 130.5 statute miles from the onshore support base located in Fourchon, Louisiana, as indicated on the vicinity map in **Appendix B.**

The following table provides information of the onshore facility that will be used to provide supply and service support for the activities proposed in this plan.

Name	Location	Existing / New / Modified
C-Port	Fourchon, LA	Existing
Heliport	Houma, LA	Existing

BP will primarily use the existing C-Port Fourchon Shorebase located in Fourchon, Terrebonne Parish, Louisiana to support general vessel operations. No expansion of these physical facilities is expected to result from the proposed activities. The C-Port Fourchon facility is located approximately 130.5 miles from the general activity area, provides a vehicle parking lot, office space, radio communication equipment, outside and warehouse storage space, crane, forklifts, water and fueling facilities, and boat dock space. The base is in operation 24-hours each day. Helicopters will be based out of Houma, Louisiana.

A small amount of vessel and helicopter traffic may originate from bases other than those described above in order to address changes in weather conditions. It is expected that this vessel traffic will originate from bases and locations that are in the near vicinity of the bases previously described.

13.2 Support Base Construction or Expansion

BP will utilize existing support bases for the proposed activities and will not require the construction or expansion of additional support bases.

13.3 Waste Disposal

Information about the onshore facilities used to store and dispose of solid and liquid wastes generated by proposed activities has been included in Table 2 found in **Appendix D**.

14 Coastal Zone Management Act (CZMA) Information

14.1 Consistency Certification

A Coastal Zone Management Act consistency certification, according to 15 CFR § 930.76(b) is not included in **Appendix H**.

14.2 New or Unusual Technology

See Sections 2.7.5, 2.7.8, 8.1.1, and 8.1.3 within the EP for a discussion of voluntary performance standards and Oil Spill Response Organization (OSRO) participation. No new or unusual technology for spill prevention, control, or cleanup is proposed. The EP Section 2.7 Blowout Scenario describes prevention, control, and cleanup technologies that are currently available.

15 Environmental Impact Analysis (EIA)

Attached as **Appendix I** is an Environmental Impact Analysis (EIA) prepared for the proposed project by CSA Ocean Sciences Inc. 8502 Sw Kansas Ave, Stuart, FL 34997.

Mitigation measures described in Appendices A, B, C and J of the NMFS 2020 Biological Opinion [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020)] will be implemented to the extent they are applicable to the activities outlined in this plan. Additionally, BOEM (or its predecessor, the Minerals Management Service) has conducted extensive environmental analyses examining the possible impacts produced by oil and gas exploration and production activities, which evaluated impacts from similar activities on the areas in the Gulf of Mexico covered by the present plan.

The EIA addresses potential impacts to environmental resources found in the deepwater Gulf of Mexico (GoM), coastal habitats, protected areas, and onshore. Based on the activity set of the project, these included:

- Drilling rig presence, physical disturbance to the seafloor, air emissions, effluent discharges, water intake, onshore waste disposal, marine debris, support vessel/helicopter traffic, and unintended releases to the marine environment.

The EIA outlines mitigation measures that will be in place to reduce associated risks.

16 Administrative Information

16.1 Exempted Information Description

In accordance with 43 CFR Part 2, Appendix E, sections (4) and (9), the following information has been determined by the BOEM GOMR exempt from public disclosure:

- Geologic Objectives (BHL, TVD and MD) on Form BOEM-0137
- Production rates and life of reservoirs
- Proprietary New or Unusual Technology
- Geological and Geophysical Information (except for non-proprietary Shallow Hazard Assessment)
- Hydrogen Sulfide Correlative Well Information

This information is excluded from the “Public Information” copies of the submitted plan.

16.2 Bibliography

Any previously submitted EP, DPP, DOCD, study report, survey report, or any other material referenced in this EP are listed below:

Plan Control No	Lease	Block	Operator Name	Operator Number	Plan Type Code	Received Date	Final Action Code	Final Action Date
S-7916	G09821	MC 520	BP Exploration & Production Inc.	02481	EP	10/15/2018	01/22/2019	A
S-7883	G09821	MC 520	BP Exploration & Production Inc.	02481	EP	1/13/2018	4/19/2018	A
S-7333	G09821	MC 520	BP Exploration & Production Inc.	02481	DOCD	6/18/2009	9/4/2009	A
R-4919	G09821	MC 520	BP Exploration & Production Inc.	02481	EP	2/12/2009	2/20/2009	A
R-3770	G09821	MC 520	Shell Offshore Inc.	00689	EP	3/4/2002	4/10/2002	A
N-7166	G09821	MC 520	Shell Offshore Inc.	00689	DOCD	6/11/2001	3/4/2002	A
N-5468	G09821	MC 520	BP America Production Company	00114	POE	7/16/1996	8/29/1996	A

16.3 Other Reference Items

iBiological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020)

Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned.

BP America Inc, (BP), 2019, Site Clearance Letter, Proposed Exploration Well Locations MC 520 "E" and MC 520 "C", Block 520 (OCS-G 09821), Mississippi Canyon Area, Gulf of Mexico.

BP America Inc, (BP), 2019, Site Clearance Letter, Proposed Exploration Well Locations MC 520 "F", "G", "H", and "I", Block 520 (OCS-G 09821), Mississippi Canyon Area, Gulf of Mexico.

Fugro USA Marine, Inc. (Fugro), 2018, "AUV Shallow Geohazards and Archaeological Assessment, Manuel M51 / Herschel Prospect Area, Block 520, Mississippi Canyon Area." Fugro, Texas, Document No. 02.1803-1355_Manuel_M51_Herschel. Submitted to BP June, 2018.

C&C Technology Services, Inc. (C&C), 2006, "Archaeological and Hazard Study, Isabela Prospect, Block 562 (OCS-G-19966) and Vicinity, Mississippi Canyon Area." C&C, Lafayette, Louisiana, Texas, Job No. 8851-061235: Submitted to BP June 2006.

In 2009, GEMS, Inc., utilized a portion of the 1997 deep-tow data and generated an archaeological assessment titled "Archaeological Assessment, Blocks 476-477, 519-521, & 563-565, Mississippi Canyon Area, Gulf of Mexico, Project No. 1208-1583

17 Appendixes

Appendix A: Plan Information Forms – Form BOEM-0137

Appendix B: Location Plat, Bathymetry Plat, and Vicinity Plat

Appendix C: Geological & Geophysical Information (Geological Description, Structure Contour Maps, Interpreted Seismic Lines, Geological Structure Cross-Section Maps, Shallow Hazards Assessments (Site Clearance Letters), Stratigraphic Column, Hydrogen Sulfide Basis of Requested Classification, Time vs. Depth Information

Appendix D: Wastes and Discharges Tables (Projected Generated Wastes and Projected Ocean Discharges)

Appendix E: Air Emissions Information – Form BOEM-0138

Appendix F: WCD Modeling Report

Appendix G: Oil Spill Response Discussion

Appendix H: Coastal Zone Management Act (CZMA) Consistency Certification

Appendix I: Environmental Impact Analysis (EIA)

Appendix J: New Technology

Appendix A: Plan Information Forms – Form BOEM-0137

OCS PLAN INFORMATION FORM – Public Information Copy

General Information

Type of OCS Plan:	X	Exploration Plan (EP)	Development Operations Coordination Document (DOCD)	

Company Name: BP Exploration & Production Inc.	BOEM Operator Number: 02481
Address: 501 Westlake Park Blvd	Contact Person: Adalberto Garcia
Houston, TX 77079	Phone Number: 281-995-2815
	E-Mail Address: Adalberto.Garcia@bp.com

If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid		Receipt No.	

Project and Worst Case Discharge (WCD) Information

Lease(s): OCS-G 09821	Area: MC	Block(s): 520	Project Name (If Applicable): Herschel Expansion

Objective(s)	X	Oil		Gas		Sulphur		Salt	Onshore Support Base(s): Fourchon, LA

Platform/Well Name: 006, 007, 008	Total Volume of WCD: 13.47 MMSTBO	API Gravity: 29°
Distance to Closest Land (Miles): 68.7 statute miles	Volume from uncontrolled blowout: 290,000 STBO/day	

Have you previously provided information to verify the calculations and assumptions for your WCD?	X	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	S-7916			
Do you propose to use new or unusual technology to conduct your activities?	X	Yes		No
Do you propose to use a vessel with anchors to install or modify a structure?		Yes	X	No
Do you propose any facility that will serve as a host facility for deepwater subsea development?		Yes	X	No

Description of Proposed Activities and Tentative Schedule (Mark all that apply)

Proposed Activity	Start Date	End Date	No. of Days
Drill and Complete Well MC520 006 (Loc. F or I)	11/01/2020	12/31/2020	61
Drill and Complete Well MC520 007 (Loc. G or H)	01/01/2021	06/09/2021	160
Drill and Complete Well MC520 008 (Loc. E or C)	01/01/2022	06/09/2022	160

Description of Drilling Rig

	Jackup	X	Drillship
	Gorilla Jackup		Platform rig
	Semisubmersible		Submersible
	DP Semisubmersible		Other (Attach Description)

Drilling Rig Name (If Known):

Description of Structure

	Caisson		Tension leg platform
	Fixed platform		Compliant tower
	Spar		Guyed tower
	Floating production system		Other (Attach Description)

Description of Lease Term Pipelines

From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name):MC520 006 (Loc. F)	Previously reviewed under an approved EP or DOCD? S-7916	X	Yes		No

Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.	

Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?	X	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 290,000	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	29.0°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 09821		OCS OCS
Area Name	Mississippi Canyon		
Block No.	520		
Blockline Departures (in feet)	N/S Departure: 4,401.74 FSL	N/S Departure:	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2,407.00 FEL	E/W Departure:	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 1,264,793.00'	X:	X: X: X:
	Y: 10,332,081.74'	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28° 27' 58.127" N	Latitude	Latitude Latitude Latitude
	Longitude 88° 10' 09.986" W	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 6,742	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	N/A			

Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

Anchor Name or No.	Area	Block	X Coordinate	Y Coordinate	Length of Anchor Chain on Seafloor
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC520 006 (Loc. I)	Previously reviewed under an approved EP or DOCD? S-7916	X	Yes		No	
Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?		X	Yes		No	
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 290,000	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	29.0°		

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 09821		OCS OCS
Area Name	Mississippi Canyon		
Block No.	520		
Blockline Departures (in feet)	N/S Departure: 4,350.79 FSL	N/S Departure:	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2,224.91 FEL	E/W Departure:	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 1,264,975.09’	X:	X: X: X:
	Y: 10,332,030.79’	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28° 27’ 57.640” N	Latitude	Latitude Latitude Latitude
	Longitude 88° 10’ 07.940” W	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 6,746	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	N/A			

Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

Anchor Name or No.	**Area**	**Block**	**X Coordinate**	**Y Coordinate**	**Length of Anchor Chain on Seafloor**
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC520 007 (Loc. G)	Previously reviewed under an approved EP or DOCD? S-7916	X	Yes		No

Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.	

Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?	X	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 290,000	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	29.0°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 09821		OCS OCS
Area Name	Mississippi Canyon		
Block No.	520		
Blockline Departures (in feet)	N/S Departure: 4,402.36 FSL	N/S Departure:	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2,311.69 FEL	E/W Departure:	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 1,264,888.31’	X:	X: X: X:
	Y: 10,332,082.36’	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28° 27’ 58.142” N	Latitude	Latitude Latitude Latitude
	Longitude 88° 10’ 08.918” W	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 6,744	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	N/A			

Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

Anchor Name or No.	**Area**	**Block**	**X Coordinate**	**Y Coordinate**	**Length of Anchor Chain on Seafloor**
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC520 007 (Loc. H)	Previously reviewed under an approved EP or DOCD? S-7916	X	Yes		No
Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?		X	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 290,000	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	29.0°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 09821		OCS OCS
Area Name	Mississippi Canyon		
Block No.	520		
Blockline Departures (in feet)	N/S Departure: 4,301.88 FSL	N/S Departure:	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2,312.05 FEL	E/W Departure:	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 1,264,887.95’	X:	X: X: X:
	Y: 10,331,981.88’	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28° 27’ 57.147” N	Latitude	Latitude Latitude Latitude
	Longitude 88° 10’ 08.911” W	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 6,747	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	N/A			

Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

Anchor Name or No.	**Area**	**Block**	**X Coordinate**	**Y Coordinate**	**Length of Anchor Chain on Seafloor**
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC520 008 (Loc. E)	Previously reviewed under an approved EP or DOCD? S-7916	X	Yes		No

Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.		

Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?	X	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 290,000	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	29.0°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 09821		OCS OCS
Area Name	Mississippi Canyon		
Block No.	520		
Blockline Departures (in feet)	N/S Departure: 6,698.18 FNL	N/S Departure:	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 3,163.59 FEL	E/W Departure:	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 1,264,036.41’	X:	X: X: X:
	Y: 10,336,821.82’	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28° 28’ 44.995” N	Latitude	Latitude Latitude Latitude
	Longitude 88° 10’ 18.982” W	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 6,692	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	N/A			

Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

Anchor Name or No.	**Area**	**Block**	**X Coordinate**	**Y Coordinate**	**Length of Anchor Chain on Seafloor**
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC520 008 (Loc. C)			Previously reviewed under an approved EP or DOCD? S-7916	X	Yes		No
Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.		
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?				X	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 290,000	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	29.0°

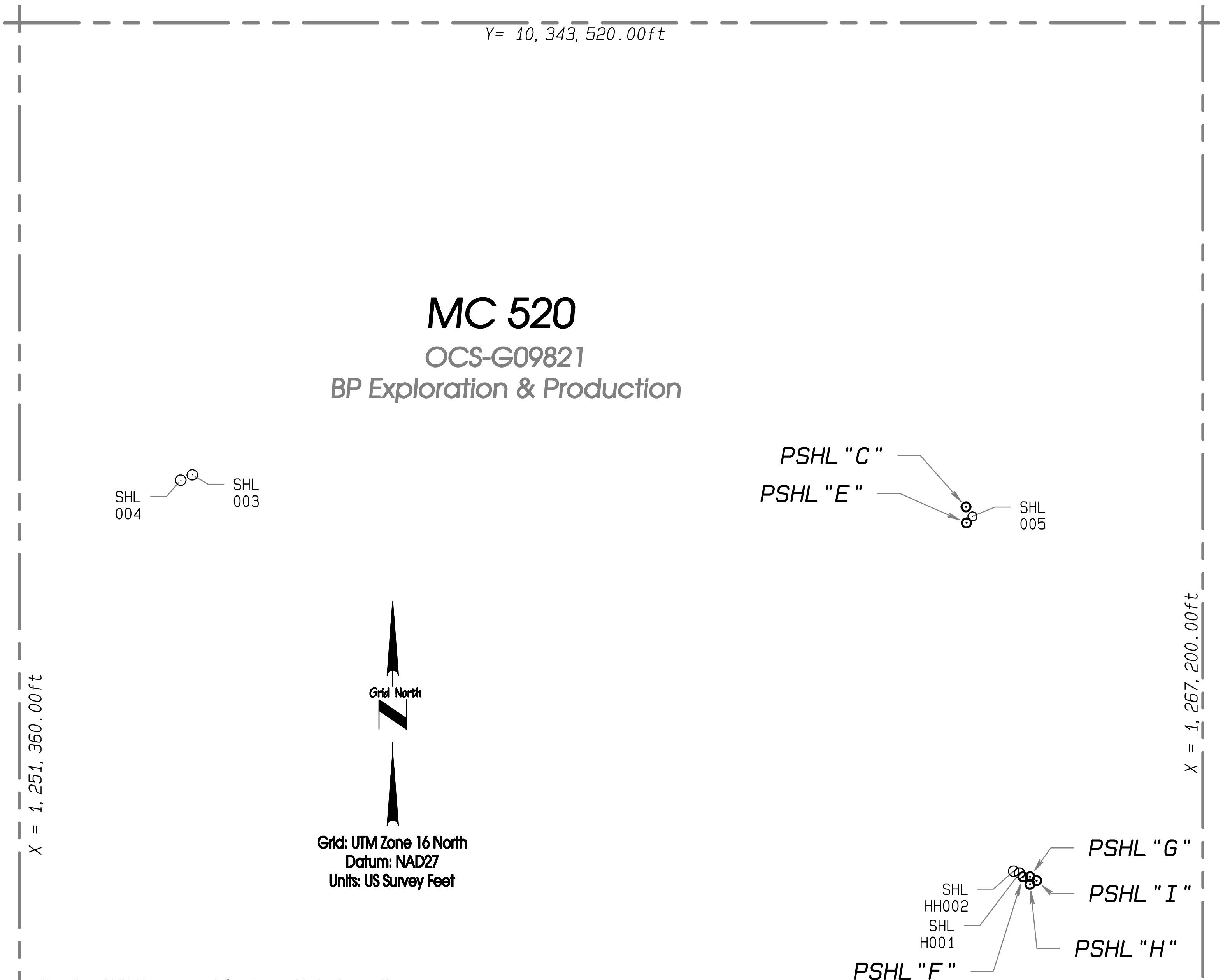
	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 09821		OCS OCS
Area Name	Mississippi Canyon		
Block No.	520		
Blockline Departures (in feet)	N/S Departure: 6,484.10 FNL	N/S Departure:	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 3,168.63 FEL	E/W Departure:	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 1,264,031.37’	X:	X: X: X:
	Y: 10,337,035.90’	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28° 28’ 47.115” N	Latitude	Latitude Latitude Latitude
	Longitude 88° 10’ 19.062” W	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 6,689	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	N/A			

Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

Anchor Name or No.	**Area**	**Block**	**X Coordinate**	**Y Coordinate**	**Length of Anchor Chain on Seafloor**
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	

Appendix B: Location Plat, Bathymetry Plat, and Vicinity Plat



Revised EP Proposed Surface Hole Locations:

EP PSHL	OCS-G09821 MC520 Lease/Block Ties	UTM Zone 16N, NAD27, US Ft Easting (X)	Northing (Y)	NAD27 Lat/Lon dd mm ss.sssN	dd mm ss.sssW	NAD83 Lat/Lon dd mm ss.sssN	dd mm ss.sssW	Depth MSL ft
C	6484.10 FNL X 3168.63 FEL	1, 264, 031.37	10, 337, 035.90	28°28'47.115"N	88°10'19.062"W	28°28'47.996"N	88°10'19.038"W	6, 689
E	6698.18 FNL X 3163.59 FEL	1, 264, 036.41	10, 336, 821.82	28°28'44.995"N	88°10'18.982"W	28°28'45.877"N	88°10'18.959"W	6, 692
F	4401.74 FSL X 2407.00 FEL	1, 264, 793.00	10, 332, 081.74	28°27'58.127"N	88°10'09.986"W	28°27'59.009"N	88°10'09.961"W	6, 742
G	4402.36 FSL X 2311.69 FEL	1, 264, 888.31	10, 332, 082.36	28°27'58.142"N	88°10'08.918"W	28°27'59.025"N	88°10'08.893"W	6, 744
H	4301.88 FSL X 2312.05 FEL	1, 264, 887.95	10, 331, 981.88	28°27'57.147"N	88°10'08.911"W	28°27'58.030"N	88°10'08.886"W	6, 747
I	4350.79 FSL X 2224.91 FEL	1, 264, 975.09	10, 332, 030.79	28°27'57.640"N	88°10'07.940"W	28°27'58.522"N	88°10'07.915"W	6, 746

Y= 10, 327, 680.00ft

Notes:
1) All spatial data based on UTM Zone 16 North, NAD27, US Survey feet, unless otherwise noted;
2) All geodetic transformations per NADCON 2.0/4.2 CONUS grids for NAD27 <-> NAD83(86);
3) Locations NOT in a Military Warning Area;
4) Location in BSEE New Orleans District;
5) Well data per BSEE as of September 2019 and internal BP sources;
6) Bathymetry based on AUV MBES data aquired by Fugro USA Marine, Inc. in 2018, adjusted 6 ft shallower to correlate with the existing driller's depths observed at wells MC520-1 and MC520-2.

"Public Information"

bp

BP EXPLORATION AND PRODUCTION

Revised EP Locations OCS-G09821 MC520 "C,E,F,G,H,I"

Mississippi Canyon Area (OPD# NH16-10) Block 520 ***Offshore Federal***

Plat prepared by: Robert M. Frost, PLS, BP Reservoir Development

Scale 1" = 2000 ft

Date: 28 October 2019

rmf

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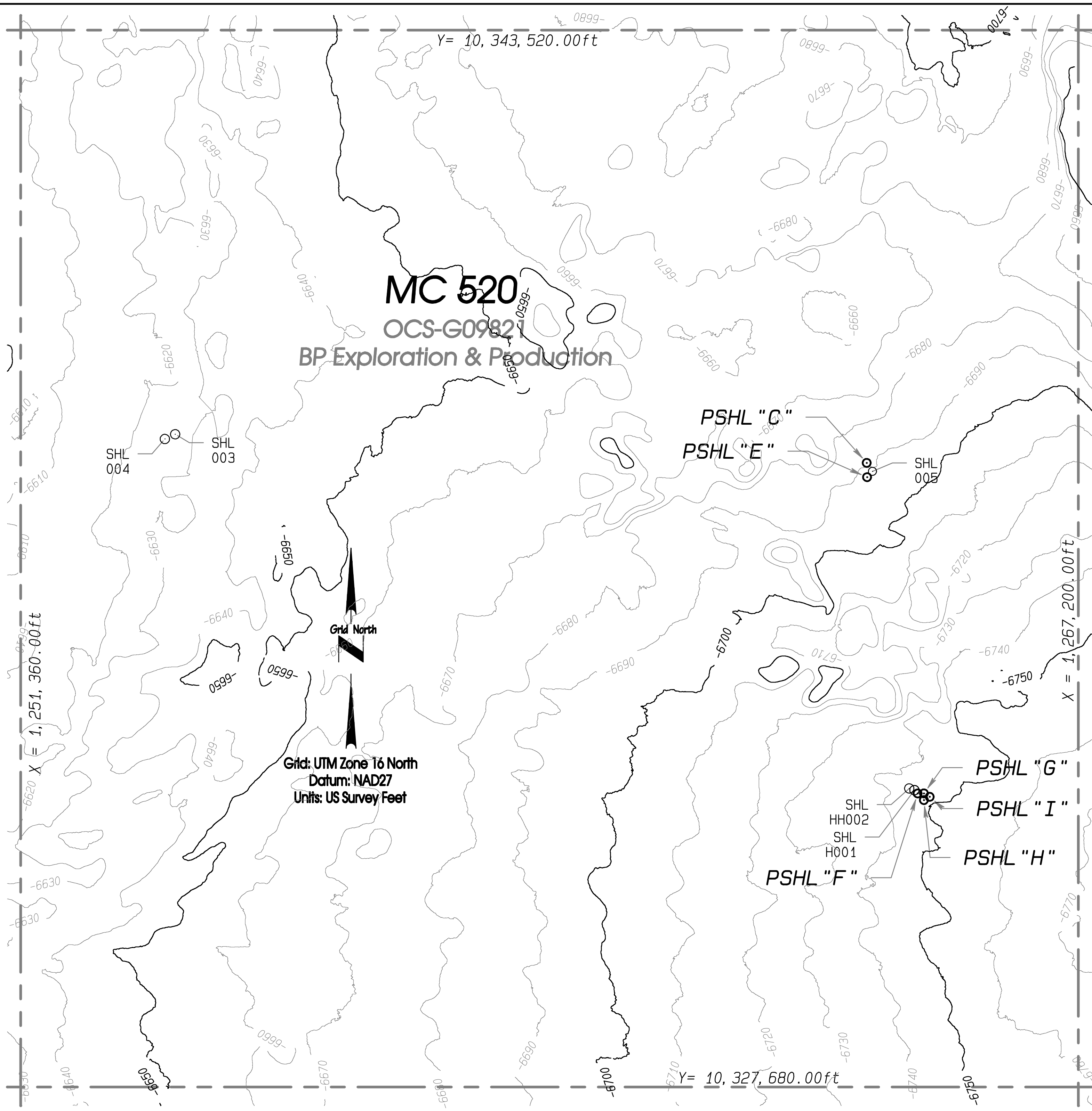

Notes:

1) All spatial data based on UTM Zone 16 North, NAD27, US Survey feet, unless otherwise noted;
2) All geodetic transformations by NADCON 2.0 or better equivalent software;
3) Locations NOT in a Military Warning Area;
4) Location in BSEE New Orleans District;
5) Well data per BSEE as of September 2018 and internal BP sources;
6) Bathymetry based on AUV MBES data aquired by Fugro USA Marine, Inc. in 2018, adjusted 6 ft shallower to correlate with the existing driller's depths observed at wells MC520-1 and MC520-2.

Bathymetric Data
Source: Fugro AUV MBES Survey 2018,
Indexed to observed Driller's Depths.
DEM gridded at 20' posting interval
Depth contour interval = 10 feet
Index depth contour interval = 50 feet

"Bathymetic Plat"

BP EXPLORATION AND PRODUCTION	Scale 1" = 2000 ft
Revised EP Locations OCS-G09821 MC520 "C,E,F,G,H,I"	Date: 28 October 2018
Mississippi Canyon Area (OPD# NH16-10) Block 520 — Offshore Federal	
Plat prepared by: Robert M. Frost, PLS, BP Reservoir Development	rmf

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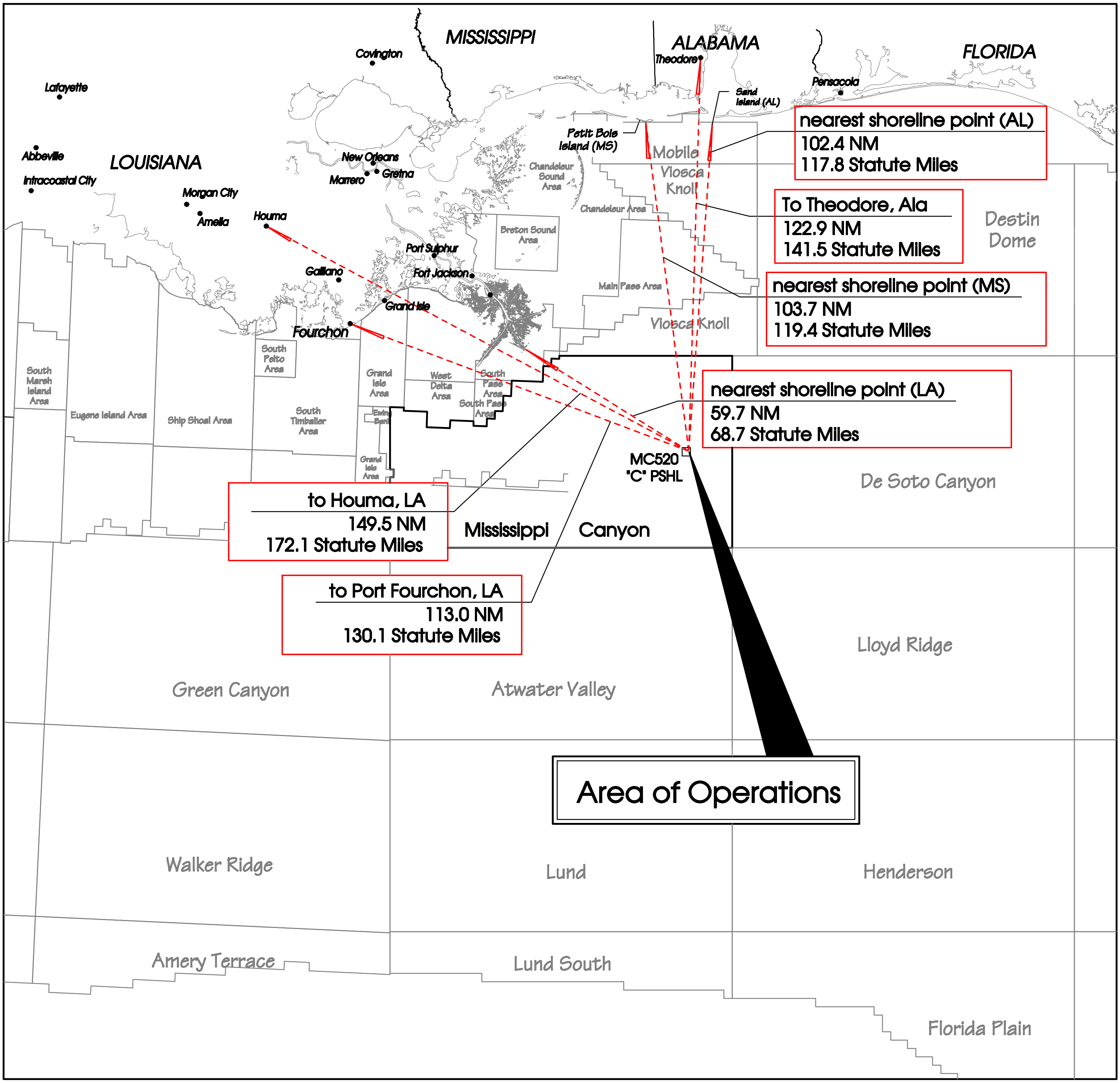
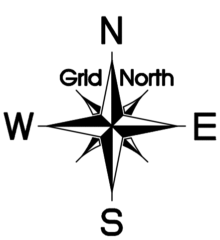


Note: Nearest Louisiana shoreline distance was computed from the Proposed Surface Location of the MC520 "C" to the nearest shoreline feature as represented in the NOAA 1:24k Continuously Updated Shoreline Product (CUSP). This vector Database is a more current, detailed, and correct representation of the actual shoreline than the NOAA 1:80k Medium-Resolution Vector Shoreline Database, which was based on medium-scale charts compiled by NOAA in the 1980's and which no longer accurately reflects the actual shoreline position in many location, especially along the Mississippi River Delta.



Grid: UTM Zone 16 North
Datum: NAD27
Units: US Survey Feet

"VICINITY CHART"

BP EXPLORATION AND PRODUCTION

Revised EP Locations OCS-G09821 MC520 "C,E,F,G,H,I"

Mississippi Canyon Area (OPD# NH16-10) Block 520 — *Offshore Federal*

Plat prepared by: Robert M. Frost, PLS, BP Reservoir Development

Scale 1" = 50 miles

Date: 27 October 2019

rmf

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Appendix C: Geological & Geophysical Information (Geological Description, Structure Contour Maps, Interpreted Seismic Lines, Geological Structure Cross-Section Maps, Shallow Hazards Assessments (Site Clearance Letters) for Well Locations, Stratigraphic Column, H_2S Correlative Wells Information, Time vs. Depth Information

SITE CLEARANCE LETTER

PROPOSED EXPLORATION WELL LOCATIONS
MC 520 “F”, “G”, “H”, AND “I”
BLOCK 520, OCS-G-09821
MISSISSIPPI CANYON AREA

PROPOSED SURFACE LOCATION - MC 520 “F”	
88° 10' 09.986" W	28° 27' 58.127" N
X = 1,264,793 ft E	Y = 10,332,081.7 ft N
4,402 ft FSL	2,407 ft FEL
Water Depth:	6,742 ft below MSL
PROPOSED SURFACE LOCATION – MC 520 “G”	
88° 10' 08.918" W	28° 27' 58.142" N
X = 1,264,888.3 ft E	Y = 10,332,082.4 ft N
4,402 FSL	2,312 FEL
Water Depth:	6,744 ft below MSL
PROPOSED SURFACE LOCATION – MC 520 “H”	
88° 10' 08.911" W	28° 27' 57.147" N
X = 1,264,888 ft E	Y = 10,331,981.9 ft N
4,302 FSL	2,312 FEL
Water Depth:	6,747 ft below MSL
PROPOSED SURFACE LOCATION – MC 520 “I”	
88° 10' 07.940" W	28° 27' 57.640" N
X = 1,264,975.1 ft E	Y = 10,332,030.8 ft N
4,351 FSL	2,225 FEL
Water Depth:	6,746 ft below MSL

X and Y Coordinates in UTM 16N (US Survey ft)
Geodetic Datum: NAD 1927
Spheroid: Clarke 1866

PROPOSED WELL LOCATIONS MC 520 "F", "G", "H", AND "I"
BLOCK 520, OCS-G-09821
MISSISSIPPI CANYON AREA, GULF OF MEXICO, USA

Introduction. This wellsite clearance letter addresses the shallow hazards for proposed wellsites MC 520 "F", MC 520 "G", MC 520 "H", and MC 520 "I" in Block 520, Mississippi Canyon, Gulf of Mexico (OCS-G-09821). This letter is intended to address seafloor and shallow geologic conditions within 2,000 ft of the proposed wellsites from the seafloor (about 6,742 ft Total Vertical Depth Sub-Sea; TVDSS) to about 11,500 ft TVDSS based on reprocessed 3D seismic, autonomous underwater vehicle (AUV) data, and limited offset well data. The proposed wells are about 100 ft from each other and are not described separately in this letter as shallow geologic conditions are expected to be very similar. BP plans to drill the proposed wells from a dynamically positioned vessel, therefore, an anchoring assessment is not required.

This letter revised the Exploration Plan (EP) to be submitted, and complies with Bureau of Ocean Energy Management (BOEM) guidelines provided in Notice to Lessees (NTL) 2014-G04, 2011-JOINT-G01, 2009-G40, 2008-G05 and 2005-G07 (BOEM, 2014, 2011, 2009, 2008 and 2005). This letter is supported by a comprehensive Stratigraphic and Geologic Assessment done by Geoscience Earth & Marine Services, Inc. (GEMS) in 1998, a regional 3D seismic based Shallow Hazards study, across multiple blocks in the area, by Gardline Surveys, Inc. in 2005, an Archaeological and Hazards Assessment by Fugro USA Marine, Inc. in 2018 (GEMS, 1998; Gardline, 2005; Fugro, 2018). The GEMS report is based on Deep-tow Survey data acquired in 1997 across the Nakika Field, while the Fugro report is based on AUV site survey data acquired in 2018. The Gardline report is a regional geohazards assessment based on the interpretation of a 3D time seismic volume. These reports were previously submitted along with, and referenced within EPs for several wells within the BP Nakika Field. The text, maps, and plates included in these reports provide detail on the regional geology of the Study Area. This letter is intended to supplement those reports with detailed site-specific interpretation conducted by BP at the proposed wellsite using recently reprocessed seismic data.

Attachments. Seafloor plates (1-5) are centered on the proposed exploration wells and are displayed at a 1 inch = 1,000 ft scale (1: 12,000). A 2,000 ft radius circle around the proposed wells is also shown on the Seafloor Plates.

- AUV Seafloor Rendering
- AUV Water Depth and Seafloor Features
- AUV Seafloor Gradient
- AUV Multibeam Backscatter
- AUV Side Scan Sonar Mosaic

Subsurface plates (6-10) accompanying this letter were extracted from the AUV and 3D data and are listed below.

- Sub-Surface Geologic Features
- Portion of AUV Subbottom Profiler Line BPUSAUV18HERS-402
- Portion of 3D Seismic Inline 2707
- Portion of 3D Seismic Crossline 8480
- Top-hole Prognosis Chart, Proposed Wellsites MC 520 "F", "G", "H", and "I"

3D Seismic Survey Parameters. The reprocessed 3D depth volume used in this site specific assessment covers an approximate 25 block area in the eastern Mississippi Canyon (MC) area. The survey was acquired using 6 streamers (648 channels per streamer) with a length of 8,100 m separated 100 m apart, a streamer depth of 9 m and 2 energy sources at a depth of 6 m. Survey Inlines are oriented northwest-southeast, have a numerical increment of one, and are spaced 41 ft (12.5 m) apart. Crosslines are oriented northeast-southwest, have a numerical increment of one, and are spaced 41 ft (12.5 m) apart.

Shallow Hazards NTL 2008-G05 addresses the data quality and frequency content required of 3D seismic data used for shallow hazards assessment. In compliance with this NTL, the original conventional 3D seismic dataset was reprocessed by CGG, Inc., in 2013, using Kirchhoff pre-stack depth migration (PSDM). The data have a loaded record length of approximately 32,500 ft and a sample rate of 10 ft. The seismic data follow North American polarity convention and demonstrate a balanced zero phase wavelet based on the seafloor reflector, and high amplitude, low-impedance anomalies indicative of shallow gas.

3D Seismic Frequency. The bandwidth of the data is approximately 3 - 78 Hz. This frequency bandwidth corresponds to a limit of separability of about 37 ft, assuming a representative frequency of 37 Hz and an average velocity of 5500 ft/sec in the shallow section.

Autonomous Underwater Vehicle (AUV) Survey Data. The survey was acquired aboard the R/V Fugro Enterprise, between April 26th and 28th, and May 2nd and 5th, 2018. The survey consisted of thirty-three (33) north-south primary tracklines spaced 492 ft (150 m) apart and nine (9) east-west tielines spaced 1640 ft (500 m) apart. For further details concerning the survey, please refer to Fugro, 2018.

Offset Well Data. Offset well data from the BOEM database and BP internal notes were used to compile a summary of shallow hazards encountered at nearby offset wells.

Archaeological Resource Survey Requirement. The study area lies within an area designated as archeologically sensitive per NTL No. 2005-G07 and NTL 2011-JOINT-G01 (BOEM, 2005 and 2011). To ensure that archaeological resources on the Outer Continental Shelf (OCS) are not damaged or destroyed by oil, gas, and sulphur operations, and pursuant to the Pre-Seabed Disturbance Survey Mitigation (BOEM, 2011), an archaeological assessment of the drilling locations was performed. In 2018, BP acquired an AUV archaeological survey that covered Block MC 520. Fugro conducted the survey and generated an archaeological assessment report (Fugro, 2018).

There are no archaeologically significant artifacts identified in the vicinity of the proposed well locations. The closest unidentified side scan sonar contact to the proposed wells is over 6,000ft to the west, and will not constrain exploratory and development drilling.

SEAFLOOR CONDITIONS

Water Depth and Seafloor Gradient. The water depth at each location are predicted to be between 6,742 ft TVDSS and 6,747 ft TVDSS. The depth was derived from the 2018 AUV bathymetry (Plates 1 and 2), which was adjusted 6 ft shallower to correlate with the existing MC520-1 and MC520-2 recorded water depths. The local seafloor gradient ranges between 1.2 and 2.2 degrees towards the south-southeast (Plate 3).

Seafloor Features. The generally hummocky nature of the seafloor is due to sediment drape covering a shallow-buried mass transport deposit within Unit I (Plates 1, 2, 3, and 7). Based on the AUV Assessments, the seafloor is likely comprised of soft, marine clays. Fine-grained drill cutting sediments from the MC520-1 and MC520-2 were assessed to cover the seabed across the proposed wellsite locations (Plate 2).

Man-Made Obstructions. The closest infrastructure to the proposed wellsite are the flying leads that connect the Herschel-1 well tree (H1) to a sled, which are located 47 ft northwest, and the Herschel-1 well tree is also located 75 ft northwest (Plate 1). The closest oil pipeline is about 50 ft south of the proposed wells. The proposed wells do not lie within a Military Warning Area as defined by BOEM NTL 2014-G04 (BOEM, 2014) and are not located within a known chemical or munitions dump site. Thus, hazardous wastes or unexploded ordnance are not expected, and nothing resembling such was detected on the AUV data in the vicinity of the proposed well locations.

Seafloor Debris. The nearest piece of debris identified in the AUV data is over 6,000ft west of the proposed well. It measures about 15.2 ft in length and 5.0 ft in width, and will not constrain drilling the proposed wells (Plates 2 and 5).

Potential High-Density Benthic Communities. There is no geophysical evidence of seafloor hardgrounds or active hydrocarbon seepage features that could potentially support high-density benthic communities within 2,000 ft of the proposed locations (Plates 2, 4, and 5). This is based on the assessment of AUV multibeam echosounder backscatter, side scan sonar and sub-bottom profiler data.

SUBSURFACE CONDITIONS

Stratigraphy. The stratigraphy of the top-hole section at the proposed wells locations, as exhibited by the AUV subbottom profiler and reprocessed 3D seismic data, is mostly comprised of fine-grained sediments, interbedded with some sand-prone channel/levee complexes. The age of the sediments within the top-hole extends from Pleistocene to Pliocene and Upper Miocene.

The seafloor and ten subsurface horizons (Horizon 10, 20, 30, 40, 50, 60, P60, P42, M104 and M92) were mapped in the subsurface study area. Pliocene and Miocene age horizons are designated by the corresponding “P” and “M”, respectively. These Horizons divide the top-hole section into ten main units (Units 1 through 10). The stratigraphic interpretations and inferred lithologies are based primarily on seismic character of the 3D reprocessed seismic, and limited offset well data. Predicted depths and thicknesses associated with each of the mapped horizons and sequences are displayed on the attached Top-hole Prognosis Chart, which represents the subsurface conditions for the proposed wells drilling locations (Plate 10).

The Pleistocene sediments are about 1,664 ft thick and comprised of predominantly fine-grained, stacked sequences of thick mass transport deposits and parallel stratified hemipelagic clays interlayered with thin debris flows; thin silts and sands may be present (Units 1 through 6). The Pliocene section is divided into two separate units (Units 7 and 8). Unit 7 is about 1,154 ft thick and comprised of sand-prone channel deposits and clay-prone debris flow deposits interbedded with fine-grained debris flow deposits. Thin siltstones and sandstones may be present across Unit 7. Unit 8 is about 296 ft thick and comprised of mostly clayey mass transport deposits interlayered with potential thin siltstones. Units 9 and 10 represent the Miocene section within the top-hole and are about 1,819 ft thick and comprised of sand-prone channel and clay-prone levee deposits, and coarse-grained debris flow deposits overlying fine-grained debris flow deposits.

Fault Penetrations. The proposed wellbores will not intersect a fault in the top-hole section.

Shallow Gas. No high amplitude anomalies interpreted to represent shallow gas will be penetrated in the top-hole section by the proposed wellbores; therefore, there is a ***Negligible*** potential for encountering shallow gas. However, several isolated amplitude anomalies representing possible shallow gas in the top-hole section are scattered within 2,000 ft of the proposed wellbores and are illustrated on Plate 6. The closest amplitude anomalies indicative of shallow gas are located about 350 ft southeast within Unit 10 (Plates 8, 9, and 10). This amplitude anomaly lies at a depth of about 11,000 ft TVDSS.

Gas Hydrate. Temperature and pressure conditions are favorable for the presence of gas hydrates within the study area. The base of the gas hydrate stability zone (BGHSZ) is sometimes manifested in seismic data either by the occurrence of a “bottom-simulating” reflector (BSR) or by a lineation formed by the tops of shallow gas accumulations (high amplitude anomalies) that may group just below the BGHSZ. A classic cross-cutting BSR was not observed in the study area; however, a theoretical BGHSZ was modeled for the proposed well path using the fundamental gas hydrate phase equilibrium curve which requires input for temperature, pressure, gas mixture and salinity (Sloan, 1998). The resulting theoretical BGHSZ is estimated to occur at approximately 1,865 ft BML (8,563 ft TVDSS).

Disseminated and fracture-filling gas hydrates, if present, may occur in fine-grained sediments above the base of gas hydrate stability zone. However, the potential for encountering massive subsurface gas hydrates is ranked as ***Negligible***, due primarily to the lack of coarse-grained sediments above the BGHSZ.

Shallow Water Flow (SWF). The proposed wells is in the Mississippi Canyon Protraction that has experienced numerous instances of SWF events (BOEM, 2011) within Pleistocene age sediments and in some cases resulted in well losses. The closest offset well to the proposed wells is the Hershel well MC 520-1, which is about 75 ft to the northwest. This well reported a low SWF event while drilling the top-hole section; however MC 520-2, which is located 75ft west-northwest of MC 520-1, did not encounter a SWF event while drilling the same sandy interval. This interval correlates to the proposed wellsites. The Pleistocene section from seafloor to H60 has been interpreted as being predominantly fine-grained and therefore has been assessed a ***Negligible*** potential for SWF. The Lower section of Pleistocene, Pliocene and Miocene top-hole sections have been assessed a ***Low*** potential for SWF within the prognosis sand intervals (Plate 10).

Standard SWF mitigation practices are recommended when drilling through any intervals that have been assessed a ***Low*** potential for SWF in the top-hole section.

Closing. The proposed well locations appear to be generally favorable for exploration and development drilling operations. We advise caution based on this assessment, but believe the risk of danger to personnel and damage to the borehole, equipment and environment is generally ***Low,*** provided strict adherence to proper drilling and cementing procedures is followed concerning these hazards until the first pressure containment string is in place.

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October 21, 2019

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ATTACHMENTS:

Plate 1 AUV Seafloor Rendering, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

Plate 2 AUV Water Depth and Seafloor Features, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

Plate 3 AUV Seafloor Gradient, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

Plate 4 AUV Multibeam Backscatter, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

Plate 5 AUV Side Scan Sonar Mosaic, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

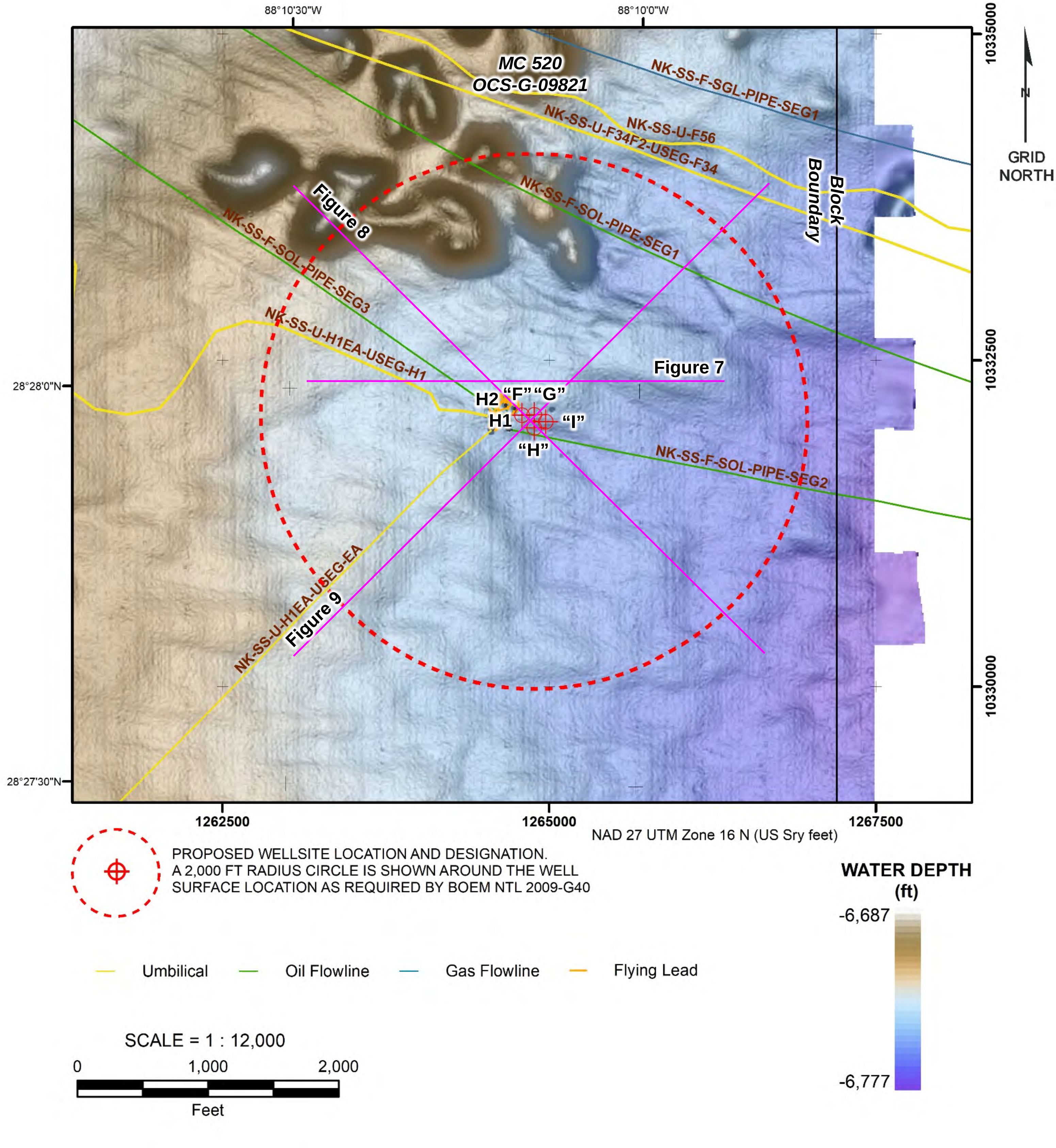
Plate 6 Sub-Surface Geologic Features, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

Plate 7 AUV Subbotom Profiler, Portion of AUV Line BPUSAUV18HERS-402, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

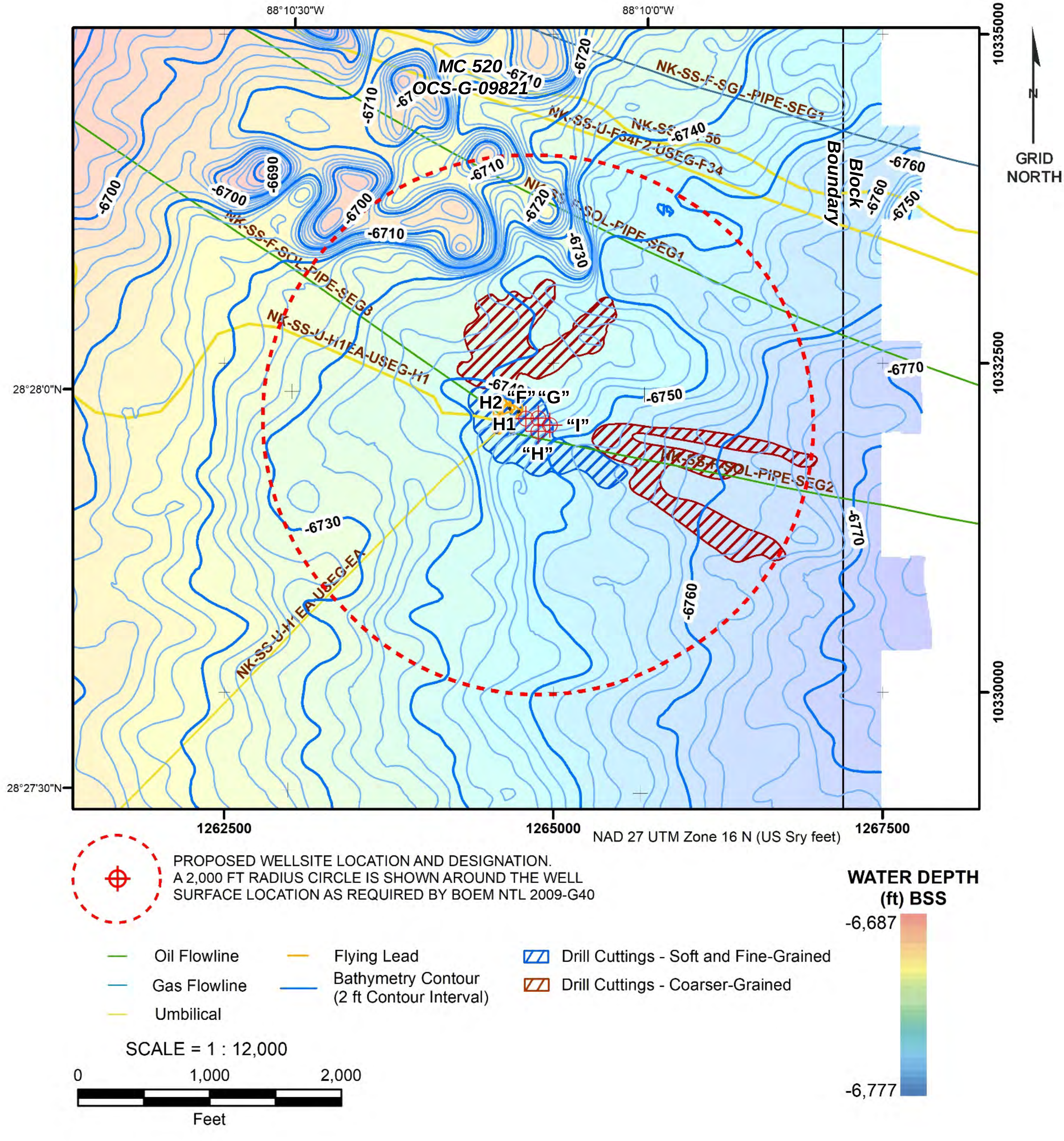
Plate 8 3D Seismic Section, Portion of Inline 2707, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

Plate 9 3D Seismic Section, Portion of Crossline 8480, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”

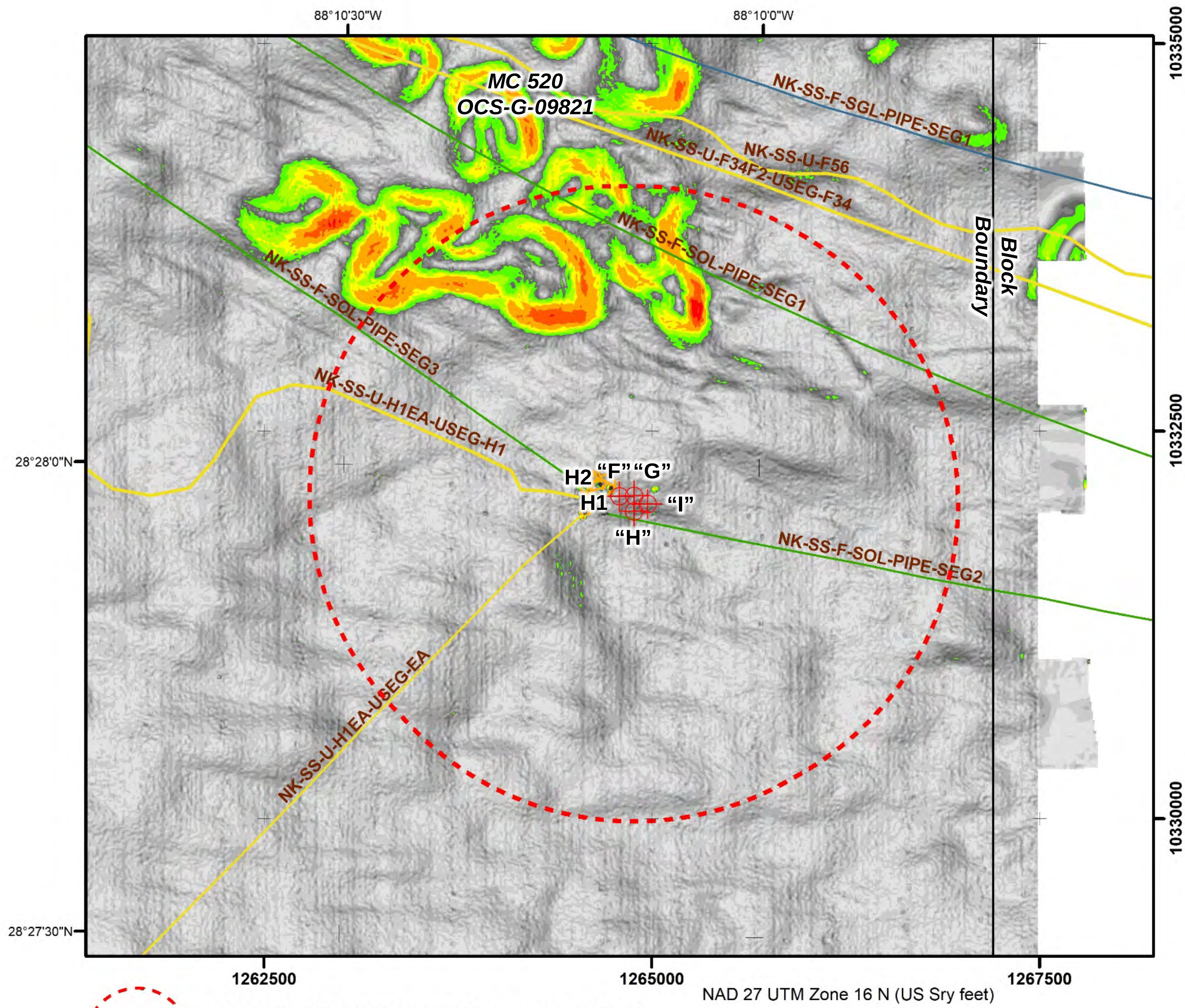
Plate 8 Top-Hole Prognosis Chart, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 “F”, “G”, “H”, and “I”



AUV SEAFLOOR RENDERING
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "F", "G", "H", AND "I"



AUV WATER DEPTH AND SEAFLOOR FEATURES
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "F", "G", "H", AND "I"



PROPOSED WELLSITE LOCATION AND DESIGNATION.
A 2,000 FT RADIUS CIRCLE IS SHOWN AROUND THE WELL SURFACE LOCATION AS REQUIRED BY BOEM NTL 2009-G40

Oil Flowline — Gas Flowline — Umbilical — Flying Lead

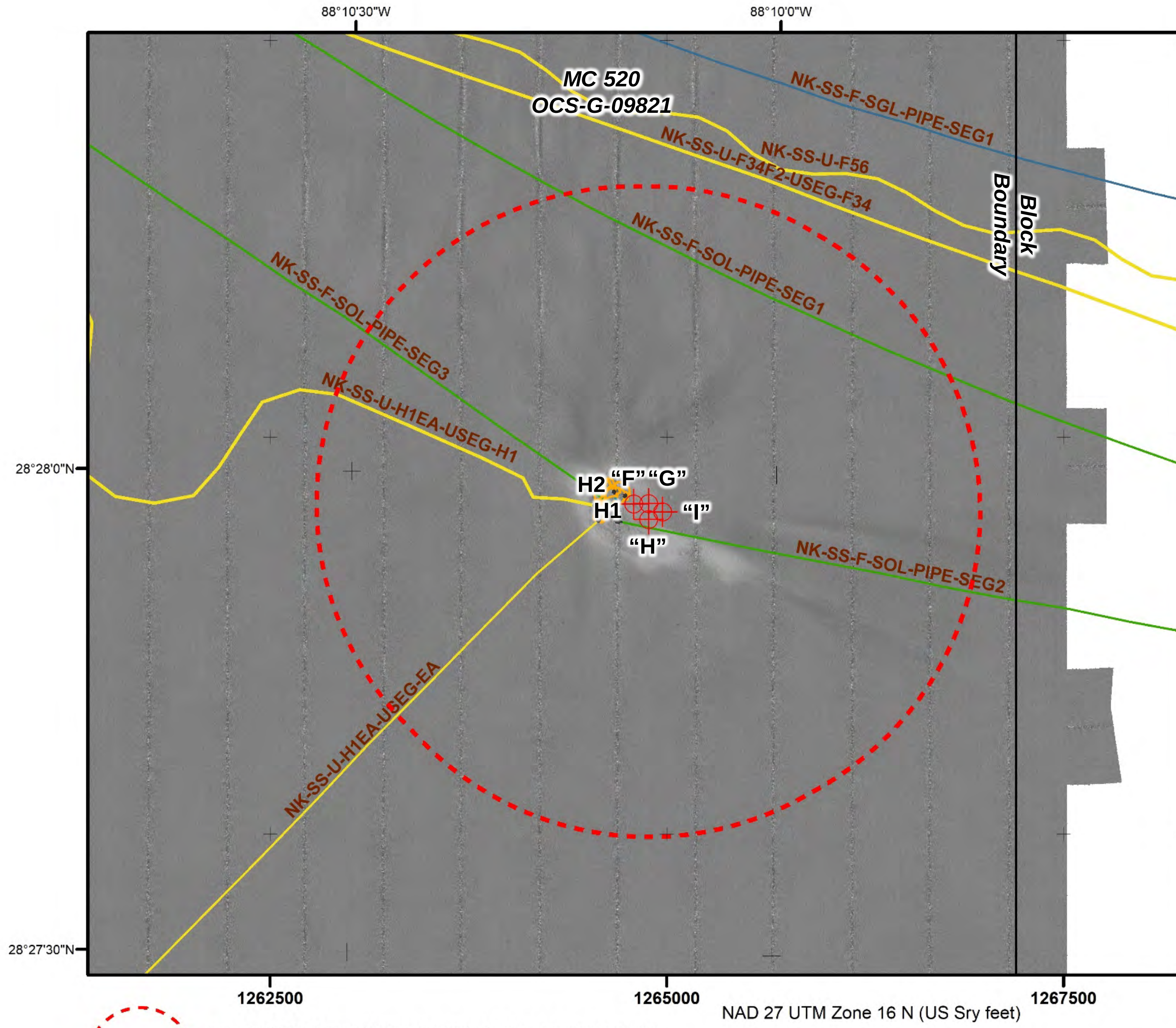
SCALE = 1 : 12,000

0 — 1,000 — 2,000 Feet

SEAFLOOR SLOPE (degrees)

- < 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- 5.0 - 6.0
- 6.0 - 8.0
- 8.0 - 10.0
- > 10.0

AUV SEAFLOOR GRADIENT
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 “F”, “G”, “H”, AND “I”



PROPOSED WELLSITE LOCATION AND DESIGNATION.
A 2,000 FT RADIUS CIRCLE IS SHOWN AROUND THE WELL SURFACE LOCATION AS REQUIRED BY BOEM NTL 2009-G40

RELATIVE SEAFLOOR BACKSCATTER INTENSITY

High

Low

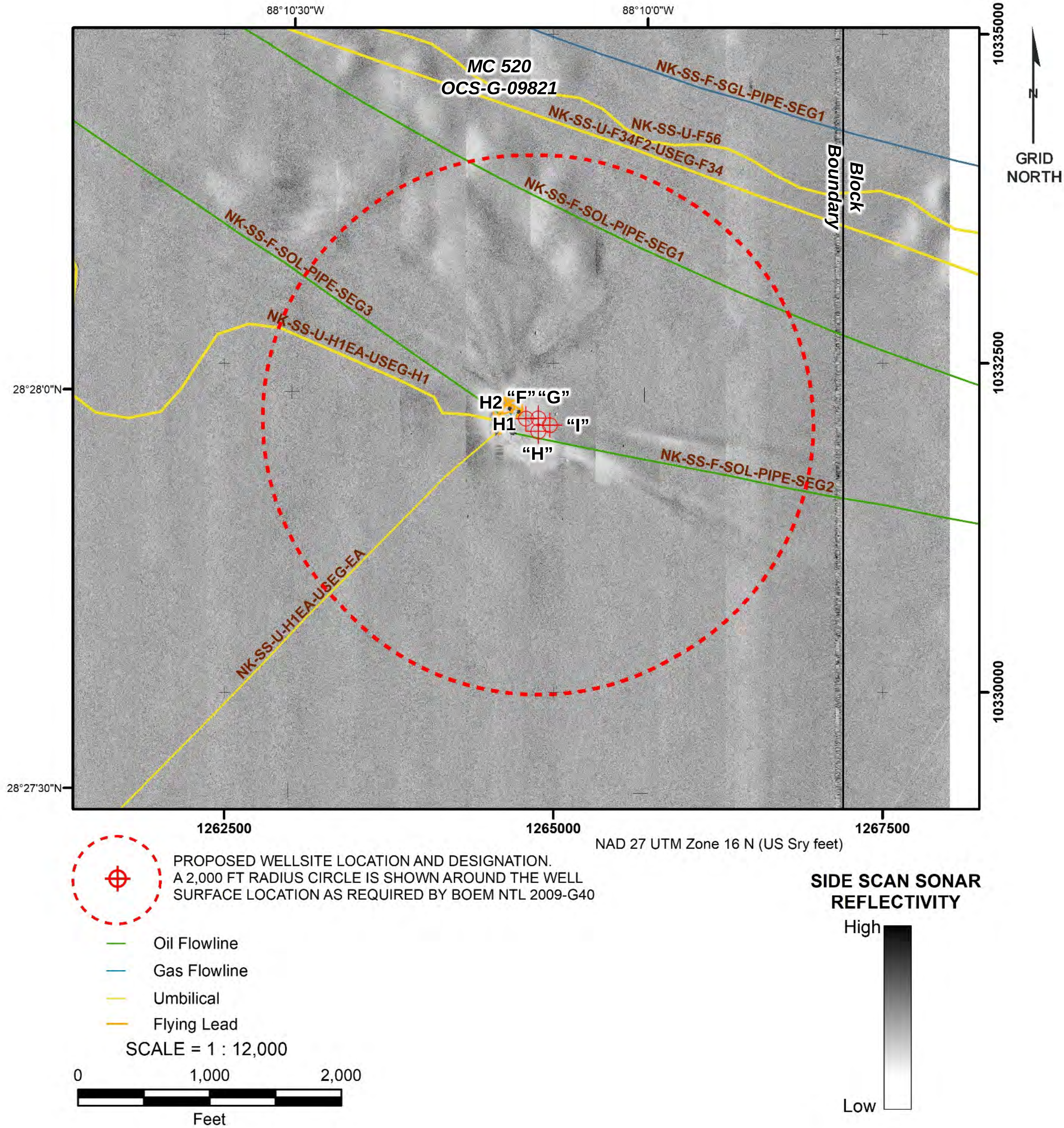
Oil Flowline — Gas Flowline — Umbilical — Flying Lead

SCALE = 1 : 12,000

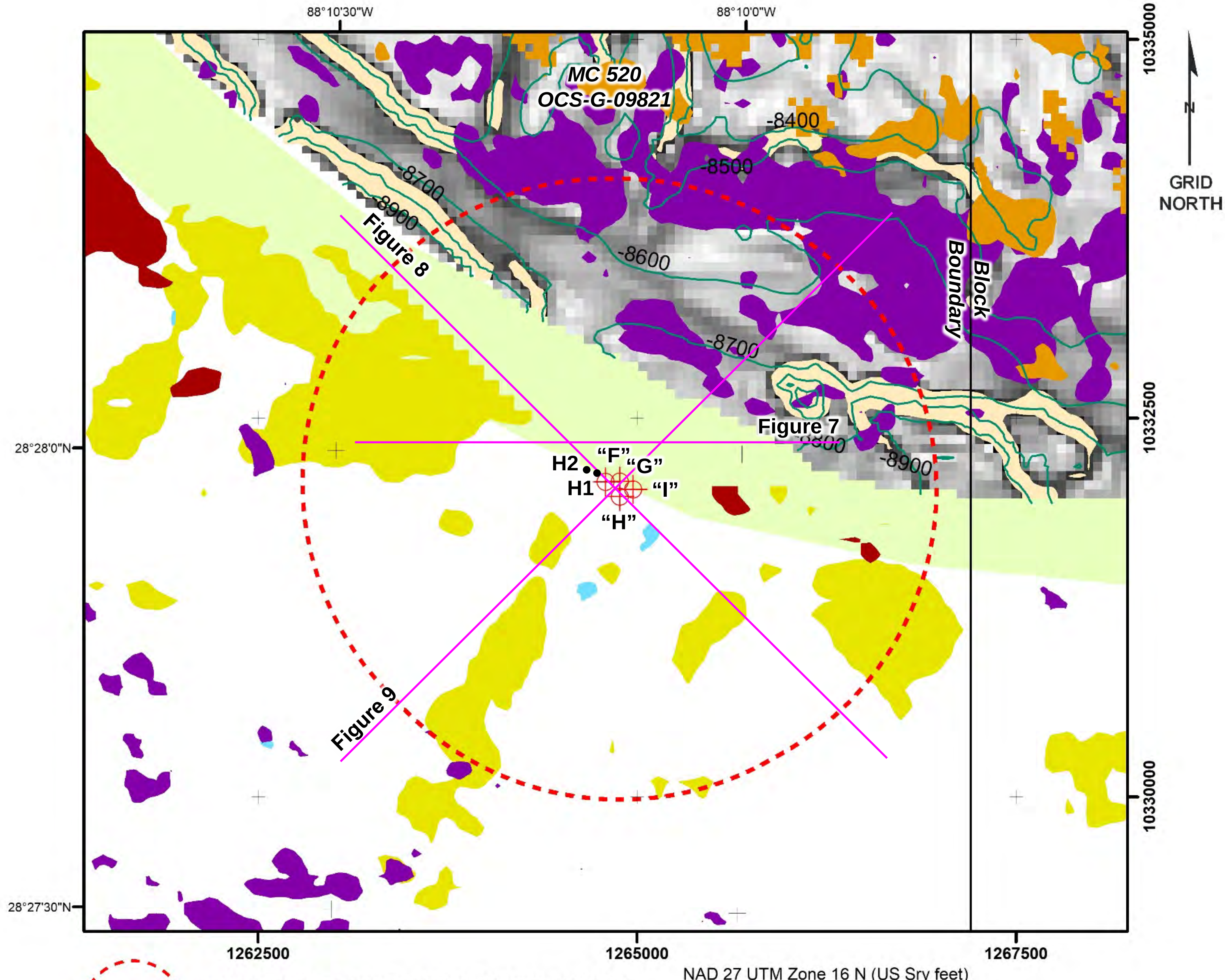
0 — 1,000 — 2,000

Feet

AUV MULTIBEAM BACKSCATTER
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 “F”, “G”, “H”, AND “I”



AUV SIDE SCAN SONAR MOSAIC
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "F", "G", "H", AND "I"



PROPOSED WELLSITE LOCATION AND DESIGNATION. A 2,000 FT RADIUS CIRCLE IS SHOWN AROUND THE WELL SURFACE LOCATION AS REQUIRED BY BOEM NTL 2009-G40

AMPLITUDE ANOMALIES BETWEEN HORIZON H40 AND HORIZON H60 (Units-5 & 6)

AMPLITUDE ANOMALIES BETWEEN HORIZON H60 AND HORIZON P60 AND TOP OF SALT (Unit-7)

AMPLITUDE ANOMALIES BETWEEN HORIZON P60 AND HORIZON P42 (Unit-8)

AMPLITUDE ANOMALIES BETWEEN HORIZON P42 AND HORIZON M104 (Unit-9)

AMPLITUDE ANOMALIES BETWEEN HORIZON M104 AND DOI (Unit-10)

EDGE OF SALT STANDOFF

TOP OF SALT GRADIENT GREATER THAN 30 DEGREES

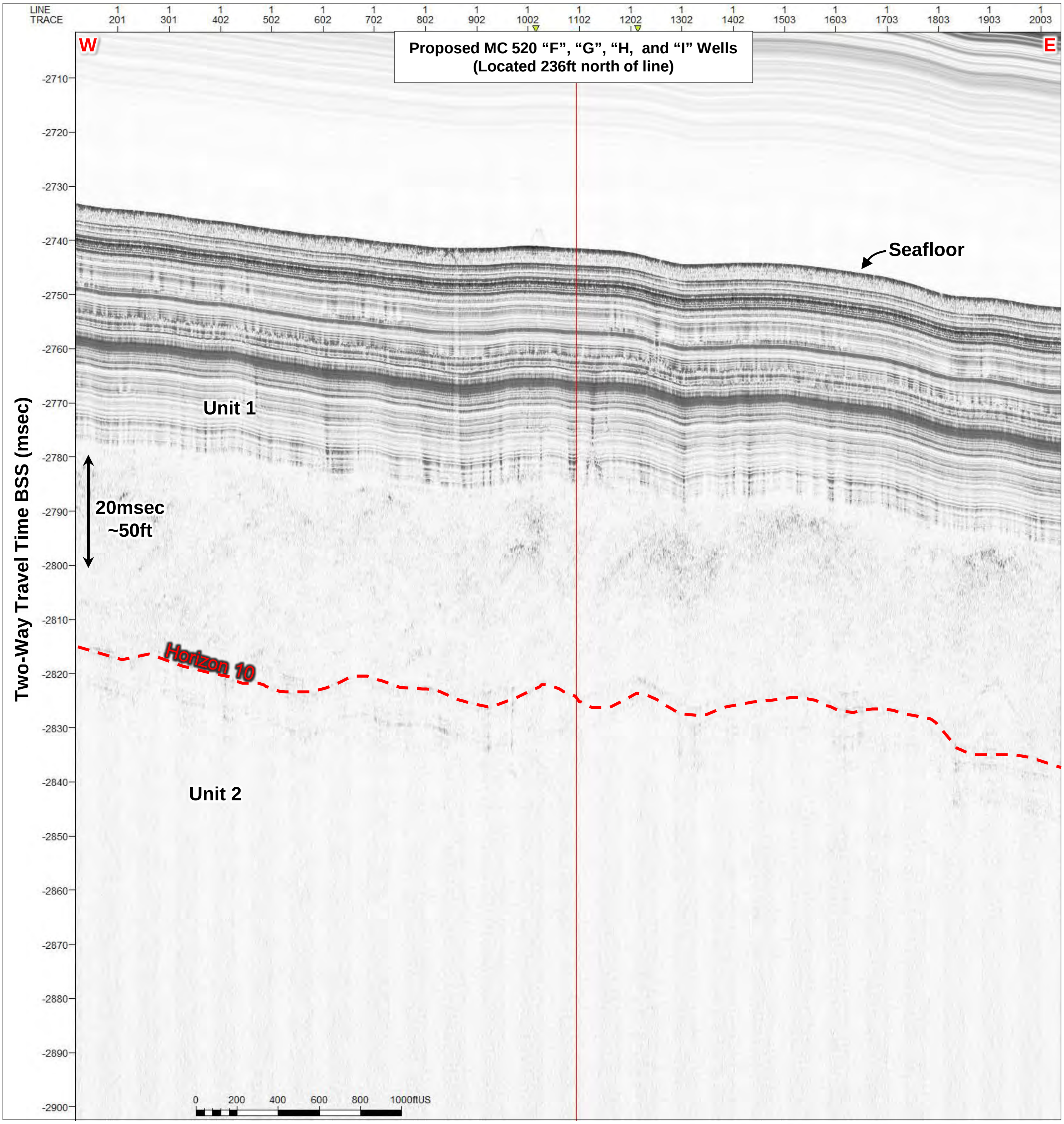
TOP OF SALT CONTOUR (TVDSS: 100FT CONTOUR INTERVAL)

SCALE = 1 : 12,000

0 1,000 2,000

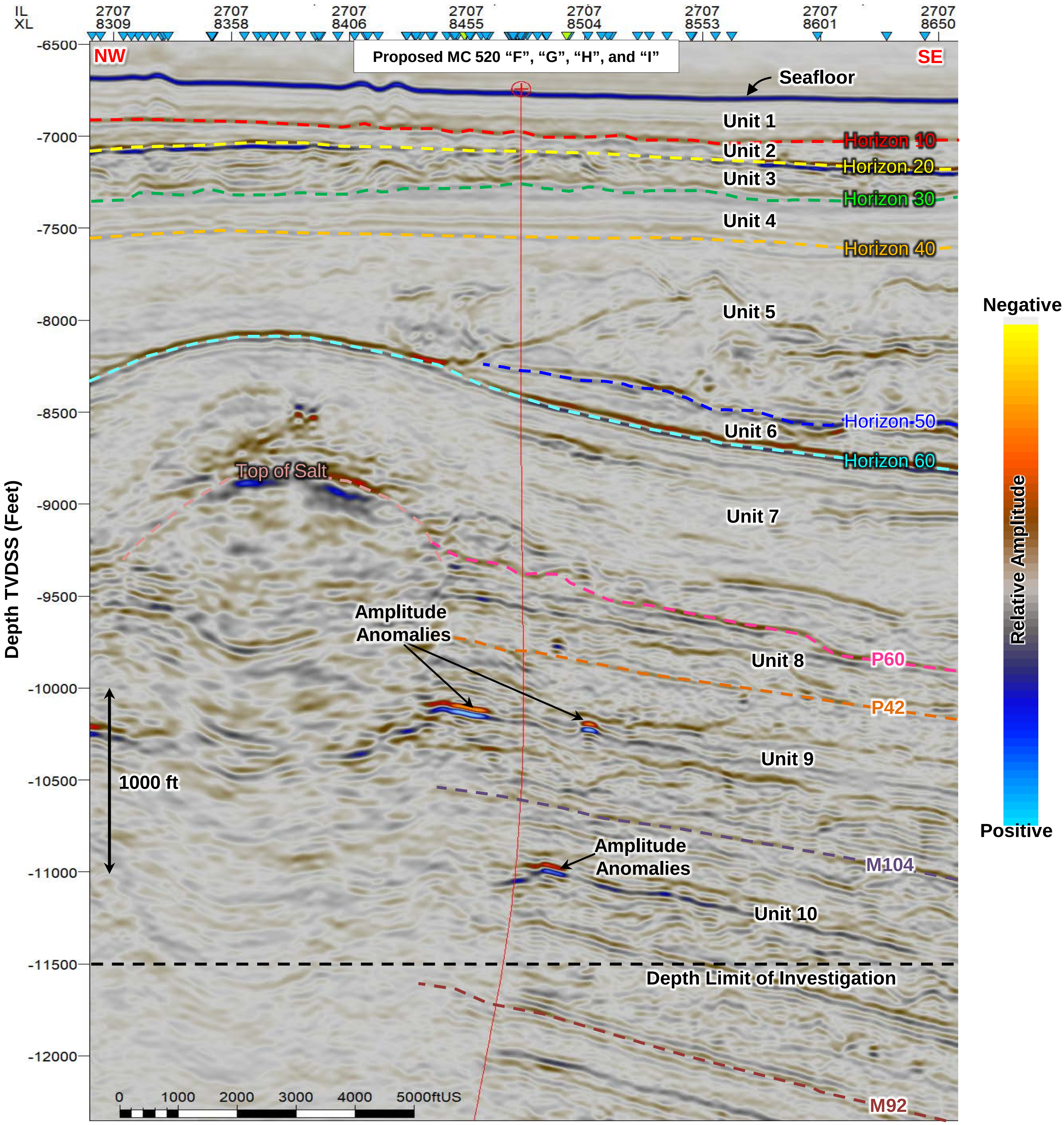
Feet

SUB-SURFACE GEOLOGIC FEATURES
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "F", "G", "H", AND "I"



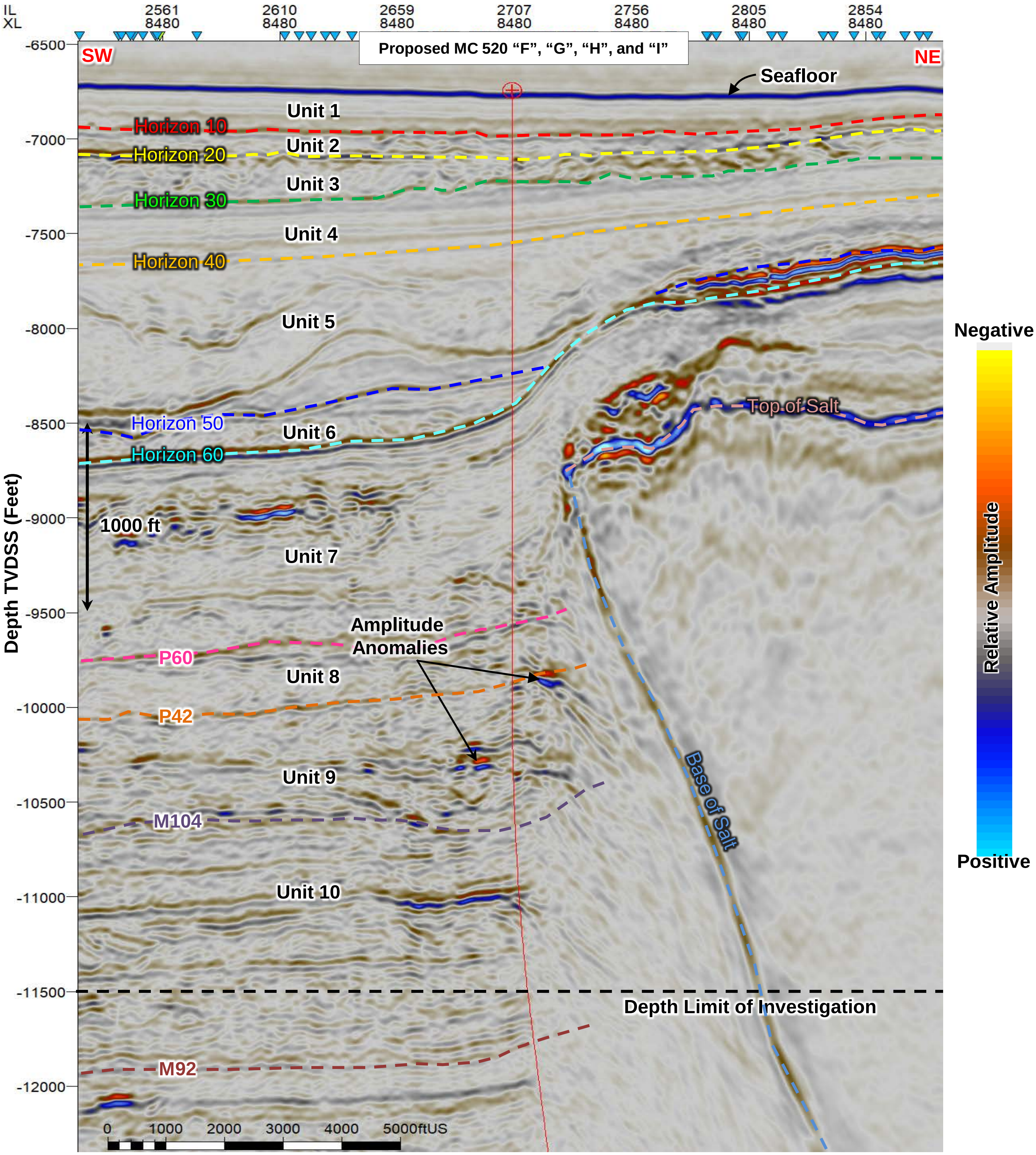
Location of Line on Plates 1 & 6

AUV SUBBOTTOM PROFILER, PORTION OF AUV LINE BPUSAUV18HERS-402
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 “F”, “G”, “H”, AND “I”



Location of Line on Plates 1 & 6

3D SEISMIC SECTION, PORTION OF INLINE 2707
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 “F”, “G”, “H”, AND “I”

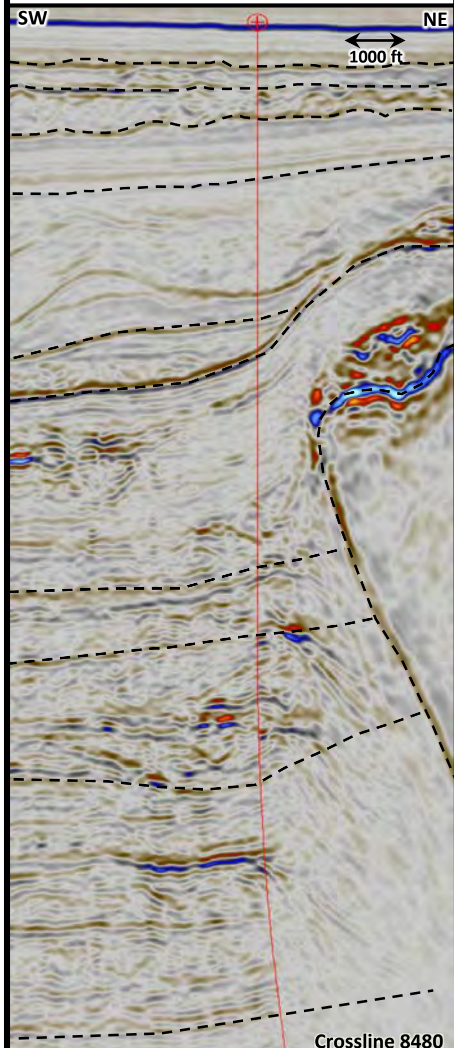


Location of Line on Plates 1 & 6

3D SEISMIC SECTION, PORTION OF CROSSLINE 8480
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "F", "G", "H", AND "I"

BP AMERICA INC.
SITE CLEARANCE LETTER, PROPOSED MC 520 "F", "G", "H", AND "I" LOCATION
MISSISSIPPI CANYON, GULF OF MEXICO

3D Seismic Section
Proposed Wellsites MC 520 "F", "G", "H", and "I"
Crossline 8480 at Inline 2707



Horizon & *Unit*	Inferred Lithology & Top-hole Conditions	DEPTHS BML (Feet)	DEPTHS TVDSS (Feet)	THICKNESS (Feet)	SHALLOW GAS POTENTIAL	SHALLOW WATER FLOW POTENTIAL
Seafloor	*Relatively smooth seafloor, slopes ~1.2°-2.2° to South-southeast*	0	6,742			
(Unit 1)	*Parallel stratified marine clays interlayered with debris flow deposits.*			236	Negligible	Negligible
Horizon 10		236	6,978			
(Unit 2)	*Predominantly clay-prone debris flow deposits.*			91	Negligible	Negligible
Horizon 20		327	7,069			
(Unit 3)	*Predominantly clay-prone debris flow deposits interbedded with thin silts.*			156	Negligible	Negligible
Horizon 30		483	7,225			
(Unit 4)	*Mostly clays interbedded w/ thin clay-prone debris flows.*			327	Negligible	Negligible
Horizon 40		810	7,552			
(Unit 5)	*Thick, fine-grained mass transport deposit with possible thin silts and sands at base of unit.*			573	Negligible	Negligible
Horizon 50		1,383	8,125			
(Unit 6)	*Clay-prone mass transport deposit.*			281	Negligible	Negligible
Horizon 60		1,664	8,406			
BGHSZ	*BGHSZ is within clay prone sequence of upper Unit 7.*	*1,865*	*8,563*			
(Unit 7)	*Mostly clays interbedded with thin debris flows and possible thin silts.* *Sand-prone channel deposit with interbedded clays and siltstones*			1,154	Negligible	Negligible Low Negligible
P60		2,818	9,560			
(Unit 8)	*Clay-prone debris flow deposits with possible thin interbedded siltstone.*			296	Negligible	Negligible
P42		3,114	9,856			
(Unit 9)	*Mostly clays interbedded with thin debris flows and possible thin silts and sands.* *Stacked channel system comprised mostly of shales/clays with interlayered siltstones and sandstones.*			716	Negligible	Negligible Low Negligible
M104		3,830	10,572			
(Unit 10)	*Mostly fine-grained deposits.* *Clay levee deposits with potential thin siltstones to sandstones near base of interval.* *Fine-grained deposits with possible thin siltstones at base.* (Depth Limit of Investigation)			928	Negligible	Negligible Low Negligible
		4,758	11,500			
M92						

Unit and Horizon nomenclature modified from previous studies in the area.

Risk Scale: Negligible | Low | Moderate | High

Seismic Section is an representation of subsurface condition along all proposed well locations.

BML = Below Mudline
BGHSZ = Base of Gas Hydrate Stability Zone
TVDSS = True Vertical Depth Subsea

TOP-HOLE PROGNOSIS CHART, HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA, PROPOSED WELLSITES MC 520 "F", "G", "H", AND "I"

SITE CLEARANCE LETTER

PROPOSED EXPLORATION WELL LOCATIONS
MC 520 “E” AND MC 520 “C”
BLOCK 520, OCS-G-09821
MISSISSIPPI CANYON AREA

PROPOSED SURFACE LOCATION - MC 520 “E”	
88° 10' 18.982" W	28° 28' 44.995" N
X = 1,264,036.41 ft E	Y = 10,336,821.82 ft N
6,698 ft FNL	3,172 ft FEL
Water Depth:	6,698 ft below MSL

PROPOSED SURFACE LOCATION – MC 520 “C”	
88° 10' 19.062" W	28° 28' 47.115" N
X = 1,264,031.37 ft E	Y = 10,337,035.9 ft N
6,484 FNL	3,172 FEL
Water Depth:	6,695 ft below MSL

X and Y Coordinates in UTM 16N (US Survey ft)
Geodetic Datum: NAD 1927
Spheroid: Clarke 1866

PROPOSED WELL LOCATIONS MC 520 “E”AND “C”
BLOCK 520, OCS-G-09821
MISSISSIPPI CANYON AREA, GULF OF MEXICO, USA

Introduction. This wellsite clearance letter addresses the shallow hazards for proposed wellsites MC 520 “E” and MC 520 “C” in Block 520, Mississippi Canyon, Gulf of Mexico (OCS-G-09821). This letter is intended to address specific seafloor and shallow geologic conditions within 2,000 ft of the proposed wellsites from the seafloor (6,698 ft Total Vertical Depth Sub-Sea; TVDSS) to about 11,500 ft TVDSS based on reprocessed 3D seismic, autonomous underwater vehicle (AUV) data, deep-tow data, and limited offset well data. The MC 520 “C” location is 214 ft to the north from the MC 520 “E” location and is not described separately in this letter as shallow geologic conditions are expected to be very similar. BP plans to drill the proposed well from a dynamically positioned vessel, therefore, an anchoring assessment is not required.

This letter supplements the Exploration Plan (EP) to be submitted, and complies with Bureau of Ocean Energy Management (BOEM) guidelines provided in Notice to Lessees (NTL) 2014-G04, 2011-JOINT-G01, 2009-G40, 2008-G05 and 2005-G07 (BOEM, 2014, 2011, 2009, 2008 and 2005). This letter is supported by a comprehensive Stratigraphic and Geologic Assessment done by Geoscience Earth & Marine Services, Inc. (GEMS) in 1998, a regional 3D seismic based Shallow Hazards study, across multiple blocks in the area, by Gardline Surveys, Inc. in 2005, an Archaeological and Hazards Assessment by Fugro USA Marine, Inc. in 2018 (GEMS, 1998; Gardline, 2005; Fugro, 2018). The GEMS report is based on Deep-tow Survey data acquired in 1997 across the Nakika Field, while the Fugro report is based on AUV site survey data acquired in 2018. The Gardline report is a regional geohazards assessment based on the interpretation of a 3D time seismic volume. These reports were previously submitted along with, and referenced within EPs for several wells within the BP Nakika Field. The text, maps, and plates included in these reports provide detail on the regional geology of the Study Area. This letter is intended to supplement those reports with detailed site-specific interpretation conducted by BP at the proposed MC 520 “E” wellsite using recently reprocessed seismic data.

Attachments. Seafloor plates (1-5) are centered on the proposed exploration well MC 520 “E” and are displayed at a 1 inch = 1,000 ft scale (1: 12,000). A 2,000 ft radius circle around the proposed wellsite is also shown on the Seafloor Plates.

- AUV Seafloor Rendering
- AUV Water Depth and Seafloor Features
- AUV Seafloor Gradient
- AUV Multibeam Backscatter
- AUV Side Scan Sonar Mosaic

Subsurface plates (6-10) accompanying this letter were extracted from the AUV and 3D data volume and are listed below.

- Sub-Surface Geologic Features
- Portion of AUV Subbottom Profiler Line BPUSAUV18HERS-326
- Portion of 3D Seismic Inline 2777
- Portion of 3D Seismic Crossline 8381
- Top-hole Prognosis Chart, Proposed Wellsites MC 520 “E” and “C”

3D Seismic Survey Parameters. The reprocessed 3D depth volume used in this site specific assessment covers an approximate 25 block area in the eastern Mississippi Canyon (MC) area. The survey was acquired using 6 streamers (648 channels per streamer) with a length of 8,100 m separated 100 m apart, a streamer depth of 9 m and 2 energy sources at a depth of 6 m. Survey Inlines are oriented northwest-southeast, have a numerical increment of one, and are spaced 41 ft (12.5 m) apart. Crosslines are oriented northeast-southwest, have a numerical increment of one, and are spaced 41 ft (12.5 m) apart.

Shallow Hazards NTL 2008-G05 addresses the data quality and frequency content required of 3D seismic data used for shallow hazards assessment. In compliance with this NTL, the original conventional 3D seismic dataset was reprocessed by CGG, Inc., in 2013, using Kirchhoff pre-stack depth migration (PSDM). The data have a loaded record length of approximately 32,500 ft and a sample rate of 10 ft. The seismic data follow North American polarity convention and demonstrate a balanced zero phase wavelet based on the seafloor reflector, and high amplitude, low-impedance anomalies indicative of shallow gas.

3D Seismic Frequency. The bandwidth of the data is approximately 3 - 78 Hz. This frequency bandwidth corresponds to a limit of separability of about 37 ft, assuming a representative frequency of 37 Hz and an average velocity of 5500 ft/sec in the shallow section.

Autonomous Underwater Vehicle (AUV) Survey Data. The survey was acquired aboard the R/V Fugro Enterprise, between April 26th and 28th, and May 2nd and 5th, 2018. The survey consisted of thirty-three (33) north-south primary tracklines spaced 492 ft (150 m) apart and nine (9) east-west tielines spaced 1640 ft (500 m) apart. For further details concerning the survey, please refer to Fugro, 2018.

Offset Well Data. Offset well data from the BOEM database and BP internal notes were used to compile a summary of shallow hazards encountered at nearby offset wells.

Archaeological Resource Survey Requirement. The study area lies within an area designated as archeologically sensitive per NTL No. 2005-G07 and NTL 2011-JOINT-G01 (BOEM, 2005 and 2011). To ensure that archaeological resources on the Outer Continental Shelf (OCS) are not damaged or destroyed by oil, gas, and sulphur operations, and pursuant to the Pre-Seabed Disturbance Survey Mitigation (BOEM, 2011), an archaeological assessment of the drilling location was performed. In 2018, BP acquired an AUV archaeological survey that covered Block MC 520. Fugro conducted the survey and generated an archaeological assessment report (Fugro, 2018).

There are no archaeologically significant artifacts identified in the vicinity of the proposed well location. The closest unidentified side scan sonar contact to the proposed well location is 1,629 ft northwest, and will not constrain exploratory drilling at MC 520 “E”.

SEAFLOOR CONDITIONS

Water Depth and Seafloor Gradient. The water depth at the proposed MC 520 “E” location is predicted to be about 6,698 ft TVDSS. The depth was derived from the 2018 AUV bathymetry (Plates 1 and 2). The local seafloor gradient is about 0.7 degrees to the south-southeast (Plate 3).

Seafloor Features. The generally hummocky nature of the seafloor is due to sediment drape covering a shallow-buried mass transport deposit within Unit I (Plates 3, 5, and 7). Based on the AUV Assessments, the seafloor is likely comprised of soft, marine clays.

Man-Made Obstructions. The closest infrastructure to the proposed wellsite is the MC520-5 well about 117 ft northeast of the proposed well location (Plate 1). Drilling cuttings and cement are not imaged on the AUV data since the well was drilled after the AUV survey. The proposed MC 520 “E” well location does not lie within a Military Warning Area as defined by BOEM NTL 2014-G04 (BOEM, 2014) and is not located within a known chemical or munitions dump site. Thus, hazardous wastes or unexploded ordnance are not expected, and nothing resembling such was detected on the AUV data in the vicinity of the proposed well location.

Seafloor Debris. The nearest piece of debris identified in the AUV data is about 1,629 ft northwest of the proposed well. It measures about 21.8 ft in length and 9.5 ft in width, and will not constrain drilling at MC 520 “E” (Plates 2 and 5).

Potential High-Density Benthic Communities. There is no geophysical evidence of seafloor hardgrounds or active hydrocarbon seepage features that could potentially support high-density benthic communities within 2,000 ft of the proposed location (Plates 2, 4, and 5). This is based on the assessment of AUV multibeam echosounder backscatter, side scan sonar and sub-bottom profiler data.

SUBSURFACE CONDITIONS

Stratigraphy. The stratigraphy of the top-hole section at the proposed MC 520 “E” location, as exhibited by the AUV subbottom profiler and reprocessed 3D seismic data, consists mostly of deep-water, fine-grained sediments and salt. The age of the sediments above salt within the top-hole extends from Pleistocene to Pliocene.

The seafloor and seven subsurface horizons (Horizon 10, 20, 30, 40, 50, 60, and Top of Salt) were mapped in the subsurface study area. These Horizons divide the top-hole section into eight main units (Units 1 through 7, and Salt). The stratigraphic interpretations and inferred lithologies are based primarily on seismic character of the 3D reprocessed seismic, AUV data, and nearby MC 520-4 well log data for the top-hole section. Predicted depths and thicknesses associated with each of the mapped horizons and sequences are displayed on the attached Top-hole Prognosis Chart for the proposed MC520 “E” drilling location (Plate 10).

At the proposed wellbore, the suprasalt sediments are comprised of Plio-Pleistocene age sediments and measure 1,833 ft thick. The Pleistocene sediments are about 1,121 ft thick and comprise predominantly of thin to thick fine-grained mass transport deposits, and parallel stratified hemipelagic clays interlayered, with minor thin silts and sands may (Units 1 through 6). Plate 7 represents the closest North-South AUV subbottom profiler line to the proposed well location, which is about 165 ft east of the well, and shows two sequences of mass transport deposits overlain by hemipelagic drape (Units 1 and 2). Unit 7 is comprised of Plio-Pleistocene age sediments that are about 712 ft thick above the Top of Salt and is comprised of mostly sand interbedded with debris flow deposits.

The Top of Salt is predicted to be at 8,531 ft TVDSS (1,833 ft BML). The Top of Salt has a relative smooth topography and a small depression within a 2,000 ft radius of the proposed well (Plate 6). Plate 6 also shows the Top of Salt Gradient and highlights areas with steep slopes greater than 30 degrees which could cause potential wellbore stability issues. Steep slopes greater than 30 degrees occur along the salt margin and will not impact drilling operations. The limit of investigation is just above the base of salt. Based on MC520-5 drilling results the salt body is interpreted to be clean, without sediment inclusion.

Shallow Gas/Oil. No high amplitude anomalies interpreted to represent shallow gas/oil will be penetrated in the top-hole section by a vertical wellbore at the proposed wellsite. However, several isolated amplitude anomalies representing possible shallow gas/oil in the top-hole section are scattered within 2,000 ft of the proposed wellbore and are illustrated on Plate 6. The closest amplitude anomaly indicative of a low potential for shallow gas is located about 360 ft south within Unit 6 (Plates 6, 8, and 9). This amplitude anomaly lies at a depth of about 7,810 ft TVDSS (1,112 ft BML).

Gas Hydrate. Temperature and pressure conditions are favorable for the presence of gas hydrates within the study area. The base of the gas hydrate stability zone (BGHSZ) is sometimes manifested in seismic data either by the occurrence of a “bottom-simulating” reflector (BSR) or by a lineation formed by the tops of shallow gas accumulations (high amplitude anomalies) that may group just below the BGHSZ. A classic cross-cutting BSR was not observed in the study area; however, a theoretical BGHSZ was modeled for the proposed well path using the fundamental gas hydrate phase equilibrium curve which requires input for temperature, pressure, gas mixture and salinity (Sloan, 1998). The resulting theoretical BGHSZ is estimated to occur at approximately 1,438 ft BML (8,136 ft TVDSS).

Disseminated and fracture-filling gas hydrates, if present, may occur in fine-grained sediments above the base of gas hydrate stability zone. However, the potential for encountering massive subsurface gas hydrates is ranked as ***Negligible***, due primarily to the lack of coarse-grained sediments above the BGHSZ.

Shallow Water Flow (SWF). The proposed MC 520 "E" well is sited in an area within Mississippi Canyon Protraction that has experienced numerous instances of SWF events (BOEM, 2011) within Plio-Pleistocene age sediments and in some cases resulted in well losses. The closest offset well to the proposed MC 520 "E" location is the MC 520-5, which is about 117 ft northeast. This well did not encounter a SWF event while drilling the top-hole section and the supra salt sediment is prognosis to be normally pressured. The seafloor to Top of Salt has been interpreted as being predominantly fine-grained, with possible thin silts, and therefore has been assessed a ***Negligible*** potential for SWF (Plate 10).

Closing. The proposed MC 520 "E" and "C" well locations appear to be generally favorable for exploration well drilling operations. We advise caution based on this assessment, but believe the risk of danger to personnel and damage to the borehole, equipment and environment is generally ***Low***, provided strict adherence to proper drilling and cementing procedures is followed concerning these hazards until the first pressure containment string is in place.

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November 21, 2019

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November 21, 2019

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Sloan, E.D. Jr., Clathrate Hydrates of Natural Gases, Marcel Dekker Inc., New York City (1998).

ATTACHMENTS:

Plate 1 AUV Seafloor Rendering, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

Plate 2 AUV Water Depth and Seafloor Features, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

Plate 3 AUV Seafloor Gradient, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C""

Plate 4 AUV Multibeam Backscatter, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

Plate 5 AUV Side Scan Sonar Mosaic, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

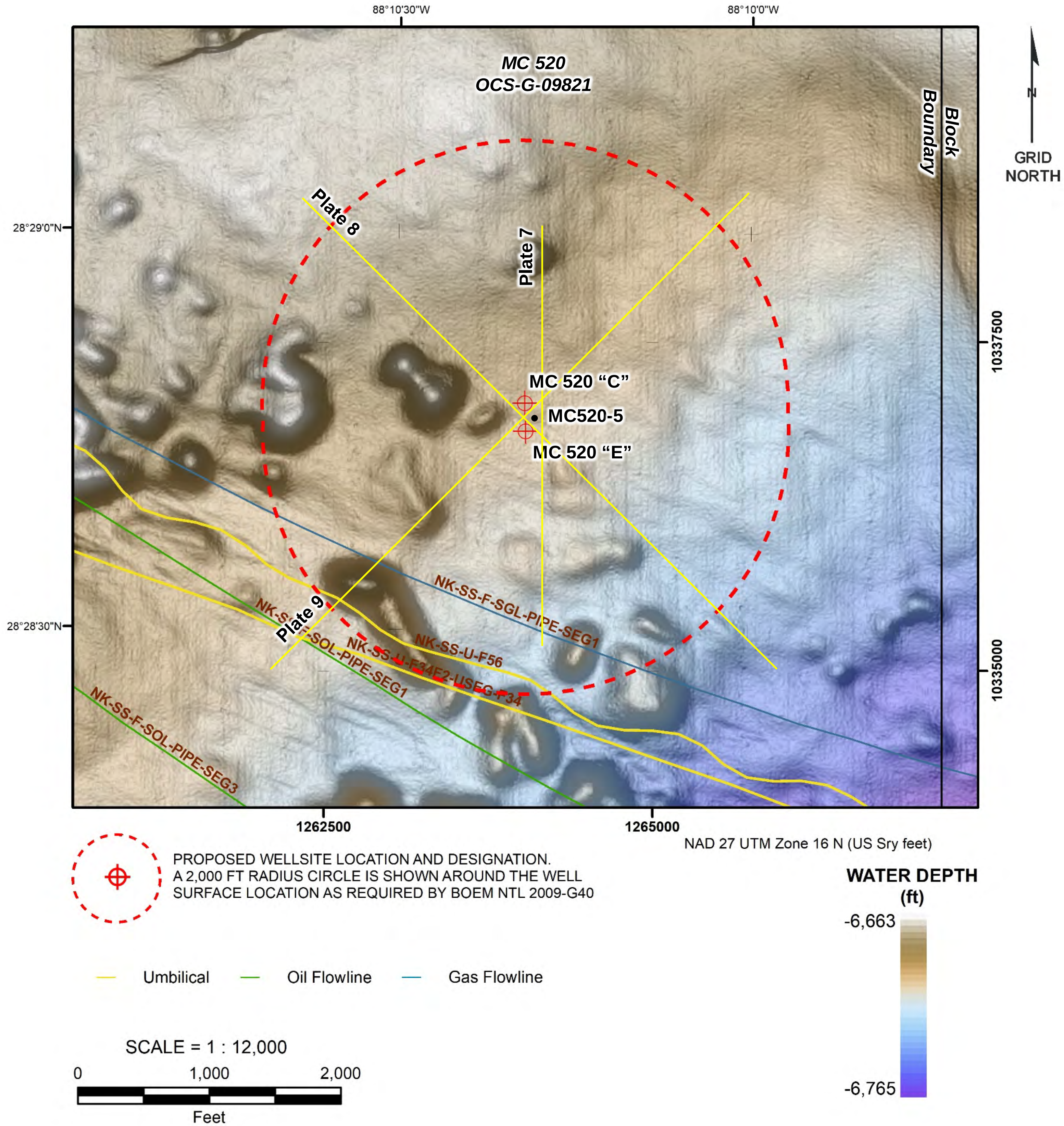
Plate 6 Sub-Surface Geologic Features, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

Plate 7 AUV Subbotom Profiler, Portion of AUV Line BPUSAUV18HERS-326, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

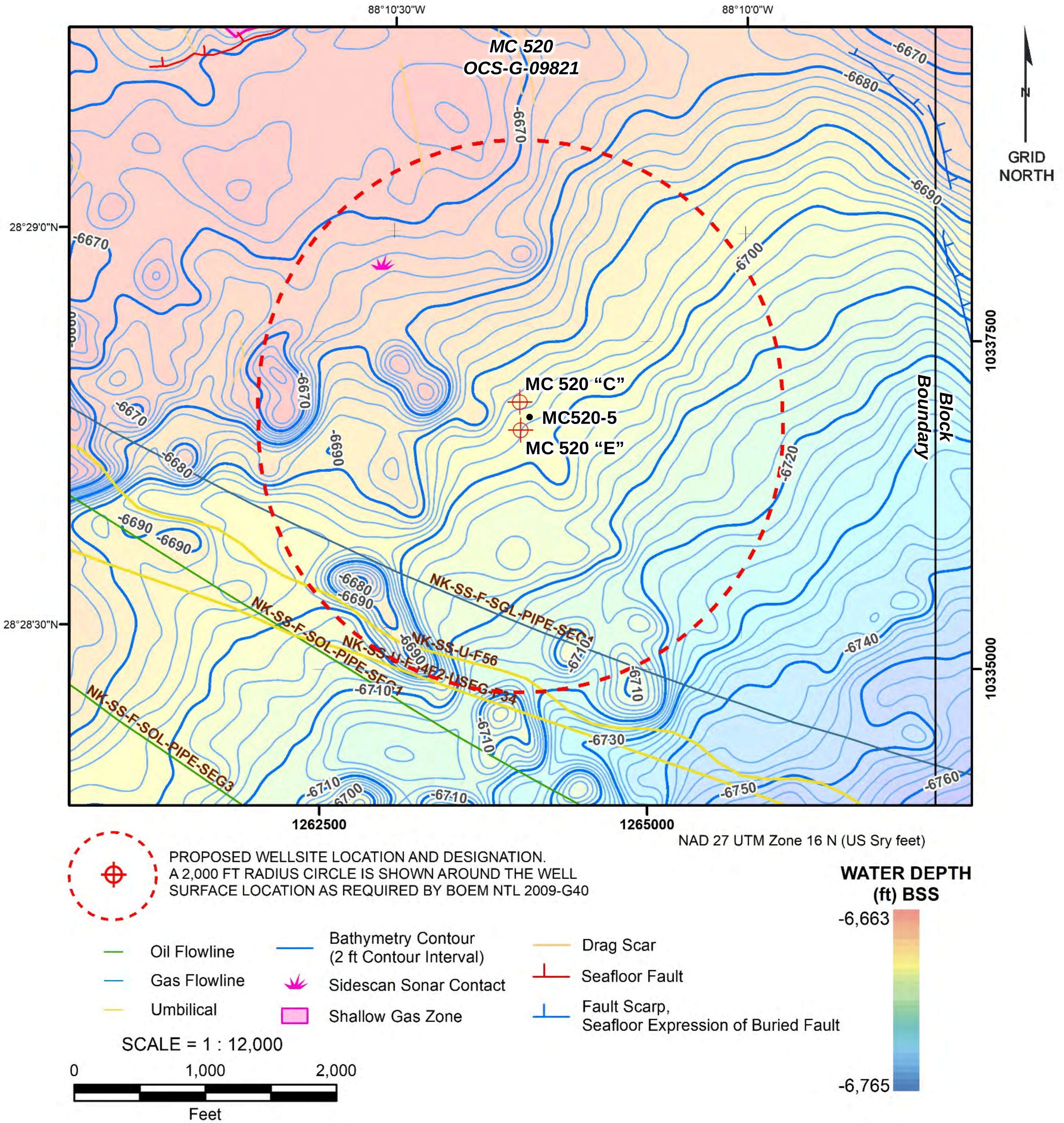
Plate 8 3D Seismic Section, Portion of Inline 2777, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

Plate 9 3D Seismic Section, Portion of Crossline 8381, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"

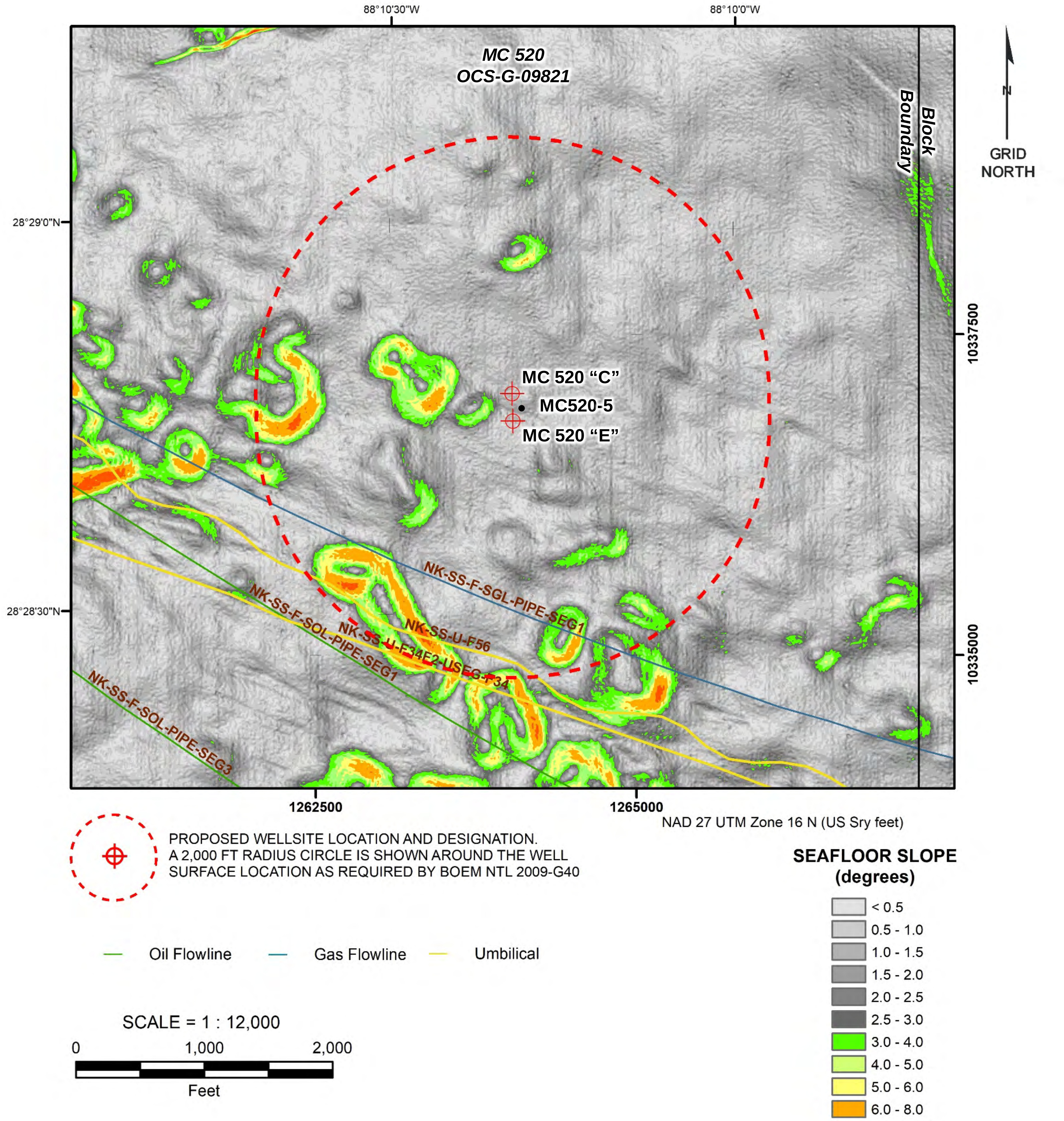
Plate 8 Top-Hole Prognosis Chart, Herschel Prospect, Block 520, Mississippi Canyon Area, Proposed Wellsites MC 520 "E" and "C"



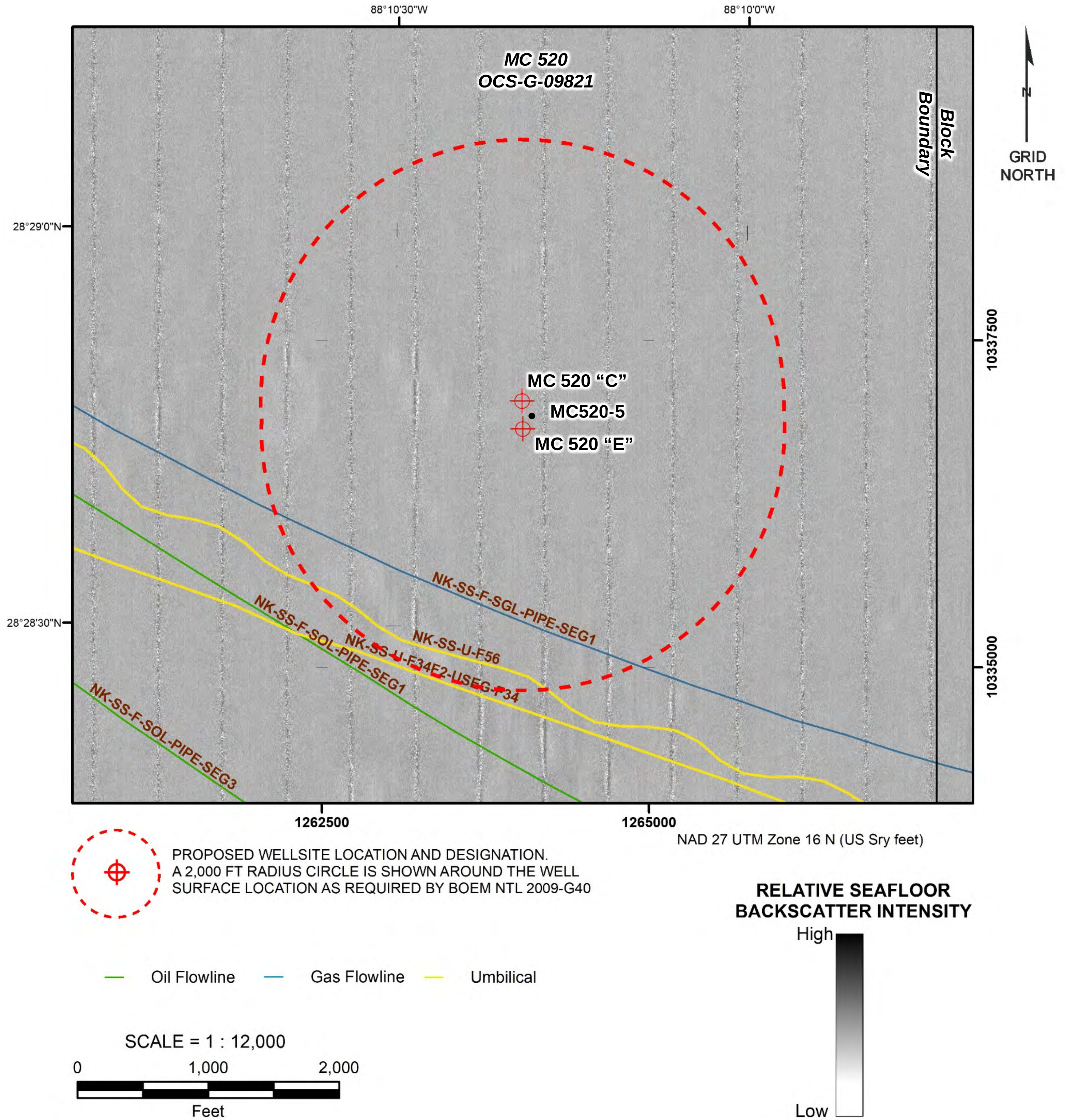
AUV SEAFLOOR RENDERING
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "E" and "C"



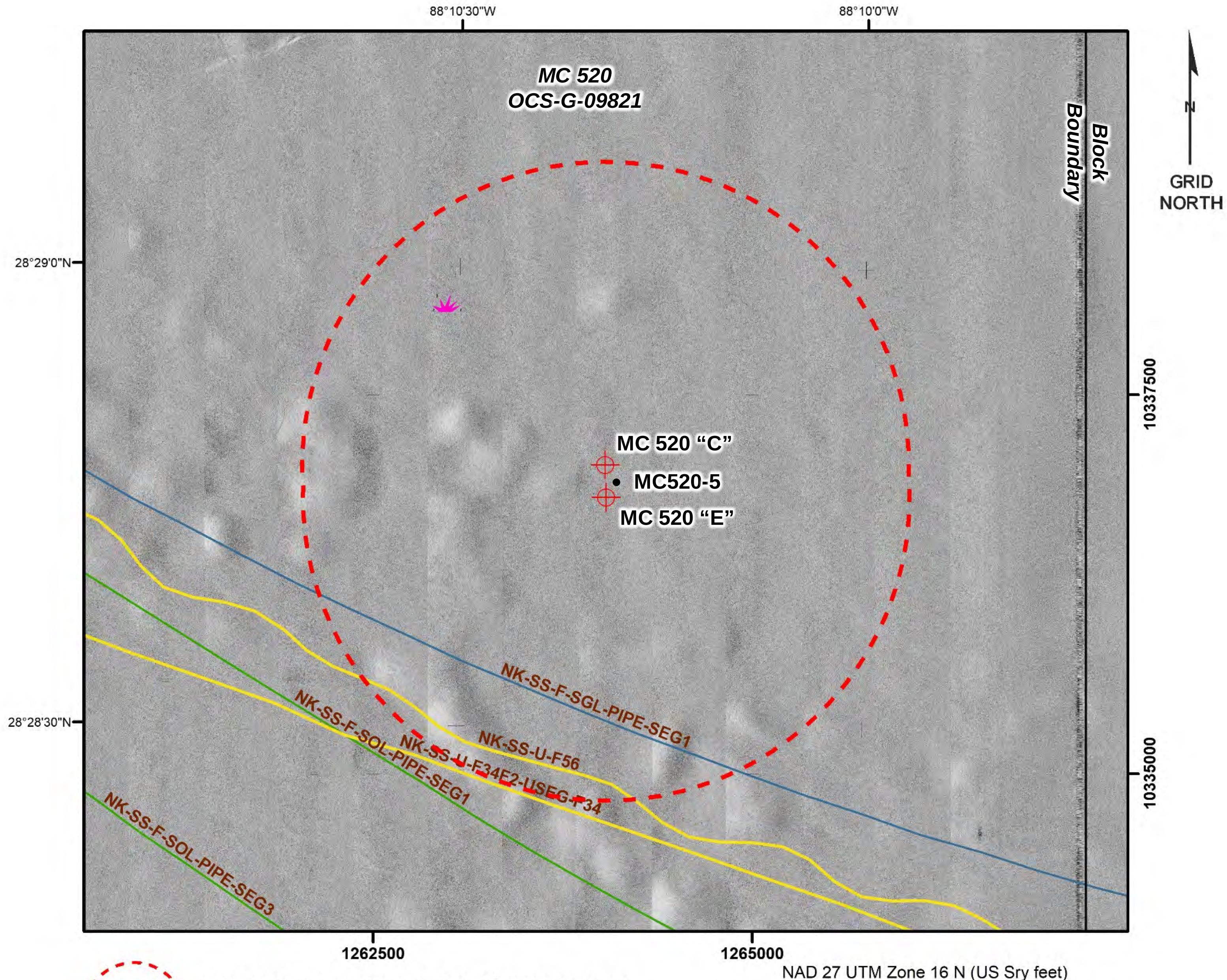
AUV WATER DEPTH AND SEAFLOOR FEATURES
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "E" and "C"



AUV SEAFLOOR GRADIENT
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "E" and "C"



AUV MULTIBEAM BACKSCATTER
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "E" and "C"



PROPOSED WELLSITE LOCATION AND DESIGNATION.
A 2,000 FT RADIUS CIRCLE IS SHOWN AROUND THE WELL SURFACE LOCATION AS REQUIRED BY BOEM NTL 2009-G40

- Oil Flowline
- Gas Flowline
- Umbilical
- Sidescan Sonar Contact

SCALE = 1 : 12,000

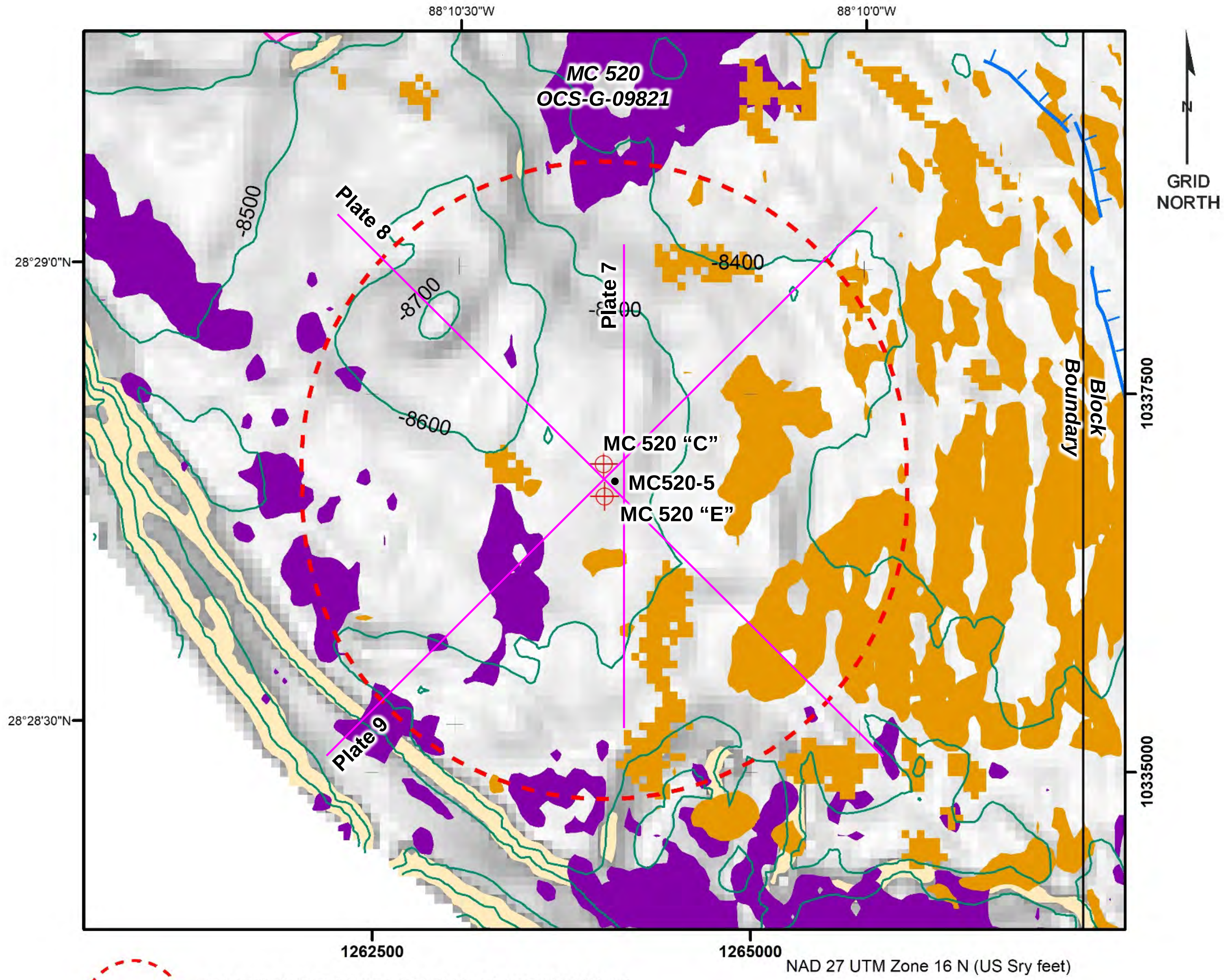
0 1,000 2,000
Feet

SIDE SCAN SONAR REFLECTIVITY

High

Low

AUV SIDE SCAN SONAR MOSAIC
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "E" and "C"



PROPOSED WELLSITE LOCATION AND DESIGNATION. A 2,000 FT RADIUS CIRCLE IS SHOWN AROUND THE WELL SURFACE LOCATION AS REQUIRED BY BOEM NTL 2009-G40

AMPLITUDE ANOMALIES BETWEEN HORIZON H40 AND HORIZON H60 (Units-5 & 6)

AMPLITUDE ANOMALIES BETWEEN HORIZON H60 AND HORIZON P60 AND TOP OF SALT (Unit-7)

POSSIBLE SHALLOW GAS FROM AUV DATA

TOP OF SALT GRADIENT GREATER THAN 30 DEGREES

AUV SURVEY MAPPED - BURIED NORMAL FAULT

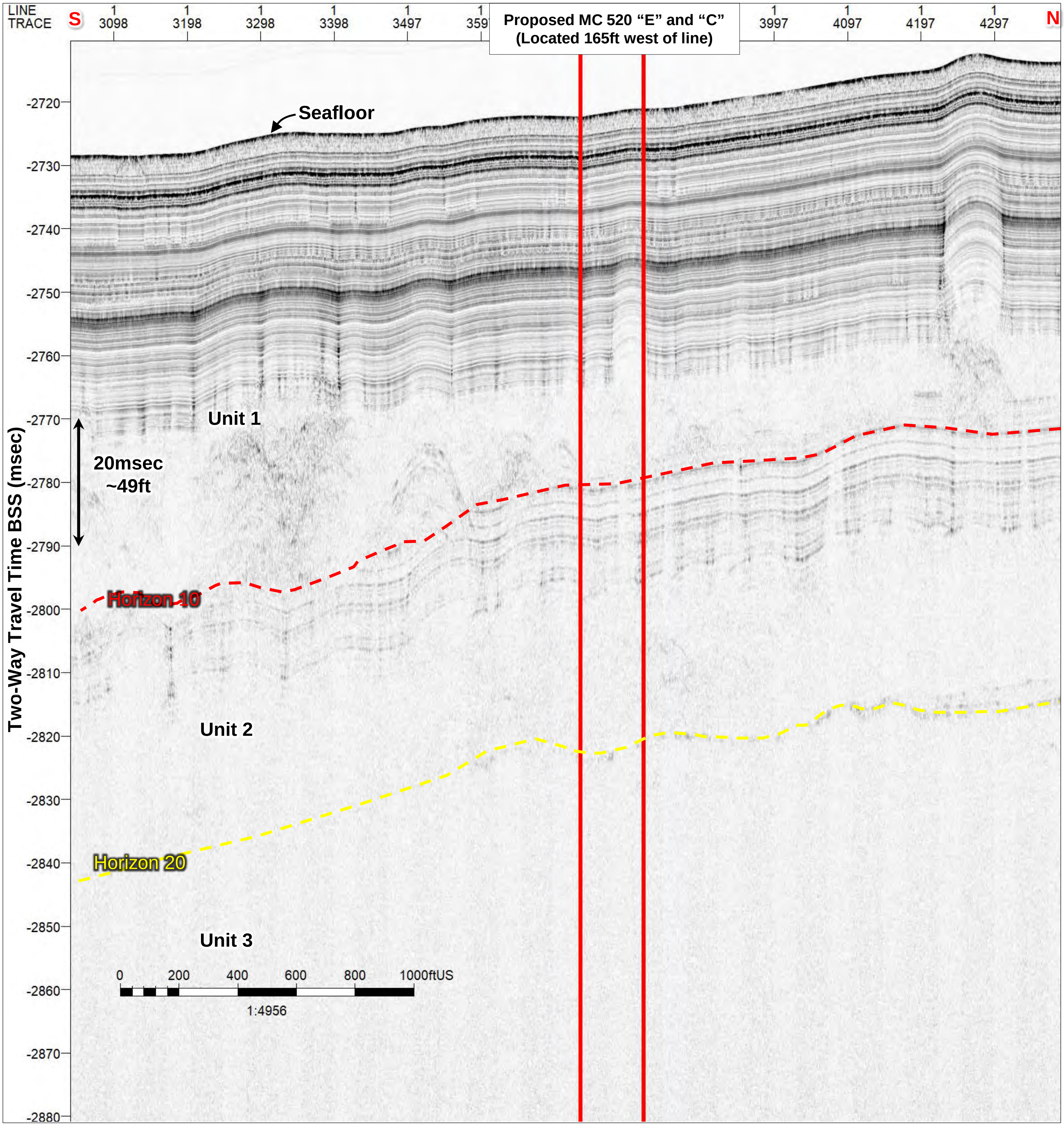
TOP OF SALT CONTOUR (TVDSS: 100FT CONTOUR INTERVAL)

SCALE = 1 : 12,000

0 1,000 2,000

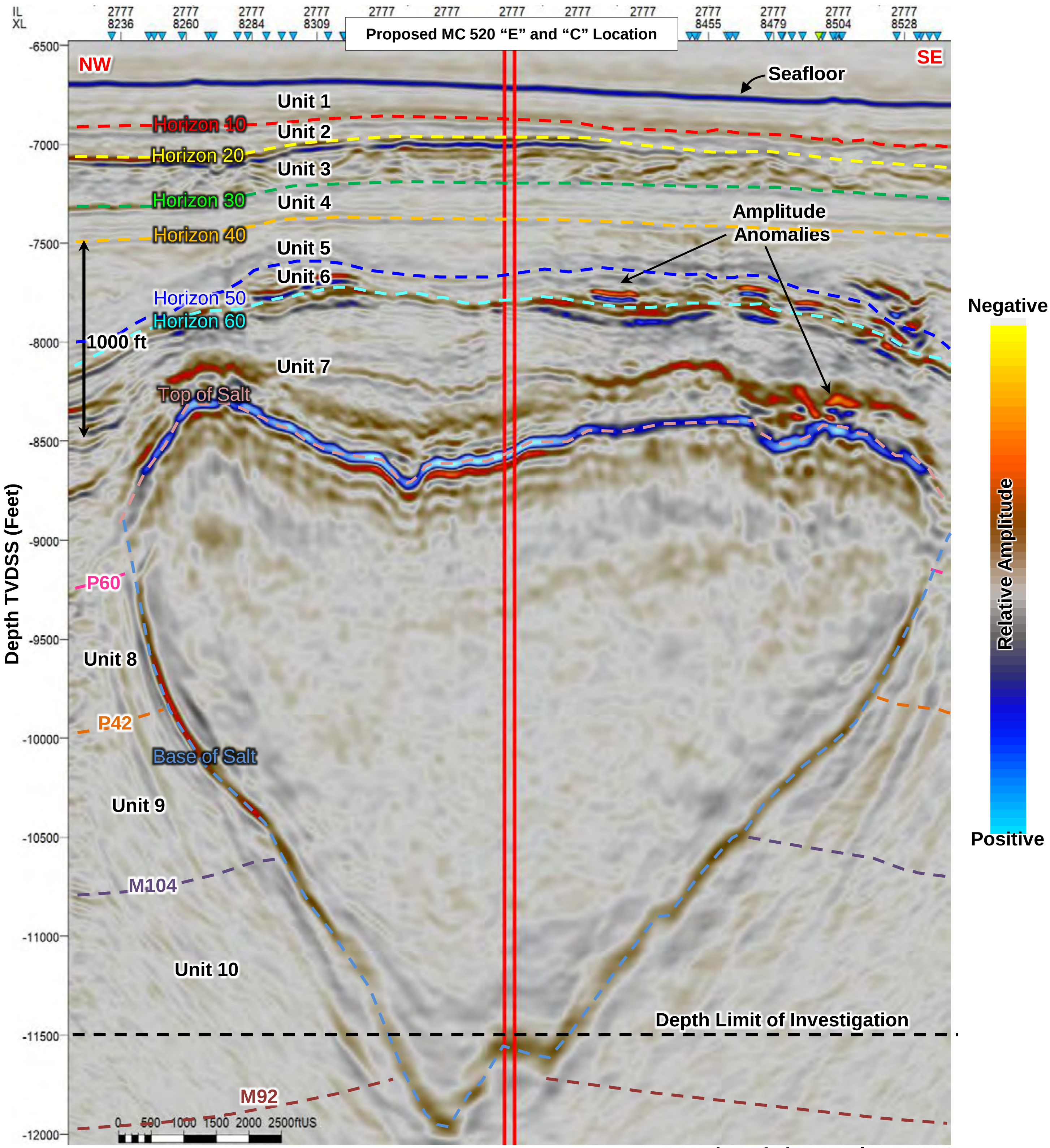
Feet

SUB-SURFACE GEOLOGIC FEATURES
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "E" and "C"



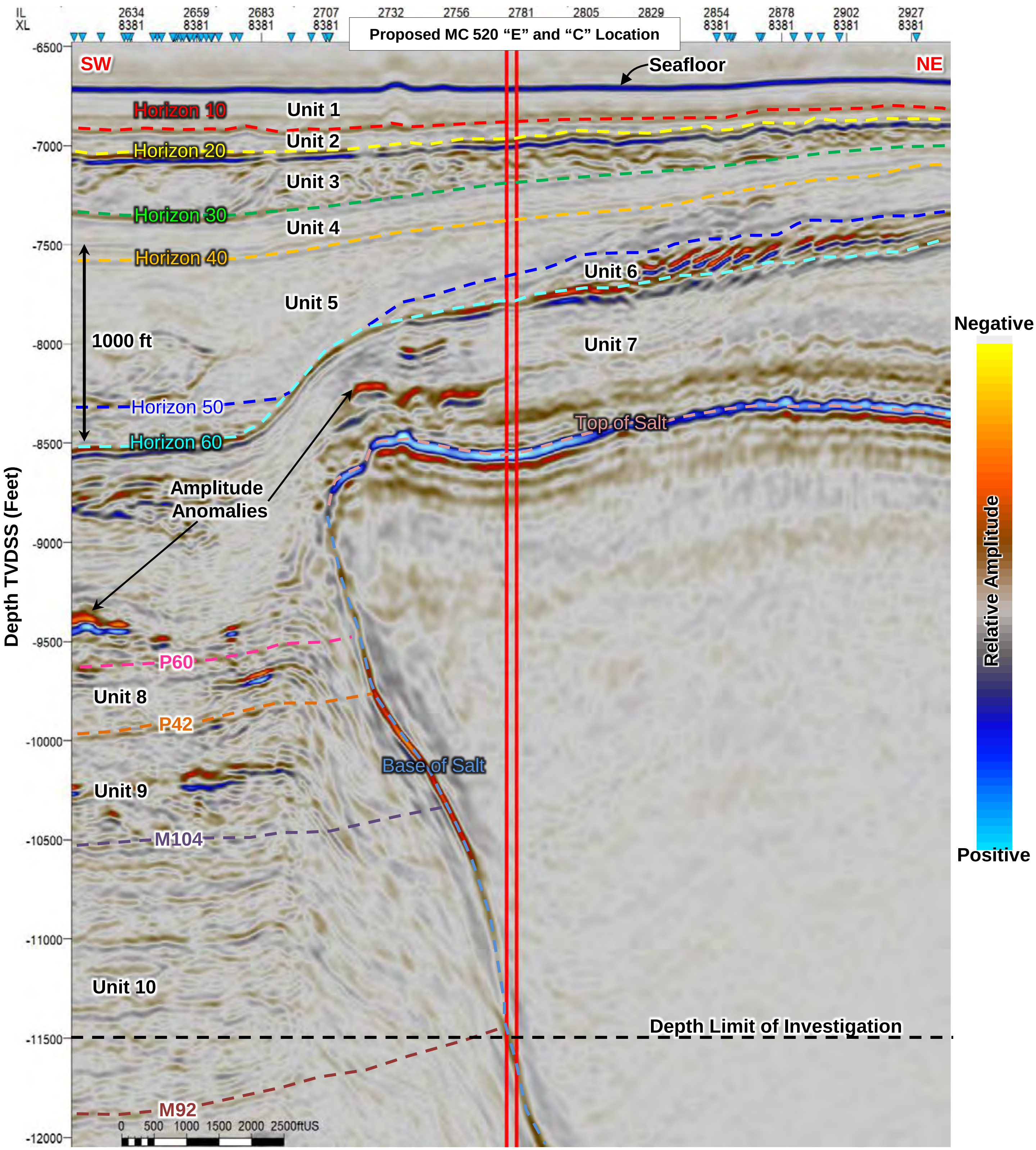
Location of Line on Plates 1 & 6

AUV SUBBOTTOM PROFILER, PORTION OF AUV LINE BPUSAUV18HERS-326
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 “E“ and “C”



Location of Line on Plates 1 & 6

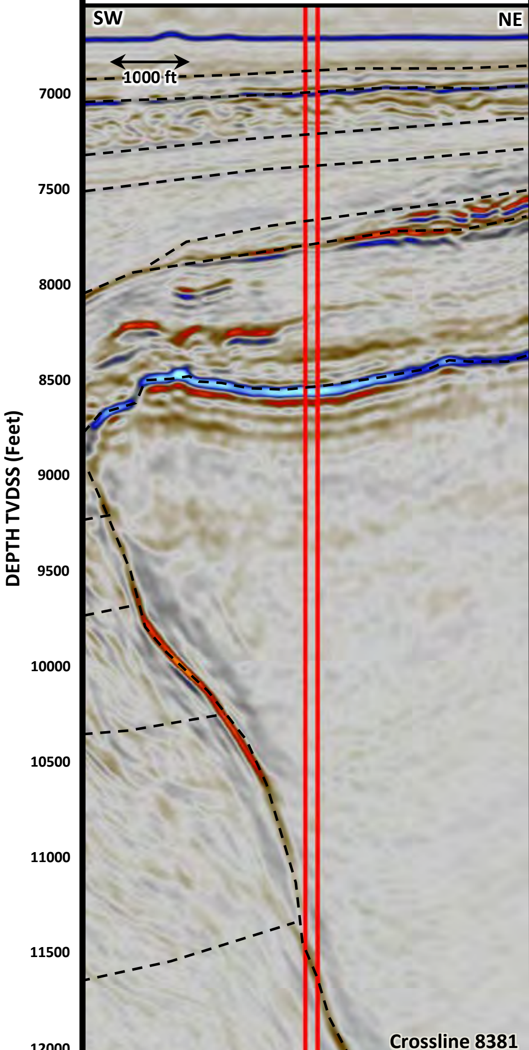
3D SEISMIC SECTION, PORTION OF INLINE 2777
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 “E“ and “C”



Location of Line on Plates 1 & 6

3D SEISMIC SECTION, PORTION OF CROSSLINE 8381
HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA
PROPOSED WELLSITES MC 520 "E" and "C"

BP AMERICA INC.
SITE CLEARANCE LETTER, PROPOSED MC 520 "E" AND "C" LOCATION
MISSISSIPPI CANYON, GULF OF MEXICO

3D Seismic Section Proposed Wellsite MC 520 "E" and "C"	*Horizon & Unit*	Inferred Lithology & Top-hole Conditions	DEPTHS BML (Feet)	DEPTHS TVDSS (Feet)	THICKNESS (Feet)	SHALLOW GAS POTENTIAL	SHALLOW WATER FLOW POTENTIAL
	Seafloor	*Relatively smooth seafloor, slopes ~0.7° to South-southeast*	0	6698			
	(Unit 1)	*Parallel stratified marine clays interlayered with debris flow deposits.*			173	Negligible	Negligible
	Horizon 10		173	6871			
	(Unit 2)	*Predominantly clay-prone debris flow.*			93	Negligible	Negligible
	Horizon 20		266	6964			
	(Unit 3)	*Predominantly clay-prone debris flow deposits with thin sand deposit.*			177	Negligible	Negligible
	Horizon 30		443	7141			
	(Unit 4)	*Mostly clays interbedded w/ thin clay-prone debris flows*			234	Negligible	Negligible
	Horizon 40		677	7375			
	(Unit 5)	*Fine-grained mass transport deposit with possible thin silts, overlying predominantly clay prone debris flow deposits.*			274	Negligible	Negligible
	Horizon 50		951	7649			
	(Unit 6)	*Clay-prone mass transport deposit with possible silty base.*			170	Negligible	Negligible
	Horizon 60		1121	7819			
	(Unit 7)	*Mostly clays interbedded with thin debris flows and possible thin silts.*			712	Negligible	Negligible
	BGHSZ	*BGHSZ is within clay prone sequence of upper Unit 7.*	*1438*	*8136*			
		Mostly sand interbedded with thin debris flows.					
	Top of Salt		1833	8531			
	(Salt)	*Interpreted Clean Salt*			2969	Negligible	Negligible
		(Depth Limit of Investigation)	4802	11,500			
	Base of Salt						

Unit and Horizon nomenclature modified from previous studies in the area.

Risk Scale: Negligible | Low | Moderate | High

UTM Zone 16 N (US ft) Geodetic Datum: NAD 1927

BML = Below Mudline
BGHSZ = Base of Gas Hydrate Stability Zone
TVDSS = True Vertical Depth Subsea

TOP-HOLE PROGNOSIS CHART, HERSCHEL PROSPECT, BLOCK 520, MISSISSIPPI CANYON AREA, PROPOSED WELLSITES MC 520 "E" and "C"

Appendix D: Wastes and Discharges Tables (Projected Generated Wastes and Projected Ocean Discharges)

WASTE TABLE FOR DRILL SHIPS

TABLE 2. WASTES YOU WILL TRANSPORT AND /OR DISPOSE OF ONSHORE

Pease specify whether the amount reported is a total or per well			Number of operational days:	160	Asset Name:	Black Hornet
Well Name: 006	Projected generated waste	Solid and Liquid Wastes transportation	Waste Disposal			
Type of Waste	Composition	Transport Method	Name/Location of Facility	Quantity	Units	Disposal Method
Will drilling occur ? If yes, fill in the muds and cuttings.						
Unused Synthetic-based drilling fluid	SBM from service - has not been downhole	Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	6885		For Reclamation & re-use
Synthetic-based drilling mud solids and barite	SBM and barite from pit cleanout	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fouchon, LA	384	bbls/well	Landfill/ Deepwell injection on land
Contaminated Synthetic base mud	SBM interface	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon, LA	384	bbls/well	Landfill/ Deepwell injection on land
Used Synthetic base mud - from downhole	SBM from downhole - sent in to vendor for reuse	Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	12000		For Reclamation & re-use
Drilling mud contaminated absorbents	Absorbent pads contaminated with drilling muds	Barged in (Omega 2 yard boxes)	Omega Waste Management, Patterson, LA	5	tons/well	Recycle
Excess barite	Excess barite from vessel tank cleaning	Barged in (supersacks)	River Birch Landfill, Avondale, LA	N/A	tons/well	Reuse / Landfill
Excess cement	Excess cement from vessel tank cleaning	Barged in (supersacks)	River Birch Landfill, Avondale, LA	12.8	tons/well	Reuse / Landfill
Rig Drilling washwater	Cleaning out of mud tanks	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon LA	2384	bbls/well	Landfill/ Deepwell injection on land
Contaminated Completion Fluids	Used Completion fluids	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fourchon LA	1500	bbls/well	Landfill/ Deepwell injection on land
Completion Fluids	Used Completion fluids	Liquid storage tanks on workboat	Ecoserv / MI Swaco Fourchon LA	6000	bbls/well	Landfill/ Deepwell injection on land
Will you produce hydrocarbons? If yes fill in for produced sand.						
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.						
Well Related Hazardous Waste	Rig lab titrations containing isopropanol alcohol, silver nitrate etc.	Barged in (5 gallon DOT containers)	Chemical Waste Management, Sulphur, LA	0.096	ton/well	Incineration / Landfill
Rig Maintenance Wastes (painting, blasting)	Paint thinner, paint chips, blast media, aerosol cans	Barged in (drums or totes)	River Birch Landfill, Avondale, LA and Chemical Waste Management, Sulphur, LA	48	ton/well	Incineration / Landfill
Rig Maintenance Wastes (non hazardous)	Oily rags, pads, oil filters etc.	Barged in (totes)	Omega Waste Management, Patterson, LA	22.4	ton/well	Reuse / Landfill
Rig Used oil	Lube oil, hydraulic oil, glycol	Barged in (drums)	Omega Waste Management, Patterson, LA	9.6	bbls/well	Recycle
Domestic waste	Municipal trash	Barged in (supersacks)	River Birch Landfill, Avondale, LA	4	ton/well	Incineration / Landfill
Scrap Metal	scrap piping, grating and other metals	Barged in (scrap baskets)	Southern Scrap, Houma, LA	36.8	ton/well	Recycle
Universal Waste	Batteries	Barged in (DOT drums)	LEI, Hammond, LA	0.64	ton/well	Recycle
Universal Waste	Fluorescent light bulbs	Barged in (DOT drums)	LEI, Hammond, LA	0.16	ton/well	Recycle
Misc. unused chemical	Pills, spacers, additives etc.	Barged in (totes)	River Birch Landfill, Avondale, LA	544	bbls/well	Recycle
Oily water	Washwater rig equipment	Transported in (15 barrel cuttings boxes)	Omega Waste Management, Patterson, LA	184	bbls/well	Recycle
Recyclyed materials	Plastic, paper, aluminum	Barged in (supersacks)	RTG/Hoover Ferguson, Iberia, LA	4.8	ton/well	Recycle

WASTE TABLE FOR DRILL SHIPS

TABLE 2. WASTES YOU WILL TRANSPORT AND /OR DISPOSE OF ONSHORE

Pease specify whether the amount reported is a total or per well			Number of operational days:	160	Asset Name:	Black Hornet
Well Name: 007	**Projected generated waste**	**Solid and Liquid Wastes transportation**	**Waste Disposal**			
Type of Waste	**Composition**	**Transport Method**	**Name/Location of Facility**	**Quantity**	**Units**	**Disposal Method**
Will drilling occur ? If yes, fill in the muds and cuttings.						
Unused Synthetic-based drilling fluid	SBM from service - has not been downhole	Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	6885		For Reclamation & re-use
Synthetic-based drilling mud solids and barite	SBM and barite from pit cleanout	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fouchon, LA	384	bbls/well	Landfill/ Deepwell injection on land
Contaminated Synthetic base mud	SBM interface	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon, LA	384	bbls/well	Landfill/ Deepwell injection on land
Used Synthetic base mud - from downhole	SBM from downhole - sent in to vendor for reuse	Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	12000		For Reclamation & re-use
Drilling mud contaminated absorbents	Absorbent pads contaminated with drilling muds	Barged in (Omega 2 yard boxes)	Omega Waste Management, Patterson, LA	5	tons/well	Recycle
Excess barite	Excess barite from vessel tank cleaning	Barged in (supersacks)	River Birch Landfill, Avondale, LA	N/A	tons/well	Reuse / Landfill
Excess cement	Excess cement from vessel tank cleaning	Barged in (supersacks)	River Birch Landfill, Avondale, LA	12.8	tons/well	Reuse / Landfill
Rig Drilling washwater	Cleaning out of mud tanks	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon LA	2384	bbls/well	Landfill/ Deepwell injection on land
Contaminated Completion Fluids	Used Completion fluids	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fourchon LA	1500	bbls/well	Landfill/ Deepwell injection on land
Completion Fluids	Used Completion fluids	Liquid storage tanks on workboat	Ecoserv / MI Swaco Fourchon LA	6000	bbls/well	Landfill/ Deepwell injection on land
Will you produce hydrocarbons? If yes fill in for produced sand.						
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.						
Well Related Hazardous Waste	Rig lab titrations containing isopropanol alcohol, silver nitrate etc.	Barged in (5 gallon DOT containers)	Chemical Waste Management, Sulphur, LA	0.096	ton/well	Incineration / Landfill
Rig Maintenance Wastes (painting, blasting)	Paint thinner, paint chips, blast media, aerosol cans	Barged in (drums or totes)	River Birch Landfill, Avondale, LA and Chemical Waste Management, Sulphur, LA	48	ton/well	Incineration / Landfill
Rig Maintenance Wastes (non hazardous)	Oily rags, pads, oil filters etc.	Barged in (totes)	Omega Waste Management, Patterson, LA	22.4	ton/well	Reuse / Landfill
Rig Used oil	Lube oil, hydraulic oil, glycol	Barged in (drums)	Omega Waste Management, Patterson, LA	9.6	bbls/well	Recycle
Domestic waste	Municipal trash	Barged in (supersacks)	River Birch Landfill, Avondale, LA	4	ton/well	Incineration / Landfill
Scrap Metal	scrap piping, grating and other metals	Barged in (scrap baskets)	Southern Scrap, Houma, LA	36.8	ton/well	Recycle
Universal Waste	Batteries	Barged in (DOT drums)	LEI, Hammond, LA	0.64	ton/well	Recycle
Universal Waste	Fluorescent light bulbs	Barged in (DOT drums)	LEI, Hammond, LA	0.16	ton/well	Recycle
Misc. unused chemical	Pills, spacers, additives etc.	Barged in (totes)	River Birch Landfill, Avondale, LA	544	bbls/well	Recycle
Oily water	Washwater rig equipment	Transported in (15 barrel cuttings boxes)	Omega Waste Management, Patterson, LA	184	bbls/well	Recycle
Recyclyed materials	Plastic, paper, aluminum	Barged in (supersacks)	RTG/Hoover Ferguson, Iberia, LA	4.8	ton/well	Recycle

WASTE TABLE FOR DRILL SHIPS

TABLE 2. WASTES YOU WILL TRANSPORT AND /OR DISPOSE OF ONSHORE

Pease specify whether the amount reported is a total or per well			Number of operational days:	160	Asset Name:	Black Hornet
Well Name: 008	**Projected generated waste**	**Solid and Liquid Wastes transportation**	**Waste Disposal**			
Type of Waste	**Composition**	**Transport Method**	**Name/Location of Facility**	**Quantity**	**Units**	**Disposal Method**
Will drilling occur ? If yes, fill in the muds and cuttings.						
Unused Synthetic-based drilling fluid	SBM from service - has not been downhole	Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	6885		For Reclamation & re-use
Synthetic-based drilling mud solids and barite	SBM and barite from pit cleanout	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fouchon, LA	384	bbls/well	Landfill/ Deepwell injection on land
Contaminated Synthetic base mud	SBM interface	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon, LA	384	bbls/well	Landfill/ Deepwell injection on land
Used Synthetic base mud - from downhole	SBM from downhole - sent in to vendor for reuse	Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	12000		For Reclamation & re-use
Drilling mud contaminated absorbents	Absorbent pads contaminated with drilling muds	Barged in (Omega 2 yard boxes)	Omega Waste Management, Patterson, LA	5	tons/well	Recycle
Excess barite	Excess barite from vessel tank cleaning	Barged in (supersacks)	River Birch Landfill, Avondale, LA	N/A	tons/well	Reuse / Landfill
Excess cement	Excess cement from vessel tank cleaning	Barged in (supersacks)	River Birch Landfill, Avondale, LA	12.8	tons/well	Reuse / Landfill
Rig Drilling washwater	Cleaning out of mud tanks	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon LA	2384	bbls/well	Landfill/ Deepwell injection on land
Contaminated Completion Fluids	Used Completion fluids	Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fourchon LA	1500	bbls/well	Landfill/ Deepwell injection on land
Completion Fluids	Used Completion fluids	Liquid storage tanks on workboat	Ecoserv / MI Swaco Fourchon LA	6000	bbls/well	Landfill/ Deepwell injection on land
Will you produce hydrocarbons? If yes fill in for produced sand.						
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.						
Well Related Hazardous Waste	Rig lab titrations containing isopropanol alcohol, silver nitrate etc.	Barged in (5 gallon DOT containers)	Chemical Waste Management, Sulphur, LA	0.096	ton/well	Incineration / Landfill
Rig Maintenance Wastes (painting, blasting)	Paint thinner, paint chips, blast media, aerosol cans	Barged in (drums or totes)	River Birch Landfill, Avondale, LA and Chemical Waste Management, Sulphur, LA	48	ton/well	Incineration / Landfill
Rig Maintenance Wastes (non hazardous)	Oily rags, pads, oil filters etc.	Barged in (totes)	Omega Waste Management, Patterson, LA	22.4	ton/well	Reuse / Landfill
Rig Used oil	Lube oil, hydraulic oil, glycol	Barged in (drums)	Omega Waste Management, Patterson, LA	9.6	bbls/well	Recycle
Domestic waste	Municipal trash	Barged in (supersacks)	River Birch Landfill, Avondale, LA	4	ton/well	Incineration / Landfill
Scrap Metal	scrap piping, grating and other metals	Barged in (scrap baskets)	Southern Scrap, Houma, LA	36.8	ton/well	Recycle
Universal Waste	Batteries	Barged in (DOT drums)	LEI, Hammond, LA	0.64	ton/well	Recycle
Universal Waste	Fluorescent light bulbs	Barged in (DOT drums)	LEI, Hammond, LA	0.16	ton/well	Recycle
Misc. unused chemical	Pills, spacers, additives etc.	Barged in (totes)	River Birch Landfill, Avondale, LA	544	bbls/well	Recycle
Oily water	Washwater rig equipment	Transported in (15 barrel cuttings boxes)	Omega Waste Management, Patterson, LA	184	bbls/well	Recycle
Recyclyed materials	Plastic, paper, aluminum	Barged in (supersacks)	RTG/Hoover Ferguson, Iberia, LA	4.8	ton/well	Recycle

TABLE 1. WASTES YOU WILL GENERATE, TREAT AND DOWNHOLE DISPOSE OR DISCHARGE TO THE GOM

please specify if the amount reported is a total or per well amount

Herschel Expansion MC520

Basis: 100 days estimated drilling operations time assuming full data acquisition and 2 bypass cores and 60 days of Completions operations..

		Projected ocean discharges			Projected Downhole Disposal
Type of Waste	**Composition**	**Projected Amount**	**Discharge Rate**	**Discharge Method**	**Answer yes or no**
Will drilling occur ? If yes, you should list muds and cuttings					
Water Based Fluid	Spent drilling fluid drilling riserless hole plus pad mud to fill the hole	111,184 bbl/well	5 days @ 22,237 bbl/day	Seafloor	No
Cuttings wetted with Water Based Fluid	Water base interval	10,350 bbl/well	4 days @ 2,588 bbl/day	Seafloor	No
Excess Cement Slurry	Excess mixed cement, including additives & waste from equipment wash down after a cement operation	500 bbl/well	10 cmt jobs @ 50 bbl/cmt job	Surface	No
Cuttings wetted with Synthetic Based Fluid	Drill cuttings, cement cuttings, & synthetic base mud retained on cuttings	3,352 bbl/well	25 days @ 134 bbl/day	Surface	No
Small Volume Drilling Fluid Discharges associated with Cuttings	Displaced interfaces, accumulated solids in sand traps, pit clean-out solids, & centrifuge discharges made while changing the mud weight	300 bbl/well	100 days @ 3 bbl/day	Surface	No
Cement transfer losses	Bulk transfer between vessels	75 sks/well	7 events @ 11 sks/event	Surface	No
Barite transfer losses	Bulk transfer between vessels	100 sks/well	8 events @ 13 sks/event	Surface	No
Will humans be there? If yes, expect conventional waste					
Domestic Waste / Gray Water	Food waste, drainage from dishwasher, shower, laundry, bath, & washbasin drains	33,215 bbl/well	160 days @ 208 bbl/day	Surface	No
Sanitary Waste	Treated human body waste discharged from toilets & urinals	15,840 bbl/well	160 days @ 99 bbl/day	Surface	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Deck washdown & rain water	32,159 bbl/well	160 days @ 201 bbl/day (avg)	Surface	No
Will you conduct well treatment, completion, or workover?					
Well Treatment Fluids	Stimulations fluids including acids, solvents & propping agents	463 bbl/well	events @ 463 bbl/event	Surface Discharge	No
Well Treatment Fluids	Stimulations fluids including acids, solvents & propping agents	3,190 bbl/well	events @ 3190 bbl/event	Downhole	No
Completion Fluids	Salt solutions, weighted brines, polymers & various additives	0 bbl/well	days @ 0 bbl/day	Surface Discharge	No
Completion Fluids	Salt solutions, weighted brines, polymers & various additives	1,277 bbl/well	days @ 42 bbl/day	Downhole	No
Workover Fluids - If applicable	Salt solutions, weighted brines, polymers, & other speciality additives	NA bbl/well	days @ NA bbl/day	Surface Discharge	No
Workover Fluids - If applicable	Salt solutions, weighted brines, polymers, & other speciality additives	NA bbl/well	days @ NA bbl/day	Downhole	No
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Desalinization Unit Discharge	Wastewater associated with the process of creating freshwater from seawater	7,970,688 bbl/well	160 days @ 49817 bbl/day	Surface	No
Blowout Preventer Fluid	Fluid used to actuate the hydraulic equipment on the BOP	360 bbl/well	30.00 events @ 12.000 bbl/event	N/A	N/A
Uncontaminated Ballast Water	Uncontaminated seawater added or removed to maintain proper draft	1,059,344 bbl/well	160 days @ 6,621 bbl/day (avg)	Surface	No
Uncontaminated Bilge Water	Water that collects in the vessels bilge	12,144 bbl/well	160 days @ 76 bbl/day (avg)	Surface	N/A
Cement discharged at seafloor	Excess mixed cement slurry	2600 bbl/well	2 event @ 1300 bbl/day	Seafloor	No
Fire Water	Uncontaminated seawater/freshwater used for fire control	0 bbl/well	160 days @ 0 bbl/week	Surface	No
Cooling Water / Utility Water	Uncontaminated seawater	174,818,512 bbl/well	160 days @ 1,092,616 bbl/day	Surface	No
Sea Water / Fresh Water that has been Chemically Treated	Biocide, corrosion inhibitors, or other chemicals used to prevent corrosion or fouling of piping or equipment	50 bbl/well	1 event @ 50 bbl/event	Surface	No
Sub Sea Fluid Discharges	Wellhead Preservation, Hydrate Control, Umbilical Steel Tube Storage, Leak Tracer, & Riser Tensioner Fluids	N/A bbl/well	N/A event @ #DIV/0! bbl/event	N/A	N/A
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced Water	Water brought up from hydrocarbon-bearing strata during extraction of oil & gas	12,144	160 days @ 4,037 bbl/day	N/A	N/A
Will you be covered by an individual or General NPDES permit ?		**GEG460000**			
NOTE: If you will not have a type of waste, enter NA in the row.		Red = Drlg Eng, Yellow = Completion Eng, Blue = Waste Specialist, Green = Calculator Tool			

PROVIDED BY Water SME:
Lerato Matlamela
PROVIDED BY DRILLING & COMPLETIONS ENGINEERS:
Scott Costa
Last Revision: 2/6/2020

Appendix E: Air Emissions Information – Form BOEM-0138

OMB Control No. 1010-0151
OMB Approval Expires: 08/31/2023

COMPANY	BP Exploration & Production Inc.
AREA	Mississippi Canyon
BLOCK	520
LEASE	OCS-G 09821
FACILITY	Not Applicable
WELL	006, 007, 008
COMPANY CONTACT	Donna Gyles (Air Quality)/ Albert Garcia (Plans)
TELEPHONE NO.	Donna Gyles (281-832-4985)/ Albert Garcia (281-995-2815)
REMARKS	Drill and complete 3 wells with surface and bottom hole locations in Mississippi Canyon (MC) Block 520

AIR EMISSIONS COMPUTATION FACTORS

Fuel Usage Conversion Factors	Natural Gas Turbines				Natural Gas Engines		Diesel Recip. Engine		Diesel Turbines			
	SCF/hp-hr	9.524			SCF/hp-hr	7.143	GAL/hp-hr	0.0514	GAL/hp-hr	0.0514		

Equipment/Emission Factors	units	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	REF.	DATE	Reference Links
Natural Gas Turbine	g/hp-hr		0.0086	0.0086	0.0026	1.4515	0.0095	N/A	0.3719	N/A	AP42 3.1-1& 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
RECIP. 2 Cycle Lean Natural Gas	g/hp-hr		0.1293	0.1293	0.0020	6.5998	0.4082	N/A	1.2009	N/A	AP42 3.2-1	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Lean Natural Gas	g/hp-hr		0.0002	0.0002	0.0020	2.8814	0.4014	N/A	1.8949	N/A	AP42 3.2-2	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Rich Natural Gas	g/hp-hr		0.0323	0.0323	0.0020	7.7224	0.1021	N/A	11.9408	N/A	AP42 3.2-3	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
Diesel Recip. < 600 hp	g/hp-hr	1	1	1	0.0279	14.1	1.04	N/A	3.03	N/A	AP42 3.3-1	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf
Diesel Recip. > 600 hp	g/hp-hr	0.32	0.182	0.178	0.0055	10.9	0.29	N/A	2.5	N/A	AP42 3.4-1 & 3.4-2	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf
Diesel Boiler	lbs/bbl	0.0840	0.0420	0.0105	0.0089	1.0080	0.0084	5.14E-05	0.2100	0.0336	AP42 1.3-6; Pb and NH3: WebFIRE (08/2018)	9/98 and 5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf https://cfpub.epa.gov/webfire/
Diesel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0013	4.45E-05	0.0105	N/A	AP42 3.1-1 & 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
Dual Fuel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0095	4.45E-05	0.3719	0.0000	AP42 3.1-1& 3.1-2a; AP42 3.1-1 & 3.1-2a	4/00	https://cfpub.epa.gov/webfire/
Vessels – Propulsion	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Vessels – Drilling Prime Engine, Auxiliary	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels – Diesel Boiler	g/hp-hr	0.0466	0.1491	0.1417	0.4400	1.4914	0.0820	3.73E-05	0.1491	0.0003	USEPA 2017 NEI;TSP (units converted) refer to Diesel Boiler Reference	3/19	
Vessels – Well Stimulation	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Natural Gas Heater/Boiler/Burner	lbs/MMscf	7.60	1.90	1.90	0.60	190.00	5.50	5.00E-04	84.00	3.2	AP42 1.4-1 & 1.4-2; Pb and NH3: WebFIRE (08/2018)	7/98 and 8/18	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf https://cfpub.epa.gov/webfire/
Combustion Flare (no smoke)	lbs/MMscf	0.00	0.00	0.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (light smoke)	lbs/MMscf	2.10	2.10	2.10	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05_02-05-18.pdf
Combustion Flare (medium smoke)	lbs/MMscf	10.50	10.50	10.50	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (heavy smoke)	lbs/MMscf	21.00	21.00	21.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Liquid Flaring	lbs/bbl	0.42	0.0966	0.0651	5.964	0.84	0.01428	5.14E-05	0.21	0.0336	AP42 1.3-1 through 1.3-3 and 1.3-5	5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf
Storage Tank	tons/yr/tank						4.300				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Fugitives	lbs/hr/component						0.0005				API Study	12/93	https://www.api.org/
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Other Construction Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Other Survey Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Tractor	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
On-Ice – Truck (for gravel island)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Truck (for surveys)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
Man Camp - Operation (max people/day)	tons/person/day		0.0004	0.0004	0.0004	0.006	0.001	N/A	0.001	N/A	BOEM 2014-1001	2014	https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2014-1001.pdf
Vessels - Ice Management Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels - Hovercraft Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

Sulfur Content Source	Value	Units
Fuel Gas	3.38	ppm
Diesel Fuel	0.0015	% weight
Produced Gas (Flare)	3.38	ppm
Produced Oil (Liquid Flaring)	1	% weight

Density and Heat Value of Diesel Fuel		
Density	7.05	lbs/gal
Heat Value	19,300	Btu/lb

Heat Value of Natural Gas		
Heat Value	1,050	MMBtu/MMscf

Natural Gas Flare Parameters	Value	Units
VOC Content of Flare Gas	0.6816	lb VOC/lb-mol gas
Natural Gas Flare Efficiency	98	%

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS												
BP Exploration & Production Inc.	Mississippi Canyon		520	OCS-G 09821	Not Applicable	006, 007, 008					Donna Gyles (Air Quality)/ Albert C	Donna Gyles (281-832-4985)/ Alb	Drill and complete 3 wells with surface and bottom hole locations in Mississippi Canyon (MC) Block 520												
OPERATIONS	EQUIPMENT	PMEN	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING: Black Hornet Drillship (Substitution likely with DP Semi-submersible or drillship of same or lower horsepower.)	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**13210** **34818**																				
Main Engines: 6 x HiMSEN (6036 hp ea) + 2	VESSELS- Drilling - Propulsion Engine - Diesel	na	60354	3104.97189	34818.00	24	61	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30	14.56	8.79	8.52	0.21	348.91	10.03	0.00	54.73	0.10
Egen: 1 x Cummins, 2548 hp	Vessels – Drilling Prime Engine, Auxiliary	na	2548	131.084408	3146.03	24	9	1.80	1.08	1.05	0.03	43.07	1.24	0.00	6.76	0.01	0.19	0.12	0.11	0.00	4.65	0.13	0.00	0.73	0.00
Temporary Large/Small Auxiliary Engines	Vessels – Drilling Prime Engine, Auxiliary	na	2500	128.615	3086.76	24	61	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.29	0.78	0.76	0.02	30.93	0.89	0.00	4.85	0.01
2020 Facility Total Emissions								**46.14**	**27.84**	**27.00**	**0.67**	**1,105.47**	**31.78**	**0.00**	**173.39**	**0.32**	**16.05**	**9.68**	**9.39**	**0.23**	**384.49**	**11.05**	**0.00**	**60.31**	**0.11**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**2,287.71**			**2,287.71**	**2,287.71**	**2,287.71**		**57,031.76**	
	68.7																								
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	61	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	3.72	2.24	2.18	0.05	89.08	2.56	0.00	13.97	0.03
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
2020 Non-Facility Total Emissions								**15.24**	**9.19**	**8.92**	**0.22**	**365.10**	**10.50**	**0.00**	**57.26**	**0.11**	**8.59**	**5.19**	**5.03**	**0.13**	**205.92**	**5.92**	**0.00**	**32.30**	**0.06**

AIR EMISSIONS CALCULATIONS - 2ND YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Mississippi Canyon		520	OCS-G 09821	Not Applicable	006, 007, 008					Donna Gyles (Air Quality)/ Alber		Donna Gyles (281-832-4985)/ A		Drill and complete 3 wells with surface and bottom hole locations in Mississippi Canyon (MC) Block 520										
OPERATIONS	**EQUIPMENT**	**IPMEN**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING: Black Hornet Drillship (Substitution likely with DP Semi-submersible or drillship of same or lower horsepower.)	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**13210** **34818**																				
Main Engines: 6 x HiMSEN (6036 hp ea) + 2	VESSELS- Drilling - Propulsion Engine - Diesel	na	60354	3104.97189	34818.00	24	160	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30	38.20	23.04	22.35	0.56	915.16	26.31	0.00	143.54	0.27
Egen: 1 x Cummins, 2548 hp	Vessels – Drilling Prime Engine, Auxiliary	na	2548	131.084408	3146.03	24	23	1.80	1.08	1.05	0.03	43.07	1.24	0.00	6.76	0.01	0.50	0.30	0.29	0.01	11.89	0.34	0.00	1.86	0.00
Temporary Large/Small Auxiliary Engines	Vessels – Drilling Prime Engine, Auxiliary	na	2500	128.615	3086.76	24	160	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	3.39	2.04	1.98	0.05	81.13	2.33	0.00	12.73	0.02
2021 Facility Total Emissions								**46.14**	**27.84**	**27.00**	**0.67**	**1,105.47**	**31.78**	**0.00**	**173.39**	**0.32**	**42.08**	**25.39**	**24.63**	**0.61**	**1,008.18**	**28.99**	**0.00**	**158.13**	**0.29**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**2,287.71**			**2,287.71**	**2,287.71**	**2,287.71**		**57,031.76**	
	68.7																								
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	160	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	9.75	5.88	5.71	0.14	233.66	6.72	0.00	36.65	0.07
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
2021 Non-Facility Total Emissions								**15.24**	**9.19**	**8.92**	**0.22**	**365.10**	**10.50**	**0.00**	**57.26**	**0.11**	**14.63**	**8.83**	**8.56**	**0.21**	**350.49**	**10.08**	**0.00**	**54.97**	**0.10**

AIR EMISSIONS CALCULATIONS - 3RD YEAR

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Mississippi Canyon	520	OCS-G 09821	Not Applicable	006, 007, 008	Donna Gyles (Air Quality)/ Albert Ga	Donna Gyles (281-832-4985)/ Albert	Drill and complete 3 wells with surface and bottom hole locations in Mississippi Canyon (MC) Block 520

OPERATIONS	EQUIPMENT		RATING	MAX. FUEL	ACT. FUEL	RUN TIME	
	Diesel Engines		HP	GAL/HR	GAL/D		
	Nat. Gas Engines		HP	SCF/HR	SCF/D		
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR
DRILLING: Black Hornet Drillship (Substitution likely with DP Semi-submersible or drillship of same or lower horsepower.)	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**13210** **34818**		
Main Engines: 6 x HiMSEN (6036 hp ea) + 2 x	VESSELS- Drilling - Propulsion Engine - Diesel	na	60354	3104.97189	34818.00	24	160
Egen: 1 x Cummins, 2548 hp	Vessels – Drilling Prime Engine, Auxiliary	na	2548	131.084408	3146.03	24	23
Temporary Large/Small Auxiliary Engines	Vessels – Drilling Prime Engine, Auxiliary	na	2500	128.615	3086.76	24	160
2022	**Facility Total Emissions**						
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**						
	68.7						
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	160
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	40
Offshore Support vessel - 312 ft Class	VESSELS- Crew/Supply/Support (Diesel)	na	7200	370.411201	8889.87	24	40
2022	**Non-Facility Total Emissions**						

OPERATIONS	MAXIMUM POUNDS PER HOUR									
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING: Black Hornet Drillship									
Main Engines: 6 x HiMSEN (6036 hp ea) + 2 x	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30
Egen: 1 x Cummins, 2548 hp	1.80	1.08	1.05	0.03	43.07	1.24	0.00	6.76	0.01
Temporary Large/Small Auxiliary Engines	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01
2022 Facility Total Emissions	**46.14**	**27.84**	**27.00**	**0.67**	**1,105.47**	**31.78**	**0.00**	**173.39**	**0.32**
EXEMPTION CALCULATION									
Offshore Support vessel - 312 ft Class	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04
Offshore Support vessel - 312 ft Class	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04
Offshore Support vessel - 312 ft Class	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04
2022 Non-Facility Total Emissions	**15.24**	**9.19**	**8.92**	**0.22**	**365.10**	**10.50**	**0.00**	**57.26**	**0.11**

OPERATIONS	ESTIMATED TONS								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING: Black Hornet Drillship									
Main Engines: 6 x HiMSEN (6036 hp ea) + 2 x	38.20	23.04	22.35	0.56	915.16	26.31	0.00	143.54	0.27
Egen: 1 x Cummins, 2548 hp	0.50	0.30	0.29	0.01	11.89	0.34	0.00	1.86	0.00
Temporary Large/Small Auxiliary Engines	3.39	2.04	1.98	0.05	81.13	2.33	0.00	12.73	0.02
2022 Facility Total Emissions	**42.08**	**25.39**	**24.63**	**0.61**	**1,008.18**	**28.99**	**0.00**	**158.13**	**0.29**
EXEMPTION CALCULATION	**2,287.71**			**2,287.71**	**2,287.71**	**2,287.71**		**57,031.76**	
Offshore Support vessel - 312 ft Class	9.75	5.88	5.71	0.14	233.66	6.72	0.00	36.65	0.07
Offshore Support vessel - 312 ft Class	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
Offshore Support vessel - 312 ft Class	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
2022 Non-Facility Total Emissions	**14.63**	**8.83**	**8.56**	**0.21**	**350.49**	**10.08**	**0.00**	**54.97**	**0.10**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
BP Exploration & Production Inc.	520	OCS-G 09821	Not Applicable	006, 007, 008		

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2020	16.05	9.68	9.39	0.23	384.49	11.05	0.00	60.31	0.11
2021	42.08	25.39	24.63	0.61	1008.18	28.99	0.00	158.13	0.29
2022	42.08	25.39	24.63	0.61	1008.18	28.99	0.00	158.13	0.29
Allowable	2287.71			2287.71	2287.71	2287.71		57031.76	

OMB Control No. 1010-0151
OMB Approval Expires: 06/30/2021

EXPLORATION PLAN (EP)
AIR QUALITY SCREENING CHECKLIST

COMPANY	BP Exploration & Production Inc.
AREA	Mississippi Canyon
BLOCK	520
LEASE	OCS-G 09281
PLATFORM	Not applicable
WELL	H005
COMPANY CONTACT	Donna Gyles (Air Quality)/ Betsy Cleland (Plans)
TELEPHONE NO.	Donna Gyles (281-832-4985)/ Betsy Cleland (281-773-9088)
REMARKS	Drill and temporarily abandon one well.

EMISSIONS FACTORS

Fuel Usage Conversion Factors	Natural Gas Turbines		Natural Gas Engines		Diesel Recip. Engine		REF.	DATE
	SCF/hp-hr	9.524	SCF/hp-hr	7.143	GAL/hp-hr	0.0483	AP42 3.2-1	4/76 & 8/84

Equipment/Emission Factors	units	PM	SOx	NOx	VOC	CO	REF.	DATE
NG Turbines	gms/hp-hr		0.00247	1.3	0.01	0.83	AP42 3.2-1& 3.1-1	10/96
NG 2-cycle lean	gms/hp-hr		0.00185	10.9	0.43	1.5	AP42 3.2-1	10/96
NG 4-cycle lean	gms/hp-hr		0.00185	11.8	0.72	1.6	AP42 3.2-1	10/96
NG 4-cycle rich	gms/hp-hr		0.00185	10	0.14	8.6	AP42 3.2-1	10/96
Diesel Recip. < 600 hp.	gms/hp-hr	1	0.1835	14	1.12	3.03	AP42 3.3-1	10/96
Diesel Recip. > 600 hp.	gms/hp-hr	0.32	0.1835	11	0.33	2.4	AP42 3.4-1	10/96
Diesel Boiler	lbs/bbl	0.084	0.3025	0.84	0.008	0.21	AP42 1.3-12,14	9/98
NG Heaters/Boilers/Burners	lbs/mmscf	7.6	0.593	100	5.5	84	P42 1.4-1, 14-2, & 14	7/98
NG Flares	lbs/mmscf		0.593	71.4	60.3	388.5	AP42 11.5-1	9/91
Liquid Flaring	lbs/bbl	0.42	6.83	2	0.01	0.21	AP42 1.3-1 & 1.3-3	9/98
Tank Vapors	lbs/bbl				0.03		E&P Forum	1/93
Fugitives	lbs/hr/comp.				0.0005		API Study	12/93
Glycol Dehydrator Vent	lbs/mmscf				6.6		La. DEQ	1991
Gas Venting	lbs/scf				0.0034			

Sulphur Content Source	Value	Units
Fuel Gas	3.33	ppm
Diesel Fuel	0.05	% weight
Produced Gas(Flares)	3.33	ppm
Produced Oil (Liquid Flaring)	1	% weight

EMISSIONS CALCULATIONS 1ST YEAR

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL		CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Mississippi Canyon	520	OCS-G 09281	Not applicable	H005		Donna Gyles (Air Quality)/ Betsy (	Donna Gyles (28	

OPERATIONS	EQUIPMENT	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR					ESTIMATED TONS				
	Diesel Engines	HP	GAL/HR	GAL/D												
	Nat. Gas Engines	HP	SCF/HR	SCF/D												
	Burners	MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	PM	SOx	NOx	VOC	CO	PM	SOx	NOx	VOC	CO
DRILLING: West Vela Drillship (Substitution likely with DP Semi-submersible or drillship of same or lower horsepower.)	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**			**14182** **31389**												
Main Engines: 6 x STX-MAN 16V32, 10877 hp ea	PRIME MOVER>600hp diesel	65262	3152.1546	31389.00	24	100	46.00	26.38	1581.24	47.44	345.00	22.90	13.13	787.29	23.62	171.77
Emergency Generator: 1 x MTU, 2145 hp	PRIME MOVER>600hp diesel	2145	103.6035	2486.48	2	52	1.51	0.87	51.97	1.56	11.34	0.08	0.05	2.70	0.08	0.59
Small/Large Auxiliary Engines	AUXILIARY EQUIP<600hp diesel	2500	120.75	2898.00	24	100	5.51	1.01	77.09	6.17	16.69	6.61	1.21	92.51	7.40	20.02
Offshore Support Vessel - 312 ft Class	VESSELS>600hp diesel(supply/supp	7200	347.76	8346.24	24	100	5.07	2.91	174.45	5.23	38.06	6.09	3.49	209.34	6.28	45.67
Offshore Support Vessel - 312 ft Class	VESSELS>600hp diesel(supply/supp	7200	347.76	8346.24	24	40	5.07	2.91	174.45	5.23	38.06	2.44	1.40	83.74	2.51	18.27
Offshore Support Vessel - 312 ft Class	VESSELS>600hp diesel(supply/supp	7200	347.76	8346.24	24	40	5.07	2.91	174.45	5.23	38.06	2.44	1.40	83.74	2.51	18.27
2019	**YEAR TOTAL**						**68.24**	**36.99**	**2233.65**	**70.86**	**487.21**	**40.55**	**20.68**	**1259.32**	**42.41**	**274.60**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**											**2277.72**	**2277.72**	**2277.72**	**2277.72**	**56865.60**
	68.4															

SUMMARY

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL
BP Exploration &	Mississippi Canyon	520	OCS-G 09281	Not applicable	H005

Year	Emitted		Substance		
	PM	SOx	NOx	VOC	CO
2019	40.55	20.68	1259.32	42.41	274.60
Allowable	2277.72	2277.72	2277.72	2277.72	56865.60

EXPLORATION PLAN (EP)
AIR QUALITY SCREENING CHECKLIST

COMPANY	BP Exploration & Production Inc.
AREA	Mississippi Canyon
BLOCK	520
LEASE	OCS-G 09821
PLATFORM	Not applicable
WELL	4
COMPANY CONTACT	Donna Gyles (Air Quality Review)/ Adalberto Garcia (Plans)
TELEPHONE NO.	Donna Gyles (281-832-4985)/ Adalberto Garcia (281-995-2815)
REMARKS	Drill and complete one well

EMISSIONS FACTORS

Fuel Usage Conversion Factors	Natural Gas Turbines		Natural Gas Engines		Diesel Recip. Engine		REF.	DATE
	SCF/hp-hr	9.524	SCF/hp-hr	7.143	GAL/hp-hr	0.0483	AP42 3.2-1	4/76 & 8/84

Equipment/Emission Factors	units	PM	SOx	NOx	VOC	CO	REF.	DATE
NG Turbines	gms/hp-hr		0.00247	1.3	0.01	0.83	AP42 3.2-1& 3.1-1	10/96
NG 2-cycle lean	gms/hp-hr		0.00185	10.9	0.43	1.5	AP42 3.2-1	10/96
NG 4-cycle lean	gms/hp-hr		0.00185	11.8	0.72	1.6	AP42 3.2-1	10/96
NG 4-cycle rich	gms/hp-hr		0.00185	10	0.14	8.6	AP42 3.2-1	10/96
Diesel Recip. < 600 hp.	gms/hp-hr	1	0.1835	14	1.12	3.03	AP42 3.3-1	10/96
Diesel Recip. > 600 hp.	gms/hp-hr	0.32	0.1835	11	0.33	2.4	AP42 3.4-1	10/96
Diesel Boiler	lbs/bbl	0.084	0.3025	0.84	0.008	0.21	AP42 1.3-12,14	9/98
NG Heaters/Boilers/Burners	lbs/mmscf	7.6	0.593	100	5.5	84	P42 1.4-1, 14-2, & 14	7/98
NG Flares	lbs/mmscf		0.593	71.4	60.3	388.5	AP42 11.5-1	9/91
Liquid Flaring	lbs/bbl	0.42	6.83	2	0.01	0.21	AP42 1.3-1 & 1.3-3	9/98
Tank Vapors	lbs/bbl				0.03		E&P Forum	1/93
Fugitives	lbs/hr/comp.				0.0005		API Study	12/93
Glycol Dehydrator Vent	lbs/mmscf				6.6		La. DEQ	1991
Gas Venting	lbs/scf				0.0034			

Sulphur Content Source	Value	Units
Fuel Gas	3.33	ppm
Diesel Fuel	0.05	% weight
Produced Gas(Flares)	3.33	ppm
Produced Oil (Liquid Flaring)	1	% weight

EMISSIONS CALCULATIONS 1ST YEAR

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL		CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Mississippi Canyon	520	OCS-G 09821	Not applicable	4		Donna Gyles (Air Quality Review)	Donna Gyles (28	

OPERATIONS	EQUIPMENT	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR					ESTIMATED TONS				
	Diesel Engines	HP	GAL/HR	GAL/D												
	Nat. Gas Engines	HP	SCF/HR	SCF/D												
	Burners	MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	PM	SOx	NOx	VOC	CO	PM	SOx	NOx	VOC	CO
DRILLING: MODU West Capricorn																
(Substitution likely by other Drillship or DP Semi-submersible of similar or lower horsepower rating)																
Main Engines: 8 x CAT C280-16, 6785 hp each	PRIME MOVER>600hp diesel	54280	2621.724	31389.00	24	61	38.26	21.94	1315.15	39.45	286.94	13.97	8.01	480.25	14.41	104.78
Egen: 1 x Leroy Somer, 2180hp	PRIME MOVER>600hp diesel	2180	105.294	2527.06	2	12	1.54	0.88	52.82	1.58	11.52	0.02	0.01	0.63	0.02	0.14
Small/Large Auxiliary Engines	AUXILIARY EQUIP<600hp diesel	2500	120.75	2898.00	24	61	5.51	1.01	77.09	6.17	16.69	4.03	0.74	56.43	4.51	12.21
Offshore Support Vessel - Class 312 ft	VESSELS>600hp diesel(crew/support)	7200	347.76	8346.24	24	61	5.07	2.91	174.45	5.23	38.06	3.71	2.13	127.70	3.83	27.86
Offshore Support Vessel - Class 312 ft	VESSELS>600hp diesel(crew/support)	7200	347.76	8346.24	24	40	5.07	2.91	174.45	5.23	38.06	2.44	1.40	83.74	2.51	18.27
Offshore Support Vessel - Class 312 ft	VESSELS>600hp diesel(crew/support)	7200	347.76	8346.24	24	40	5.07	2.91	174.45	5.23	38.06	2.44	1.40	83.74	2.51	18.27
2018	**YEAR TOTAL**						**60.53**	**32.56**	**1968.41**	**62.91**	**429.34**	**26.61**	**13.69**	**832.48**	**27.80**	**181.53**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**											**2221.11**	**2221.11**	**2221.11**	**2221.11**	**55919.44**
	66.7															

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL		CONTACT		PHONE	REMARKS						
BP Exploration & Production Inc.	Mississippi Canyon	520	OCS-G 09821	Not applicable	4			Donna Gyles (Air Quality Review)	Donna Gyles (28							
OPERATIONS	**EQUIPMENT**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**					**ESTIMATED TONS**				
	Diesel Engines	**HP**	**GAL/HR**	**GAL/D**												
	Nat. Gas Engines	**HP**	**SCF/HR**	**SCF/D**												
	Burners	**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**PM**	**SOx**	**NOx**	**VOC**	**CO**	**PM**	**SOx**	**NOx**	**VOC**	**CO**
DRILLING: MODU West Vela Drillship (Substitution likely by other Drillship or DP Semi-submersible of similar or lower horsepower rating)	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**			**14181** **31389**												
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea	PRIME MOVER>600hp diesel	65262	3152.1546	75651.71	24	143	46.00	26.38	1581.24	47.44	345.00	78.94	45.26	2713.40	81.40	592.02
Egen: 1 x Leroy Somer, 2145hp	PRIME MOVER>600hp diesel	2145	103.6035	2486.48	2	52	1.51	0.87	51.97	1.56	11.34	0.08	0.05	2.70	0.08	0.59
Small/Large Auxiliary Engines	AUXILIARY EQUIP<600hp diesel	2500	120.75	2898.00	24	143	5.51	1.01	77.09	6.17	16.69	9.45	1.73	132.29	10.58	28.63
Offshore Support Vessel - Class 312 ft	VESSELS>600hp diesel(crew/suppo	7200	347.76	8346.24	24	143	5.07	2.91	174.45	5.23	38.06	8.71	4.99	299.36	8.98	65.31
Offshore Support Vessel - Class 312 ft	VESSELS>600hp diesel(crew/suppo	7200	347.76	8346.24	24	40	5.07	2.91	174.45	5.23	38.06	2.44	1.40	83.74	2.51	18.27
Offshore Support Vessel - Class 312 ft	VESSELS>600hp diesel(crew/suppo	7200	347.76	8346.24	24	40	5.07	2.91	174.45	5.23	38.06	2.44	1.40	83.74	2.51	18.27
2019	**YEAR TOTAL**						**68.24**	**36.99**	**2233.65**	**70.86**	**487.21**	**102.04**	**54.83**	**3315.22**	**106.07**	**723.09**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES** 66.7											**2221.11**	**2221.11**	**2221.11**	**2221.11**	**55919.44**

SUMMARY

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL
BP Exploration	Mississippi Canyon	520	OCS-G 09821	Not applicable	4

Year	Emitted		Substance		
	PM	SOx	NOx	VOC	CO
2018	26.61	13.69	832.48	27.80	181.53
2019	102.04	54.83	3315.22	106.07	723.09
Allowable	2221.11	2221.11	2221.11	2221.11	55919.44

Ocean BlackHornet

GENERAL DESCRIPTION

Design .... Gusto P10,000 DW

Year Entered Service 2015

Classification. ABS, +A1, Drillship, Helidk, +AMS, +ACCU, +CDS, + DPS-3, SH-DLA, GP

Dimensions .... 754 ft long x 118 ft wide x 59 ft deep

Draft .... 36 ft operating / 29 ft transit

Displacement .... 70,000T operating

Variable Deck .... 22,045T operating

Transit Speed .... up to 12.5 knots

Water Depths .... 12,000 ft designed / 10,000 ft outfitted

Drilling Depth .... 40,000 ft

DRILLING EQUIPMENT

Derrick	NOV Dual Bottleneck, 210 ft high with 80 ft x 60 ft base, combined hook load capacity of 4,000 kips
Drawworks	(Main): NOV / AHD 1250, six AC electric motors, 9,000hp total, 1,250T with sixteen 2 1/8" drilling lines
	(Aux): NOV / AHD 750, five AC electric motors, 5,750hp total, 750T with fourteen 1 ¾" drilling lines
Compensator	Active Heave Compensating Drawworks
Rotary Table	(Main): NOV RST 75 ½" hydraulic, 1,375T static
	(Aux): NOV RST 60 ½" hydraulic, 1,000T static
Top Drive	(Main): NOV TDX-1250, 1,250T with 7,500 psi
	(Aux): NOV TDS-8SA. 750T with 7,500 psi
Tubular handling	2 x NOV MPT 'Hydraulic Roughneck' for tubular range 3 ½" to 9 ¾" + 2 x NOV HR IV-ER
Mud Pumps	5 x NOV 14-P-220, 2,200hp, 7,500 psi

POWER EQUIPMENT

Main Power	6 x Himsen diesel engines rated 4,500kW, each driving 5,375 kVA AC generators
	2 x Himsen V-type diesel engines rated 9,000kW, each driving 10,875 kVA AC generators
Emergency Power	V-type Cummins diesel engine rated 1,900kW driving 1 x STX engine rated 1,550kW AC generator

STORAGE CAPACITIES

Liquid Mud .... 15,204 bbls

Base Oil .... 7,209 bbls

Brine .... 13,175 bbls

Drill Water .... 18,593 bbls

Potable Water .... 8,834 bbls

Bulk Storage .... 16,315 ft³ (barite + bentonite) + 15,891ft³ (cement)

Sack Storage .... 6,000 sacks

CRANES

Knuckle-boom	1 x 100 ton + 2 x 85 ton knuckle-boom
AHC Subsea	165 ton Active Heave Compensation knuckle-boom

SUBSEA EQUIPMENT

Diverter	Vetco CSO 21¼" 500 psi diverter with 1 x 20" flow line + 2 x 16" overboard diverter lines
BOP Stacks (2)	Hydril 18 ¾" 15,000 psi seven-ram preventer
	2 x Hydril 18 ¾" 10,000 psi annular preventers
	APIS53 compliant
C&K Manifold	3 1/16", 15,000 psi
Marine Riser	Vetco HMF Class H 21", 75 ft long per joint
Tensioners	16 x 225 kips NOV wireline riser tensioners. Total capacity 3,600 kips with 50 ft of wire travel
Moonpool	73 ft x 42 ft

STATION KEEPING / PROPULSION SYSTEM

Thrusters	6 x Thrustmaster, 5,000kW azimuth thrusters with fixed pitch variable speed propellers
DP System	Kongsberg K-POS

OTHER INFORMATION

Dual Activity	Yes
Accommodation	210 people
Helideck	Sikorsky S-61 & S-92, CAP 437 compliant

DIAMOND OFFSHORE

Sep 2015

INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE

Issued under the provisions of
the Protocol of 1997, as amended by resolution MEPC.176(58) in 2008,
to amend the International Convention for the Prevention of Pollution from
Ships, 1973, as modified by the Protocol of 1978 related thereto
(hereinafter referred to as "the Convention")
under the authority of the Government of:

Republic of the Marshall Islands

(name of state)

by American Bureau of Shipping

Particulars of Ship

Name of Ship		Distinctive Number or Letters
OCEAN BLACKHORNET		5314
IMO Number[1]	Port of Registry	Gross Tonnage
9618903	Majuro	51732

THIS IS TO CERTIFY:

1. That the ship has been surveyed in accordance with regulation 5 of Annex VI of the Convention; and
2. That the survey shows that the equipment, systems fittings, arrangements and materials fully comply with the applicable requirements of Annex VI of the Convention.

This Certificate is valid only when Supplement IAPPC-VI 2008 issued at Pascagoula, United States on 21 December 2019 is attached.

This certificate is valid until 30 November 2024 [2] subject to surveys in accordance with regulation 5 of Annex VI of the Convention.

Completion date of the survey on which this certificate is based: **21 December 2019**

Issued at Pascagoula,United States on 21 December 2019

(Place of Issue of Certificate) *(Date of Issue)*

Electronically Signed By
Fields, Eric L, Mobile Port
Surveyor, American Bureau of Shipping

1 In accordance with IMO ship identification number scheme, adopted by the Organization by resolution A.600(15).
2 Insert the date of expiry as specified by the Administration in accordance with regulation 9.1 of Annex VI of the Convention. The day and month of this date correspond to the anniversary date as defined in regulation 2.3 of Annex VI of the Convention, unless amended in accordance with regulation 9.8 of Annex VI of the Convention.

ENDORSEMENT FOR ANNUAL AND INTERMEDIATE SURVEYS

THIS IS TO CERTIFY that, at a survey required by Regulation 5 of Annex VI of the Convention, the ship was found to comply with the relevant requirements of the Convention.

Annual Survey: Signed: ______________________________
(Surveyor, American Bureau of Shipping)
Place: ______________________________
Date: ______________________________

Annual / Intermediate[3] Survey: Signed: ______________________________
(Surveyor, American Bureau of Shipping)
Place: ______________________________
Date: ______________________________

Annual / Intermediate[3] Survey: Signed: ______________________________
(Surveyor, American Bureau of Shipping)
Place: ______________________________
Date: ______________________________

Annual Survey: Signed: ______________________________
(Surveyor, American Bureau of Shipping)
Place: ______________________________
Date: ______________________________

ABS

3 Delete as appropriate

ANNUAL / INTERMEDIATE SURVEY IN ACCORDANCE WITH REGULATION 9.8.3

THIS IS TO CERTIFY that, at an annual / intermediate[3] survey in accordance with Regulation 9.8.3 of Annex VI of the Convention, the ship was found to comply with the relevant provisions of the Convention.

Signed: ______________________________
(Surveyor, American Bureau of Shipping)

Place: ______________________________

Date: ______________________________

ENDORSEMENT TO EXTEND THE CERTIFICATE IF VALID FOR LESS THAN 5 YEARS WHERE REGULATION 9.3 APPLIES

The ship complies with the relevant provisions of the Convention, and this Certificate shall, in accordance with Regulation 9.3 of Annex VI of the Convention, be accepted as valid until ______________________

Signed: ______________________________
(Surveyor, American Bureau of Shipping)

Place: ______________________________

Date: ______________________________

ENDORSEMENT WHERE THE RENEWAL SURVEY HAS BEEN COMPLETED AND REGULATION 9.4 APPLIES

The ship complies with the relevant provisions of the Convention, and this Certificate shall, in accordance with Regulation 9.4 of Annex VI of the Convention, be accepted as valid until ______________________

Signed: ______________________________
(Surveyor, American Bureau of Shipping)

Place: ______________________________

Date: ______________________________

ENDORSEMENT TO EXTEND THE VALIDITY OF THE CERTIFICATE UNTIL REACHING THE PORT OF SURVEY OR FOR A PERIOD OF GRACE WHERE REGULATION 9.5 OR 9.6 [3] APPLIES

This Certificate shall, in accordance with regulation 9.5 / 9.6 [3] of Annex VI of the Convention, be accepted as valid until______________________

Signed: ______________________________
(Surveyor, American Bureau of Shipping)

Place: ______________________________

Date: ______________________________

ABS

3 Delete as appropriate

ENDORSEMENT FOR ADVANCEMENT OF ANNIVERSARY DATE WHERE REGULATION 9.8 APPLIES

In accordance with Regulation 9.8 of Annex VI of the Convention, the new anniversary date is ______________________

Signed: ____

(Surveyor, American Bureau of Shipping)

Place: ____

Date: ____

In accordance with Regulation 9.8 of Annex VI of the Convention, the new anniversary date is ______________________

Signed: ____

(Surveyor, American Bureau of Shipping)

Place: ____

Date: ____

SUPPLEMENT TO INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE (IAPP CERTIFICATE)

RECORD OF CONSTRUCTION AND EQUIPMENT

Notes:

1. This Record shall be permanently attached to the IAPP Certificate. The IAPP Certificate shall be available on board the ship at all times.
2. The Record shall be at least in English, French or Spanish. If an official language of the issuing country is also used, this shall prevail in case of a dispute or discrepancy.
3. Entries in boxes shall be made by inserting either a cross (x) for the answer "yes" and "applicable" or a (-) for the answers "no" and "not applicable" as appropriate.
4. Unless otherwise stated, regulations mentioned in this Record refer to regulations of Annex VI of the Convention and resolutions or circulars refer to those adopted by the International Maritime Organization.

1 Particulars of ship

1.1 Name of ship: OCEAN BLACKHORNET

1.2 IMO number: 9618903

1.3 Date on which keel was laid or ship was at a similar stage of construction: 19 November 2012

1.4 Length (L)* metres: N/A

* Completed only in respect of ships constructed on or after 1 January 2016 that are specially designed, and used solely, for recreational purposes and to which, in accordance with regulation 13.5.2.1, the NO_x emission limit as given by regulation 13.5.1.1 will not apply.

2 Control of emissions from ships

2.1 *Ozone-depleting substances* (regulation 12)

2.1.1 The following fire-extinguishing systems, other systems and equipment containing ozone-depleting substances, other than hydrochlorofluorocarbons (HCFCs), installed before 19 May 2005 may continue in service:

System or Equipment	Location on board	Substance
-	-	-

2.1.2 The following systems containing hydrochlorofluorocarbons (HCFCs) installed before 1 January 2020 may continue in service:

System or Equipment	Location on board	Substance
-	-	-

2.2 *Nitrogen oxides (NO_X)* (regulation 13)

2.2.1 The following marine diesel engines installed on this ship comply with the applicable emission limit of regulation 13 in accordance with the revised NO_X Technical Code 2008:

	Engine #1	Engine #2	Engine #3	Engine #4	Engine #5	Engine #6	Engine #7	Engine #8	Engine #9	Engine #10	Engine #11	Engine #12
Manufacturer and model	Hyundai-Himsen 9H32/40	Hyundai-Himsen 9H32/40	Hyundai-Himsen 9H32/40	Hyundai-Himsen 9H32/40	Hyundai-Himsen 9H32/40	Hyundai-Himsen 9H32/40	Hyundai-Himsen 18H32/40V	Hyundai-Himsen 18H32/40V				
Serial number	BA4513-1	BA4513-2	BA4513-3	BA4513-4	BA4513-5	BA4513-6	BA4512-1	BA4512-2				
Use	Main Generator Engine	Main Generator Engine	Main Generator Engine	Main Generator Engine	Main Generator Engine	Main Generator Engine	Main Generator Engine	Main Generator Engine				
Power output (kW)	4500	4500	4500	4500	4500	4500	9000	9000				
Rated speed (rpm)	720	720	720	720	720	720	720	720				
Date of installation (dd/mm/yyyy)	01 December 2014	01 December 2014	01 December 2014	01 December 2014	01 December 2014	01 December 2014	01 December 2014	01 December 2014				
Date of major conversion (dd/mm/yyyy) Reg. 13.2.2	-	-	-	-	-	-	-	-				
Date of major conversion (dd/mm/yyyy) Reg. 13.2.3	-	-	-	-	-	-	-	-				
Exempted by regulation 13.1.1.2	-	-	-	-	-	-	-	-	☐	☐	☐	☐
Tier I Reg.13.3	-	-	-	-	-	-	-	-	☐	☐	☐	☐
Tier II Reg.13.4	X	X	X	X	X	X	X	X	☐	☐	☐	☐
Tier II Reg. 13.2.2 or 13.5.2	-	-	-	-	-	-	-	-	☐	☐	☐	☐
Tier III Reg.13.5.1.1	-	-	-	-	-	-	-	-	☐	☐	☐	☐
Approved method exists	-	-	-	-	-	-	-	-	☐	☐	☐	☐
Approved method not commercially available	-	-	-	-	-	-	-	-	☐	☐	☐	☐
Approved method installed	-	-	-	-	-	-	-	-	☐	☐	☐	☐

2.3 *Sulphur oxides (SO_X) and particulate matter* (regulation 14)

2.3.1 When the ship operates outside of an Emission Control Area specified in regulation 14.3, the ship uses:

.1 fuel oil with a sulphur content as documented by bunker delivery notes that does not exceed the limit value of:

▪ 4.50% m/m (not applicable on or after 1 January 2012); or	-
▪ 3.50% m/m (not applicable on or after 1 January 2020); or	X
▪ 0.50% m/m, and/or	X

.2 an equivalent arrangement approved in accordance with regulation 4.1 as listed in 2.6 that is at least as effective in terms of SO_X emission reductions as compared to using a fuel oil with a sulphur content limit value of:

▪ 4.50% m/m (not applicable on or after 1 January 2012)	-
▪ 3.50% m/m (not applicable on or after 1 January 2020)	-
▪ 0.50% m/m	-

2.3.2 When the ship operates inside an Emission Control Area specified in regulation 14.3, the ship uses:

.1 fuel oil with a sulphur content as documented by bunker delivery notes that does not exceed the limit value of:

▪ 1.00% m/m (not applicable on or after 1 January 2015); or	X
▪ 0.10% m/m, and/or	X

.2 an equivalent arrangement approved in accordance with regulation 4.1 as listed in 2.6 that is at least as effective in terms of SO_X emission reductions as compared to using a fuel oil with a sulphur content limit value of:

▪ 1.00% m/m (not applicable on or after 1 January 2015)	-
▪ 0.10% m/m	-

2.4 *Volatile organic compounds (VOCs)* (regulation 15)

2.4.1 The tanker has a vapour collection system installed and approved in accordance with MSC/Circ.585	-
2.4.2.1 For a tanker carrying crude oil, there is an approved VOC Management Plan	-
2.4.2.2 VOC Management Plan approval reference:	-

2.5 *Shipboard incineration* (regulation 16)

2.5.1 The ship has an incinerator:

.1 installed on or after 1 January 2000 which complies with resolution MEPC.76(40), as amended	-
.2 installed before 1 January 2000 which complies with:	
▪ resolution MEPC.59(33)	-
▪ resolution MEPC.76(40)	-

2.6 *Equivalents* (regulation 4)

The ship has been allowed to use the following fitting, material, appliance or apparatus to be fitted in a ship or other procedures, alternative fuel oils, or compliance methods used as an alternative to that required by this Annex:

System or Equipment	Equivalent Used	Approval Reference
-	-	-

THIS IS TO CERTIFY that this Record is correct in all respects.

Issued at Ulsan, Korea on 01 December 2014

(Place of issue) *(Date of issue)*

ABS

Kim, Hyun-Chul, Ulsan Port

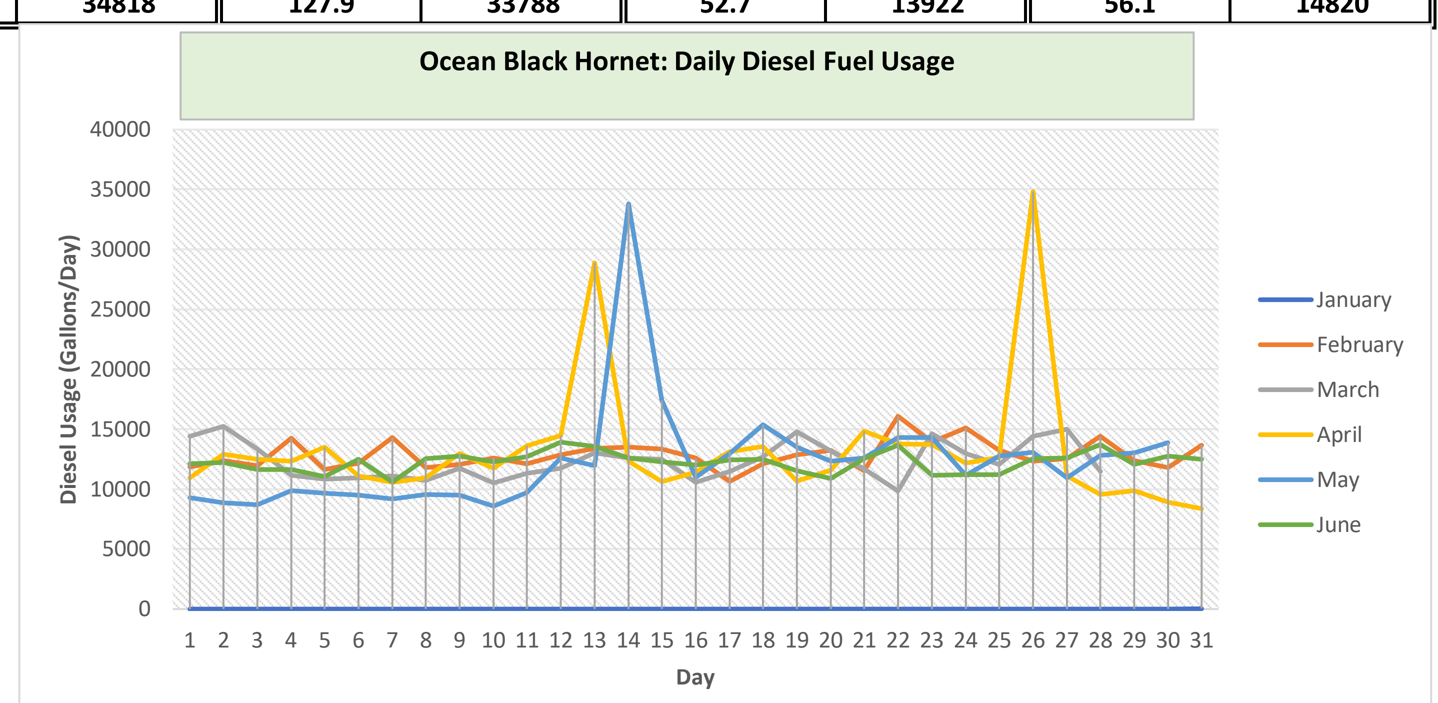
(Surveyor, American Bureau of Shipping)

ABS ULSAN

OCEAN BLACK HORNET ACTUAL FUEL USAGE (JANUARY - JUNE 2019)												
	January		February		March		April		May		June	
Day	(Cubic Meter)	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons
1	44.9	11861	54.6	14424	41.4	10937	35.1	9272	45.8	12099	47.7	12601
2	46.9	12390	57.7	15243	48.9	12918	33.5	8850	46.2	12205	43.5	11491
3	45.3	11967	50.5	13341	47.2	12469	32.9	8691	44.1	11650	39.1	10329
4	54	14265	42.3	11174	46.7	12337	37.3	9854	44	11624	39.1	10329
5	44	11624	41.1	10857	51.1	13499	36.6	9669	41.9	11069	41.4	10937
6	46.1	12178	41.5	10963	42	11095	36	9510	47.3	12495	41.2	10884
7	54.1	14292	42.1	11122	40	10567	34.8	9193	40.1	10593	50.6	13367
8	44.6	11782	40.7	10752	41.4	10937	36.2	9563	47.4	12522	46.8	12363
9	45.7	12073	44.5	11756	49.2	12997	36	9510	48.3	12760	41.7	11016
10	47.7	12601	39.8	10514	44.4	11729	32.5	8586	46.5	12284	46	12152
11	45.9	12125	42.8	11307	51.5	13605	36.7	9695	48.1	12707	40.8	10778
12	48.8	12892	44.4	11729	54.8	14477	47.6	12575	52.7	13922	41	10831
13	50.8	13420	49.3	13024	109.3	28874	45.3	11967	51.3	13552	43.3	11439
14	51.2	13526	47.8	12627	46.6	12310	127.9	33788	47.6	12575	46.1	12178
15	50.5	13341	47.2	12469	40.3	10646	65.8	17383	46.4	12258	41.7	11016
16	47.6	12575	40.1	10593	43.2	11412	41.7	11016	45.5	12020	50.3	13288
17	40.3	10646	43.4	11465	49.7	13129	49.1	12971	47.1	12443	54.6	14424
18	45.9	12125	48.1	12707	51.4	13578	58.2	15375	47.2	12469	45.9	12125
19	48.7	12865	56	14794	40.4	10673	51.1	13499	43.7	11544	52.5	13869
20	50.1	13235	50	13209	43.8	11571	46.7	12337	41.3	10910	53	14001
21	43.6	11518	44.2	11676	56.1	14820	47.7	12601	47.4	12522	49.9	13182
22	60.9	16088	37.3	9854	52.2	13790	54.1	14292	51.8	13684	56	14794
23	52.8	13948	55.3	14609	51.9	13711	54.2	14318	42.2	11148	55	14529
24	57.1	15084	49.1	12971	46	12152	42.2	11148	42.5	11227	44.5	11756
25	50.1	13235	45.6	12046	47.9	12654	48.3	12760	42.5	11227	51.3	13552
26	46.6	12310	54.6	14424	131.8	34818	49.6	13103	47.4	12522	55.7	14714
27	47.5	12548	56.8	15005	42	11095	41.5	10963	47.8	12627	56.1	14820
28	54.6	14424	43.4	11465	36.2	9563	48.5	12812	51.9	13711	48	12680
29	46.8	12363			37.3	9854	49.3	13024	45.7	12073	45.8	12099
30	44.6	11782			33.7	8903	52.6	13895	48.3	12760	48.8	12892
31	51.8	13684			31.7	8374			47.3	12495		
Total	**1509.5**	**398768**	**1310.2**	**346118**	**1550.1**	**409493**	**1409**	**372218**	**1437.3**	**379694**	**1417.4**	**374437**
Average	**49**	**12864**	**47**	**12362**	**51**	**13210**	**47**	**12408**	**47**	**12249**	**48**	**12482**
Maximum	**60.9**	**16088**	**57.7**	**15243**	**131.8**	**34818**	**127.9**	**33788**	**52.7**	**13922**	**56.1**	**14820**

Average Daily Fuel Usage Rate = 13210 gals/day

Maximum Daily Fuel Usage Rate = 34818 gals/day



Appendix F: WCD Modeling Report -

Revised Exploration Plan
Na Kika Herschel Expansion
MC520

Worst Case Discharge

The additional well activities proposed in this revised EP have been assessed for their WCD potential. These well activities in Na Kika lease Mississippi Canyon Block 520 do not exceed the currently approved WCD for well MC520 005, previously submitted and approved with Na Kika supplemental EP S-7916 on January 22, 2019.

Appendix G: Oil Spill Response Discussion -

SPILL RESPONSE DISCUSSION

1) <u>Worst Case Discharge Scenario</u>

Under this revised Exploration Plan, BP Exploration & Production Inc. (BP) proposes to drill and complete up to six wells as part of the NK Herschel Expansion project. Surface and bottom hole locations will be in Mississippi Canyon Block 520. This revised EP is to re-locate surface hole locations C, E, F, G, H and I in MC520 and extend the proposed activities as initially approved in the supplemental EP (S-7916) on January 22, 2019.

The proposed well does not result in a change to the worst case oil spill scenario described in the previous supplemental EP S-7916, approved on January 22, 2019. The worst case oil spill scenario described in supplemental EP S-7916 is based upon an uncontrolled blowout with a discharge rate determined in accordance with 30 CFR 254.47(b). The uncontrolled blowout scenario described in supplemental EP S-7916 is more particularly described below:

The uncontrolled blowout scenario is for a potential blowout of the MC 520 005 well which BP calculates has the highest liquid hydrocarbons rate potential in the MC520 area. The blowout scenario assumes that the pipe has been tripped out of the hole when a problem with the wellhead connector develops resulting in the removal of the BOP stack. Due to the loss of riser margin, the well flows unrestricted. Day 1 WCD is estimated to be 290,000 barrels of oil per day (BOPD). The maximum duration of a blowout is estimated at 101 days based on the time required to drill a relief well. The rate profile associated with the well blowout over this 101day period results in a potential worst case spill volume estimated at 13.47 million bbl of oil.

The data and information presented in the following sections 2) – 9) of this Oil Spill Discussion relate to well MC520 005, which BP believes to be analogous to the proposed well that is covered under this revised EP for MC 520.

2) <u>Facility Information:</u>

- Type of Operation: Drilling
- Facility Name: Semisubmersible or Drillship
- Area and Block: Mississippi Canyon Block 520
- Latitude: 28˚ 28’ 45.87”
- Longitude: -88˚ 10’ 18.09”
- Distance to Shore: 69 statute miles
- Water Depth: Approximately 6,698 ft
- API Gravity: 29°
- Total Fuel Oil Storage Capacity (on-board rig): 26,804 – 54,820 bbls

3) <u>Worst Case Discharge Volume</u>

Description	Barrels of Oil
24 hour uncontrolled blowout	290,000 bbls

Oil spill response-related activities for wells to be drilled under BP’s EP are governed by the BP Regional Oil Spill Response Plan (OSRP). All proposed activities and facilities in this EP will be covered by the GoM Regional OSRP filed by BP America Inc. (Operator No. 21372) under cover letter dated February 14, 2019 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on March 15, 2019. Modifications were made to the approved OSRP under cover letter dated June 20, 2019 and confirmed in compliance by BSEE on July 24, 2019.

The BP OSRP should meet the requirements contained in 30 CFR Part 254. BP (Operator No. 02481) has demonstrated oil spill financial responsibility for the facilities proposed in this EP, according to 30 CFR Part 553 and

NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities." The OSRP details BP's plan for response to manage oil spills that may result from drilling and production operations. BP has designed its response program based on a regional capability of response to spills ranging from small operations-related spills to a worst-case discharge (WCD) from a well blowout. BP's spill response program is intended to meet the response planning requirements of the relevant coastal states and applicable federal oil spill planning regulations. It also includes information regarding BP's incident management team (IMT) and dedicated response assets, potential spill risks, and local environmentally sensitive areas. The OSRP describes personnel and equipment mobilization, the incident management team organization, and an overview of strategies, actions and notifications to be taken in the event of a spill.

BP will make every effort to respond to the Worst Case Discharge as effectively as practicable. A description of the response equipment to contain and recover the Worst Case Discharge is shown in **Figure 4**, which outlines contracted equipment, personnel, materials and support vessels as well as temporary storage equipment to respond to the worst case discharge. The list estimates individual times needed for procurement, load out, travel time to the site, and deployment. **Figure 4** also indicates how operations would be supported.

Using the estimated chemical and physical characteristics of crude oil, an ADIOS weathering model was run on a similar product from the ADIOS oil database. The results indicate 9% or approximately 26,100 barrels of crude oil would be evaporated/dispersed within 24 hours, with approximately 263,900 barrels remaining.

Natural Weathering Data: MC 520, H-5	**Barrels of Oil**
WCD Volume	290,000
Less 9% natural evaporation/dispersion	26,100
Remaining volume	263,900

4) Land Segment and Resource Identification

In compliance with NTL 2012-N06, BP has determined the land areas that could be potentially impacted by a potential oil spill using the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico available on the BOEM website. The results are shown in **Figure 1** below. The BOEM OSRAM identifies the highest probability of impact to the shorelines of Plaquemines Parish, Louisiana. **Figure 2** contains a list of environmental sensitivities and **Figure 3** contains a list of shoreline types found in Plaquemines Parish.

Plaquemines Parish includes Barataria Bay, the Mississippi River Delta, Breton Sound and the affiliated islands and bays. This region includes sensitive habitat and serves as a migratory, breeding, feeding and nursery habitat for numerous species of wildlife. Beaches in this area vary in grain particle size and can be classified as fine sand, shell or perched shell beaches. Sandy and muddy tidal flats are also abundant.

FIGURE 1
TRAJECTORY BY LAND SEGMENT

Conditional probabilities of a spill in Mississippi Canyon Block 520 (MC 520) contacting shoreline segments have been projected utilizing BP's WCD and information in the BOEM Oil Spill Risk Analysis Model (OSRAM) (Ji et al., 2004) for the Central and Western Gulf of Mexico available on the BOEM website using 3, 10, and 30 day impact. The results are tabulated below.

Location	Shoreline Segment	County/Parish, State	Conditional Probability [1](%)		
			3 Day	10 Day	30 day
MC 520, H-5 *69 statute miles from shore* OCS-G: G09821 Launch Area: C 57	C13	Cameron, LA	--	--	1
	C14	Vermilion, LA	--	--	1
	C17	Terrebonne, LA	--	1	2
	C18	Lafourche, LA	--	1	2
	C20	**Plaquemines, LA**	**4**	**14**	**21**
	C21	St. Barnard, LA	--	1	3
	C22	Hancock & Harrison, MS	--	--	1
	C23	Jackson, MS	--	--	1
	C24	Mobile, AL	--	--	1
	C25	Baldwin, AL	--	--	1
	C26	Escambia, FL	--	--	1
	C28	Okaloosa, FL	--	--	1
	C29	Walton, FL	--	--	1
	C30	Bay, FL	--	--	1

[1] Conditional probability refers to the probability of contact within the stated time period, assuming that a spill has occurred (-- indicates <0.5%).

Figure 2 – Environmental Sensitivities
Plaquemines Parish, Louisiana

Sensitive Areas	Descriptions	Wildlife	Access	Contact
Delta National Wildlife Refuge	48,800 acres of marsh, shallow ponds, channels and bayous. Provides a winter sanctuary for migratory waterfowl such as snow geese and more than 18 species of ducks. Also the home of many other water birds and various wildlife species.	**RTE:** **Brown pelican, American alligator** **Others:** Waterfowl (winter), peregrine falcon, sea birds, shore birds, bass, bream, catfish, crappie, drum, garfish, redfish, speckled trout, flounder, nutria, mink, otter, muskrat, raccoon, white-tailed deer	By boat only.	Delta NWR Bayou Lacombe Centre 61389 Hwy 434 Lacombe, LA 70445 Phone: (985) 882-2000
Pass A Loutre Wildlife Management Area	66,000 acres characterized by river channels with attendant pass banks, natural bayous and man-made canals which are interspersed with intermediate and fresh marshes. Furbearers and alligators are fairly common in the marsh. Freshwater finfish flourish in the interior marsh ponds.	**RTE:** **Brown pelican, American alligator** **Others:** Waterfowl (winter), peregrine falcon, sea birds, shore birds, bass, bream, catfish, crappie, drum, warmouth fish, garfish, redfish, speckled trout, flounder, nutria, mink, otter, muskrat, raccoon, white-tailed deer	By boat only, however, the tributaries along the Mississippi River provide excellent traveling passages. The nearest public launches are in Venice.	Pass A Loutre WMA Hammond Field Office 42371 Phyllis Ann Drive Hammond, LA 70403 Phone (985) 543-4777
Breton National Wildlife Refuge	Breton Island and the adjoining Chandeleur Islands. Breton Island is made up of 2 adjacent islands with a combined length of about 3 miles and a width of less than 1 mile. The Chandeleur Islands have a length of approximately 20 miles and a width of less than 1 mile. The islands are low with sandy beaches on the Gulf side and saltwater marshes on the Chandeleur Sound side. Shoals along the sound side provide wintering habitat for about 20,000 redhead ducks. Nesting colonies of thousands of birds are found on the islands in the summer. Dominant vegetation is black mangrove, groundsel bush and wax murtle. Shallow bay waters around the islands support beds of varying grasses.	**RTE:** **Brown pelican, least tern, piping plover** **Others:** Redhead ducks and other waterfowl (winter), wading birds, shorebirds and seabirds (including laughing gulls, sandwich terns and black skimmers), finfish	By boat only. Motorized land vehicles are prohibited.	Breton NWR c/o Southeast Louisiana Refuges 61389 Highway 434 Lacombe, LA 70445 Phone : (985) 882-2000

Areas of Socio-Economic Concern in Plaquemines Parish:

- Commercial fishing routes
  - South Pass
  - Tiger Pass
  - Barataria Waterway

- Surface Raw Water Intake
  - Belle Chasse Water District
  - Dalcour waterworks District
  - Pointe a la Hache W S
  - Port Sulphur water District

- Public Water Intake
  - Dalcour Water Intake
  - Belle Chase Water Intake
  - Boothville Water Intake
  - Empire Water Intake

- Industrial Water Intake
  - International Matex Terminal Site
  - United Bulk Terminal
  - Freeport Nickle Plant
  - Tennessee Gas Pipeline
  - Freeport Dock
  - Harvest States Grain Elevator

- Diversions
  - West Point La Hache Fresh Water Diversion
  - Ostrica Locks
  - Bayou Lamoque

- Shipping Safety Fairways
  - Grand Bayou Pass
  - Empire to the Gulf
  - South Pass, South Pass to Sea
  - Southwest Pass to Sea
  - Mississippi River-Gulf Outlet

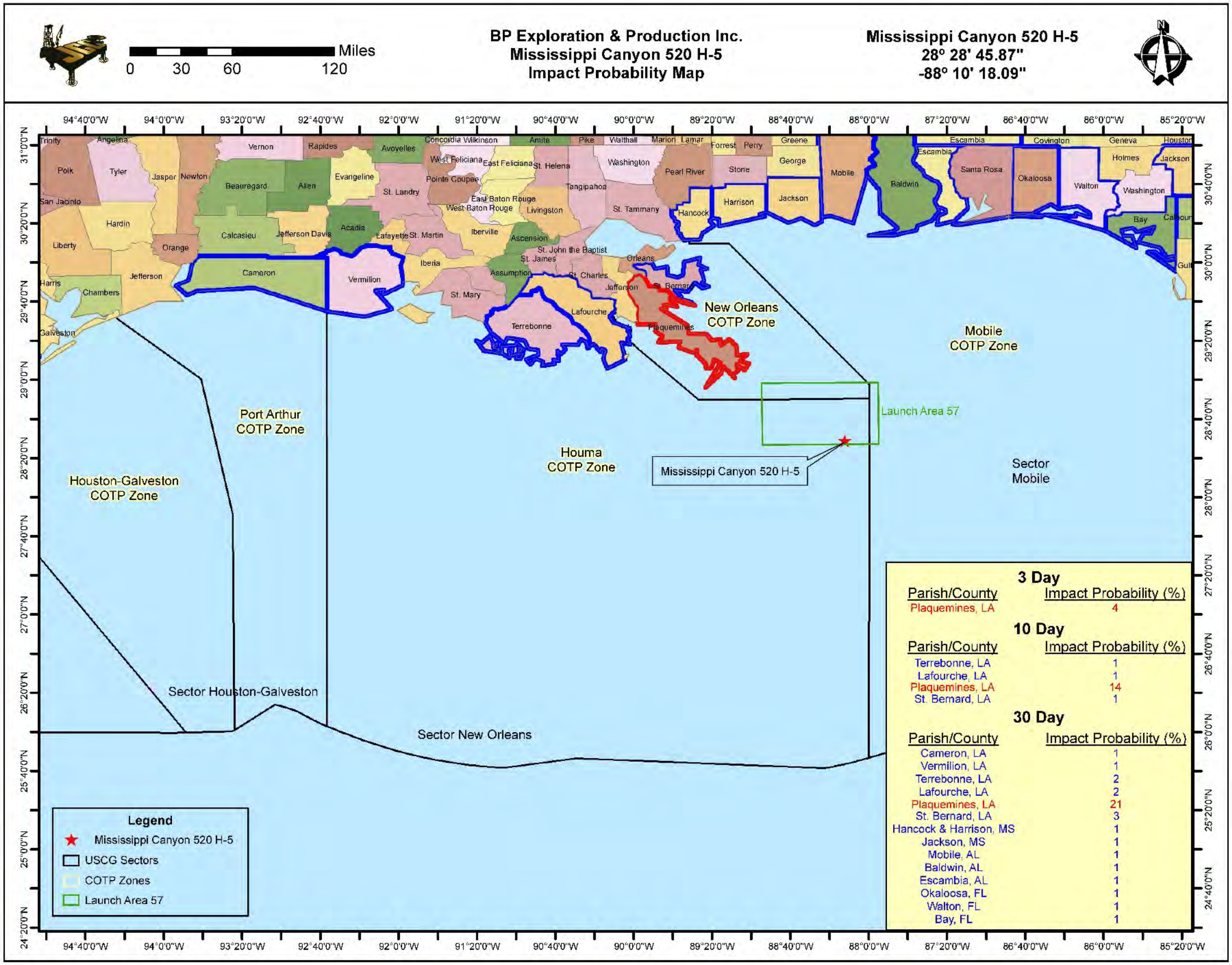
- Coastal Maintained Channels
  - Southwest Pass Channel
  - South Pass Channel
  - Baptiste Collette Bayou

Protection Priorities for Plaquemines Parish:

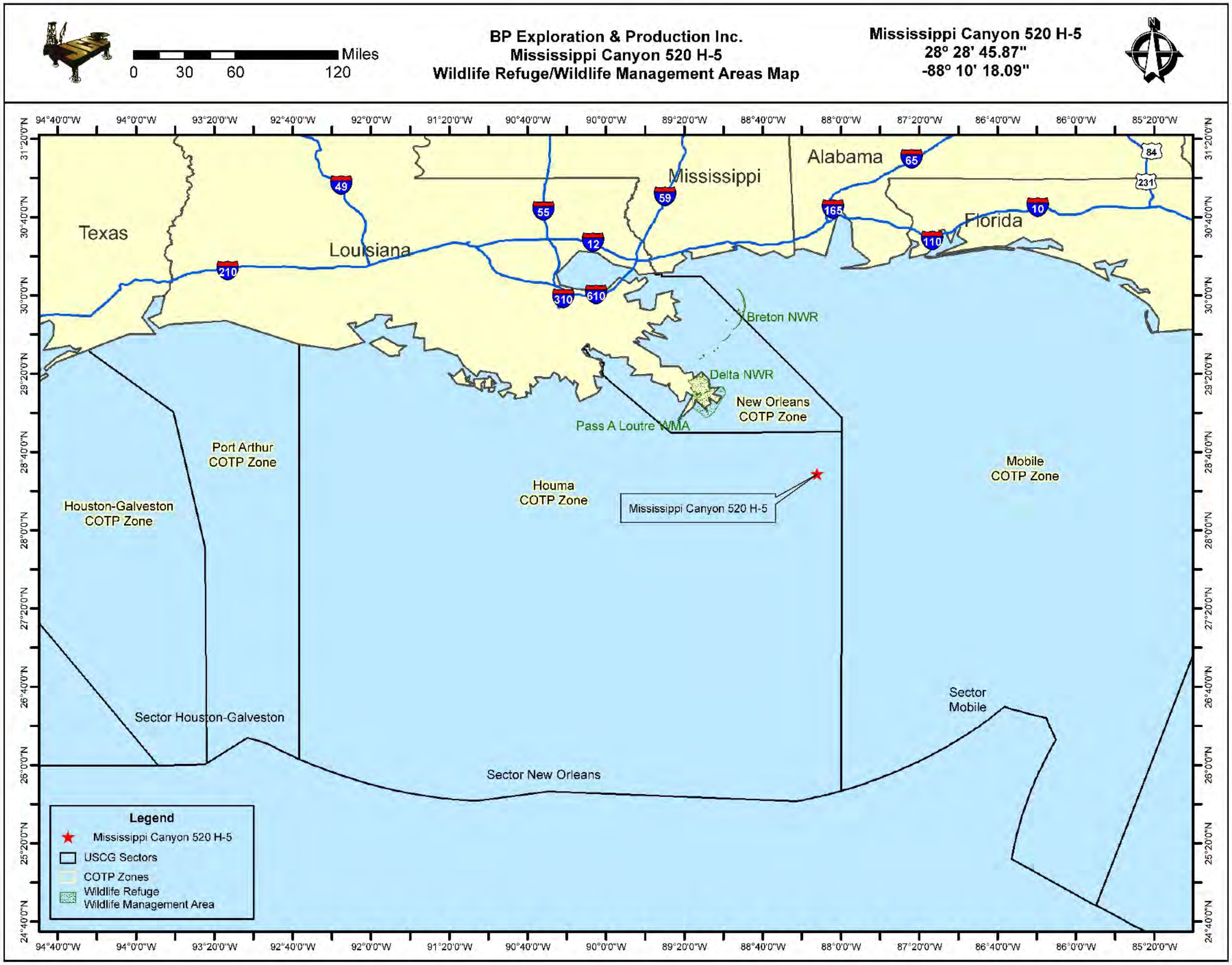
- Delta National Wildlife Refuge
- Pass-A-Loutre Wildlife Management Area
- Other coastal marshes

Figure 3
Plaquemines Parish – Shorelines

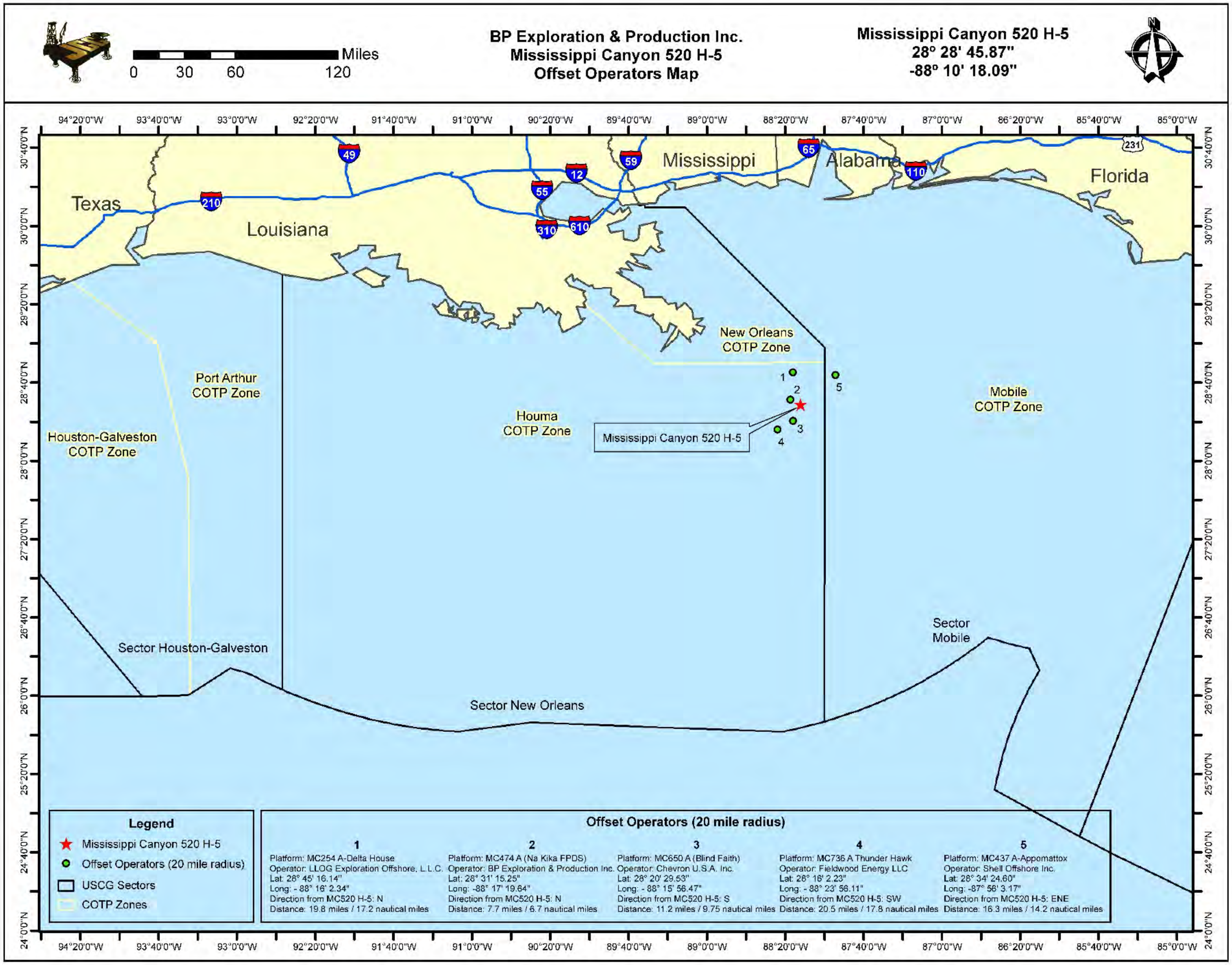
Shoreline Type	Description
Fine Sand Beaches	Beaches with low slopes and a grain-size of 0.625 to 0.200 mm. Low percentage of shells and hash. Major fine sand beaches on the delta plain are found at Southwest Pass, Pelican Island and Chandeleur Island.
Perched Shell Beaches	Shoreline type where a thin shell beach overlies a fresh or salt marsh with an eroded marsh platform outcropping in the surf zone. Organic debris is common to this shoreline type. Where the marsh platform outcrops on the shoreline, it can become re-vegetated by marsh grass.
Shell Beaches	Shoreline types comprised of almost entirely of shell. Shell material may be in the form of shell hash or whole shells. Shell beaches form extremely steep beach faces. Major shell beaches on the delta plain are found at Point Au Fer and Shell Island.
Muddy Tidal Flats	Shoreline types comprised of broad intertidal areas consisting of mud and minor amounts of shell hash. The grain-size is smaller than 0.0625 mm. Muddy tidal flats are typically found in association with prograding river mouths. Major muddy tidal flats on the delta plain are found at the Mississippi and Atchafalaya River mouths.
Sandy Tidal Flats	Shoreline types comprised of broad intertidal areas consisting of fine and coarse grain sand and minor amounts of shell hash. Mean grain size is between 0.0625 and 0.4 mm. Typically found in association with barrier island and tidal inlet systems. This type of flat is submerged during each tidal cycle and at low tide may be 100-200 m wide. Slight changes in water levels can produce significant shoreline changes. Low water levels can expose extensive tidal flat areas to oiling. Major sandy tidal flats on the delta plain are found at Barataria Bay and the Mississippi River mouth.



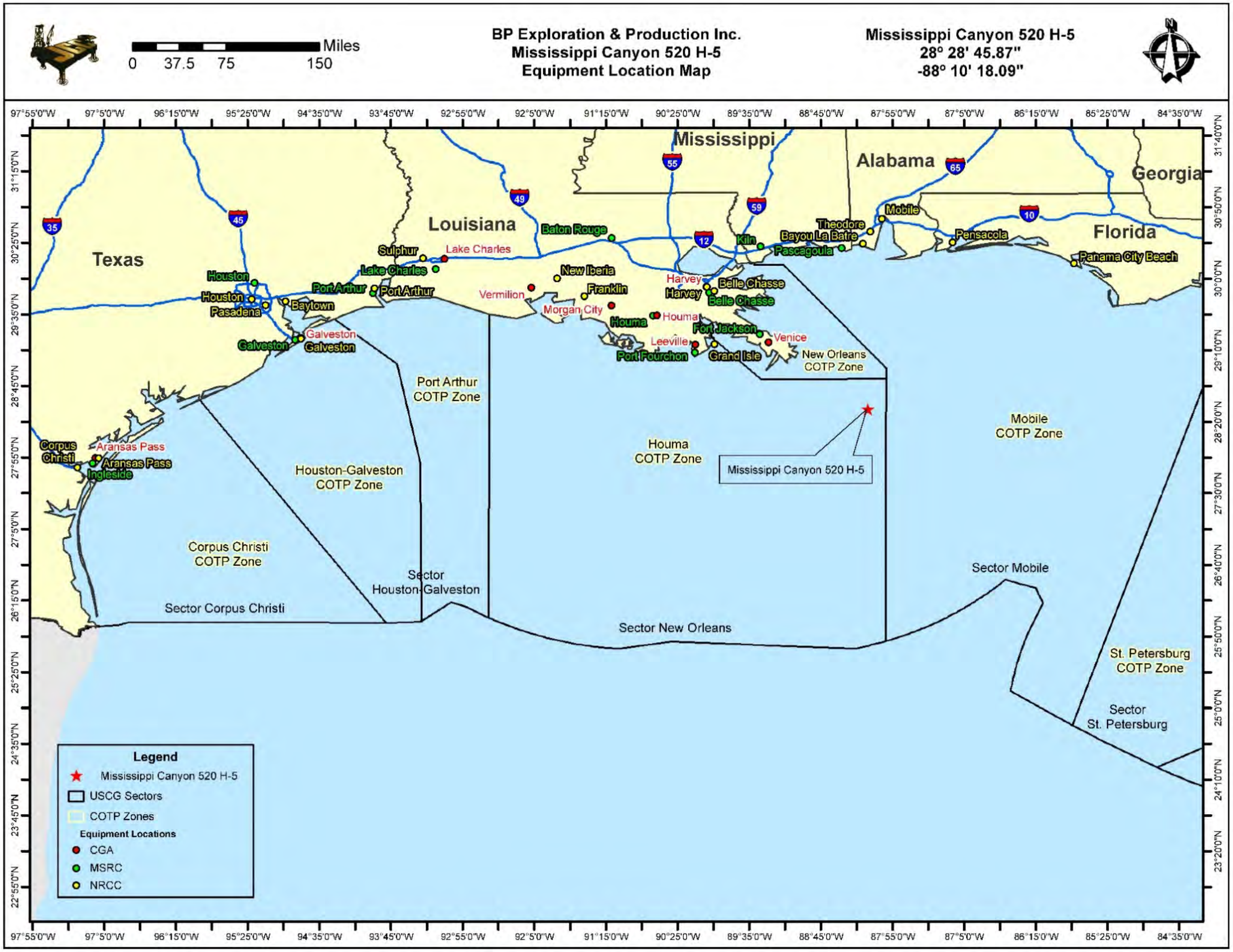
BP Exploration & Production Inc.
Mississippi Canyon 520 H-5
Impact Probability Map
Miles
0 30 60 120
Mississippi Canyon 520 H-5
28° 28' 45.87"
-88° 10' 18.09"
Houston-Galveston COTP Zone
Port Arthur COTP Zone
Houma COTP Zone
New Orleans COTP Zone
Mobile COTP Zone
Sector Houston-Galveston
Sector New Orleans
Sector Mobile
Launch Area 57
Mississippi Canyon 520 H-5
Legend
Mississippi Canyon 520 H-5
USCG Sectors
COTP Zones
Launch Area 57
3 Day
Parish/County Impact Probability (%)
Plaquemines, LA 4
10 Day
Parish/County Impact Probability (%)
Terrebonne, LA 1
Lafourche, LA 1
Plaquemines, LA 14
St. Bernard, LA 1
30 Day
Parish/County Impact Probability (%)
Cameron, LA 1
Vermilion, LA 1
Terrebonne, LA 2
Lafourche, LA 2
Plaquemines, LA 21
St. Bernard, LA 3
Hancock & Harrison, MS 1
Jackson, MS 1
Mobile, AL 1
Baldwin, AL 1
Escambia, AL 1
Okaloosa, FL 1
Walton, FL 1
Bay, FL 1



BP Exploration & Production Inc.
Mississippi Canyon 520 H-5
Wildlife Refuge/Wildlife Management Areas Map
Mississippi Canyon 520 H-5
28° 28' 45.87"
-88° 10' 18.09"
Miles
0 30 60 120
Texas
Louisiana
Mississippi
Alabama
Florida
Breton NWR
Delta NWR
Pass A Loutre WMA
New Orleans COTP Zone
Port Arthur COTP Zone
Houma COTP Zone
Mobile COTP Zone
Houston-Galveston COTP Zone
Mississippi Canyon 520 H-5
Sector Houston-Galveston
Sector New Orleans
Sector Mobile
Legend
Mississippi Canyon 520 H-5
USCG Sectors
COTP Zones
Wildlife Refuge
Wildlife Management Area



BP Exploration & Production Inc.
Mississippi Canyon 520 H-5
Offset Operators Map
Mississippi Canyon 520 H-5
28° 28' 45.87"
-88° 10' 18.09"
Miles
0 30 60 120
Texas
Louisiana
Mississippi
Alabama
Florida
New Orleans COTP Zone
Port Arthur COTP Zone
Houma COTP Zone
Houston-Galveston COTP Zone
Mobile COTP Zone
Mississippi Canyon 520 H-5
Sector Houston-Galveston
Sector New Orleans
Sector Mobile
Legend
Mississippi Canyon 520 H-5
Offset Operators (20 mile radius)
USCG Sectors
COTP Zones
Offset Operators (20 mile radius)
1
Platform: MC254 A-Delta House
Operator: LLOG Exploration Offshore, L.L.C.
Lat: 28° 45' 16.14"
Long: - 88° 16' 2.34"
Direction from MC520 H-5: N
Distance: 19.8 miles / 17.2 nautical miles
2
Platform: MC474 A (Na Kika FPDS)
Operator: BP Exploration & Production Inc.
Lat: 28° 31' 15.25"
Long: -88° 17' 19.64"
Direction from MC520 H-5: N
Distance: 7.7 miles / 6.7 nautical miles
3
Platform: MC650 A (Blind Faith)
Operator: Chevron U.S.A. Inc.
Lat: 28° 20' 29.53"
Long: - 88° 15' 56.47"
Direction from MC520 H-5: S
Distance: 11.2 miles / 9.75 nautical miles
4
Platform: MC736 A Thunder Hawk
Operator: Fieldwood Energy LLC
Lat: 28° 16' 2.23"
Long: - 88° 23' 56.11"
Direction from MC520 H-5: SW
Distance: 20.5 miles / 17.8 nautical miles
5
Platform: MC437 A-Appomattox
Operator: Shell Offshore Inc.
Lat: 28° 34' 24.60"
Long: -87° 56' 3.17"
Direction from MC520 H-5: ENE
Distance: 16.3 miles / 14.2 nautical miles


BP Exploration & Production Inc.
Mississippi Canyon 520 H-5
Equipment Location Map
Mississippi Canyon 520 H-5
28° 28' 45.87"
-88° 10' 18.09"
Miles
0 37.5 75 150
Texas
Louisiana
Mississippi
Alabama
Georgia
Florida
Port Arthur COTP Zone
Houston-Galveston COTP Zone
Corpus Christi COTP Zone
Houma COTP Zone
New Orleans COTP Zone
Mobile COTP Zone
St. Petersburg COTP Zone
Sector Houston-Galveston
Sector Corpus Christi
Sector New Orleans
Sector Mobile
Sector St. Petersburg
Mississippi Canyon 520 H-5
Legend
Mississippi Canyon 520 H-5
USCG Sectors
COTP Zones
Equipment Locations
CGA
MSRC
NRCC

5) General Considerations for all Oil Spill Recovery Operations

BP will use all appropriate measures possible to safely and efficiently recover oil spilled from its well. These include but are not limited to:

- Conducting detailed safety analyses on response operations and preparing/disseminating resulting safety plans to all response personnel
- Use of tactics described in the most current *MSRC Gulf Area Tactics Guide Book* and *CGA Equipment Guide Book and Tactic Manual* and any other appropriate tactics developed during the event
- Configuring surface recovery systems to achieve maximum throughput and recovery efficiency rates:
  - Maximization of the use of advanced and adverse weather recovery systems to increase oil to recovery system encounter rates
  - Use of vessels with the largest possible onboard recovered oil storage to minimize off-load times
  - Use of appropriate vessels to deploy ocean boom to form the widest practical width to maximize oil to recovery system encounter rate
  - Use of appropriate recovery systems to maximize recovery rate in all operable environmental conditions
- Deployment of CGA, MSRC, and NRCC spill response equipment to recover and store oil while minimizing rig/derig and transit time, maximizing onboard storage and on-station time
- Obtaining approval for decanting of oil to maximize storage capacity
- Use of most efficient, high volume pumps for oil recovery and decanting, offloading and lightering
- Use of advanced technology (such as thermal infrared and multi-spectral cameras) to detect oil on the water's surface and classify it as recoverable or non-recoverable. This will allow more efficient use of on-water recovery task forces, maximize recovery rates and expand operational windows. This advanced technology is effective in both day and night time surveillance activities depending upon atmospheric conditions
- Early consideration of advanced oil removal methods (e.g. dispersant application and in-situ burning) and coordination/consultation with the USCG and appropriate Regional Response Team for obtaining permission to proceed as necessary
- Providing effective communication systems to allow for the command and control of deployed resources to ensure safety, reduce response times, and collect information necessary to develop a comprehensive, timely, and accurate Common Operating Picture (COP)
- BP's Oil Spill Response Plan includes alternative response technologies such as dispersants and in-situ burn. Strategies will be decided by Unified Command based on size of the spill, weather and potential impacts. The use of new or unusual technology for spill response is not anticipated at this time.

6) <u>Location Specific Worst Case Discharge Response</u>

BP's Oil Spill Response Plan includes alternative response technologies such as dispersants and in-situ burn. Strategies will be decided by Unified Command based on an operations safety analysis, the size of the spill, weather and potential impacts. If the conditions are favorable for dispersant application and/or in-situ burning, once the proper approvals have been obtained and the proper planning is in place, dispersant application and/or in-situ burning of oil may be employed. Slick containment boom will be immediately called out and on scene as soon as possible. Offshore response strategies may include attempting to skim utilizing CGA, MSRC, and NRCC spill response equipment, with a total derated skimming capacity of 1,350,038 barrels. Temporary storage associated with skimming equipment equals 489,896 barrels. If additional storage is needed, various storage barges with a total capacity of 1.17 million+ barrels may be mobilized and centrally located to provide temporary storage and minimize off-loading time. **Safety is first priority. Air monitoring will be conducted and operations deemed safe prior to the commencement of any containment/skimming operations.**

If the spill went unabated, shoreline impact in Plaquemines Parish, Louisiana will depend upon existing environmental conditions. Shoreline protection will include the use of CGA, MSRC, and NRCC near shore and shallow water skimmers with a total derated skimming capacity of 419,203 barrels. Temporary storage associated with skimming equipment equals 12,597 barrels. If additional storage is needed, various storage barges with a total capacity of 441,000+ barrels may be mobilized and centrally located to provide temporary storage and minimize off-loading time. Onshore response may include the deployment of shoreline boom on beach areas, or protection and sorbent boom on vegetated areas. Contracts with AMPOL, MSRC, and NRCC will ensure access to 113,450 feet of 18" shoreline protection boom. **Figure 4** outlines individual times needed for procurement, load out, travel time to the site and deployment. Strategies will be based upon surveillance and real time trajectories that depict areas of potential impact given actual sea and weather conditions. Applicable Area Contingency Plans (ACPs), Geographic Response Plans (GRPs), federal and state agencies that oversee and manage some of the resources that may be at risk, and Unified Command (UC) will be consulted to ensure that environmental and special economic resources are correctly identified and prioritized to ensure optimal protection. BP's Spill Management Team has access to the applicable ACP(s) and GRP(s) Shoreline protection strategies that depict the protection response modes applicable for oil spill clean-up operations. As a secondary resource, the State of Louisiana Initial Oil Spill Response Plan will be consulted as appropriate to provide detailed shoreline protection strategies and describe necessary action to keep the oil spill from entering Louisiana's coastal wetlands. The UC should take into consideration all appropriate items detailed in the Tactics discussion below. The UC and their personnel have the option to modify the deployment and operation of equipment to allow for a more effective response to site-specific circumstances.

Based on the anticipated worst case discharge scenario, BP can estimate onsite arrival of contracted oil spill recovery equipment with adequate response capacity to contain and recover surface hydrocarbons, and prevent land impact, to the maximum extent practicable*, within approximately 76 hours (based on the equipment's Effective Daily Recovery Capacity (EDRC) and expected travel time to spill site).*

7) Response Strategies

BP will take action to provide a safe, coordinated response to contain and recover spilled oil in a timely manner. Response actions will be designed to provide protection strategies meant to recover oil and protect the responders, the public, wildlife and environmentally sensitive areas. Safety will take precedence over all other considerations during these operations.

Coordination of response assets will be supervised by the designation of a SIMOPS group as necessary for close quarter vessel response activities. Most often, this group will be used during source control events that require a significant number of large vessels operating independently to complete a common objective, in close coordination and support of each other. This group must also monitor the subsurface activities of each vessel (ROV, dispersant application, well control support, etc.).

In addition, these activities will be monitored by the Incident Management Team (IMT) and Unified Command via a structured Common Operating Picture (COP) established to track resource and slick movement in real time.

Offshore Response

Surveillance

- Aerial Observation:
  - Deployment of surveillance aircraft as soon as possible
  - Trained observer to provide on-site status reports
  - Aerial photography and visual confirmation
- Command and control platform at the site if needed
- Remote Sensing:
  - Use of thermal infrared and multi-spectral sensing systems or other technology to detect oil and classify it as recoverable or non-recoverable to enhance on-water recovery capability
  - Surveillance platforms should be appropriate for weather and atmospheric conditions to provide the greatest altitude (e.g. aircraft, aerostats or ship mounted)
  - Continued surveillance of oil movement by remote sensing systems
- Continuous monitoring of vessel assets using vessel monitoring systems

Dispersant application

- Place aerial dispersant providers on standby
- Depending on the scenario, a Modular Subsea Dispersant Application Unit (SDAU) may be ordered and installed at or adjacent to the spill site.
- Conduct analysis to determine appropriateness of dispersant application (refer to Section 18 of approved Oil Spill Response Plan)
- Obtain regulatory approval for use of surface and subsea dispersants
- Confirm dispersant availability for current and long range operations
- Coordinate deployment of a Special Monitoring of Applied Response Technologies (SMART) team as required
- Coordinate movement of dispersants, aircraft, and support equipment and personnel
- Initiate orders for additional dispersant stocks required for expected operations

Containment boom

- Call out OSRO boom equipment early and expedite deployment
- Ensure boom handling and mooring equipment is deployed with boom
- Provide continuous reports to vessels to expedite their arrival at sites and provide for most effective containment
- Use support vessels to deploy and maintain boom

Dedicated off-shore skimming systems

- Determine if weather conditions allow for skimming operations
- Deployed to the highest concentration of oil
- Assets deployed at safe distance from aerial dispersant and in-situ burn operations
- Deploy OSRO's mechanical recovery equipment such as OSRVs, OSRBs, and VOSS
- Vessels should be organized into task forces or groups with consideration for effective communication and control
- The use of alternative spill surveillance technologies could be used to guide skimming vessels during night time operations

Storage Vessels

- Establish availability of contracted assets (Appendix E of BP GoM OSRP)
- Early call out (to allow for tug boat acquisition and deployment speeds)
- Phase mobilization to allow storage vessels to arrive with skimming systems
- Position as closely as possible to skimming assets to minimize offloading time

In-situ Burn Assets

- Determine appropriateness of in-situ burning in coordination with the FOSC and affected SOSC
- Conduct analysis to determine appropriateness of in-situ burn application (refer to Section 19 of approved Oil Spill Response Plan)
- Obtain regulatory approval to conduct in-situ burn operations
- Determine availability of fire boom and selected ignition systems
- Determine assets to perform on-water operations
- Build operations into safety plan
- Initiate orders for additional fire boom stocks required for expected operations
- Conduct initial test burn to ensure effectiveness
- Conduct operations in accordance with an approved plan

Adverse Weather Operations:

During adverse weather conditions such as seas being $\geq$ 3 feet, the use of larger recovery and storage vessels, oleophilic skimmers, and large offshore boom will be maximized. Safety will be the overriding factor and operations will cease at the order of the Unified Command or vessel captain. In an emergency, "stop work" may be directed by any crew member.

Near Shore Response Actions

Timing

- Put near shore assets on standby and deploy in accordance with planning based on the actual situation, real time trajectories and oil budgets
- Support vessel identification and induction training in advance of spill nearing shoreline if possible
- Outfitting of support vessels for specific missions
- Deployment of assets based on actual movement of oil

Considerations

- Water depth, vessel draft
- Shoreline gradient
- State of the oil
- Use of support vessels
- Distance of surf zone from shoreline

Surveillance

- Provide trained observer to direct skimming operations
- Continuous surveillance of oil movement by remote sensing systems, aerial photography and visual confirmation
- Continuous monitoring of vessel assets

Dispersant Use

- Generally will not be approved within 3 miles of shore or with less than 10 meters of water depth
- Approval would be at Regional Response Team level (Region 6) on a case by case basis

Shoreline Protection Operations

Response Planning Considerations

- Review appropriate Area Contingency Plan(s)
- Locate and review appropriate Geographic Response and Site Specific Plans
- Refer to associated Environmentally Sensitive Area Maps
- Ensure capability of continuous analysis of trajectories run periodically during response
- Order personnel and equipment
- Perform aerial surveillance of oil movement
- Perform Pre-impact beach cleaning and debris removal
- Adhere to Shoreline Cleanup Assessment Team (SCAT) Plans
- Determine requirements and availability of boom types, sizes and lengths
- Consider need for in-situ burning in near shore areas
- Assess current wildlife situation, especially status of migratory birds, threatened and endangered species
- Check for critical habitat in the area
- Check for archeological sites and arrange assistance for the appropriate state agency when planning operations may impact these areas

Placement of boom

- Position boom in accordance with the information gained from references listed above and based on the actual situation
- Determine areas of natural collection and develop booming strategies accordingly
- Assess timing of boom placement based on the most current trajectory analysis and the availability of each type of boom needed. Determine an overall booming priority and conduct booming operations accordingly. Consider:
    - Trajectories
    - Weather forecast
    - Oil impact forecast
    - Verified spill movement
    - Boom, manpower and vessel (shallow draft) availability
    - Near shore boom and support material, (stakes, anchors, line)

Beach Preparation Considerations and Actions

- SCAT reports and recommendations
- Monitor tide tables and weather to determine extent of high tides
- Pre-clean beaches by moving waste/organic matter above high tide lines to minimize waste
- Determine if it's considered a sensitive area or a critical habitat (i.e turtle nesting grounds)
- Determine logistical requirements of waste removal and disposal
- Stage equipment and housing of response personnel as close to job site as possible to maximize on-site work time
- Tend to boom, repair, replace and secure as needed (use of local assets may be advantageous)
- Maintain constant awareness of weather and oil movement for resource re-deployment as necessary
- Consider earthen berms and shoreline protection boom to protect sensitive inland areas
- Requisition earth moving equipment
- Plan for efficient and safe use of personnel, ensuring:
- Assess remediation requirements, i.e., replacement of sands, rip rap, etc.
- Ensure availability of surface washing agents and associated protocol requirements for their use (see National Contingency Plan (NCP) Product Schedule for list of possible agents)
- Discuss with all stakeholders, i.e., land owners, refuge/park managers, and others as appropriate, covering the following:
    - Access to areas

- Possible response measures and impact of property and ongoing operations
- Determination of any specific safety concerns
- Any special requirements or prohibitions
- Area security requirements
- Handling of waste
- Remediation expectations
- Vehicle traffic control
- Domestic animal safety concerns
- Wildlife or exotic game concerns/issues

Inland and Coastal Marsh Protection and Response Considerations and Actions

- All considered response methods will be weighed against the possible damage they may do to the marsh. Methods will be approved by Unified Command only after discussions with local Stakeholder, as identified above
    - In-situ burn may be considered when marshes have been impacted
- Passive clean-up of marshes should considered and appropriate stocks of sorbent boom and/or sweep obtained.
- Response personnel must be briefed on methods to traverse the marsh, i.e.,
    - use of appropriate vessel
    - use of temporary walkways or road ways
- Discuss and gain approval prior to cutting or moving vessels through vegetation
- Discuss use of vessels that may disturb wildlife, i.e, airboats
- Ensure safe movement of vessels through narrow cuts and blind curves
- Consider the possibility that no response in a marsh may be best
- In the deployment of any response asset, actions will be taken to ensure the safest, most efficient operations possible. This includes, but is not limited to:
    - Planning for stockage of high use items for expeditious replacement
    - Use of shallow water craft
    - Use of communication systems appropriate ensure command and control of assets
    - Use of appropriate boom in areas that can offer effective protection
    - Planning of waste collection and removal to maximize cleanup efficiency
- Consideration of on-site remediation of contaminated soils to minimize replacement operations and impact on the area

8) Equipment Limitations

The capability for any spill response equipment, whether a dedicated or portable system, to operate in differing weather conditions will be directly in relation to the capabilities of the vessel the system is placed on. Most importantly, however, the decision to operate will be based on the judgment of the Unified Command and/or the Captain of the vessel, who will ultimately have the final say in terminating operations. Skimming equipment listed below may have operational limits which exceed those safety thresholds.

Boom	3 foot seas, 20 knot winds
Dispersants	Winds more than 25 knots Visibility less than 3 nautical miles Ceiling less than 1,000 feet.
FRU	8 foot seas
HOSS Barge/OSRB	8 foot seas
Koseq Arms	8 foot seas
OSRV	4 foot seas

9) Environmental Conditions in the GOM

Louisiana is situated between the easterly and westerly wind belts, and therefore experiences westerly winds during the winter and easterly winds in the summer. Average wind speed is generally 14-15 mph along the coast. Wave heights average 4 and 5 feet. However, during hurricane season, Louisiana has recorded wave heights ranging from 40 to 50 feet high and winds reaching speeds of 100 mph. Because much of southern Louisiana lies below sea level, flooding is prominent.

Surface water temperature ranges between 70 and 80 ˚ F during the summer months. During the winter, the average temperature will range from 50 and 60 ˚ F.

The Atlantic and Gulf of Mexico hurricane season is officially from 1 June to 30 November. About 97% of all tropical activity occurs within this window. The Atlantic basin shows a very peaked season from August through October, with 78% of the tropical storm days, 87% of the minor (Saffir-Simpson Scale categories 1 and 2) hurricane days, and 96% of the major (Saffir-Simpson categories 3, 4 and 5) hurricane days occurring then. Maximum activity is in early to mid September. Once in a few years there may be a hurricane occurring "out of season" - primarily in May or December. Globally, September is the most active month and May is the least active month.

WCD Scenario– <u>BASED ON WELL BLOWOUT DURING DRILLING OPERATIONS</u> (69 statute miles from shore)
263,900 bbls of crude oil (Volume considering natural weathering, based on 24 hour estimate)
API Gravity 29°

FIGURE 4 – Equipment Response Time to MC 520, H-5

Surveillance Aircraft

Name/Type	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI (available through contract with CGA)						
Aero Commander	2	Houma, LA	2	2	1	5
T&T Marine (available through contract with CGA)						
CJ3 Citation	2	Houston/Galveston, TX	2	2	2.1	6.1

Dispersant Aircraft

Name/Type	Dispersant Capacity (gal)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI (available through contract with CGA)							
Basler 67T	2000	2	Houma, LA	2	2	0.8	4.8
DC 3	1200	2	Houma, LA	2	2	1.1	5.1
DC 3	1200	2	Houma, LA	2	2	1.1	5.1
MSRC							
C-130 Spray AC	3,250	3	Kiln, MS	4	0	0.5	4.5
King Air BE90 Spray AC	250	2	Kiln, MS	4	0	0.7	4.7
ASI (available through contract with NRCC)							
Convair 340 (3)	4500	6	Opa-Locka, FL	2	2	2	6

Offshore Response

Offshore Equipment Pre-Determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
95' FRV	22885	249	NA	6	Leeville, LA	2	0	2	6.5	1	11.5
95' FRV	22885	249	NA	6	Venice, LA	2	0	3	4.5	1	10.5
95' FRV	22885	249	NA	6	Vermilion, LA	2	0	3	13.5	1	19.5
95' FRV	22885	249	NA	6	Galveston, TX	2	0	2	20	1	25
Boom Barge (CGA-300) 42" Auto Boom (25000')	NA	NA	1 Tug 50 Crew	4 (Barge) 2 (Per Crew)	Leeville, LA	8	0	4	18.5	2	32.5
HOSS Barge	76285	4000	3 Tugs	8	Harvey, LA	6	0	12	11.5	2	31.5

Offshore Response, cont'd.

Offshore Equipment Pre-determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
MSRC											
S.T. Benz Responder LFF 100 Brush + OSRV *2,640' 67" Curtain Pressure Boom*	18086	4000	NA	10	Grand Isle, LA	3	1	1	9.3	1	15.3
Florida Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Miami, FL	2	1	1	42.8	1	47.8
Gulf Coast Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Lake Charles, LA	2	1	4	22.8	1	30.8
Louisiana Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Fort Jackson, LA	2	1	4	7.1	1	15.1
Mississippi Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Pascagoula, MS	2	1	2	8.6	1	14.6
Southern Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Ingleside, TX	2	1	2	39.3	1	45.3
Texas Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Galveston, TX	2	1	1	28.6	1	33.6
MSRC 360 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	36000	2 Tugs	9	Tampa, FL	4	1	3	45	1	54
MSRC 402 Offshore Barge 2 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	22244	40300	2 Tugs	9	Pascagoula, MS	4	1	3	15	1	24
MSRC 403 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	40300	2 Tugs	9	Ingleside, TX	4	1	2	68.8	1	76.8
MSRC 452 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	45000	2 Tugs	9	Fort Jackson, LA	4	1	6	12.5	1	24.5
MSRC 570 Offshore Barge 2 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	22244	56900	2 Tugs	9	Galveston, TX	4	1	2	50	1	58

Offshore Response, cont'd.

Offshore Equipment Pre-determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
NRCC											
OSRB Defender Marco Class XI AB Vikoma Cascade *3,000 ft 42" Boom*	24000 5520	16500	2 Tugs	4-6	Bayou La Batre, AL	4	2	0	16.3	1	23.3
OSRB Valiant Marco Class XI AB *2,000 ft 42" Boom*	24000	20300	2 Tugs	4-6	Aransas Pass, TX	4	2	0	68.8	1	75.8
OSRB Valor	NA	20000	2 Tugs	4-6	Tampa, FL	4	2	0	45	1	52
OSRV Admiral Marco Class XI AB Elastec X150 *2,000 ft 42" Boom*	24000 4526	300	NA	4-6	Galveston, TX	4	2	0	28.6	1	35.6
OSRV Energy Vikoma Sea 50 *2,000 ft 42" Boom*	1509	300	NA	4-6	Grand Isle, LA	4	2	0	9.3	1	16.3

Offshore Recovered Oil Storage Pre-determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
Kirby Offshore (available through contract with CGA and/or MSRC)											
RO Barge	NA	80000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	100000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	100000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	100000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	100000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	110000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	130000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	140000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	150000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72
RO Barge	NA	160000+	1 Tug	6	Venice, LA	43.5	12	4	11.5	1	72

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
CGA											
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Aransas Pass, TX	2	6	17	11	1	37
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Galveston, TX	2	6	12	11	1	32
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Lake Charles, LA	2	6	7	11	1	27
FRU (3) + 100 bbl Tank (6)	12753	600	3 Utility	18	Leeville, LA	2	6	2	11	1	22
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Venice, LA	2	6	5	11	1	25
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Vermilion, LA	2	6	5.5	11	1	25.5
1500' Hydro-Fire Boom	NA	NA	8 Utility	40	Harvey, LA	0	24	3	11	6	44
T&T Marine (available through direct contract with CGA)											
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Galveston, TX	4	12	12	11	2	41
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Harvey, LA	4	12	3	11	2	33
Koseq Skimming Arms (10) Lamor brush	228850	60000	10 OSV	60	Galveston, TX	24	24	12	11	2	73
Koseq Skimming Arms (2) Lamor brush	45770	12000	2 OSV	12	Harvey, LA	24	24	3	11	2	64
Koseq Skimming Arms (6) MariFlex 150 HF	108978	36000	6 OSV	36	Galveston, TX	24	24	12	11	2	73
Koseq Skimming Arms (4) MariFlex 150 HF	72652	24000	4 OSV	24	Harvey, LA	24	24	3	11	2	64

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
MSRC											
Crucial Disk 56/30 Skimmer (1)	5671	1000	2 Utility	5	Belle Chasse, LA	1	1	3	22	1	28
Crucial Disk 56/30 Skimmer (1)	5671	1000	2 Utility	5	Ingleside, TX	1	1	17	22	1	42
Crucial Disk 56/30 Skimmer (1)	5671	1000	2 Utility	5	Tampa, FL	1	1	22	22	1	47
Crucial Disk 88/30 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	11122	1000	1 PSV	5	Fort Jackson, LA	1	1	5	22	1	30
Crucial Disk 88/30 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	11122	1000	1 PSV	5	Fort Jackson, LA	1	1	5	22	1	30
Desmi Skimmer (1)	3017	1000	2 Utility	5	Fort Jackson, LA	1	1	5	22	1	30
Desmi Skimmer (1)	3017	1000	2 Utility	5	Lake Charles, LA	1	1	7	22	1	32
Desmi Skimmer (1)	3017	1000	2 Utility	5	Miami, FL	1	1	28	22	1	53
Foilex 200 Skimmer (1)	1989	1000	2 Utility	5	Belle Chasse, LA	1	1	3	22	1	28
Foilex 250 Skimmer (1)	3977	1000	2 Utility	5	Belle Chasse, LA	1	1	3	22	1	28
Foilex 250 Skimmer (1)	3977	1000	2 Utility	5	Galveston, TX	1	1	12	22	1	37
Foilex 250 Skimmer (1)	3977	1000	2 Utility	5	Ingleside, TX	1	1	17	22	1	42
Foilex 250 Skimmer (1)	3977	1000	2 Utility	5	Lake Charles, LA	1	1	7	22	1	32
GT-185 Skimmer w Adaptor (1)	1371	1000	2 Utility	5	Fort Jackson, LA	1	1	5	22	1	30
GT-185 Skimmer w Adaptor (2)	2742	2000	4 Utility	10	Galveston, TX	1	1	12	22	1	37
GT-185 Skimmer w Adaptor (1)	1371	1000	2 Utility	5	Ingleside, TX	1	1	17	22	1	42
GT-185 Skimmer w Adaptor (2)	2742	2000	4 Utility	10	Lake Charles, LA	1	1	7	22	1	32
GT-185 Skimmer w Adaptor (1)	1371	1000	2 Utility	5	Miami, FL	1	1	28	22	1	53
GT-185 Skimmer w Adaptor (1)	1371	1000	2 Utility	5	Pascagoula, MS	1	1	6	22	1	31
GT-185 Skimmer w Adaptor (1)	1371	1000	2 Utility	5	Port Arthur, TX	1	1	9	22	1	34
GT-185 Skimmer w Adaptor (1)	1371	1000	2 Utility	5	Tampa, FL	1	1	22	22	1	47
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	1000	1 PSV	9	Lake Charles, LA	1	1	7	22	1	32
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	1000	1 PSV	9	Lake Charles, LA	1	1	7	22	1	32
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	1000	1 PSV	9	Lake Charles, LA	1	1	7	22	1	32
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	1000	1 PSV	9	Houma, LA	1	1	2	22	1	27

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
MSRC											
Stress I Skimmer (1)	15840	1000	2 Utility	5	Grand Isle, LA	1	1	1	22	1	26
Stress I Skimmer (1)	15840	1000	2 Utility	5	Galveston, TX	1	1	12	22	1	37
Stress I Skimmer (1)	15840	1000	2 Utility	5	Ingleside, TX	1	1	17	22	1	42
Stress I Skimmer (2)	31680	2000	4 Utility	10	Lake Charles, LA	1	1	7	22	1	32
Stress I Skimmer (1)	15840	1000	2 Utility	5	Miami, FL	1	1	28	22	1	53
Stress I Skimmer (1)	15840	1000	2 Utility	5	Pascagoula, MS	1	1	6	22	1	31
Stress I Skimmer (1)	15840	1000	2 Utility	5	Fort Jackson, LA	1	1	5	22	1	30
Stress I Skimmer (1)	15840	1000	2 Utility	5	Tampa, FL	1	1	22	22	1	47
Stress II Skimmer (1)	3017	1000	2 Utility	5	Pascagoula, MS	1	1	6	22	1	31
Transrec 350 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	10567	1000	1 PSV	9	Lake Charles, LA	1	1	7	22	1	32
Transrec 350 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	10567	1000	1 PSV	9	Lake Charles, LA	1	1	7	22	1	32
Walosep W4 Skimmer (1)	3017	1000	2 Utility	5	Fort Jackson, LA	1	1	5	22	1	30
Walosep W4 Skimmer (1)	3017	1000	2 Utility	5	Galveston, TX	1	1	12	22	1	37
Walosep W4 Skimmer (1)	3017	1000	2 Utility	5	Miami, FL	1	1	28	22	1	53
67" Curtain Pressure Boom (53570')	NA	NA	80*	160	Houston, TX	1	2	11	22	1	36
1000' Fire Resistant Boom	NA	NA	3*	6	Galveston, TX	1	4	12	22	6	44
2000' Fire Resistant Boom	NA	NA	3*	6	Lake Charles, LA	1	4	7	22	6	39
16000' Fire Resistant Boom	NA	NA	8*	16	Houston, TX	1	4	11	22	6	43

** Utility Boats, Crew Boats, Supply Boats, or Fishing Vessels*

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
NRCC											
4-Band Rope Mop Skimmer	1509	100	1 Offshore Vessel	4-8	Ft. Lauderdale, FL	4	4	27	11	1	47
4-Band Rope Mop Skimmer	1509	100	1 Offshore Vessel	4-8	Mobile, AL	4	4	7	11	1	27
4-Band Rope Mop Skimmer (2)	3018	200	1 Offshore Vessel	8-16	New Iberia, LA	4	4	4	11	1	24
4-Band Rope Mop Skimmer (2)	3018	200	1 Offshore Vessel	8-16	Corpus Christi, TX	4	4	17	11	1	37
Action 48 Skimmer	2414	100	1 Offshore Vessel	4-8	Key West, FL	4	4	32	11	1	52
Hoyle Disc Skimmer	1632	100	1 Offshore Vessel	4-8	Tampa, FL	4	4	22	11	1	42
Marco Class XI AB	24000	100	1 Offshore Vessel	4-8	New Iberia, LA	4	4	4	11	1	24
Marco Class XI AB	24000	100	1 Offshore Vessel	4-8	Harvey, LA	4	4	3	11	1	23
Vikoma Cascade Skimmer	5520	100	1 Offshore Vessel	4-8	Baytown, TX	4	4	10	11	1	30
Vikoma Cascade Skimmer	5520	100	1 Offshore Vessel	4-8	Sulphur, LA	4	4	7	11	1	27
42" Boom (2000')	NA	NA	1 Offshore Vessel	4-8	Baytown, TX	4	4	10	11	1	30
42" Boom (4000')	NA	NA	2 Offshore Vessels	8-16	Corpus Christi, TX	4	4	17	11	1	37
42" Boom (1000')	NA	NA	1 Offshore Vessel	4-8	Port Arthur, TX	4	4	9	11	1	29
42" Boom (2200')	NA	NA	1 Offshore Vessel	4-8	Tampa, FL	4	4	22	11	1	42
1000' Pyro Fire Boom	NA	NA	6 Utility	20	Houston, TX	4	4	11	11	1	31

Nearshore Response

Nearshore Equipment	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Staging	Hrs to Deploy	Total Hrs
CGA											
46' FRV	15257	65	NA	4	Aransas Pass, TX	2	0	2	26	1	31
46' FRV	15257	65	NA	4	Leeville, LA	2	0	2	3	1	8
46' FRV	15257	65	NA	4	Lake Charles, LA	2	0	2	13	1	18
46' FRV	15257	65	NA	4	Venice, LA	2	0	2	2.5	1	7.5
Trinity SWS	21500	249	NA	4	Aransas Pass, TX	2	0	NA	48	1	51
Trinity SWS	21500	249	NA	4	Leeville, LA	2	0	NA	48	1	51
Trinity SWS	21500	249	NA	4	Lake Charles, LA	2	0	NA	48	1	51
Trinity SWS	21500	249	NA	4	Vermilion, LA	2	0	NA	48	1	51
Mid-Ship SWS	22885	249	NA	4	Leeville, LA	2	0	N/A	48	1	51
Mid-Ship SWS	22885	249	NA	4	Venice, LA	2	0	N/A	48	1	51
Mid-Ship SWS	22885	249	NA	4	Galveston, TX	2	0	N/A	48	1	51
MSRC											
MSRC Lightning 2 LORI Brush Pack	5000	50	NA	3	Tampa. FL	2	0	1	20	1	24
MSRC Quick Strike 2 LORI Brush Pack	5000	50	NA	3	Lake Charles, LA	2	0	1	10	1	14

Nearshore Equipment	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Staging	Hrs to Deploy	Total Hrs
Enterprise Marine (available through contract with CGA)											
CTCo 2603	NA	25000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
CTCo 2604	NA	20000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
CTCo 2605	NA	20000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
CTCo 2606	NA	20000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
CTCo 2607	NA	23000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
CTCo 2608	NA	23000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
CTCo 2609	NA	23000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
CTCo 5001	NA	47000	1 Tug	6	Amelia, LA	26	12	6	15	1	60
Kirby Offshore (available through contract with CGA and/or MSRC)											
RO Barge	NA	80000+	1 Tug	6	Venice, LA	48	12	4	7	1	72
RO Barge	NA	80000+	1 Tug	6	Venice, LA	48	12	4	7	1	72
RO Barge	NA	80000+	1 Tug	6	Venice, LA	48	12	4	7	1	72

Staging Area: Venice

Nearshore and Inland Skimmers With Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Lake Charles, LA	2	2	8	2	1	15
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Harvey, LA	2	2	2	2	1	9
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Lake Charles, LA	2	2	8	2	1	15
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Harvey, LA	2	2	2	2	1	9
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Lake Charles, LA	4	12	8	2	2	28
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Galveston, TX	4	12	13	2	2	33
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Harvey, LA	4	12	2	2	2	22
SWS Egmopol	1810	100	NA	3	Galveston, TX	2	2	13	2	1	20
SWS Egmopol	1810	100	NA	3	Leeville, LA	2	2	5	2	1	12
SWS Marco	3588	20	NA	3	Lake Charles, LA	2	2	8	2	1	15
SWS Marco	3588	34	NA	3	Leeville, LA	2	2	5	2	1	12
SWS Marco	3588	34	NA	3	Venice, LA	2	2	2	2	1	9
MSRC											
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	2	Ingleside, TX	1	1	18	2	1	23
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	2	Galveston, TX	1	1	13	2	1	18
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	2	Belle Chasse, LA	1	1	2	2	1	7
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	2	Pascagoula, MS	1	1	5.5	2	1	10.5
AardVac Skimmer (1)	3840	500	1 Utility	5	Lake Charles, LA	1	1	8	2	1	13
AardVac Skimmer (1)	3840	500	1 Utility	5	Pascagoula, MS	1	1	5.5	2	1	10.5
AardVac Skimmer (2)	7680	1000	2 Utility	10	Miami, FL	1	1	27	2	1	32
Queensboro Skimmer (1)	905	500	1 Push Boat	4	Galveston, TX	1	1	13	2	1	18
Queensboro Skimmer (5)	4525	2500	5 Push Boat	20	Lake Charles, LA	1	1	8	2	1	13
Queensboro Skimmer (1)	905	500	1 Push Boat	5	Belle Chasse, LA	1	1	2	2	1	7
Queensboro Skimmer (1)	905	500	1 Push Boat	5	Pascagoula, MS	1	1	5.5	2	1	10.5
WP 1 Skimmer (1)	3017	500	1 Utility	5	Pascagoula, MS	1	1	5.5	2	1	10.5
WP 1 Skimmer (1)	3017	500	1 Utility	5	Tampa, FL	1	1	21	2	1	26
WP 1 Skimmer (1)	3017	500	1 Utility	5	Miami, FL	1	1	27	2	1	32

Staging Area: Venice

Nearshore and Inland Skimmers With Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
					NRCC						
Action 24 Skimmer	823	100	1 Utility	4-8	Baytown, TX	4	4	11.5	2	1	22.5
Crucial Drum Skimmer	240	100	1 Utility	4-8	Cocoa, FL	4	4	22	2	1	33
Crucial ORD Disk Skimmer	342	100	1 Utility	4-8	Tampa, FL	4	4	21	2	1	32
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Cocoa, FL	4	4	22	2	1	33
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Ft. Lauderdale, FL	4	4	26	2	1	37
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Pensacola, FL	4	4	8	2	1	19
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Tampa, FL	4	4	21	2	1	32
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	New Iberia, LA	4	4	6	2	1	17
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Corpus Christi, TX	4	4	18	2	1	29
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Pasadena, TX	4	4	12	2	1	23
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Port Arthur, TX	4	4	10	2	1	21
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Atlantic Beach, FL	4	4	18.5	2	1	29.5
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Pensacola, FL	4	4	8	2	1	19
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Belle Chasse, LA	4	4	2	2	1	13
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	New Iberia, LA	4	4	6	2	1	17
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Sulphur, LA	4	4	8.5	2	1	19.5
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Olive Branch, MS	4	4	13.5	2	1	24.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Atlantic Beach, FL	4	4	18.5	2	1	29.5
VTU w/weir head skimmer (2)	13714	48	1 Utility	8-12	Ft. Lauderdale, FL	4	4	26	2	1	37
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Pensacola, FL	4	4	8	2	1	19
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Tampa, FL	4	4	21	2	1	32
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Harvey, LA	4	4	2	2	1	13
VTU w/weir head skimmer (2)	13714	48	1 Utility	8-12	New Iberia, LA	4	4	6	2	1	17
VTU w/weir head skimmer (2)	13714	48	1 Utility	8-12	Sulphur, LA	4	4	8.5	2	1	19.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Olive Branch, MS	4	4	13.5	2	1	24.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Baytown, TX	4	4	11.5	2	1	22.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Corpus Christi, TX	4	4	18	2	1	29
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Pasadena, TX	4	4	12	2	1	23
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Port Arthur, TX	4	4	10	2	1	21

Staging Area: Venice

Shoreline Protection Boom	Support Vessel(s)	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
AMPOL (Available through MSA)									
34,050' 18" Boom	13 Crew	26	New Iberia, LA	2	2	6	2	12	24
12,850' 18" Boom	7 Crew	14	Chalmette, LA	2	2	2.5	2	6	14.5
900' 18" Boom	1 Crew	2	Morgan City, LA	2	2	4.5	2	2	12.5
3,200' 18" Boom	2 Crew	4	Venice, LA	2	2	0	2	2	8
12,750' 18" Boom	7 Crew	14	Port Arthur, TX	2	2	10	2	6	22
MSRC									
6,950' 18" Boom	3 Crew	6	Pascagoula, MS	1	2	5.5	2	1	11.5
2,950' 18" Boom	3 Crew	6	Miami, FL	1	2	27	2	1	33
9,700' 18" Boom	3 Crew	6	Lake Charles, LA	1	2	8	2	1	14
NRCC									
100' 18" Boom	2 Crew	4-8	Mobile, AL	4	2	7	2	4	19
2,000' 18" Boom	2 Crew	4-8	Cocoa, FL	4	2	22	2	4	34
100' 18" Boom	2 Crew	4-8	Ft. Lauderdale, FL	4	2	26	2	4	38
1,100' 18" Boom	2 Crew	4-8	Key West, FL	4	2	31	2	4	43
4,100' 18" Boom	4 Crew	8-16	Pensacola, FL	4	2	8	2	4	20
100' 18" Boom	2 Crew	4-8	Tampa, FL	4	2	21	2	4	33
6,100' 18" Boom	6 Crew	12-24	New Iberia, LA	4	2	6	2	4	18
100' 18" Boom	2 Crew	4-8	Sulphur, LA	4	2	8.5	2	4	20.5
4,000' 18" Boom	4 Crew	8-16	Walls, MS	4	2	13.5	2	4	25.5
1,100' 18" Boom	2 Crew	4-8	Baytown, TX	4	2	11.5	2	4	23.5
2,100' 18" Boom	2 Crew	4-8	Corpus Christi, TX	4	2	18	2	4	30
5,200' 18" Boom	4 Crew	8-16	Pasadena, TX	4	2	12	2	4	24
4,000' 18" Boom	4 Crew	8-16	Port Arthur, TX	4	2	10	2	4	22

Shoreline Protection Response, cont'd.

Wildlife Response	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
Wildlife Support Trailer	NA	NA	NA	2	Harvey, LA	2	2	2	1	2	9
Bird Scare Guns (48)	NA	NA	NA	2	Harvey, LA	2	2	2	1	2	9
Bird Scare Guns (12)	NA	NA	NA	2	Galveston, TX	2	2	13	1	2	20
Bird Scare Guns (12)	NA	NA	NA	2	Aransas Pass, TX	2	2	18	1	2	25
Bird Scare Guns (24)	NA	NA	NA	2	Lake Charles, LA	2	2	8	1	2	15
Bird Scare Guns (24)	NA	NA	NA	2	Leeville, LA	2	2	5	1	2	12

Response Asset Totals	Total (bbls)
Offshore EDRC	1,350,038
Offshore Recovered Oil Storage	1,659,896+
Nearshore / Shallow Water EDRC	419,203
Nearshore / Shallow Water Recovered Oil Storage	453,597+

References

Ji, Zhen-Gang, Walter R. Johnson, Charles F. Marshall, and Eileen M. Lear. 2004. Oil-Spill Risk Analysis: Contingency Planning Statistics for Gulf of Mexico OCS Activities. OCS Report 2004-026, Herndon, VA: U.S. Dept. of the Interior, Minerals Management Service, Environmental Division.

Appendix H: Coastal Zone Management Act (CZMA) Consistency Certification – *None Included*

Appendix I: Environmental Impact Analysis (EIA) –

Environmental Impact Analysis

for a

REVISED EXPLORATION PLAN
for
Mississippi Canyon Block 520 (OCS-G09821)
Offshore Alabama

August 2020

Prepared for:

BP Exploration & Production Inc.
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Contents

Contents
(Continued)

List of Tables

List of Figures

Acronyms and Abbreviations

µPa	micropascal
ac	acre
ADIOS2	Automated Data Inquiry for Oil Spills 2
AUV	autonomous underwater vehicle
bbl	barrel
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOP	blowout preventer
BOPD	barrels of oil per day
BP	BP Exploration & Production Inc.
BSEE	Bureau of Safety and Environmental Enforcement
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CFR	Code of Federal Regulations
dB	decibel
DP	dynamically positioned
DPS	distinct population segment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIA	Environmental Impact Analysis
EIS	Environmental Impact Statement
EP	Exploration Plan
ESA	Endangered Species Act
FAD	fish aggregating device
FR	*Federal Register*
ft	feet
GPS	global positioning system
GMFMC	Gulf of Mexico Fishery Management Council
H_2S	hydrogen sulfide
ha	hectare
HAPC	Habitat Area of Particular Concern
Hz	hertz
IPF	impact-producing factor
IMT	Incident Management Team
km	kilometer
m	meter
MARPOL	International Convention for the Prevention of Pollution from Ships
MC	Mississippi Canyon
MC 520	Mississippi Canyon Block 520
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MODU	mobile offshore drilling unit
NAAQS	National Ambient Air Quality Standards
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Assessment
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OSRA	Oil Spill Risk Analysis
OSRP	Oil Spill Response Plan
PAH	polycyclic aromatic hydrocarbons
PM	particulate matter
PSD	Prevention of Significant Deterioration
re	referenced to
SBM	synthetic-based drilling muds
SEL_{cum}	cumulative sound exposure level
SEMS	Safety and Environmental Management system
SO_x	sulfur oxides
SPL	sound pressure level
SPL_{rms}	root-mean-square sound pressure level
SWSS	Sperm Whale Seismic Study
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WCD	worst case discharge

Introduction

BP Exploration & Production Inc. (BP) is submitting a Revised Exploration Plan (EP) for Mississippi Canyon (MC) Block 520 (MC 520), Gulf of Mexico, Outer Continental Shelf (OCS)-G09821. Under this EP, BP proposes to drill up to six wells (well locations C, E, F, G, H, and I). Surface and bottom hole locations will be in MC 520. The Environmental Impact Analysis (EIA) provides information on potential impacts to environmental, archaeological, and socioeconomic resources that could be affected by BPs proposed activities in the project area under this EP.

MC 520 is located within the Central Gulf of Mexico OCS Planning Area, approximately 64 statute miles (103 kilometers [km]) from the nearest shoreline (Plaquemines Parish, Louisiana), 128 statute miles (206 km) from the regional onshore support base (Port Fourchon, Louisiana), and 169 statute miles (272 km) from the helicopter base at Houma, Louisiana (**Figure 1**). Water depths at the locations of the proposed wellsites range from approximately 2,040 to 2,056 m (6,695 to 6,747 ft) (BP, 2019a,b). A dynamically positioned (DP) semisubmersible drilling rig or a DP drillship is anticipated to be on site for approximately 160 days for drilling and completion activities.

The EIA for this EP was prepared for submittal to the Bureau of Ocean Energy Management (BOEM) in accordance with applicable regulations, including Title 30 Code of Federal Regulations (CFR) 550.212(o) and 550.227. The EIA is a project- and site-specific analysis of the potential environmental impacts of BP's planned activities. The EIA complies with guidance provided in existing Notices to Lessees and Operators (NTLs) issued by BOEM and its predecessors, Minerals Management Service (MMS) and Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), including NTLs 2008-G04 (extended by 2015-N02) and 2015-N01. Potential impacts have been analyzed at a broader level in the 2017-2022 Programmatic Environmental Impact Statement (EIS) for the OCS Oil and Gas Leasing Program (BOEM, 2016a) and in multisale EISs for the Western and Central Gulf of Mexico Planning Areas (BOEM, 2012a; b; 2013; 2014; 2015; 2016b; 2017a). The most recent multisale EIS contains updated environmental baseline information in light of the Macondo (*Deepwater Horizon*) incident and addresses potential impacts of a catastrophic spill (BOEM, 2012a; b; 2013; 2014; 2015; 2016b; 2017a). The NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico assesses impacts and requires additional mitigation measures for protected species (NMFS, 2020). The analyses from those documents are incorporated here by reference.

Oil spill response-related activities for wells to be drilled under this EP are governed by the BP Regional Oil Spill Response Plan (OSRP), as filed by BP America Inc. (Operator No. 21372) under cover letter dated 14 February 2019. The OSRP was filed on behalf of several BP companies, including BP Exploration & Production Inc. (Operator No. 02481) and approved by the Bureau of Safety and Environmental Enforcement (BSEE) on 15 March 2019. Modifications were made to the approved OSRP under cover letter dated 20 June 2019 and confirmed in compliance by BSEE 24 July 2019. The BP OSRP should meet the requirements contained in 30 CFR Part 254. BP (Operator No. 02481) has demonstrated oil spill financial responsibility for the facilities proposed in this EP, according to 30 CFR Part 553 and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities." The OSRP details BP's plan for response to manage oil spills that may result from drilling and production operations. BP has designed its response program based on a regional capability of response to spills ranging from small operations-related spills to a worst-case discharge (WCD) from a well blowout. BP's spill response program is intended to meet the response planning requirements of the relevant coastal states and applicable federal oil spill planning regulations. It also includes information regarding BP's incident management team (IMT) and dedicated response assets, potential spill risks, and local environmentally sensitive areas. The OSRP describes personnel and equipment mobilization, the incident management team organization, and an overview of strategies, actions and notifications to be taken in the event of a spill.

The EIA is organized into **Sections A** through **I** corresponding to the information required by NTLs 2008-G04 and 2015-N01. The main impact-related discussions are in **Section A** (Impact-Producing Factors) and **Section C** (Impact Analysis). **Table 1** lists and summarizes the NTLs applicable to the EIA.

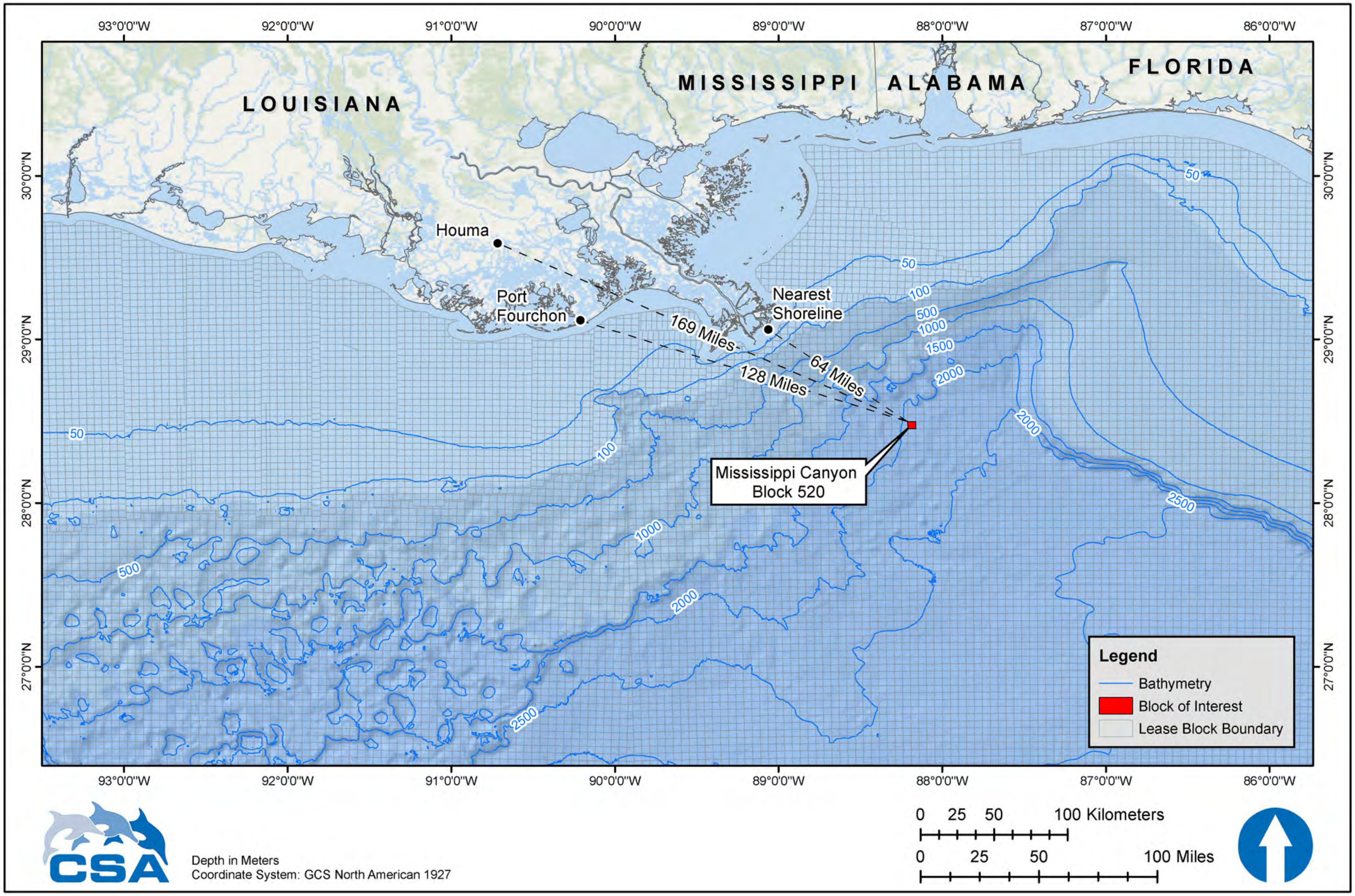

Figure 1. Location of Mississippi Canyon Block 520.

Table 1. Notices to Lessees and Operators (NTLs) applicable to the Environmental Impact Analysis (EIA).

NTL	Title	Summary
BOEM-2016-G01	Vessel Strike Avoidance and Injured/Dead Protected Species Reporting	Recommends protected species identification training; recommends that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel movement to avoid colliding with protected species; and requires operators to report sightings of any injured or dead protected species.
BOEM-2016-G02	Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program	Summarizes seismic survey mitigation measures, updates regulatory citations, and provides clarification on how the measures identified in the NTL will be used by BOEM, BSEE, and operators in order to comply with the Endangered Species Act and the Marine Mammals Protection Act.
BSEE-2015-G03	Marine Trash and Debris Awareness and Elimination	Instructs operators to exercise caution in the handling and disposal of small items and packaging materials; requires the posting of instructional placards at prominent locations on offshore vessels and structures; and mandates a yearly marine trash and debris awareness training and certification process.
BOEM 2015-N02	Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance	Eliminates expiration dates (past or upcoming) of all NTLs currently posted on the BOEM website.
BOEM 2015-N01	Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge and Blowout Scenarios	Provides guidance regarding information required in WCD descriptions and blowout scenarios.
BOEM 2014-G04	Military Warning and Water Test Areas	Provides contact links to individual command headquarters for the military warning and water test areas in the Gulf of Mexico.
BSEE 2014-N01	Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance	Eliminates expiration dates (past or upcoming) of all NTLs currently posted on the BSEE website.
BSEE-2012-N06	Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans	Provides clarification, guidance, and information for preparation of regional Oil Spill Response Plans. Recommends description of response strategy for worst-case discharge scenarios to ensure capability to respond to oil spills is both efficient and effective.
2011-JOINT-G01	Revisions to the List of Outer Continental Shelf (OCS) Blocks Requiring Archaeological Resource Surveys and Reports	Provides new information of which OCS blocks require archaeological surveys and reports; identifies required survey line spacing in each block. This NTL augments NTL 2005-G07.

Table 1. (Continued).

NTL	Title	Summary
2010-N10	Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources	Informs operators using subsea blowout preventers (BOPs) or surface BOPs on floating facilities that applications for well permits must include a statement signed by an authorized company official stating that the operator will conduct all activities in compliance with all applicable regulations, including the increased safety measures regulations (75 *Federal Register* [FR] 63346). Informs operators that the Bureau of Ocean Energy Management will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy containment resources to respond promptly to a blowout or other loss of well control.
2009-G40	Deepwater Benthic Communities	Provides guidance for avoiding and protecting high-density deepwater benthic communities (including chemosynthetic and deepwater coral communities) from damage caused by OCS oil and gas activities in water depths greater than 300 m (984 ft). Prescribes separation distances of 610 m (2,000 ft) from each mud and cuttings discharge location and 76 m (250 ft) from all other seafloor disturbances.
2009-G39	Biologically Sensitive Underwater Features and Areas	Provides guidance for avoiding and protecting biologically sensitive features and areas (i.e., topographic features, pinnacles, low relief live bottom areas, and other potentially sensitive biological features) when conducting OCS operations in water depths less than 300 m (984 ft) in the Gulf of Mexico.
2008-G04	Information Requirements for Exploration Plans and Development Operations Coordination Documents	Provides guidance on information requirements for OCS plans, including EIA requirements and information regarding compliance with the provisions of the Endangered Species Act and Marine Mammal Protection Act.
2008-N05	Guidelines for Oil Spill Financial Responsibility (OSFR) for Covered Facilities	Provides clarification and guidance to operators/lessees on policies for submitting required OSFR documents to the Gulf of Mexico OCS Region as required under 30 CFR Part 253.
2005-G07	Archaeological Resource Surveys and Reports	Provides guidance on regulations regarding archaeological discoveries, specifies requirements for archaeological resource surveys and reports, and outlines options for protecting archaeological resources.

A. Impact-Producing Factors

Based on the description of BP's proposed activities, a series of impact-producing factors (IPFs) have been identified. **Table 2** identifies the environmental resources that may be affected in the left column and identifies sources of impacts associated with the proposed project across the top. **Table 2**, adapted from Form BOEM-0142, has been developed *a priori* to focus the impact analysis on those environmental resources that may be impacted as a result of one or more IPFs. The tabular matrix indicates which of the routine activities and accidental events could affect specific resources. An "X" indicates that an IPF could reasonably be expected to affect a certain resource, and a dash (--) indicates no impact or negligible impact. Where there may be an effect, an analysis is provided in **Section C**. Potential IPFs for the proposed activities are listed below and briefly discussed in the following sections.

- Drilling rig presence (including sound and lights);
- Physical disturbance to the seafloor;
- Air pollutant emissions;
- Effluent discharges;
- Water intake;
- Onshore waste disposal;
- Marine debris;
- Support vessel and helicopter traffic (includes vessel collisions with resources and marine sound); and
- Accidents.

A.1 Drilling Rig Presence, Marine Sound, and Lights

The wells proposed in this EP will be drilled using either a DP drillship or a DP semisubmersible drilling rig. DP vessels use a global positioning system (GPS), specific computer software, and sensors in conjunction with a series of thrusters to maintain position. Through satellite navigation and position reference sensors, the location of the drilling rig is precisely monitored while thrusters, positioned at various locations about the rig pontoons, are activated to maintain position. This allows operations at sea in areas where mooring or anchoring is not feasible. Consequently, there will be no anchoring of the drilling rig in MC 520 during this project. The selected drilling rig is expected to be on site for an estimated 160 days, inclusive of mobilization and demobilization time. The drilling rig will maintain exterior lighting in accordance with applicable federal navigation and aviation safety regulations (International Regulations for Preventing Collisions at Sea, 1972 [72 COLREGS], Part C).

Potential impacts to marine resources from the drilling rig include the physical presence of the drilling rig in the ocean, entanglement and entrapment from moon pools and equipment in the water, working and safety lighting on the rig, and underwater sound produced during operations.

Table 2. Matrix of impact-producing factors (IPF) and affected environmental resources. X = potential impact; dash (--) = no impact or negligible impact.

Environmental Resources	Impact-Producing Factors									
	Drilling Rig Presence (incl. sound & lights)	Physical Disturbance to Seafloor	Air Pollutant Emissions	Effluent Discharges	Water Intake	Onshore Waste Disposal	Marine Debris	Support Vessel/Helo Traffic	Accidents	
									Small Fuel Spill	Large Oil Spill
Physical/Chemical Environment										
Air quality	--	--	--**X**(9)	--	--	--	--	--	**X**(6)	**X**(6)
Water quality	--	--	--	**X**	--	--	--	--	**X**(6)	**X**(6)
Seafloor Habitats and Biota										
Soft bottom benthic communities	--	**X**	--	**X**	--	--	--	--	--	**X**(6)
High-density deepwater benthic communities	--	--(4)	--	--(4)	--	--	--	--	--	**X**(6)
Designated topographic features	--	--(1)	--	--(1)	--	--	--	--	--	--
Pinnacle trend area live bottoms	--	--(2)	--	--(2)	--	--	--	--	--	--
Eastern Gulf live bottoms	--	--(3)	--	--(3)	--	--	--	--	--	--
Threatened, Endangered, and Protected Species and Critical Habitat										
Sperm whale (endangered)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Bryde's whale (endangered)	X(8)	--	--	--	--	--	--	X(8)	X(6,8)	X(6,8)
West Indian manatee (threatened)	--	--	--	--	--	--	--	**X**(8)	--	**X**(6,8)
Non-endangered marine mammals (protected)	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Sea turtles (endangered/threatened)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Piping Plover (threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Whooping Crane (endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Oceanic whitetip shark (threatened)	**X**	--	--	--	--	--	--	--	--	**X(6)**
Giant manta ray (threatened)	**X**	--	--	--	--	--	--	--	--	**X** (6)
Gulf sturgeon (threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Nassau grouper (threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Smalltooth sawfis	==	==	==	==	==	==	==	==	==	**X**(6)
Beach mice (endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Florida salt marsh vole (endangered_	--	--	--	--	--	--	--	--	--	**X**(6)
Threatened coral	--	--	--	--	--	--	--	--	--	**X**(6)
Coastal and Marine Birds										
Marine birds	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Coastal Birds	--	--	--	--	--	--	--	**X**	--	**X**(6)
Fisheries Resources										
Pelagic communities and ichthyoplankton	**X**	--	--	**X**	**X**	--	--	--	**X**(6)	**X**(6)
Essential Fish Habitat	**X**	--	--	**X**	**X**	--	--	--	**X**(6)	**X**(6)
Archaeological Resources										
Shipwreck sites	--	--(7)	--	--	--	--	--	--	--	**X**(6)
Prehistoric archaeological sites	--	--(7)	--	--	--	--	--	--	--	**X**(6)
Coastal Habitats and Protected Areas										
Coastal habitats and protected areas	--	--	--	--	--	--	--	**X**	--	**X**(6)

Table 2. (Continued).

Environmental Resources	Impact-Producing Factors									
	Drilling Rig Presence (incl. sound & lights)	Physical Disturbance to Seafloor	Air Pollutant Emissions	Effluent Discharges	Water Intake	Onshore Waste Disposal	Marine Debris	Support Vessel/Helo Traffic	Accidents	
									Small Fuel Spill	Large Oil Spill
Socioeconomic and Other Resources										
Recreational and commercial fishing	**X**	--	--	--	--	--	--	--	**X**(6)	**X**(6)
Public health and safety	--	--	--	--	--	--	--	--	--	**X**(5,6)
Employment and infrastructure	--	--	--	--	--	--	--	--	--	**X**(6)
Recreation and tourism	--	--	--	--	--	--	--	--	--	**X**(6)
Land use	--	--	--	--	--	--	--	--	--	**X**(6)
Other marine uses	--	--	--	--	--	--	--	--	--	**X**(6)

*numbers refer to table footnotes; Helo = helicopter.

Table 2 Footnotes and Applicability to this Program:

*Footnotes are numbered to correspond to entries in **Table 2**; applicability to each case is noted by a bullet point following the footnote.*

(1) *Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well, rig site, or any anchors will be on the seafloor within the following:*
   (a) *4-mile zone of the Flower Garden Banks, or the 3-mile zone of Stetson Bank;*
   (b) *1,000-m, 1-mile, or 3-mile zone of any topographic feature (submarine bank) protected by the Topographic Features Stipulation attached to an Outer Continental Shelf (OCS) lease;*
   (c) *Essential Fish Habitat (EFH) criteria of 152 m (500 ft) from any no-activity zone; or*
   (d) *Proximity of any submarine bank (152 m [500-ft] buffer zone) with relief greater than 2 m (7 ft) that is not protected by the Topographic Features Stipulation attached to an OCS lease.*
   - None of these conditions (a through d) are applicable. The lease is not within or near any marine sanctuary, topographic feature, submarine bank, or no-activity zone.

(2) *Activities with any bottom disturbance within an OCS lease block protected through the Live Bottom (Pinnacle Trend) Stipulation attached to an OCS lease.*
   - The Live Bottom (Pinnacle Trend) Stipulation is not applicable to the project area.

(3) *Activities within any Eastern Gulf OCS block where seafloor habitats are protected by the Live Bottom (Low-Relief) Stipulation attached to an OCS lease.*
   - The Live Bottom (Low-Relief) Stipulation is not applicable to the project area.

(4) *Activities on blocks designated by the BOEM as being in water depths 400 m or greater.*
   - No impacts on high-density deepwater benthic communities are anticipated. There are no features indicative of seafloor hard bottom that could support high-density chemosynthetic communities or coral communities within 2,000 ft (610 m) of the proposed wellsite locations (BP, 2019a; b).

(5) *Exploration or production activities where Hydrogen Sulfide (H_2S) concentrations greater than 500 ppm might be encountered.*
   - The lease block is classified as H_2S absent.

(6) *All activities that could result in an accidental spill of produced liquid hydrocarbons or diesel fuel that you determine would impact these environmental resources. If the proposed action is located a sufficient distance from a resource that no impact would occur, the EIA can note that in a sentence or two.*
   - Accidental hydrocarbon spills could affect the resources marked (X) in the matrix, and impacts are analyzed in **Section C**.

(7) *All activities that involve seafloor disturbances, including anchor emplacements, in any OCS block designated by the BOEM as having high-probability for the occurrence of shipwrecks or prehistoric sites, including such blocks that will be affected that are adjacent to the lease block in which your planned activity will occur. If the proposed activities are located a sufficient distance from a shipwreck or prehistoric site that no impact would occur, the EIA can note that in a sentence or two.*
   - No impacts to archaeological resources are expected. While MC 520 is on the list of high-probability blocks for shipwrecks (BOEM, 2011), the project area is well beyond the 60-m depth contour used by BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. The site clearance letters (BP, 2019a; b), reported that no archaeologically significant sonar contacts were identified within 2,000 ft (610 m) of the proposed wellsites.

(8) *All activities that you determine might have an adverse effect on endangered or threatened marine mammals or sea turtles or their critical habitats.*
   - IPFs that may affect marine mammals, sea turtles, or their critical habitats include drilling rig presence, support vessel and helicopter traffic, and accidents. See **Section C**.

(9) *Production activities that involve transportation of produced fluids to shore using shuttle tankers or barges.*
   - Not applicable.

The physical presence of the drilling rig in the ocean can attract and potentially impact pelagic marine resources, as discussed in **Section C.5.1**. DP drillships and semisubmersible drilling rigs maintain exterior lighting for working at night and for navigational and aviation safety in accordance with applicable federal safety regulations. This artificial lighting may also attract and directly or indirectly impact natural resources. Drilling operations produce underwater sounds that may impact certain marine resources. Sources of drilling-related sounds include, for example, riser rotation, DP thrusters, remotely operated vehicle (ROV) operations, and seabed mounted active acoustics (such as ultra-short baseline systems) for positioning. Only sound related to DP thruster activity is expected to produce sound at levels which could result in potential impacts on marine life.

Entanglement and entrapment of protected species can occur from equipment with slack or looping lines and cables in the water. Marine mammals and sea turtles can become entangled in vessel lines in the water with loops or sufficient looping to trap the animals if they come into contact with them. Entanglement and entrapment can be minimized with proper maintenance of equipment lines in the water by encasing fleixible lines, removing excess lines, and keeping lines taught to remove slack and line loops.

The drilling rig operations and equipment can be expected to produce sound associated with propulsion machinery that transmits directly to the water during station keeping, drilling, and maintenance operations. Additional sound and vibration are transmitted through the hull to the water from auxiliary machinery, such as generators, pumps, and compressors onboard the drilling rig (Richardson et al., 1995). Source levels produced by DP vessels for station-keeping are largely dependent on the level of thruster activity, thruster size, and power required to keep position and, therefore, vary based on local ocean currents, sea and weather conditions, and operational requirements. Representative source levels for vessels in DP activities range from 184 to 190 dB re 1 µPa m, with a primary frequency below 600 Hz (Blackwell and Greene Jr., 2003, McKenna et al., 2012; Kyhn et al., 2014). When drilling, the drill string represents a long vertical sound source (McCauley, 1998). Sound associated with drilling operations have maximum broadband (10 Hz to 10 kHz) source levels of approximately 190 dB re 1 µPa m (Hildebrand, 2005). The use of thrusters can elevate source levels from a drillship or semisubmersible to approximately 188 dB re 1 µPa m (Nedwell and Howell, 2004). Nedwell and Edwards (2004) reported that the majority of sound from a semisubmersible drilling rig occurred below 600 Hz, and sound pressure levels (SPLs) increased by 10 to 20 dB when drilling was active. Within the low frequency bandwidths (<600Hz), measured SPLs were shown to be greatly influenced by the drilling rig for up to 2 km; but at distances beyond 5 km, the drill rig did not contribute significantly to the overall SPLs in that bandwidth. It is worth noting most source level estimates for active drilling rigs assume a single point source, when in reality multiple DP thrusters are dispersed around the rig which contribute to received sound levels near the rig. This results in source levels close to the rig being overestimated.

The response of marine mammals, sea turtles, and fishes to a perceived marine sound depends on a range of factors, including 1) SPL, frequency, duration, and novelty of the sound; 2) the physical and behavioral state of the animal at the time of perception; and 3) the ambient acoustic features of the environment (Hildebrand, 2004).

A.2 Physical Disturbance to the Seafloor

In water depths of 600 m (1,969 ft) or greater, DP drilling rigs disturb only a very small area of the seafloor around the wellbore where the bottom template and blowout preventer (BOP) are located. Depending on the specific well configuration, the total disturbed area is estimated to be 0.25 hectares (ha) (0.62 acres [ac]) per well (BOEM, 2012a). For the six wells proposed in this EP, the total potential area of seafloor disturbance is expected to be approximately 1.5 ha (3.1 ac).

A.3 Air Pollutant Emissions

The air pollutant emissions are calculated in accordance with BOEM requirements for screening air impacts and summarized in the Air Quality Emissions Report in EP Section 7 and EP Appendix E. The primary air pollutants typically associated with OCS activities are suspended particulate matter (PM), sulfur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds (VOCs), and carbon monoxide (CO) (Reşitoğlu et al., 2015). These emissions occur mainly from combustion diesel and aviation fuel, also known as Jet-A.

The Air Quality Emissions Report demonstrates that the projected emissions are below exemption levels set by the applicable regulations in 30 CFR 550.303. Based on this and the distance from shore, it can be concluded that the emissions will not significantly affect the air quality of the onshore area for any of the criteria pollutants.

A.4 Effluent Discharges

Effluent discharges are summarized in EP Section 6.2 and EP Appendix D. All offshore discharges are expected to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit issued by the U.S. Environmental Protection Agency (USEPA) and any applicable U.S. Coast Guard (USCG) regulations.

Water-based drilling muds and cuttings are expected to be released at the seafloor during the initial well-drilling intervals before the marine riser that enables the return of muds and cuttings to the surface is set. Excess cement slurry will also be released at the seafloor during casing installation for the riserless portion of the drilling operations. Synthetic-based drilling muds (SBMs) will be collected on the rig and will either be reused by the vendor or transported to Port Fourchon, Louisiana, for recycling and/or disposal at an approved facility. Cuttings wetted with SBMs will be discharged at the surface in accordance with the NPDES permit conditions.

Other effluent discharges are expected to include treated sanitary and domestic wastes, deck drainage, well treatment, and completion and workover fluids. Miscellaneous discharges of seawater and freshwater to which treatment chemicals have been added, such as desalination unit brine, chemically treated freshwater and seawater, uncontaminated ballast and bilge water, fire water, cooling water, excess cement slurry, and blowout prevention fluids also are expected to be discharged in accordance with the conditions in the NPDES permit.

Under certain circumstances, the drilling rig may relocate to a safe zone which is not located within the leased area to avoid severe weather, loop currents, or to conduct routine maintenance while idled from drilling activities. During these limited times of safe zone harboring, incidental vessel discharges may occur. These discharges are expected to be within the limits represented in the waste and water discharge table estimates submitted as part of this EP.

A.5 Water Intake

Seawater will be drawn from the ocean for once-through, non-contact cooling of machinery on the drilling rig. Section 316(b) of the Clean Water Act requires NPDES permits to ensure that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available to minimize adverse environmental impact from impingement and entrainment of aquatic organisms. The General NPDES Permit specifies design requirements for facilities for which construction commenced after 17 July 2006 with a cooling water intake structure having a design intake capacity of greater than two million gallons of water per day, of which at least 25% is used for cooling purposes. It is expected that the drilling rig ultimately selected for this project will be in compliance with all applicable cooling water intake structure design requirements, monitoring, and limitations. Where applicable, the drilling rig operator takes responsibility for obtaining necessary NPDES permit coverage for its cooling water intake structure and associated permit compliance.

A.6 Onshore Waste Disposal

A list of the solid and liquid wastes generated during this project to be disposed of onshore are tabulated in EP Section 6.1. Typical waste streams requiring onshore disposal from a project of this nature include the following:

- Unused synthetic-based drilling fluid, synthetic-based drilling mud solids and barite, contaminated synthetic-based mud, and drilling mud contaminated absorbents;
- Excess barite and cement;
- Rig drilling washwater;
- Well-related hazardous waste;
- Rig maintenance wastes (hazardous and non-hazardous);
- Used rig oil (e.g., lube oil, hydraulic oil, glycol);
- Domestic (e.g., municipal trash) and universal wastes (e.g., batteries, florescent light bulbs);
- Nonhazardous domestic recyclables (e.g., plastic, paper, aluminum);
- Scrap metal;
- Oily water;
- Radioactive waste; and
- Miscellaneous unused chemicals.

These waste streams are expected to be segregated on the drilling rig and transported to shore for disposal in an appropriately permitted facility. All other wastes generated by BP and its contractors are managed by their respective waste management procedures. Compliance with established practices and procedures is expected to result in either no or negligible impacts from this factor.

A.7 Marine Debris

BP and its contractors intend to comply with all applicable regulations relating to solid waste handling, transportation, and disposal, including the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) Annex V requirements, and USEPA, USCG, BSEE, and BOEM regulations. These regulations include prohibitions and compliance requirements regarding the deliberate discharging of containers and other similar materials (i.e., trash and debris) into the marine environment as well as the protective measures to be implemented to prevent the accidental loss of solid material into the marine environment. For example, BSEE regulations 30 CFR 250.300(a) and (b)(6) prohibit operators from deliberately discharging containers and other similar materials (i.e., trash and debris) into the marine environment, and 30 CFR 250.300(c) requires durable identification markings on equipment, tools, containers (especially drums), and other material. The USEPA and USCG regulations require operators to be proactive in avoiding accidental loss of solid materials 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. Additionally, the debris awareness training, instruction, and placards required by the Protected Species Lease Stipulation should minimize the amount of debris that is accidentally lost overboard by offshore personnel (NMFS [2020] Appendix B). BP is expecting to comply with NTL BSEE-2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of informational placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process. Compliance with these requirements is expected to result in minimal and only accidental loss of solid waste. Consequently, there will be either no or negligible impacts from this factor.

A.8 Support Vessel and Helicopter Traffic

A.8.1 Physical Presence

IPFs associated with support vessel and helicopter traffic include their physical presence and operational sound. Each factor is discussed below.

BP will use existing shorebase facilities at Port Fourchon, Louisiana, for support vessel activities. Support helicopters are expected to be based at heliport facilities in Houma, Louisiana. No terminal expansion or construction is planned at either location.

NMFS (2020) has found that support vessel traffic has the potential to disturb protected species (e.g., marine mammals, sea turtles, fishes) and creates a risk of vessel collisions. The probability of a vessel collision depends on the number, size, and speed of vessels as well as the distribution, abundance, and behavior of the species (Conn and Silber, 2013; Hazel et al., 2007; Jensen and Silber, 2004; Laist et al., 2001; Vanderlaan and Taggart, 2007; NMFS, 2020).
To reduce the potential for vessel collisions, BOEM issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species and requires operators to report sightings of any injured or dead protected species. The project will be supported by onshore crew boats and supply vessels making generally two to four round trips per week. The boats typically move to the project area via the most direct route from the shorebase.

A helicopter will make approximately 7 round trips per week between the drilling rig and the heliport. The helicopter will be used to transport personnel and small supplies and will normally take the most direct route of travel between the shorebase and the project area when air traffic and weather conditions permit. Offshore support helicopters typically maintain a minimum altitude of 213 m (700 ft) while in transit offshore, 305 m (1,000 ft) over unpopulated areas or across coastlines, and 610 m (2,000 ft) over populated areas and sensitive habitats such as wildlife refuges and park properties. Additional guidelines and regulations specify that helicopters maintain an altitude of 305 m (1,000 ft) within 100 m (328 ft) of marine mammals (NMFS, 2020).

Table 3 summarizes the estimated fuel capacity and trip frequency of the support vessels and aircraft.

Table 3. Support vessel and aircraft fuel capacity and trip frequency or duration in Mississippi Canyon Block 520 during the proposed exploratory drilling project.

Vessel/Aircraft Type	Maximum Fuel Tank Storage Capacity	Trip Frequency or Duration
Helicopter	760 gal	7 flights per week
Crew boats	1,000 bbl	2 trips per week
Supply Boats	5,000 bbl	4 trips per week

gal = gallons; bbl = barrel.

A.8.2 Operational Sound

Offshore support vessels associated with the proposed project will contribute to the overall acoustic environment by transmitting sound through both air and water. The support vessels will use conventional diesel-powered screw propulsion. Vessel sound is a combination of narrow band (tonal) and broadband sound (Richardson et al., 1995; Hildebrand, 2009; McKenna et al., 2012). Tones typically dominate up to approximately 50 Hz, whereas broadband sounds may extend to 100 kHz. The primary sources of vessel sound are propeller cavitation, propeller singing, and propulsion; other sources include engine sound, flow sound from water dragging along the hull, and bubbles breaking in the vessel's wake (Richardson et al., 1995). The intensity of sound from support vessels is roughly related to ship size, weight, and speed. Broadband source levels for smaller boats (a category that include supply and other service vessels) are in the range of 150 to 180 dB re 1 µPa m (Richardson et al., 1995; Hildebrand, 2009; McKenna et al., 2012).

Penetration of aircraft sound below the sea surface is greatest directly below the aircraft. Aircraft sound produced at angles greater than 13 degrees from vertical is mostly reflected from the sea surface and does not propagate into the water (Richardson et al., 1995). The duration of underwater sound from passing aircraft is much shorter in water than air; for example, a helicopter passing at an altitude of 152 m (500 ft) that is audible in air for 4 minutes may be detectable under water for only 38 seconds at 3 m (10 ft) depth and for 11 seconds at 18 m (59 ft) depth (Richardson et al., 1995).

Dominant tones for helicopters are generally below 500 Hz with source levels of approximately 149 to 151 dB re 1 µPa m (for a Bell 212 helicopter) (Richardson et al., 1995). However, underwater sound levels received from passing aircraft depend on the aircraft's altitude, the aspect (direction and angle) of the aircraft relative to the receiver, receiver depth, water depth, and seafloor type (Richardson et al., 1995). The received level diminishes with increasing receiver depth when an aircraft is directly overhead, but may be stronger at mid-water than at shallow depths when an aircraft is not directly overhead (Richardson et al., 1995). Because of the relatively high expected airspeeds during transits and these physical variables, aircraft-related sound (including both airborne and underwater sound) is expected to be very brief in duration.

A.9 Accidents

The accidents addressed in the EIA focuses on the following two potential types:

- a small fuel spill, which is the most likely type of spill during OCS exploration activities; and
- a large oil spill, up to and including the WCD for this EP, which is an oil spill resulting from an uncontrolled blowout.

The following subsections summarize assumptions about the sizes and fates of these spills as well as BP's spill response plans. Impacts are analyzed in **Section C**.

Recent EISs (BOEM, 2012a; b; 2013; 2014; 2015; 2016b; 2017a) analyzed three types of accidents relevant to drilling operations that could lead to potential impacts to the marine environment: loss of well control, vessel collision, and chemical and drilling fluid spills. These types of accidents, along with a H_2S release, are discussed briefly below.

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, and/or water. Loss of well control includes incidents from the very minor up to the most serious well control incidents, while blowouts are considered to be a subset of more serious incidents with greater risk of oil spill or human injury (BOEM, 2016a; 2017a). Loss of well control may result in the release of drilling fluid and/or loss of oil. Not all loss of well control events result in blowouts (BOEM, 2012a). In addition to the potential release of gas, condensate, oil, sand, and/or water, the loss of well control can also resuspend and disperse bottom sediments (BOEM, 2012a; 2017a). BOEM (2016a) noted that most OCS blowouts have resulted in the release of gas.

BP has a robust system in place to prevent loss of well control. Measures to prevent a blowout, reduce the likelihood of a blowout, and conduct effective and early intervention in the event of a blowout are described in the NTL 2015-N01 package submitted with this EP, as required by BOEM (as discussed in **Section A.9.1**). The potential for a loss of well control event will be minimized by adhering to the requirements of applicable regulations and NTL 2010-N10, which specifies additional safety measures for OCS activities.

Vessel Collisions. BSEE data show that there were 168 OCS-related collisions between 2007 and 2017 (BSEE, 2017). Most collision mishaps are the result of service vessels colliding with platforms or vessel collisions with pipeline risers. Approximately 10% of vessel collisions with platforms in the OCS resulted in diesel spills, and in several collision incidents, fires resulted from hydrocarbon releases. 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 lease area, spilling 1,500 barrels (bbl). Diesel fuel is the product most frequently spilled, but oil, natural gas, corrosion inhibitor, hydraulic fluid, and lube oil have also been released as the result of vessel collisions. Human error accounted for approximately half of all reported vessel collisions from 2006 to 2009. As summarized by BOEM (2017a), vessel collisions occasionally occur during routine operations. Some of these collisions have caused spills of diesel fuel or chemicals. BP and it's contractors intend to comply with all applicable USCG and BOEM safety requirements to minimize the potential for vessel collisions.

Dropped Objects. Objects dropped overboard the DP drilling rig could potentially pose a risk to existing live subsea pipelines or other infrastructure. If a dropped pipe or other subsea equipment landed on existing seafloor infrastructure, loss of integrity of seafloor pipelines, umbilicals, etc. could result in a spill. Dropped objects could also result in seafloor disturbance and potential impacts to benthic communities. BP and its contractors intend to comply with all BOEM and BSEE safety requirement to minimize the potential for objects dropped overboard.

Chemical Spills. Chemicals are stored and used for pipeline hydrostatic testing, leak and pressure testing of subsea equipment and during drilling and in well completion operations. The relative quantities of their use is reflected in the largest volumes spilled (BOEM, 2017b). Completion, workover, and treatment fluids are the largest quantity used and comprise the largest releases. Any potential leak due to pressure testing failure will be limited to a single line leak and would be limited to less than 1bbl. Potentially spilled fluids include Transaqua HT, MEG 50/50, or methanol. Between 2007 and 2014, an average of two chemical spills <50 bbl in volume and three chemical spills >50 bbl in volume occurred each year (BOEM, 2017a).

Drilling Fluid Spills. There is the potential for drilling fluids, specifically SBMs, to be spilled due to an accidental riser disconnect (BOEM, 2017a). SBMs are relatively nontoxic to the marine environment and have the potential to biodegrade (BOEM, 2014). The majority of SBM releases are <50 bbl in size, but accidental riser disconnects may result in the release of medium (238 to 2,380 bbl) to large (>2,381 bbl) quantities of drilling fluids. In the event of an SBM spill, there could be short-term localized impacts on water quality and the potential for localized benthic impacts due to SBM deposition on the seafloor. Benthic impacts would be similar to those described in **Section C.2.1**. The potential for riser disconnect SBM spills will be minimized by adhering to the requirements of applicable regulations.

H_2S Release. MC 520 is classified as H_2S absent.

A.9.1 Small Fuel Spill

Spill Size. According to the analysis by BOEM (2017b), the most likely type of small spill (<1,000 bbl) resulting from OCS activities is a failure related to the storage of oil or diesel fuel. Historically, most diesel spills have been ≤1 bbl, and this is predicted to be the most common spill volume in ongoing and future OCS activities in the Western and Central Gulf of Mexico Planning Areas (Anderson et al., 2012). As the spill volume increases, the incident rate declines dramatically (BOEM, 2017a). The median size for spills ≤1 bbl is 0.024 bbl, and the median volume for spills of 1 to 10 bbl is 3 bbl (Anderson et al., 2012). For the EIA, a small diesel fuel spill of 3 bbl is used. Operational experience suggests that the most likely cause of such a spill would be a rupture of the fuel transfer hose resulting in a loss of contents (3 bbl of fuel) (BOEM, 2012a).

Spill Fate. The fate of a small fuel spill in the project area would depend on meteorological and oceanographic conditions at the time as well as the effectiveness of spill response activities. However, given the open ocean location of the project area and response actions, it is expected that impacts from a small spill would be minimal (BOEM, 2016a).

The water-soluble fractions of diesel are dominated by two- and three-ringed polycyclic aromatic hydrocarbons (PAHs), which are moderately volatile (National Research Council, 2003a). The constituents of these oils are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. Due to its light density, diesel will not sink to the seafloor. Diesel dispersed in the water column can adhere to suspended sediments, but this generally occurs only in coastal areas with high suspended solids loads (National Research Council, 2003a) and would not be expected to occur to any appreciable degree in offshore waters of the Gulf of Mexico. Diesel fuel is readily and completely degraded by naturally occurring microbes (NOAA, 2006).

Sheens from small fuel spills are expected to persist for relatively short periods of time, ranging from minutes (<1 bbl) to hours (<10 bbl) to a few days (10 to 1,000 bbl), and rapidly spread out, evaporate, and disperse into the water column (BOEM, 2012a).

For purposes of the EIA, the fate of a small diesel fuel spill was estimated using the National Oceanic and Atmospheric Administration's (NOAA) Automated Data Inquiry for Oil Spills 2 (ADIOS2) model (NOAA, 2016a). This model uses the physical properties of oils in its database to predict the rate of evaporation and dispersion over time as well as changes in the density, viscosity, and water content of the product spilled. It is estimated that over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it during this 24-hour period would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

The ADIOS2 results, coupled with spill trajectory information discussed below for a large spill, indicate that a small fuel spill would not impact coastal or shoreline resources. The project area is 64 statute miles (103 km) from the nearest shoreline (Plaquemines Parish, Louisiana). Slicks from small fuel spills are expected to persist for relatively short periods of time ranging from minutes (<1 bbl) to hours (<10 bbl) to a few days (10 to 1,000 bbl) and rapidly spread out, evaporate, and disperse into the water column (BOEM, 2012a). Because of the distance from shore of these potential spills on the OCS and their lack of persistence, it is unlikely that a spill would make landfall prior to dissipation (BOEM, 2012a).

Spill Response. In the unlikely event the shipboard procedures fail to prevent a fuel spill, response equipment and trained personnel would be activated so that any spill effects would be localized and would result only in short-term environmental consequences. EP Appendix G provides a discussion of BP's response efforts if a spill were to occur during operational activities associated with the proposed EP.

Weathering. Following a diesel fuel spill, several physical, chemical, and biological processes, collectively called weathering, interact to change the physical and chemical properties of the diesel, and thereby influence its harmful effects on marine organisms and ecosystems. The most important weathering processes include spreading, evaporation, dissolution, dispersion into the water column, formation of water-in-oil emulsions, photochemical oxidation, microbial degradation, adsorption to suspended particulate matter, and stranding on shore or sedimentation to the seafloor (National Research Council, 2003a, International Tanker Owners Pollution Federation Limited, 2018).

Weathering decreases the concentration of diesel fuel and produces changes in its chemical composition, physical properties, and toxicity. The more toxic, light aromatic and aliphatic hydrocarbons are lost rapidly by evaporation and dissolution from the slick on the water surface. Evaporated hydrocarbons are degraded rapidly by sunlight. Biodegradation of diesel fuel on the water surface and in the water column by marine bacteria removes first the n-alkanes and then the light aromatics. Other petroleum components are biodegraded more slowly (National Research Council, 2003a). Diesel fuel spill response-related activities for facilities included in this EP are governed by BP's Regional OSRP, which meets the requirements contained in 30 CFR 254.

A.9.2 Large Oil Spill (Worst Case Discharge)

Under this EP, BP proposes to drill up to six wells in MC 520. All surface and bottom hole locations will be in MC 520.

The uncontrolled blowout scenario is for a potential blowout of the well which BP calculates has the highest liquid hydrocarbons rate potential in the MC 520 area. The blowout scenario assumes that the pipe has been tripped out of the hole when a problem with the wellhead connector develops resulting in the removal of the BOP stack. Due to the loss of riser margin, the well will flow unrestricted.

Spill Size. Day 1 WCD is estimated to be 290,000 barrels of oil per day (BOPD). The maximum duration of a blowout is estimated at 101 days based on the time required to drill a relief well. The rate profile associated with the well blowout over this 101-day period results in a potential worst-case spill volume estimated at 13.47 million bbl of oil.

Spill Probability. Statistics from offshore drilling in the U.S. Gulf of Mexico provide a reasonable basis for evaluating oil spill risk during exploratory drilling. Historically, blowouts are rare events and most do not result in oil spills. A 2010 analysis using the SINTEF[1] database estimates a blowout frequency of 0.0017 per exploratory well for non-North Sea locations (International Association of Oil & Gas Producers, 2010). BOEM has updated spill frequencies to include the *Deepwater Horizon* incident and found that spill rates (bbl spilled per bbl produced) for OCS platform spills were unchanged for spills >1,000 bbl when compared with previously published data (Anderson et al., 2012). According to the BSEE analysis conducted for the Final Drilling Safety Rule issued in 2010, the baseline risk of a catastrophic blowout is estimated to be once every 26 years (75 *Federal Register* [FR] 63365).

BP is expected to comply with NTL 2010-N10 and the drilling safety regulations in 30 CFR Part 250, Subparts D and G, which specify additional safety measures for OCS activities.

Spill Trajectory. The fate of a large oil spill in the project area would depend on meteorological and oceanographic conditions at the time. The Oil Spill Risk Analysis (OSRA) model is a computer simulation of oil spill transport that uses realistic data for winds and currents to predict spill trajectory. The OSRA report by Ji et al. (2004) provides conditional contact probabilities for shoreline segments in the Gulf of Mexico.

The results for Launch Area 57 (where MC 520 is located) are presented in **Table 4**. The model predicts a 4% chance of shoreline contact within three days of a spill (Plaquemines Parish, Louisiana), and a 1% to 14% chance of shoreline contact within 10 days of a spill (Terrebonne, Lafourche, St. Bernard, and Plaquemines Parishes). Shoreline contact is predicted within 30 days for shorelines ranging from Cameron Parish, Louisiana, to Bay County, Florida. The conditional probability of shoreline contact is low (1% to 3%) for most shorelines with predicted contact within 30 days. However, the conditional probability of shoreline contact to Plaquemines Parish, Louisiana, is 21% within 30 days.

[1] Stiftelsen for industriell og teknisk forskning (Foundation for Scientific and Industrial Research, Norwegian Institute of Technology).

Table 4. Conditional probabilities of a spill in Mississippi Canyon Block 520 (MC 520) contacting shoreline segments based on the 30-day Oil Spill Risk Analysis (OSRA) (From: Ji et al., 2004). Values are conditional probabilities that a hypothetical spill in MC 520 (represented by OSRA Launch Area 57) could contact shoreline segments within 3, 10, or 30 days.

Shoreline Segment	County or Parish, State	Conditional Probability of Contact[1] (%)		
		3 Days	10 Days	30 Days
C13	Cameron Parish, Louisiana	--	--	1
C14	Vermilion Parish, Louisiana	--	--	1
C17	Terrebonne Parish, Louisiana	--	1	2
C18	Lafourche Parish, Louisiana	--	1	2
C20	Plaquemines Parish, Louisiana	4	14	21
C21	St. Bernard Parish, Louisiana	--	1	3
C22	Hancock and Harrison Counties, Mississippi	--	--	1
C23	Jackson County, Mississippi	--	--	1
C24	Mobile County, Alabama	--	--	1
C25	Baldwin County, Alabama	--	--	1
C26	Escambia County, Florida	--	--	1
C28	Okaloosa County, Florida	--	--	1
C29	Walton County, Florida	--	--	1
C30	Bay County, Florida	--	--	1

[1] Conditional probability refers to the probability of contact within the stated time period, assuming that a spill has occurred (-- indicates <0.5%). Values are conditional probabilities that a hypothetical spill in the project area (represented by OSRA Launch Area 57) could contact shoreline segments within 3, 10, or 30 days.

The original OSRA modeling runs reported by Ji et al. (2004) did not evaluate the fate of a spill over time periods exceeding 30 days, nor did they estimate the fate of a release that continues over a period of weeks or months. As noted by Ji et al. (2004), the OSRA model does not consider the chemical composition or biological weathering of oil spills, the spreading and splitting of oil spills, or spill response activities. The model does not specify a particular spill size but has been used by BOEM to evaluate contact probabilities for spills greater than 1,000 bbl.

BOEM presented additional OSRA modeling to simulate a spill that continues for 90 consecutive days, with each trajectory tracked for 60 days during four seasons. In this updated OSRA model (herein referred to as the 60-day OSRA model), 60 days was chosen as a conservative estimate of the maximum duration that spilled oil would persist on the sea surface following a spill (BOEM, 2017b). The spatial resolution is limited, with five launch points in the entire Western and Central Planning Areas of the Gulf of Mexico. These launch points were deliberately located in areas identified as having a high possibility of containing large oil reserves. The 60-day OSRA model launch point most appropriate for modeling a spill in the project area is Launch Point 2. The 60-day OSRA results for Launch Point 2 are presented in **Table 5**.

Table 5. Shoreline segments with a 1% or greater conditional probability of contact from a spill starting at Launch Point 2 based on the 60-day Oil Spill Risk Analysis (OSRA). Values are conditional probabilities that a hypothetical spill in the project area could contact shoreline segments within 60 days. Modified from: BOEM (2017a).

Season	Spring				Summer				Fall				Winter			
Day	3	10	30	60	3	10	30	60	3	10	30	60	3	10	30	60
County or Parish	Conditional Probability of Contact[1] (%)															
Matagorda, Texas	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
Vermilion, Louisiana	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
Terrebonne, Louisiana	--	--	--	--	--	--	--	1	--	--	--	--	--	--	2	2
Lafourche, Louisiana	--	--	--	--	--	--	--	--	--	--	1	1	--	--	--	1
Jefferson, Louisiana	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1
Plaquemines, Louisiana	--	2	3	3	2	9	17	19	2	17	24	24	1	12	18	20
St. Bernard, Louisiana	--	5	6	6	1	8	13	14	1	8	10	10	1	5	8	8
Hancock, Mississippi	--	2	3	3	--	2	2	2	1	2	3	3	--	1	2	3
Harrison, Mississippi	2	5	5	5	1	4	5	5	1	2	3	3	2	3	4	4
Jackson, Mississippi	7	13	14	14	3	6	8	8	6	11	12	13	6	10	12	13
Mobile, Alabama	13	18	19	19	4	9	10	10	8	12	12	13	9	12	13	13
Baldwin, Alabama	8	15	18	18	2	8	9	9	1	2	3	3	3	6	7	7
Escambia, Florida	1	6	9	10	1	4	6	6	--	1	1	1	--	2	2	3
Okaloosa, Florida	--	1	2	2	--	1	2	2	--	--	--	--	--	--	--	--
Walton, Florida	--	--	1	1	--	1	1	1	--	--	--	1	--	--	--	--
Bay, Florida	--	2	3	3	--	1	2	3	--	--	--	--	--	--	--	1
Gulf, Florida	--	1	3	4	--	--	2	2	--	--	--	--	--	--	--	--
Franklin, Florida	--	--	1	2	--	--	1	1	--	--	--	--	--	--	--	--
Dixie, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Levy, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
State Coastline	Conditional Probability of Contact[1] (%)															
Texas	--	--	--	--	--	--	--	1	--	--	1	2	--	--	--	2
Louisiana	--	6	8	9	3	17	30	35	3	25	36	36	2	18	29	33
Mississippi	9	20	22	22	5	12	15	15	8	15	18	19	8	15	18	20
Alabama	21	33	37	37	6	17	20	20	9	14	15	15	12	18	20	20
Florida	1	11	19	26	1	7	14	16	--	1	3	3	--	2	4	5

[1] Conditional probability refers to the probability of contact within the stated time period assuming that a spill has occurred (-- indicates <0.5%). Values are conditional probabilities that a hypothetical spill in the project area could contact shoreline segments within 60 days.

From Launch Point 2, potential shorelines with a 1% or greater conditional probability of contact within 60 days range from Matagorda County, Texas (winter season), to Levy County, Florida (spring season). Based on statewide contact probabilities within 60 days, Louisiana has the highest likelihood of contact during summer, fall and winter (ranging from 33% to 36% conditional probability), while Alabama has the highest probability of contact in spring (37% conditional probability). The model predicts potential contact with Mississippi shorelines in any season ranging from a 15% conditional probability in summer to a 22% conditional probability in spring (within 60 days of a spill). Texas shorelines are predicted to be potentially contacted only during summer, fall, or winter, with conditional probabilities of contact 2% or less within 60 days. Florida shorelines are predicted to be potentially contacted during any season, with a probability up to 26% in spring. Based on the 60-day trajectories, counties or parishes with 10% or greater contact probability during any season include Plaquemines and St. Bernard Parishes in Louisiana; Jackson County in Mississippi; Mobile and Baldwin counties in Alabama; and Escambia County, Florida (**Table 5**).

OSRA is a preliminary risk assessment model. In the event of an actual oil spill, real-time monitoring and trajectory modeling would be conducted using current and wind data available from the rigs and permanent production structures in the area. Satellite and aerial monitoring of the plume and real-time trajectory modeling using wind and current data would continue on a daily basis to help position equipment and human resources throughout the duration of any major spill or uncontrolled release.

Weathering. The constituents of diesel fuel are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. NOAA has reported that diesel fuel is readily and completely degraded by naturally occurring microbes (NOAA, 2006).

Weathering decreases the concentration of oil and produces changes in its chemical composition, physical properties, and toxicity. The more toxic, light aromatic and aliphatic hydrocarbons are lost rapidly by evaporation and dissolution from a slick on the water surface. For example, the light, paraffinic crude oil spilled during the *Deepwater Horizon* incident lost approximately 55 wt. % to evaporation during the first 3 to 5 days while floating on the sea surface (Daling et al., 2014). Evaporated hydrocarbons are degraded rapidly by sunlight. Biodegradation of oil on the water surface and in the water column by marine bacteria removes first the n-alkanes and then the light aromatics from the oil. Other petroleum components are biodegraded more slowly. Photo-oxidation attacks mainly the medium and high molecular weight PAHs in the oil on the water surface.

Spill Response. All proposed activities and facilities in this EP will be covered by the Gulf of Mexico Regional OSRP filed by BP America Inc. (Operator No. 21372) under cover letter dated 14 February 2019 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on 15 March 2019. Modifications were made to the approved OSRP under cover letter dated 20 June 2019 and confirmed in compliance by BSEE on 24 July 2019.

BP's OSRP includes information about enhanced measures for responding to a spill in open water, near shore spill response, and shoreline spill response based on lessons learned from the *Deepwater Horizon* oil spill. In compliance with the requirements of 30 CFR 254 and related NTLs, BP's OSRP includes the following:

- Provisions to maintain access to a supply of dispersant and fire boom for use in the event of an uncontrolled, long-term blowout, for the length of time required to drill a relief well;
- Contingencies for maintaining an ongoing response for the length of time required to drill a relief well;
- A description of the measures and equipment necessary to maximize the effectiveness and efficiency of the response equipment used to recover the discharge on the water's surface. The description will include methods to increase encounter rates, the use of vessel tracking, and the use of remote sensing technologies;
- Information on remote sensing technology and equipment to be used to track oil slicks, including oil spill detection systems and remote thickness detection systems (such as X-band/infrared systems);
- Information pertaining to the use of vessel tracking systems and communication systems between response vessels and spotter personnel;
- A shoreline protection strategy that is consistent with applicable area contingency plans; and
- For operations using a subsea BOP or a surface BOP on a floating facility, a discussion regarding strategies and plans related to source abatement and control for blowouts from drilling.

BP is a member of the Marine Spill Response Corporation, Clean Gulf Associates, and a client of the National Response Corporation. BP would utilize oil spill response organization personnel and equipment in the event of an oil spill in the Gulf of Mexico. Primary response equipment for the activation of BP's OSRP is located in Houma, Louisiana; Lake Charles, Louisiana; Galveston, Texas; Pensacola, Florida; Mobile, Alabama; Pascagoula, Mississippi; Ft. Jackson, Louisiana; Venice, Louisiana; and Corpus Christi, Texas. The preplanned staging area for this EP is Port Fourchon, Louisiana.

See EP Appendix G for a detailed description of BP's OSRP and site-specific response for an oil spill associated with this project.

B. Affected Environment

The project area is in the central Gulf of Mexico, 64 statute miles (103 km) from the nearest shoreline (Plaquemines Parish, Louisiana), 128 statute miles (206 km) from the onshore support base at Port Fourchon, Louisiana, and 169 statute miles (272 km) from the helicopter base at Houma, Louisiana (**Figure 1**). Water depths at the locations of the proposed wellsites range from approximately 2,040 to 2,056 m (6,695 to 6,747 ft) (**Figure 2**) (BP, 2019a; b).

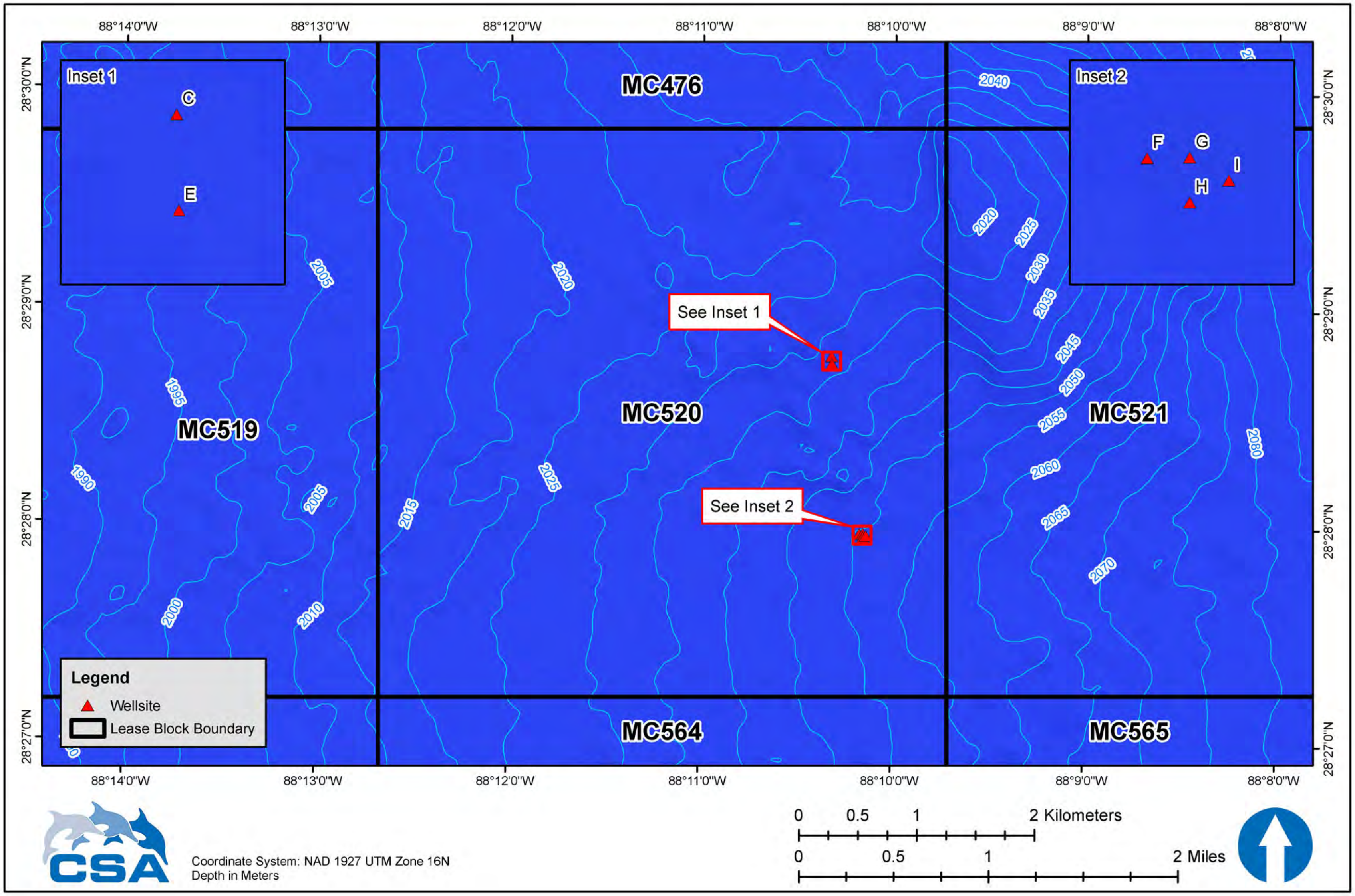

Figure 2. Bathymetric map of the project area showing the surface hole location of the proposed wellsite in Mississippi Canyon Block 520.

The seafloor in the vicinity of the proposed wellsites is hummocky due to a sediment drape covering a shallow-buried mass transport deposit. The seafloor gradient at the proposed wellsites ranges from 0.7 to 2.2°. Based on an assessment of autonomous underwater vehicle survey datasets, no geophysical evidence, hard bottoms or active hydrocarbon seeps were identified that could indicate the presence of high density chemosynthetic communities within 610 m (2,000 ft) of the proposed wellsites (BP, 2019a; b).

A detailed description of the regional affected environment, including meteorology, oceanography, geology, air and water quality, benthic communities, threatened and endangered species, biologically sensitive resources, archaeological resources, socioeconomic conditions, and other marine uses is provided in recent EISs (BOEM, 2012a; 2013; 2014; 2015; 2016b; 2017a). These regional descriptions remain valid and are incorporated by reference. General background information is presented in the following sections, and brief descriptions of each potentially affected resource, including site-specific and new information if available, are presented in **Section C**.

C. Impact Analysis

This section analyzes the potential direct and indirect impacts of routine activities and accidents. Impacts have been analyzed extensively in lease sale EISs for the Central and Western Gulf of Mexico Planning Areas (BOEM, 2013; 2014; 2015; 2016a; b; 2017a). The information in these documents is incorporated by reference. Potential site-specific issues are addressed in this section, which is organized by the environmental resources identified in **Table 2** and addresses each potential IPF.

C.1 Physical/Chemical Environment

C.1.1 Air Quality

There are no site-specific air quality data for the project area due to the distance from shore. Because of the distance from shore-based pollution sources and the lack of sources offshore, air quality at the wellsite is expected to be good. The attainment status of federal OCS waters is unclassified because there is no provision in the Clean Air Act for classification of areas outside state waters (BOEM, 2012a).

In general, ambient air quality of coastal counties along the Gulf of Mexico is relatively good (BOEM, 2012a). As of June 2020, Mississippi, Alabama, and Florida Panhandle coastal counties are in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants (USEPA, 2020). St. Bernard Parish in Louisiana is a nonattainment area for sulfur dioxide based on the 2010 standard. One coastal metropolitan area in Texas (Houston-Galveston-Brazoria) is a nonattainment area for 8-hour ozone (2015 Standard). One coastal metropolitan area in Florida (Tampa) was reclassified in 2018 from a nonattainment area to maintenance status for lead based on the 2008 Standard (USEPA, 2020).

Winds in the region are driven by the anticyclonic (clockwise) atmospheric circulation around the Bermuda High, a semi-permanent, subtropical area of high pressure in the North Atlantic Ocean off the East Coast of North America that migrates east and west with varying central pressure (BOEM, 2017a). The Gulf of Mexico is located to the southwest of this center of circulation, resulting in a prevailing southeasterly to southerly flow, which is conducive to transporting emissions toward shore. However, circulation is also affected by tropical cyclones (hurricanes) during summer and fall and by extratropical cyclones (cold fronts) during winter.

As noted earlier, based on calculations made pursuant to applicable regulations, emissions from drilling activities are not expected to be significant. Therefore, the only potential effects to air quality would be from air pollutant emissions associated with routine operations and accidental spills (a small fuel spill or a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Air Pollutant Emissions

Air pollutant emissions are the only routine IPF likely to affect air quality. Offshore air pollutant emissions result primarily from the drilling operations and service vessels. These emissions occur mainly from combustion or burning of diesel and Jet-A aircraft fuel. The combustion of fuels occurs primarily in generators, pumps, or motors and from lighter fuel motors. Primary air pollutants typically associated with OCS activities are suspended PM, SOx, NOx, VOCs, and CO. As noted by BOEM (2017b), emissions from routine activities are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, anticipated emission rates, anticipated heights of emission sources, and the distance to shore of the proposed activities. However, support vessel and helicopter traffic entering or departing coastal facilities will release air pollutants in these areas during the project period. The incremental contribution to cumulative impacts from activities similar to BP's proposed activities is not significant and is not expected to cause or contribute to a violation of NAAQS. Given the levels of expected emissions and the distance of the project from shore, emissions from the activities described in BP's proposed EP are not likely to contribute to violations of any NAAQS onshore.

Greenhouse gas emissions may contribute to climate change, with important effects on temperature, rainfall, frequency of severe weather, ocean acidification, and sea level rise (Intergovernmental Panel on Climate Change, 2014). Greenhouse gas emissions from this proposed project represent a negligible contribution to the total greenhouse gas emissions from reasonably foreseeable activities in the Gulf of Mexico area and are not expected to significantly alter or exceed any of the climate change impacts evaluated in the Programmatic EIS (BOEM, 2016a). Carbon dioxide (CO_2) and methane (CH_4) emissions from the project would constitute a small incremental contribution to greenhouse gas emissions from all OCS activities. According to Programmatic and OCS lease sale EISs (BOEM, 2016a; 2017a), estimated CO_2 emissions from OCS oil and gas sources are 0.4% of the U.S. total. Because of the distance from shore, routine operations in the project area are not expected to have any impact on air quality conditions along the coast, including nonattainment areas.

As noted in the lease sale EIS (BOEM, 2017a), emissions of air pollutants from routine activities in the Central Gulf of Mexico Planning Area 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 Air Quality Emissions Report indicates that the projected project emissions are below exemption levels set by the applicable regulations in 30 CFR 550.303. Based on this and the distance from shore, it can be concluded that the emissions will not significantly affect the air quality of the onshore area for any of the criteria pollutants.

The Breton Wilderness Area, which is part of the Breton National Wildlife Refuge (NWR), is designated under the Clean Air Act as a Prevention of Significant Deterioration (PSD) Class I air quality area. BOEM is required to notify the National Park Service and U.S. Fish and Wildlife Service (USFWS) if emissions from proposed projects may affect the Breton Class I area. Additional review and mitigation measures may be required for sources within 186 miles (300 km) of the Breton Class I area that exceed emission limits agreed upon by the administering agencies (National Park Service, 2010). The project area is approximately 88 statute miles [2] (142 km) from the Breton Wilderness Area. BP and it's contractors intend to comply with all BOEM requirements regarding air emissions.

Impacts of a Small Fuel Spill

Potential impacts of a small spill on air quality are expected to be consistent with those analyzed and discussed by (BOEM, 2012a; 2015; 2016b; 2017a). The probability of a small spill would be minimized by BP's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of BP's OSRP is expected to reduce the potential impacts. EP Appendix G includes a detailed discussion of the spill response measures that would be employed.

In the EIA, the small spill scenario is proposed to occur in offshore waters at or near the drilling rig. A small fuel spill would affect air quality near the spill site by introducing VOCs into the atmosphere through evaporation. The ADIOS2 model (see **Section A.9.1**) indicates that over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

Because of the offshore location of the proposed small fuel spill, coastal air quality would not be affected because the spill would be expected to dissipate prior to making landfall or reaching coastal waters (see **Section A.9.1**).

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on air quality are expected to be consistent with those analyzed and discussed by (BOEM, 2012a; 2015; 2016b; 2017a).

A large oil spill could potentially affect air quality by introducing VOCs into the atmosphere through evaporation from the slick. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. Real-time wind and current data from the project area would be available at the time of a spill and would be used to assess the fate and effects of VOCs released. Additional air quality impacts could occur if response measures included *in situ* burning of floating oil. Burning would generate a plume of black smoke and result in emissions of NO_x, SO_x, CO, and PM as well as greenhouse gases. However, *in situ* burning would occur only after authorization from the USCG Federal On-Scene Coordinator. This approval would also be based upon consultation with the regional response team (RRT), including USEPA.

[2] Distance calculated based on the nearest point of block MC 520 (Lat: 28° 29' 50.979" N Long: 88° 12' 41.810" W) to the Breton Wilderness Area. Coordinate geodesy: WGS 1984.

Because of the project area's location (64 statute miles [103 km]) from the nearest shoreline, most air quality impacts would occur in offshore waters with minimal chance to affect onshore air quality. However, depending on the spill trajectory and the effectiveness of spill response measures, coastal air quality could be affected if oil on the sea surface approaches or contacts the coast.

C.1.2 Water Quality

There are no site-specific baseline water quality data for the project area. Deepwater areas in the northern Gulf of Mexico are relatively similar with respect to patterns of water column temperature, salinity, and oxygen (BOEM, 2017a). Kennicutt (2000) noted that the deepwater region has little evidence of contaminants in the dissolved or particulate phases of the water column. Within the northern Gulf of Mexico, there are localized areas (termed natural seeps) that release natural seepage of oil, gas, and brines from sub-surface deposits into near surface sediments and up through the water column. No natural seeps were noted within 610 m (2,000 ft) of the proposed wellsites (BP, 2019a; b).

The only IPFs that may affect water quality are effluent discharges associated with routine operations and two types of accidents (a small fuel spill and a large oil spill) as discussed below.

Impacts of Effluent Discharges

Discharges of treated SBM cuttings may produce temporary, localized increases in suspended solids in the water column around the drilling rig. In general, turbid water can be expected to extend between a few hundred meters and several kilometers down current from the discharge point for water-based drilling muds and cuttings (Neff, 1987). SBMs will be collected on the rig and either reused by the vendor or transported to Port Fourchon, Louisiana, for recycling and disposal at an approved facility. Cuttings wetted with SBMs and SBM discharges associated with weekly safety diverter valve testing on the MODU are expected to be treated to SBM levels at or below NPDES requirements and discharged overboard at the drillsite in accordance with all NPDES permit limitations and requirements. After discharge, SBMs retained on cuttings would be expected to adhere tightly to the cuttings particles and, consequently, would not produce substantial turbidity as the cuttings sink through the water column (Neff et al., 2000). No persistent impacts on water quality in the project area are expected.

Water-based drilling muds and cuttings will be released at the seafloor during the initial well intervals before the marine riser, which allows returns to the surface, is set. Excess cement slurry also will be released at the seafloor during casing installation for the riserless portion of the drilling operations. The seafloor discharges of WBM and associated drill cuttings will result in seafloor disturbances that will produce locally turbid conditions in the water column near the seafloor. The turbidity plume will be carried away from the well by near-bottom currents and, based on current speed(s), may be detectable within tens to hundreds of meters of the wellbore. As suspended WBM and resuspended sediments settle to the seafloor, the water clarity will return to background conditions within minutes to a few hours after drilling of these well intervals ceases (Neff, 1987). Discharges of WBM and cuttings are likely to have little or no impact on water quality due to the low toxicity and rapid dispersion of these discharges (National Research Council, 1983; Neff, 1987; Hinwood et al., 1994).

Treated sanitary and domestic wastes, including those from support vessels, may have a transient effect on water quality in the immediate vicinity of the discharge at the sea surface. Treated sanitary and domestic wastes may have elevated levels of nutrients, organic matter, and chlorine but should dilute rapidly to undetectable levels within tens to hundreds of meters from the source. All NPDES permit limitations and requirements as well as USCG regulations (as applicable) are expected to be met during proposed activities; therefore, little or no impact on water quality from the overboard releases of treated sanitary and domestic wastes is anticipated.

Deck drainage includes all effluents resulting from rain, deck washings, and runoff from curbs, gutters, and drains (including drip pans) in work areas. Rainwater that falls on uncontaminated areas of the drilling rig will flow overboard without treatment. However, rainwater that falls on the drilling rig deck and other areas such as chemical storage areas and places where equipment is exposed (such as drip or containment pans) will be collected, and oil and water will be separated to meet NPDES permit requirements. Based on expected adherence to permit limits and applicable regulations, little or no impact on water quality from deck drainage is anticipated.

Other discharges in accordance with the NPDES permit, such as desalination unit brine; BOP hydraulic fluids; and uncontaminated cooling water, firewater, ballast water, bilge water, and other discharges of seawater and freshwater to which treatment chemicals have been added are expected to dilute rapidly and have little or no impact on offshore water quality.

Support vessels will discharge treated sanitary and domestic wastes. These are not expected to have a significant impact on water quality in the vicinity of the discharges. Support vessel discharges are expected be in accordance with USCG and MARPOL 73/78 regulations and, as applicable, the NPDES Vessel General Permit, and therefore are not expected to cause significant impacts on water quality.

Impacts of a Small Fuel Spill

Potential impacts of a small spill on water quality are expected to be consistent with those analyzed and discussed by BOEM (2012a; 2015; 2016b; 2017a). In the EIA, the small spill scenario is proposed to occur in offshore waters at or near the drilling rig. The probability of a small spill would be minimized by BP's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of BP's OSRP is expected to potentially help mitigate and reduce the impacts. EP Appendix G provides details on spill response measures in addition to the summary information provided in the EIA.

The water-soluble fractions of diesel are dominated by two- and three-ringed PAHs, which are moderately volatile (National Research Council, 2003a). The molecular weight of diesel oil constituents are light to intermediate and can be readily degraded by abiological weathering processes (e.g., evaporation, dissolution, dispersion, and photochemical oxidation) and biological processes (microbial degradation). Diesel oil is much lighter than water (specific gravity is between 0.83 and 0.88, compared to 1.03 for seawater). When spilled on water, diesel oil spreads very quickly to a thin film of rainbow and silver sheens, except for marine diesel, which may form a thicker film of dull or dark colors. However, because diesel oil has a very low viscosity, it is readily dispersed into the water column when winds reach 5 to 7 knots or with breaking waves (NOAA, 2017a). It is possible for the diesel oil that is dispersed by wave action to form droplets that are small enough be kept in suspension and moved by the currents.

Diesel dispersed in the water column can adhere to suspended sediments, but this generally occurs only in coastal areas with high suspended solid loads (National Research Council, 2003a) and would not be expected to occur to any appreciable degree in offshore waters of the Gulf of Mexico.

The extent and persistence of water quality impacts from a small diesel fuel spill would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. It is estimated that more than 90% of a small diesel spill would evaporate or disperse within 24 hours (NOAA, 2016a) (see **Section A.9.1**). The sea surface area covered with a very thin layer of diesel fuel would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions. In addition to removal by evaporation, constituents of diesel oil are readily and completely degraded by naturally occurring microbes (NOAA, 2006; 2017a). Given the open ocean location of the project area, the extent and duration of water quality impacts from a small spill would not be significant.

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on water quality are expected to be consistent with those analyzed and discussed by BOEM (2012a; 2015; 2016b; 2017a).

Most of the spilled oil would be expected to form a slick at the surface, although information from the *Deepwater Horizon* incident indicates that submerged oil droplets can be produced when subsea dispersants are applied at the wellhead (Camilli et al., 2010; Hazen et al., 2010; NOAA, 2011a; b; c). Dispersants would be applied only after approval from the Federal On-Scene Coordinator with collaboration from the USEPA and Regional Response Team Region 6.

The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. Real-time wind and current data from the project area would be available at the time of a spill and would be used to assess the fate and effects of VOCs released. Weathering processes that affect spilled oil on the sea include adsorption (sedimentation), biodegradation, dispersion, dissolution, emulsification, evaporation, and photo oxidation. Most crude oil blends will emulsify quickly when spilled, creating a stable mousse that presents a more persistent cleanup and removal challenge (NOAA, 2017b).

Hazen et al. (2010) studied the impacts and fate of oil released in the deepwater environment after the 2010 *Deepwater Horizon* incident. Initial studies suggested that the potential exists for rapid intrinsic bioremediation (bacterial degradation) of subsea dispersed oil in the water column by deep-sea indigenous microbial activity without significant oxygen depletion (Hazen et al., 2010), although other studies showed that oil bioremediation caused oxygen drawdown in deep waters (Kessler et al., 2011; Dubinsky et al., 2013). Additional studies investigated the effects of deepwater dissolved hydrocarbon gases (e.g., methane, propane, and ethane) and the microbial response to a deepwater oil spill. Results suggest deepwater dissolved hydrocarbon gases may promote rapid hydrocarbon respiration by low-diversity bacterial blooms, thus priming indigenous bacterial populations for rapid hydrocarbon degradation of subsea oil (Kessler et al., 2011; Du and Kessler, 2012; Valentine et al., 2014). A 2017 study identified water temperature, taxonomic composition of initial bacterial community, and dissolved nutrient levels as factors that may regulate oil degradation rates by deep-sea indigenous microbes (Liu et al., 2017).

Due to the project area being located approximately 64 statute miles (103 km) from the nearest shoreline (Plaquemines Parish, Louisiana), it is expected that most water quality impacts would occur in offshore waters before low molecular weight alkanes and volatiles are weathered (Operational Science Advisory Team, 2011), especially in the event of a spill lasting less than 30 days. The 30-day OSRA modeling (**Table 4**) indicates nearshore waters and embayments of Plaquemines Parish, Louisiana, are the coastal areas with the most potential for water quality to be affected (4% probability within three days; 14% probability within 10 days; and 21% probability within 30 days). Other Louisiana shorelines may be affected within 10 days, and shorelines in Mississippi, Alabama, and Florida could be affected within 30 days. The 60-day OSRA model predicts contact of shorelines between Matagorda County, Texas, and Levy County Florida, with a maximum conditional probability of contact of 24% in Plaquemines Parish, Louisiana (**Table 5**) (BOEM, 2017b).

C.2 Seafloor Habitats and Biota

Water depths at the locations of the proposed wellsites range from approximately 2,040 to 2,056 m (6,695 to 6,747 ft) (BP, 2019a; b). According to BOEM (2016a), existing information for the deepwater Gulf of Mexico indicates that the seafloor is composed primarily of soft sediments; exposed hard substrate habitats and associated biological communities are rare. The site clearance letters did not note the presence of hard bottom communities or potential seepage locations within 610 m (2,000 ft) of the proposed wellsite locations (BP, 2019a; b). The IPFs with potential impacts listed in **Table 2** are discussed below.

C.2.1 Soft Bottom Benthic Communities

There are no site-specific benthic community data from the project area. However, data from the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (Wei, 2006; Rowe and Kennicutt, 2009; Wei et al., 2010; Carvalho et al., 2013) can be used to describe typical baseline benthic communities in the area. **Table 6** summarizes data collected at two stations in water depths similar to those in the proposed drilling area.

Table 6. Baseline benthic community data from stations near the project area in similar depths sampled during the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (Adapted from: Wei, 2006; Rowe and Kennicutt, 2009).

Station	Water Depth (m)	Abundance		
		Meiofauna (individuals m^{-2})	Macroinfauna (individuals m^{-2})	Megafauna (individuals ha^{-1})
HiPro	1,565	343,118	5,076	--
S37	2,387	291,179	2,192	1,451

Meiofaunal and megafaunal abundances from Rowe and Kennicutt (2009); macroinfaunal abundance from Wei (2006). -- = no data available. m = meter, ha = hectare.

Densities of meiofauna (animals passing through a 0.5-mm sieve but retained on a 0.062-mm sieve) at stations in the vicinity of the project area ranged from approximately 290,000 to 340,000 individuals m^{-2} (**Table 6**) (Rowe and Kennicutt, 2009). Nematodes, nauplii, and harpacticoid copepods were the three dominant meiofaunal groups, accounting for about 90% of total abundance.

The benthic macroinfauna is characterized by small mean individual sizes and low densities, both of which reflect the meager primary production in surface waters of the Gulf of Mexico continental slope (Wei, 2006). Densities decrease exponentially with water depth. Based on an equation presented by Wei (2006), macroinfaunal densities in the water depths of the project area are expected to range from approximately 1,482 to 1,500 individuals m^{-2}.

Polychaetes are typically the most abundant macroinfaunal group on the northern Gulf of Mexico continental slope, followed by amphipods, tanaids, bivalves, and isopods. Carvalho et al. (2013) found polychaete abundance to be higher in the central region of the northern Gulf of Mexico when compared to the eastern and western regions. Wei (2006) recognized four depth-dependent faunal zones (1 through 4), two of which are divided horizontally. The project area is in Zone 2E, which extends from the Texas-Louisiana slope to the west Florida terrace. The most abundant species in this zone were the polychaetes *Aricidea suecica*, *Litocorsa antennata*, *Paralacydonia paradoxa*, and *Tharyx marioni*; and the bivalve *Heterodonta* spp. (Wei, 2006).

The megafaunal density at a station in the vicinity of the project area was 1,451 individuals ha^{-1}. Common megafauna included motile taxa such as decapod crustaceans, holothurian echinoderms, and demersal fishes as well as sessile taxas such as sponges and octocorals (Rowe and Kennicutt, 2009).

Bacteria also are an important component in terms of biomass and cycling of organic carbon (Cruz-Kaegi, 1998). For example, in deep sea sediments, Main et al. (2015) observed that microbial oxygen consumption rates increased and bacterial biomass decreased with hydrocarbon contamination. Bacterial biomass at the depth range of the project area typically is about 1 to 2 g C m^{-2} in the top 15 cm of sediments (Rowe and Kennicutt, 2009).

IPFs that potentially may affect benthic communities are physical disturbance to the seafloor, effluent discharges (drilling muds and cuttings), and potential effects from large oil spill resulting from a well blowout at the seafloor. A small fuel spill would not affect benthic communities because the diesel fuel is expected to float and dissipate on the sea surface.

Impacts of Physical Disturbance to the Seafloor

In water depths such as those in the project area, DP drillships or semisubmersibles disturb the seafloor only around the wellbore (surface hole location) where the bottom template and BOP are located. Depending upon the specific well configuration, this area is generally about 0.25 ha (0.62 ac) per well (BOEM, 2012a).

The areal extent of these impacts from the DP drilling rig are expected to be small compared to the project area itself, and these types of soft bottom communities are ubiquitous along the northern Gulf of Mexico continental slope (Gallaway, 1988; Gallaway et al., 2003; Rowe and Kennicutt, 2009). Impacts from the physical disturbance of the seafloor during this project are expected be spatially localized and temporally short term. Therefore, these disturbances will not likely have a significant impact on soft bottom benthic communities in the region.

Impacts of Effluent Discharges

Drilling mud and cuttings are the only effluents that could be present in vicinity of the wellsites that are likely to affect local soft bottom benthic communities. During initial well drilling interval(s) before the marine riser is set, cuttings and water-based mud will be released at the seafloor. Excess cement slurry will also be released at the seafloor during casing installation for the riserless portion of the drilling operations. Cement slurry components typically include cement mix and some of the same chemicals used in water-based drilling muds (Boehm et al., 2001). The main impacts will be burial and smothering of benthic organisms within several meters to tens of meters around the wellbore where cuttings and water-based muds physically contact the seafloor. Soft bottom sediments disturbed by cuttings, drilling muds, and cement slurry will eventually be recolonized through larval settlement and migration from adjacent areas. Because some deep-sea biota grow and reproduce slowly, recovery may require several years for the area within meters to tens of meters of the wellbore.

Discharges of washed SBM cuttings from the rig may affect benthic communities, primarily within several hundred meters of the wellsite. The fate and effects of SBM cuttings have been reviewed by Neff et al. (2000), and monitoring studies have been conducted in the Gulf of Mexico by Continental Shelf Associates (2004; 2006). In general, washed cuttings with adhering SBMs tend to clump together and form thick cuttings piles close to the drillsite. Areas of SBM cuttings deposition may develop elevated organic carbon concentrations and anoxic conditions (Continental Shelf Associates, 2006). Where SBM cuttings accumulate in concentrations of approximately 1,000 mg kg^{-1} or higher, benthic infaunal communities may be adversely affected due to both the toxicity of the base fluid and organic enrichment (with resulting anoxia) (Neff et al., 2000). Infauna numbers may increase and diversity may decrease as opportunistic species that tolerate low oxygen and high H_2S predominate (Continental Shelf Associates, 2006). As the base synthetic fluid is decomposed by microbes, the area will gradually return to pre-drilling conditions. Disturbed sediments will be recolonized through larval settlement and migration from adjacent areas.

The areal extent of impacts from drilling discharges will be small. Assuming a typical effect radius of 500 m (1,640 ft), the affected area around the wellsite would represent about 3% of the seafloor within a lease block. Soft bottom communities are ubiquitous along the northern Gulf of Mexico continental slope (Gallaway, 1988; Gallaway et al., 2003; Rowe and Kennicutt, 2009). Impacts from drilling discharges are expected to have no significant impact on soft bottom benthic communities in the region. It is expected that the rig will move to safe zones for short periods of time to perform maintenance on critical equipment. All discharges during these times are expected to meet NPDES permit requirements.

Impacts of a Large Oil Spill

The most likely effects of a subsea blowout on benthic communities would be within a few hundred meters of the wellsite. BOEM (2012a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 300 m (984 ft) radius. While coarse sediments (sands) would probably settle at a rapid rate within 400 m (1,312 ft) from the blowout site, fine sediments (silts and clays) could be resuspended for more than 30 days and dispersed over a wider area. Based on previous studies, surface sediments at the project area are assumed to largely be silt and clay (Rowe and Kennicutt, 2009).

While impacts from a large oil spill are anticipated to be confined to the immediate vicinity of the wellhead, depending on the specific circumstances of the incident, additional benthic community impacts could extend beyond the immediate vicinity of the wellhead (BOEM, 2017a). During the *Deepwater Horizon* incident, subsurface oil plumes were reported in water depths of approximately 1,100 m (3,600 ft), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010).

C.2.2 High-Density Deepwater Benthic Communities

As defined by NTL 2009-G40, high-density deepwater benthic communities are features or areas that could support high-density chemosynthetic communities or features or areas that could support high-density hard bottom communities, including deepwater coral-dominated communities. Chemosynthetic communities were discovered in the central Gulf of Mexico in 1984 and have been studied extensively (MacDonald, 2002). Deepwater coral communities are also known from numerous locations in the Gulf of Mexico (Brooke and Schroeder, 2007; CSA International, 2007; Brooks et al., 2012). In the Gulf of Mexico, deepwater coral communities occur almost exclusively on exposed authigenic carbonate rock created by a biogeochemical (microbial) process.

Monitoring programs on the Gulf of Mexico continental slope have shown that benthic impacts from drilling discharges typically are concentrated within approximately 500 m (1,640 ft) of the wellsite, although detectable deposits may extend beyond this distance (Continental Shelf Associates, 2004; Neff et al., 2005; Continental Shelf Associates, 2006). In water depths such as those encountered in the project area, DP drilling vessels disturb the seafloor only around the wellbore where the bottom template and BOP are located. Depending on the specific well configuration, this area is approximately 0.25 ha (0.62 ac) per well (BOEM, 2012a).

The site clearance letters did not identify any features that could support high-density deepwater benthic communities within 610 m (2,000 ft) of the proposed wellsites (BP, 2019a,b).

The only IPF identified for this project that could affect high-density deepwater benthic communities is a large oil spill from a well blowout at the seafloor. A small fuel spill would not affect benthic communities because the diesel fuel would float and dissipate on the sea surface. Physical disturbance and effluent discharge are not considered IPFs for deepwater benthic communities because these communities are not expected to be present down current of the proposed wellsite.

Impacts of a Large Oil Spill

A large oil spill caused by a seafloor blowout could cause direct impacts (i.e., caused by the physical impacts of a blowout) on benthic communities within approximately 300 m (984 ft) of the wellhead (BOEM, 2012a; 2013). However, based on the site clearance letters for the proposed wellsites (BP, 2019a; b), there are no seafloor features that could support high-density deepwater benthic communities within 610 m (2,000 ft) of the proposed wellsite. Therefore, this type of impact is not expected.

Additional benthic community impacts could extend beyond the immediate vicinity of the wellhead, depending on the specific circumstances (BOEM, 2017a). During the *Deepwater Horizon* spill, subsurface plumes were reported at a water depth of approximately 1,100 m (3,600 ft), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). Oil plumes that contact sensitive benthic communities before degrading could potentially impact the resource (BOEM, 2017a). Potential impacts on sensitive resources would be an integral part of the decision and approval process for the use of dispersants, and such approval would be obtained from the Federal On-Scene Coordinator upon consultation with the regional response team (RRT), including USEPA, prior to the use of dispersants.

The biological effects and fate of the oil remaining in the Gulf of Mexico from the *Deepwater Horizon* incident are still being studied, but numerous papers have been published discussing the nature of subsea oil plumes (e.g. Ramseur, 2010; Reddy et al., 2012; Valentine et al., 2014). . Hazen et al. (2010) reported changes in plume hydrocarbon composition with distance from the source. Incubation experiments with environmental isolates demonstrated faster than expected hydrocarbon biodegradation rates at 5°C (41°F). Based on these results, Hazen et al. (2010) suggested the potential exists for intrinsic bioremediation of the oil plume in the deepwater column without substantial oxygen drawdown.

Potential impacts of oil on high-density deepwater benthic communities are discussed in recent EISs (BOEM, 2012a; 2015; 2016b; 2017a). Oil droplets or oiled sediment particles could come into contact with chemosynthetic organisms or deepwater corals in the vicinity of the spill site. Impacts could include loss of habitat, biodiversity, and live coral coverage; destruction of hard substrate; reduction or loss of one or more commercial and recreational fishery habitats; or changes in sediment characteristics (BOEM, 2012a; 2017a).

C.2.3 Designated Topographic Features

The lease block is not within or near a designated topographic feature or a no-activity zone as identified in NTL 2009-G39. The nearest designated Topographic Feature Stipulation Block is located approximately 78 statute miles (126 km) west of the project area. There are no IPFs associated with routine operations that could cause impacts to designated topographic features.

Due to the distance from the project area, it is unlikely that designated topographic features could be affected by an accidental spill. A small fuel spill would float and dissipate on the surface and would not reach these seafloor features. In the event of an oil spill from a well blowout, a surface slick would not contact these seafloor features. If a subsurface plume were to occur, impacts on these features would be unlikely due to the distance and the difference in water depth. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge.

C.2.4 Pinnacle Trend Area Live Bottoms

The project area is not covered by the Live Bottom (Pinnacle Trend) Stipulation. As defined by NTL 2009-G39, the nearest Pinnacle Stipulation Block is located approximately 48 statute miles (77 km) north of the project area. There are no IPFs associated with routine operations that could cause impacts to pinnacle trend area live bottoms due to the distance from the project area.

Due to the distance from the project area, it is unlikely that pinnacle trend live bottom areas would be affected by an accidental spill. A small fuel spill would float on the surface and would not reach these seafloor features. In the event of an oil spill from a well blowout, a surface slick would not contact these seafloor features. If a subsurface plume were to occur, impacts on these features would be unlikely due to the distance and the difference in water depth. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge.

C.2.5 Eastern Gulf Live Bottoms

The project area is not covered by the Live Bottom (Low-Relief) Stipulation, which applies to seagrass communities and low-relief hard bottom reef within the Eastern Gulf of Mexico Planning Area leases in water depths of 100 m (328 ft) or less and portions of Pensacola and Destin Dome Area blocks in the Central Gulf of Mexico Planning Area. The nearest block covered by the Live Bottom Stipulation, as defined by NTL 2009-G39, is located approximately 65 statute miles (105 km) north-northeast of the project area. There are no IPFs associated with routine operations that could cause impacts to eastern Gulf live bottom areas due to the distance from the project area.

Because of the distance from the project area, it is unlikely that Eastern Gulf live bottom areas would be affected by an accidental spill. A small fuel spill would float and dissipate on the surface and would not reach these seafloor features. In the event of an oil spill from a well blowout, a surface slick would not contact these seafloor features. If a subsurface plume were to occur, impacts on these features would be unlikely due to the distance and the difference in water depth. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf.

C.3 Threatened, Endangered, and Protected Species and Critical Habitat

This section discusses species listed as Endangered or Threatened under the Endangered Species Act (ESA). In addition, it includes all marine mammal species in the region, all of which are protected under the Marine Mammal Protection Act (MMPA).

Endangered or Threatened species that may occur in the project area and/or along the northern Gulf Coast are listed in **Table 7**. The table also indicates the location of critical habitat (if designated in the Gulf of Mexico). Critical habitat is defined as (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. The National Marine Fisheries Service (NMFS) has jurisdiction for ESA-listed marine mammals (cetaceans), sea turtles, and fishes in the Gulf of Mexico. The USFWS has jurisdiction for ESA-listed birds, the West Indian manatee, and sea turtles while on their nesting beaches.

Table 7. Federally listed Endangered and Threatened species potentially occurring in the project area and along the northern Gulf Coast.

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Marine Mammals					
Bryde's whale	*Balaenoptera edeni*[1]	E	X	--	None
Sperm whale	*Physeter macrocephalus*	E	X	--	None
West Indian manatee	*Trichechus manatus*[2]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T,E[3]	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); *Sargassum* habitat including most of the central & western Gulf of Mexico.
Green turtle	*Chelonia mydas*	T	X	X	None
Leatherback turtle	*Dermochelys coriacea*	E	X	X	None
Hawksbill turtle	*Eretmochelys imbricata*	E	X	X	None
Kemp's ridley turtle	*Lepidochelys kempii*	E	X	X	None
Birds					
Piping Plover	*Charadrius melodus*	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	*Grus americana*	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Fishes					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	X	--	None
Giant manta ray	*Manta birostris*	T	X	X	None
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Nassau grouper	*Epinephelus striatus*	T	--	X	None
Smalltooth sawfish	*Pristis pectinata*	E	--	X	Southwest Florida
Invertebrates					
Elkhorn coral	*Acropora palmata*	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	*Acropora cervicornis*	T	--	X	Florida Keys and the Dry Tortugas
Pillar coral	*Dendrogyra cylindrus*	T	--	X	None
Rough cactus coral	*Mycetophyllia ferox*	T	--	X	None
Lobed star coral	*Orbicella annularis*	T	--	X	None
Mountainous star coral	*Orbicella faveolata*	T	--	X	None
Boulder star coral	*Orbicella franksi*	T	--	X	None
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus* subsp. *ammobates, allophrys, trissyllepsis,* and *peninsularis,* respectively	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	E	--	X	None

E = endangered; T = threatened; X = potentially present; -- = not present.

[1]Distinct (unnamed) Gulf of Mexico subspecies

[2] There are two subspecies of West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern Gulf of Mexico to Virginia, and the Antillean manatee (*T. m. manatus*), which ranges from northern Mexico to eastern Brazil. Only the Florida manatee subspecies is likely to be found in the northern Gulf of Mexico. On 30 March 2017, the USFWS announced the West Indian manatee, including the Florida manatee subspecies, was reclassified as threatened.

[3] [3]The Northwest Atlantic Ocean Distinct Population Segment (DPS) of loggerhead turtles is designated as Threatened (76 *Federal Register* [*FR*] 58868). The National Marine Fisheries Service and the U.S. Fish and Wildlife Service designated critical habitat for this DPS, including beaches and nearshore reproductive habitat in Mississippi, Alabama, and the Florida Panhandle as well as *Sargassum* spp. habitat throughout most of the central and western Gulf of Mexico (79 *FR* 39756 and 79 *FR* 39856).

Coastal Endangered or Threatened species that may occur along the northern Gulf Coast include the West Indian manatee, Piping Plover, Whooping Crane, Gulf sturgeon, and four subspecies of *Peromyscus* beach mouse. Critical habitat has been designated for all of these species as indicated in **Table 7** and discussed in individual sections.

The sperm whale, five species of sea turtles, and the oceanic whitetip shark are the only Endangered or Threatened species likely to occur in or near the project area. The listed sea turtles include the leatherback turtle, Kemp's ridley turtle, hawksbill turtle, loggerhead turtle, and green turtle (Pritchard, 1997). Effective 11 August 2014, NMFS has designated certain marine areas as critical habitat for the Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle (see **Section C.3.5**). No critical habitat has been designated in the Gulf of Mexico for the leatherback turtle, Kemp's ridley turtle, hawksbill turtle, green turtle, or the sperm whale. Five endangered mysticetes (blue whale, fin whale, humpback whale, North Atlantic right whale, and sei whale) have been reported in the Gulf of Mexico, but are considered rare or extralimital (Würsig et al., 2000). These species are not included in the most recent NMFS stock assessment report (Hayes et al., 2019) nor in the most recent BOEM multisale EIS (BOEM, 2017a); therefore, they are not considered further in the EIA.

The Bryde's whale exists in the Gulf of Mexico as a small, resident population. It is the only baleen whale known to be resident to the Gulf and is federally listed as Endangered. The genetically distinct Northern Gulf of Mexico stock is severely restricted in range, being found almost exclusively in its core distribution area within the northeastern Gulf in the waters of the DeSoto Canyon (Waring et al., 2016) and are therefore expected to be uncommon within the project area. The Threatened giant manta ray (*Manta birostris*) is known from the Gulf of Mexico and could occur in the project area but is most commonly observed in the Gulf of Mexico at the Flower Garden Banks. The Nassau grouper (*Epinephelus striatus*) has been observed in the Gulf of Mexico at the Flower Garden Banks but is most commonly observed in shallow tropical reefs of the Caribbean and is not expected to occur in the project area.

Seven Threatened coral species are known from the northern Gulf of Mexico: elkhorn coral (*Acropora palmata*), staghorn coral (*Acropora cervicronis*), lobed star coral (*Orbicella annularis*), mountainous star coral (*Orbicella faveolata*), boulder star coral (*Orbicella franksi*), pillar coral (*Dendrogyra cylindrus*), and rough cactus coral (*Mycetophyllia ferox*). These corals are shallow water, zooxanthellate species (containing symbiotic photosynthetic zooxanthellae which contribute to their nutritional needs) and so are not present in the deepwater project area (see **Section C.3.15**). The giant manta ray (*Manta birostris*) could occur in the project area but is most commonly observed in the Gulf of Mexico at the Flower Garden Banks.

There are no other Threatened or Endangered species in the Gulf of Mexico that are reasonably likely to be adversely affected by either routine or accidental events. The IPFs with potential impacts listed in **Table 2** are discussed below.

C.3.1 Sperm Whale (Endangered)

The Endangered marine mammal likely to be present at or near the project area is the sperm whale (*Physeter macrocephalus*). Resident populations of sperm whales occur within the Gulf of Mexico; a species description is presented in the recovery plan for this species (NMFS, 2010b). Gulf of Mexico sperm whales are classified as an Endangered species and a "strategic stock" (defined as a stock that may have unsustainable human-caused impacts) by NOAA Fisheries

(Waring et al., 2016). A "strategic stock" is defined by the MMPA as a marine mammal stock that meets the following criteria:

- The level of direct human-caused mortality exceeds the potential biological removal level;
- Based on the best available scientific information, is in decline and is likely to be listed as a threatened species under the ESA within the foreseeable future; or
- Is listed as a Threatened or Endangered species under the ESA, or is designated as depleted under the MMPA.

Current threats to sperm whale populations are defined as "any factor that could represent an impediment to recovery." Current threats to sperm whale populations worldwide include fisheries interactions, anthropogenic marine sound, vessel interactions, contaminants and pollutants, disease, injury from marine debris, research, predation and natural mortality, direct harvest, competition for resources, loss of prey base due to climate change and ecosystem change, and cable laying. In the Gulf of Mexico, the impacts from many of these threats are identified as either low or unknown (BOEM, 2012a).

In 2013, NMFS conducted a status review to consider designating the Gulf of Mexico population of the sperm whale as a DPS under the ESA but concluded that the designation of a Gulf of Mexico DPS for sperm whales was not warranted (78 FR 68032).

The distribution of sperm whales in the Gulf of Mexico is correlated with mesoscale physical features such as eddies associated with the Loop Current (Jochens et al., 2008). Sperm whale populations in the north-central Gulf of Mexico are present throughout the year (Davis et al., 2000). Results of a multi-year tracking study show female sperm whales are typically concentrated along the upper continental slope between the 200- and 1,000-m (656 and 3,280 ft) depth contours (Jochens et al., 2008). Male sperm whales were more variable in their movements and were documented in water depths greater than 3,000 m (9,843 ft). Generally, groups of sperm whales observed in the Gulf of Mexico during the MMS-funded Sperm Whale Seismic Study (SWSS) consisted of mixed-sex groups comprising adult females with juveniles, and groups of bachelor males. Typical group size for mixed groups was 10 individuals (Jochens et al., 2008).

A review of PSO sighting reports from seismic mitigation surveys in the Gulf of Mexico conducted over a 6-year period found a mean group size for sperm whales of 2.5 individuals (Barkaszi et al., 2012). In these mitigation surveys, sperm whales were the most common large cetacean encountered. Tagging and observation data from the SWSS also showed that sperm whales transit through the vicinity of the project area. Movements of satellite-tracked individuals suggest that this area of the continental slope is within the home range of the Gulf of Mexico population (within the 95% utilization distribution) (Jochens et al., 2008).

IPFs that may potentially affect sperm whales include drilling rig presence, underwater sound, and lights; support vessel and helicopter marine sound; support vessel collisions; and two types of accidents – a small fuel spill and a large oil spill. Effluent discharges are likely to have negligible impacts on sperm whales due to rapid dilution, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these marine mammals. Compliance with NTL BSEE-2015-G03 is intended to minimize the potential for marine debris-related impacts on sperm whales.

Though NMFS (2020) stated marine debris as an IPF, compliance with BSEE NTL 2015-G03 and NMFS (2020) Appendix B will minimize the potential for marine debris-related impacts on sperm whales. NMFS (2020) estimates that no more than three sperm whales will be non-lethally taken, with one sperm whale lethally taken through the ingestion of marine debris over 50 years of proposed action. Therefore, marine debris is likely to have negligible impacts on sperm whales and is not discussed further (See **Table 2**).

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Sound from routine drilling activities (see **Section A.1**) has the potential to disturb individuals or groups of sperm whales or mask the sounds they would normally produce or hear. Behavioral responses to sound by marine mammals vary widely and overall, are short-term and include, temporary displacement or cessation of feeding, resting, or social interactions (NMFS, 2009a; Gomez et al., 2016). Additionally, behavioral changes resulting from auditory masking sounds may induce an animal to produce more calls, longer calls, or shift the frequency of the calls. For example, masking caused by vessel sound was found to result in a reduced number of whale calls in the Gulf of Mexico (Azzara et al., 2013).

NMFS (2016) lists sperm whales in the same functional hearing group (i.e., mid frequency cetaceans) as most dolphins and other toothed whales, with an estimated hearing sensitivity from 150 Hz to 160 kHz. Therefore, DP vessel related sound is likely to be heard by sperm whales. Frequencies <150 Hz produced by the drilling operations may be audible, but are not likely to be perceived with any significance by mid-frequency cetaceans. The sperm whale may possess better low frequency hearing than some of the other odontocetes, although not as low as many baleen whale species whose vocalizations between 30 Hz and 5 kHz (Wartzok and Ketten, 1999). Generally, most of the vocalizations produced by sperm whales occur at frequencies below 10 kHz, although diffuse energy up to and past 20 kHz is common, with source levels up to 236 dB re1 µPa m (Møhl et al., 2003).

It is expected that, due to the relatively stationary nature of the proposed drilling operations, sperm whales would move away from the proposed operations area, and sound levels that could cause auditory injury would be avoided. Sound associated with proposed vessel operations may cause behavioral disturbances to sperm whales. Observations of behavioral responses of marine mammals to anthropogenic sounds, in general, have been limited to short term behavioral responses, which included the cessation of feeding, resting, or social interactions (NMFS, 2009a). Animals can determine the direction from which a sound arrives based on cues, such as differences in arrival times, sound levels, and phases at the two ears. Thus, an animal's directional hearing capabilities have a bearing on its ability to avoid sound sources (National Research Council, 2003b). Received root-mean-square sound pressure levels (SPL_{rms}) of 120 dB re 1 µPa from a non-impulsive source are considered high enough to elicit a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, exposure to a SPL_{rms} of 120 dB re 1 µPa alone does not equate to a behavioral response or a biological consequence; rather it represents the level at which onset of a behavioral response may occur. In actuality, behavioral effects are highly contextual, dependent on the environmental in which the source is producing sound, life stage of the animal, and the animal's past experience with similar types of sound (Southall et al., 2007; Ellison et al., 2012).

The most recent acoustic criteria (NMFS, 2018a) are based on received sound level accumulations that equate to the onset of marine mammal auditory threshold shifts. For mid frequency cetaceans exposed to a non-impulsive sources, permanent threshold shifts are estimated to occur when the mammal has received a cumulative sound exposure level (SEL_{cum}) of 198 dB re 1 μPa^2 s over a 24-hour period. Similarly, temporary threshold shifts are estimated to occur when the mammal has received a SEL_{cum} of 178 dB re 1 μPa^2 s over a 24-hour period. While above-threshold levels may occur up to 100s of meters away from the source, the transient nature of sperm whales and the stationary nature of installation activities make it unlikely that any sperm whales will remain in proximity to drilling activities for a full 24-hour period to receive SEL_{cum} necessary for the onset of auditory threshold shifts.

There are other OCS facilities and activities near the project area, and the region as a whole has a large number of similar marine sound sources. Drilling-related marine sound associated with this project may contribute to increases in the ambient soundscape within the region, but it is not expected to be at amplitudes sufficient to result in auditory injuries to sperm whales. The proposed activity may cause behavioral effects, primarily avoidance or temporary displacement from the project area, but are not expected to be biologically significant for the population. Drilling rig lighting and presence are not expected to impact sperm whales (NMFS, 2007; BOEM, 2016a; 2017a).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sperm whales, and there is also a risk of vessel collisions, which are identified as a threat in the recovery plan for this species (NMFS, 2010b). To reduce the potential for vessel collisions, BOEM issued BOEM-2016-G01. This NTL recommends that vessel operators and crews receive protected species identification training. Vessel operators are required to maintain a vigilant watch for and report sightings of any injured or dead protected species. In addition, when sperm whales are sighted, vessel operators and crews are required to maintain a distance of 100 m (328 ft) or greater whenever possible (NTL BOEM 2016-G01 and NMFS, 2020).

Vessel operators are required to reduce vessel speed to 10 knots or less, as safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel (NTL BOEM-2016-G01). When sperm whales are sighted while a vessel is underway, the vessel should take action (e.g., attempt to remain parallel to the whale's course, avoid excessive speed or abrupt changes in direction until the whale has left the area) as necessary to avoid violating the relevant separation distance. However, if the sperm whale is sighted within this distance, the vessel should reduce speed and shift the engine to neutral and not re-engage until the whale is outside of the separation area. This does not apply to any vessel towing gear (NMFS [2020] Appendix C). Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing sperm whales. However, this mitigation is effective only during daylight hours and during periods of adequate visibility.

NMFS (2020) analyzed the potential for vessel collisions and harassment of sperm whales in its Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. NMFS concluded that the observed avoidance of passing vessels by sperm whales is an advantageous response to avoid a potential threat and is not expected to result in any significant effect on migration, breathing, nursing, breeding, feeding, or sheltering to individuals, or have any consequences at the level of the population. With the implementation of the NMFS vessel collision protocols listed in Appendix C of NMFS (2020) in addition to the NTL BOEM-2016-G01, NMFS concluded that the likelihood of collisions between vessels and sperm whales would be reduced during daylight hours. During nighttime and during periods of poor visibility, it is assumed that vessel noise and sperm whale avoidance of moving vessels would reduce the chance of vessel collisions with this species. It is, however, likely that a collision between a sperm whale and a moving support vessel would result in severe injury or mortality of the stricken animal. The current Potential Biological Removal (PBR) level for the Gulf of Mexico stock of sperm whales is 1.1 (Hayes et al., 2019). The PBR level is defined by the MMPA 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. Mortality of a single sperm whale would constitute a significant impact to the local (Gulf of Mexico) stock of sperm whales but would not likely be significant at the species level.

Helicopter traffic also has the potential to disturb sperm whales. Smultea et al. (2008) documented responses of sperm whales offshore Hawaii to fixed wing aircraft flying at an altitude of 245 m (800 ft). A reaction to the initial pass of the aircraft was observed during 3 (12%) of 24 sightings. All three responses consisted of a hasty dive and occurred at less than 360 m (1,180 ft) lateral distance from the aircraft. Additional reactions were seen when aircraft circled certain whales to make further observations. Based on other studies of cetacean responses to sound, the authors concluded that the observed reactions to brief overflights by the aircraft were short-term and limited to behavioral disturbances.

While flying offshore in the Gulf of Mexico, support helicopters maintain altitudes above 213 m (700 ft) during transit to and from the working area. In the event that a whale is observed during transit, the helicopter will not approach or circle the animals. Although whales may respond to helicopters (Smultea et al., 2008), NMFS (2020) concluded that this altitude would minimize the potential for disturbing sperm whales. Therefore, no significant impacts are expected.

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals, including sperm whales, are discussed by NMFS (2020) and BOEM (2017a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011) with discussions germane to the Gulf of Mexico populations concerning composition and fate of petroleum and spill-treating agents in the marine environment, aspects of cetacean ecology, and physiological and toxic effects of oil on cetaceans. For this EP, there are no unique site-specific issues with respect to spill impacts on these animals that were not analyzed in the previous documents.

The probability of a fuel spill will be minimized by BP’s preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of BP’s OSRP will mitigate and lessen the potential for impacts on sperm whales. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be brief.

A small fuel spill in offshore waters would produce a thin sheen on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and marine sound of response vessels and aircraft (MMC, 2011). However, due to the limited areal extent and short duration of water quality impacts from a small fuel spill as well as the mobility of sperm whales, no significant impacts would be expected.

The probability of a fuel spill will be minimized by BP's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of BP's OSRP will mitigate and lessen the potential for impacts on sperm whales. Given the open ocean location of the project area, the duration of a small spill and therefore potential for impacts to occur are expected to be brief.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals, including sperm whales, are discussed by NMFS (2020) and BOEM (2017a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011). For this EP, there are no unique site-specific issues with respect to spill impacts on sperm whales.

Impacts of oil spills on sperm whales can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and marine sound of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Hayes et al., 2019). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals, including displacement from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb sperm whales and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for colliding with or disturbing these animals.

C.3.2 Bryde's Whale (Endangered)

The Bryde's whale (*Balaenoptera edeni*) is the only year-round resident baleen whale in the northern Gulf of Mexico. The Bryde's whale is most frequently sighted in the waters over the DeSoto Canyon between the 100 m (328 ft) and 400 m (3,280 ft) isobaths (Rosel et al., 2016; Hayes et al., 2019). Although their distribution is primarily restricted to the DeSoto Canyon, available data suggests it is possible that Bryde's whales could occur in the project area, although their presence would be uncommon.

Bryde's whales found in the Gulf of Mexico are distinct from Bryde's whales worldwide and are considered a separate (unnamed) subspecies. The Gulf of Mexico Bryde's whale subspecies was classified by NOAA as an Endangered species under the ESA on May 15, 2019.

IPFs that could affect the Bryde's whales include drilling rig presence, marine sound, and lights; support vessel and helicopter traffic; and both types of spill accidents: a small fuel spill and a large oil spill. It is unlikely that the Bryde's whales could occur in the project area. Effluent discharges are likely to have negligible impacts on Bryde's whales due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility and low abundance of Bryde's whales in the Gulf of Mexico.

Though NMFS (2020) identified marine debris as an IPF, compliance with BSEE NTL 2015-G03 and NMFS (2020) Appendix B will minimize the potential for marine debris-related impacts on Bryde's whales. NMFS (2020) estimated one sublethal take and no lethal takes of Bryde's whales from marine debris over 50 years of proposed action. Therefore, marine debris is likely to have negligible impacts on Bryde's whales and is not further discussed (See **Table 2**).

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Sound produced by the drilling rig may be emitted at levels that could potentially disturb individual whales or mask the sounds animals would normally produce or hear. Sound associated with drilling and installation activities is relatively low in intensity relative to impulsive sources such as airgun sounds, and an individual animal's sound exposure would be transient. As discussed in **Section A.1**, an actively drilling rig may produce broadband (10 Hz to 10 kHz) sound with a root-mean-square source level (SL_{rms}) of approximately 180 to 190 dB re 1 µPa m (Hildebrand, 2005). Sound produced by the drilling rig may be emitted at levels that could potentially disturb individual whales or mask the sounds animals would normally produce or hear. However, it is worth noting most source level estimates for active drilling rigs assume a single point source, when in reality multiple DP thrusters are dispersed around the rig which contribute to received sound levels near the rig. This results in source levels close to the rig being overestimated.

NMFS (2018b) lists Bryde's whales in the functional hearing group of low frequency cetaceans (baleen whales), with an estimated hearing sensitivity from 7 Hz to 35 kHz. Therefore, vessel related sound is likely to be heard by Bryde's whales. Frequencies <1,000 Hz produced by the drilling operations are more likely to be perceived by low-frequency cetaceans.

It is expected that, due to the relatively stationary nature of the drilling operations, Bryde's whales would move away from the proposed operations area, and sound levels that could cause auditory injury would be avoided. Sound associated with proposed vessel or semisubmersible operations using DP thrusters may cause behavioral disturbances to individual Bryde's whales. NMFS (2018b) presents criteria that are used in the interim to determine behavioral disturbance thresholds for marine mammals and are applied equally across all hearing groups. Received SPL_{rms} of 120 dB re 1 µPa from a non-impulsive source are considered high enough to elicit a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, exposure to a SPL_{rms} of 120 dB re 1 µPa does not equate to a behavioral response or a biological consequence; rather it represents the level at which onset of a behavioral response may occur. In actuality, behavioral effects are highly contextual, dependent on the environmental in which the source is producing sound, life stage of the animal, and the animal's past experience with similar types of sound (Southall et al., 2007; Ellison et al., 2012).

For low frequency cetaceans, specifically the Bryde's whale, permanent and temporary threshold shift onset is estimated to occur at SEL_{cum} of 199 dB re 1 µPa^2 s and 179 re 1 µPa^2 s, repectively. While above-threshold levels may occur up to 100s of meters away from the source, the stationary nature of installation activities and animal movement or avoidance behavior from Bryde's whales make it unlikely that any Bryde's whale will remain in proximity to drilling activities for a full 24-hour period to receive SEL_{cum} necessary for the onset of auditory threshold shifts

The drilling rig will be located within a deepwater, open ocean environment. Sounds generated by drilling operations will be generally non-impulsive, with some variability in sound level and frequency. This analysis assumes that the continuous nature of sounds produced by the drilling rig will provide individual whales with cues relative to the direction and relative distance (sound intensity) of the sound source, and the fixed position of the drilling rig will allow for active avoidance of potential physical impacts. Drilling-related sound associated with this project may contribute to increases the ambient sound in the region, but it is not expected to be at amplitudes sufficient enough to cause hearing effects to Bryde's whales. Furthermore, it is very unlikely that Bryde's whales occur within the project area and occur only in low densities in the Gulf of Mexico; therefore, no significant impacts are expected.. Drilling rig lighting and presence are not expected to impact Bryde's whales (BOEM, 2017a).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb Bryde's whales and creates of the potential for vessel collisions. To reduce the potential for vessel collisions, BOEM has issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid colliding with protected species and requires operators to report sightings of any injured or dead protected species. When whales are sighted, vessel operators and crews are required to maintain a distance of 1,640 ft (500 m) or greater whenever possible (NTL BOEM-2016-G01; NMFS, 2020). Vessel operators are required to reduce vessel speed to 10 knots or less, as safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel (NTL BOEM-2016-G01). When a Bryde's whale is sighted while a vessel is underway, the vessel should take action (e.g., attempt to remain parallel to the whale's course, avoid excessive speed or abrupt changes in direction until the whale has left the area) as necessary to avoid violating the relevant separation distance. However, if the whale is sighted within this distance, the vessel should reduce speed and shift the engine to neutral and not re-engage until the whale is outside of the separation area. This does not apply to any vessel towing gear (NMFS [2020] Appendix C). However, this mitigation is effective only during daylight hours and during periods of adequate visibility.

Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing Bryde's whales. The current PBR level for the Gulf of Mexico stock of Bryde's whale is 0.03 (Hayes et al., 2019). Mortality of a single Bryde's whale would constitute a significant impact to the local (Gulf of Mexico) stock of Bryde's whales.

However, it is very unlikely that Bryde's whale occur within the project area, including the transit corridor for support vessels; consequently, the probability of a vessel collision with this species is extremely low.

Helicopter traffic also has the potential to disturb Bryde's whales. Based on studies of cetacean responses to sound, the observed responses to brief overflights by aircraft were short-term and limited to behavioral disturbances (Smultea et al., 2008). Helicopters maintain altitudes above 213 m (700 ft) during transit to and from the offshore working area. In the event that a whale is observed during transit, the helicopter will not approach or circle the animal(s). In addition, guidelines and regulations issued by NMFS under the authority of the MMPA specify that helicopters maintain an altitude of 305 m (1,000 ft) within 100 m (328 ft) of marine mammals (BOEM, 2016a; 2017a; NMFS, 2020). Due to the brief potential for disturbance the low density of Bryde's whales thought to reside in the Gulf of Mexico, no significant impacts are expected.

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by NMFS (2020) and BOEM (2012a; 2015; 2016b; 2017a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011). In the unlikely event of a spill, implementation of BP's OSRP will mitigate and reduce the potential for impacts on Bryde's whales. Given the open ocean location of the project area and the duration of a small spill, any impacts are expected to be brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill as well as the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours (NOAA, 2016a). The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and sound of response vessels and aircraft (MMC, 2011). However, due to the limited areal extent and short duration of water quality impacts from a small fuel spill, as well as the mobility of Bryde's whales and the unlikelihood of occurrence in the project area, no significant impacts are expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012a; 2015; 2016b; 2017a), and NMFS (2020). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011).

Potential impacts of a large oil spill on Bryde's whales could include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, sound, and dispersants) (MMC, 2011). Direct physical and physiological effects could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey;

and stress from the activities and sound of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Hayes et al., 2019). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb Bryde's whales and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 (see Table 1) to reduce the potential for colliding with or disturbing these animals. In the event of oil from a large spill contacting Bryde's whales, it is expected that impacts resulting in the injury or death of individual Bryde's whales would be significant based on the current PBR level for the Gulf of Mexico subspecies and stock (0.03). Mortality of a single Bryde's whale would constitute a significant impact to the local (Gulf of Mexico) stock of Bryde's whales. The core distribution area for Bryde's whales is within the eastern Gulf of Mexico OCS Planning Area; therefore, it is very unlikely that Bryde's whales occur within the project area and surrounding waters. Consequently, the probability of spilled oil from a project-related well blowout reaching Bryde's whales is extremely low.

C.3.3 West Indian Manatee (Threatened)

Most of the Gulf of Mexico manatee population is located in peninsular Florida, but manatees have been seen as far west as Texas during the summer (U.S. Fish and Wildlife Service, 2001). A species description is presented in the West Indian manatee recovery plan (U.S. Fish and Wildlife Service, 2001a). Critical habitat has been designated in southwest Florida.

Manatee sightings in Louisiana have increased as the species extends its presence farther west of Florida in the warmer months (Wilson, 2003). Manatees are typically found in coastal and riverine habitats, but have rarely been seen in deepwater areas, usually in colder months when they seek refuge from colder coastal waters (U.S. Fish and Wildlife Service, 2001a; Fertl et al., 2005; Pabody et al., 2009). There have been three verified reports of Florida manatee sightings by PSOS on the OCS during seismic mitigation surveys in mean water depths of over 600 m (1,969 ft) (Barkaszi and Kelly, 2019).

IPFs that potentially may affect manatees include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the project area would be unlikely to affect manatees, as the project area is approximately 64 statute miles (103 km) from the nearest shoreline (Louisiana). As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with BSEE-NTL 2015-G03 is intended to minimize the potential for marine debris-related impacts on manatees.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb manatees, and there is also a risk of vessel collisions, which are identified as a threat in the recovery plan for this species (U.S. Fish and Wildlife Service, 2001). Manatees are expected to be limited to shelf and coastal waters, and impacts are expected to be limited to transits of these vessels and helicopters through these waters. To reduce the potential for vessel collisions, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessel operators and that vessels slow down or stop their vessel to avoid colliding with protected species. Vessel collision avoidance measures described in NMFS (2020) for the marine mammal species managed by that agency may also provide some additional indirect protections to manatees. If a manatee is sighted, vessels associated with the operation should operate at “no wake/idle speed within that area, follow routes in deep water whenever possible, and attempt to maintain a distance of 50 m if practical. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling).

Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing manatees during daylight hours. The current PBR level for the Florida subspecies of Antillean manatee is 14 (USFWS, 2014). In the event of a vessel collision during support vessel transits, the mortality of a single manatee would constitute an adverse but insignificant impact to the subspecies.

Helicopter traffic also has the potential to disturb manatees. Rathbun (1988) reported that manatees were disturbed more by helicopters than by fixed-wing aircraft; however, the helicopter was flown at relatively low altitudes of 20 to 160 m (66 to 525 ft). Helicopters used in support operations maintain a minimum altitude of 213 m (700 ft) while in transit offshore, 305 m (1,000 ft) over unpopulated areas or across coastlines, and 610 m (2,000 ft) over populated areas and sensitive habitats such as wildlife refuges and park properties. In addition, guidelines and regulations specify that helicopters maintain an altitude of 305 m (1,000 ft) within 100 m (328 ft) of marine mammals (BOEM, 2017a; NMFS, 2020). This mitigation measure will minimize the potential for disturbing manatees. No significant impacts are expected.

Impacts of a Large Oil Spill

The potential for significant impacts to manatees from a large oil spill would be most likely associated with coastal oiling in areas of manatee habitats. The OSRA results summarized in **Table 4** predict that Plaquemines Parish in Louisiana is the coastal area most likely to be affected (4% probability within 3 days; 14% probability within 10 days; and 21% probability within 30 days). Other Louisiana shorelines may be affected within 10 days, and shorelines in Mississippi, Alabama, and Florida could be affected within 30 days. There is no manatee critical habitat designated in these areas, and the number of manatees potentially present is a small fraction of the population residing in peninsular Florida. The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, may be contacted within 60 days of a spill. This range does not include any areas of manatee critical habitat.

In the event that manatees were exposed to oil, effects could include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include asphyxiation, acute poisoning, lowering of tolerance to other stress, nutritional stress, and inflammation from infection (BOEM, 2017a). Indirect impacts include stress from the activities and sound of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event that a large spill reached coastal waters where manatees were present, the level of vessel and aircraft activity associated with spill response could disturb manatees and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels would be expected to operate in accordance with NTL BOEM-2016-G01 (see **Table 1**) to reduce the potential for colliding with or disturbing these animals. The current PBR level for the Florida subspecies of Antillean manatee is 14 (USFWS, 2014). It is not anticipated that groups of manatees would occur in coastal waters of the north central GOM; therefore, in the event of mortality of individual manatees from a large oil spill would constitute an adverse but insignificant impact to the subspecies.

C.3.4 Non-Endangered Marine Mammals (Protected)

Excluding the three Endangered or Threatened species that have been cited previously, there are 20 additional species of whales and dolphins (cetaceans) that may be found in the Gulf of Mexico, including dwarf and pygmy sperm whales, four species of beaked whales, and 14 species of delphinid whales (dolphins). All marine mammals are protected species under the MMPA. The most common non-endangered cetaceans in the deepwater environment are small odontocetes such as the pantropical spotted dolphin, spinner dolphin, and bottlenose dolphin. A brief summary is presented below, and additional information on these groups is presented by BOEM (2017a).

<u>Dwarf and pygmy sperm whales</u>. At sea, it is difficult to differentiate dwarf sperm whales (*Kogia sima*) from pygmy sperm whales (*Kogia breviceps*), and sightings are often grouped together as *Kogia* spp. Both species have a worldwide distribution in temperate to tropical waters. In the Gulf of Mexico, both species occur primarily along the continental shelf edge and in deeper waters off the continental shelf (Mullin et al., 1991; Mullin, 2007; Waring et al., 2016). Either species could occur in the project area.

<u>Beaked whales</u>. Four species of beaked whales are known to occur in the Gulf of Mexico: Blainville's beaked whale (*Mesoplodon densirostris*), Sowerby's beaked whale (*Mesoplodon bidens*), Gervais' beaked whale (*Mesoplodon europaeus*), and Cuvier's beaked whale (*Ziphius cavirostris*). Stranding records (Würsig et al., 2000) as well as passive acoustic monitoring in the Gulf of Mexico (Hildebrand et al., 2015) suggest that Gervais' beaked whale and Cuvier's beaked whale are the most common species in the region. The Sowerby's beaked whale is considered extralimital, with only one document stranding in the Gulf of Mexico (Bonde and O'Shea, 1989). Blainville's beaked whales are rare, with only four documented strandings in the northern Gulf of Mexico (Würsig et al., 2000).

Due to the difficulties of at sea identification, beaked whales in the Gulf of Mexico are identified either as Cuvier's beaked whales or are grouped into an undifferentiated species complex (*Mesoplodon* spp.). In the northern Gulf of Mexico, they are broadly distributed in water depths greater than 1,000 m (3,281 ft) over lower slope and abyssal landscapes (Davis et al., 2000; Hldebrand et al., 2015). Any of these species could occur in the project area (Waring et al., 2016).

Delphinids. Fourteen species of delphinids are known from the Gulf of Mexico, including Atlantic spotted dolphin (*Stenella frontalis*), bottlenose dolphin (*Tursiops truncatus*), Clymene dolphin (*Stenella clymene*), false killer whale (*Pseudorca crassidens*), Fraser's dolphin (*Lagenodelphis hosei*), killer whale (*Orcinus orca*), melon-headed whale (*Peponocephala electra*), pantropical spotted dolphin (*Stenella attenuata*), pygmy killer whale (*Feresa attenuata*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), spinner dolphin (*Stenella longirostris*), and striped dolphin (*Stenella coeruleoalba*). Any of these species could occur in the project area (Waring et al., 2016).

The bottlenose dolphin (*Tursiops truncatus*) is a common inhabitant of the northern Gulf of Mexico, particularly within continental shelf waters. There are two ecotypes of bottlenose dolphins, a coastal form and an offshore form, which are genetically isolated from each other (Waring et al., 2016). The offshore form of the bottlenose dolphin may occur within the project area. Inshore populations of coastal bottlenose dolphins in the northern Gulf of Mexico are separated into 31 geographically distinct population units, or stocks, for management purposes by NMFS (Hayes et al., 2019).

IPFs that potentially may affect non-endangered marine mammals include drilling rig presence, marine sound, and lights; support vessel and helicopter traffic; and two types of accidents – a small fuel spill and a large oil spill. Effluent discharges are likely to have negligible impacts on marine mammals due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of marine mammals. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on marine mammals.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

The presence of the drilling rig presents an attraction to pelagic food sources that may attract cetaceans. Some odontocetes have shown increased feeding activity around lighted platforms at night (Todd et al., 2009). Therefore, prey congregation could pose an attraction to protected species that exposes them to higher levels or longer durations of sound that might otherwise be avoided. Drilling and support vessel presence and lighting are not considered as IPFs for marine mammals (BOEM, 2017a).

If the vessel is equipped with a moon pool, a trained crew member or company representative must monitor the moon pool area for marine mammals during operations. If a marine mammal is detected in the moon pool, immediate reporting to NMFS, BOEM, and BSEE is required (NMFS, 2020).

Sound from routine drilling and well completion operations has the potential to disturb marine mammals. As discussed in **Section A.1**, sound impacts would be expected at greater distances when DP thrusters are in use than with vessel and drilling sounds alone and are dependent on variables relating to sea state conditions, thruster type and usage. Three functional hearing groups are represented in the 20 non-endangered cetaceans found in the Gulf of Mexico. Eighteen of the 20 odontocete species are considered to be in the mid-frequency functional hearing group and two species (*Kogia* spp.) are in the high frequency functional hearing group, (NMFS, 2018b). Thruster and drilling sound will affect each group differently depending on the frequency bandwidths produced by operations. Generally, sounds produced by drilling rigs on

DP is dominated by frequencies below 10 kHz. Thus, drilling rig DP sound sources are out of range for the high frequency group.

For mid frequency cetaceans exposed to a non-impulsive source (like drilling operations), permanent threshold shifts are estimated to occur when the mammal has received a SEL_{cum} of 198 dB re 1 μPa^2 s over a 24-hour period (NMFS, 2018b). Similarly, temporary threshold shifts are estimated to occur when a mammal has received a SEL_{cum} of 178 dB re 1 μPa^2 s over a 24-hour period. Due to the transient nature of marine mammals and the stationary nature of drilling activities, it is not expected that any marine mammals will remain in proximity to the source for a full 24-hour period to receive SEL_{cum} necessary for the onset of auditory threshold shifts. Received SPL_{rms} of 120 dB re 1 μPa from non-impulsive sources are considered high enough to elicit a behavioral reaction in some marine mammal species. The SPL_{rms} 120 dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, exposure to a SPL_{rms} of 120 dB re 1 μPa does not equate to a behavioral response or a biological consequence; rather it represents the level at which onset of a behavioral response may occur. In actuality, behavioral effects are highly contextual, dependent on the environmental in which the source is producing sound, life stage of the animal, and the animal's past experience with similar types of sound (Southall et al., 2007; Ellison et al., 2012).

There are other OCS facilities and activities near the project area, and the region as a whole has a large number of similar sources. Marine mammal species in the northern Gulf of Mexico have been exposed to sound from anthropogenic sources for a long period of time and over large geographic areas and likely do not represent a naïve population with regard to sound (National Research Council, 2003b). Due to the limited scope, timing, and geographic extent of installation activities, this project would represent a small, temporary contribution to the overall soundscape, and any short-term behavioral impacts are not expected to be biologically significant to marine mammal populations. Support vessel lighting and presence are not expected to impact marine mammals by BOEM (2017a).

Drilling rig lighting and rig presence are not identified as IPFs for marine mammals by BOEM (2017a).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb marine mammals, and there is also a risk of vessel collisions. Data concerning the frequency of vessel collisions are presented by BOEM (2012a). To reduce the potential for vessel collisions, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessels operators and that vessels slow down or stop to avoid colliding with protected species. The NTL also requires that operators and crews maintain a vigilant watch for marine mammals and report sightings of any injured or dead protected species. Vessel operators and crews are required to attempt to maintain a distance of 100 m (328 ft) or greater when toothed whales are sighted and 50 m (164 ft) when small cetaceans are sighted (NMFS, 2020). When cetaceans are sighted while a vessel is underway, vessels must attempt to remain parallel to the animal's course and avoid excessive speed or abrupt changes in direction until the cetacean has left the area. Vessel operators are required to reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel, when safety permits. These mitigation measures are only effective during daylight hours, or in sea and weather conditions where cetaceans are sighted. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 meters from all "other aquatic protected species" including sea turtles, with an exception made for those animals that approach the vessel. Vessel speeds must also be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages (greater than three) of any marine mammal are observed near a vessel. When aquatic protected species are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array, site clearance trawling). Use of these measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing marine mammals, and therefore no significant impacts are expected.

Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing cetaceans. The current PBR level for several non-endangered cetacean species in the Gulf of Mexico are less than 3 individuals (e.g., rough-toothed dolphin = 2.5, Clymene dolphin = 0.6, killer whale = 0.1, pygmy killer whale = 0.8, dwarf, and pygmy sperm whales = 0.9) (Hayes et al. 2019). Mortality of individuals equal to or in excess of their PBR level would constitute a significant impact to the local (Gulf of Mexico) stocks of these species.

Aircraft traffic also has the potential to disturb marine mammals (Würsig et al., 1998). However, while flying offshore, helicopters maintain altitudes above 213 m (700 ft) during transit to and from the working area. In addition, guidelines and regulations specify that helicopters maintain an altitude of 305 m (1,000 ft) within 100 m (328 ft) of marine mammals (BOEM, 2012a; 2016a). Maintaining this altitude will minimize the potential for disturbing marine mammals, and no significant impacts are expected (BOEM, 2017a; NMFS, 2020).

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012a; 2015; 2016b). Oil impacts on marine mammals in general are discussed by Geraci and St. Aubin (1990). For this EP, there are no unique site-specific issues with respect to spill impacts on these animals.

The probability of a fuel spill is expected to be minimized by BP's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of BP's OSRP is expected to lessen the potential for impacts on marine mammals. EP Appendix G provides detail on spill response measures, and those measures are summarized in the EIA. Given the open ocean location of the project area, the limited duration of a small spill, and response efforts, it is expected that any impacts would be brief and minimal.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce the concentrations of petroleum hydrocarbons and their degradation products. Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and sound of response vessels and aircraft (MMC, 2011). The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. A small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (**Section A.9.1**). Therefore, due to the limited areal extent and short duration of water quality impacts from a small fuel spill as well as the mobility of marine mammals, no significant impacts would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues. Impacts of oil spills on marine mammals can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey. Complications of the above may lead to dysfunction of immune and reproductive systems (De Guise et al., 2017), physiological stress, declining physical condition, and death. Indirect impacts could include stress from the activities and sound of response vessels and aircraft. Behavioral responses can include displacement of animals from prime habitat (McDonald et al., 2017), disruption of social structure, change in prey availability and foraging distribution or patterns, change in reproductive behavior/productivity, and change in movement patterns or migration (MMC, 2011).

In the event of a large spill, response activities that may impact marine mammals include increased vessel traffic and remediation activities (e.g., use of dispersants, controlled burns, skimmers, boom, etc.) (BOEM, 2017a). The increased level of vessel and aircraft activity associated with spill response could disturb marine mammals, potentially resulting in behavioral changes. The large number of response vessels could result in vessel collisions, entanglement or other injury, or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for colliding with or disturbing these animals, and therefore no significant impacts are expected. The application of dispersants greatly reduces exposure risks to marine mammals as the dispersants would remove oil from the surface thereby reducing the risk of contact and rendering it less likely to adhere to skin, baleen plates, or other body surfaces (BOEM, 2017a). Based on the current PBR level for several non-endangered cetacean species in the Gulf of Mexico that are less than 3 individuals (e.g., rough-toothed dolphin = 2.5, Clymene dolphin = 0.6, killer whale = 0.1, pygmy killer whale = 0.8, dwarf and pygmy sperm whales = 0.9) (Hayes et al. 2019), mortality of individuals equal to or in excess of their PBR level would constitute a significant impact to the local (Gulf of Mexico) stocks of these species.

C.3.5 Sea Turtles (Endangered/Threatened)

Five species of Endangered or Threatened sea turtles may be found near the project area. Endangered species include the leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) turtles. As of 6 May 2016, the entire North Atlantic DPS of the green turtle (*Chelonia mydas*) is listed as Threatened (81 FR 20057). The DPS of loggerhead turtles (*Caretta caretta*) that occurs in the Gulf of Mexico is listed as Threatened, although other DPSs are Endangered.

Critical habitat has been designated for the loggerhead turtle in the Gulf of Mexico as shown in **Figure 3**. Loggerhead turtles in the Gulf of Mexico are part of the Northwest Atlantic Ocean DPS (76 FR 58868). In July 2014, NMFS and the USFWS designated critical habitat for this DPS (NMFS, 2014b). The USFWS designation (79 FR 39756) includes nesting beaches in Jackson County, Mississippi; Baldwin County, Alabama; and Bay, Gulf, and Franklin Counties in the Florida Panhandle as well as several counties in southwest Florida and the Florida Keys (and other areas along the Atlantic coast). The NMFS designation (79 FR 39856) includes nearshore reproductive habitat within 0.99 miles (1.6 km) seaward of the mean high-water line along these same nesting beaches. NMFS also designated a large area of shelf and oceanic waters, termed *Sargassum* habitat, in the Gulf of Mexico (and Atlantic Ocean) as critical habitat. *Sargassum* is a brown algae (Class Phaeophyceae) that takes on a planktonic, often pelagic existence after being removed from reefs during rough weather. Rafts of *Sargassum* serve as important foraging and developmental habitat for numerous fishes, and young sea turtles, including loggerhead turtles. NMFS designated three other categories of critical habitat; of these, two (migratory habitat and overwintering habitat) are along the Atlantic coast and the third (breeding habitat) is found in the Florida Keys and along the Florida east coast (NMFS, 2014b).

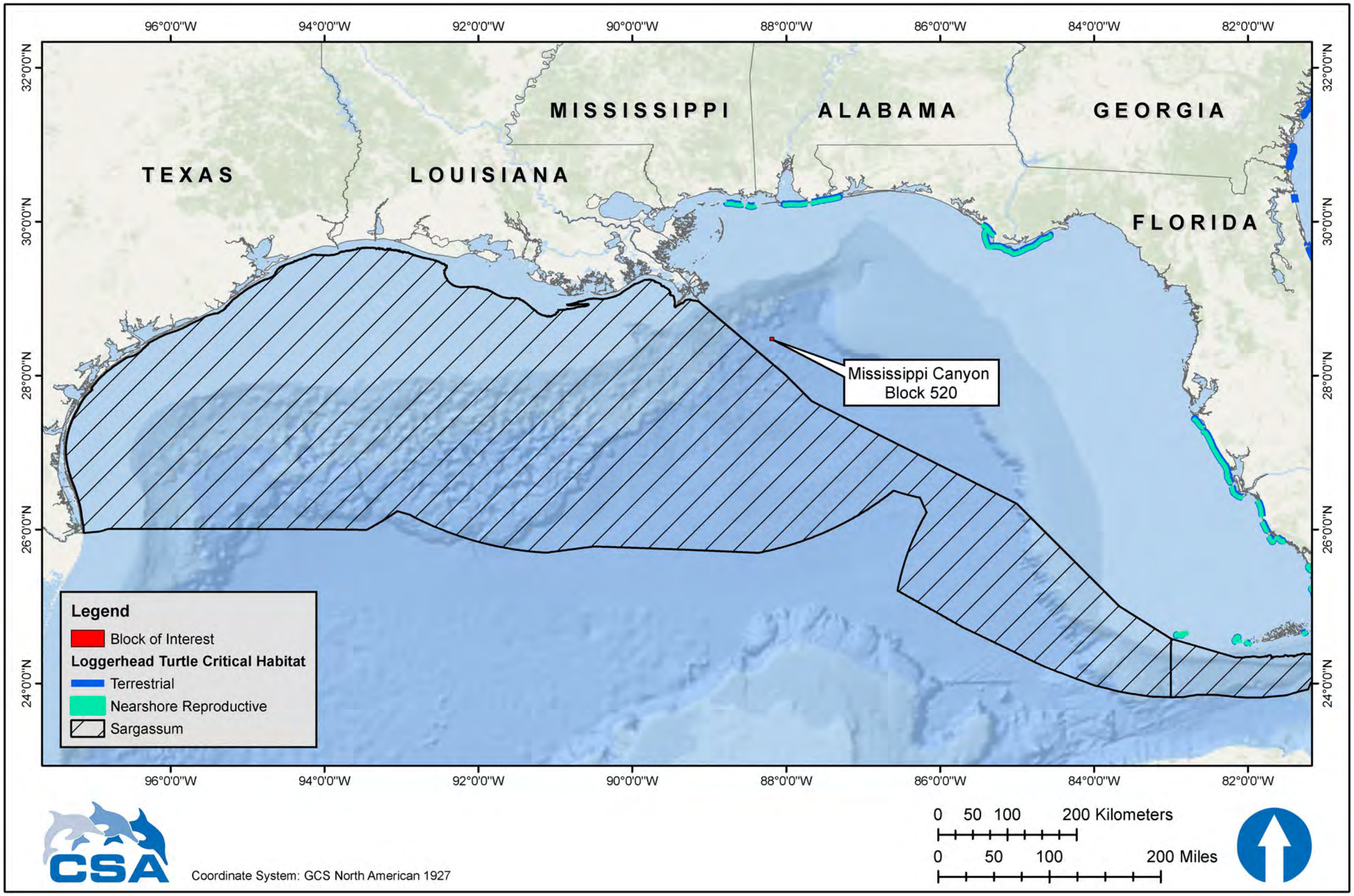

Figure 3. Location of loggerhead turtle designated critical habitat in relation to the project area.

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 117 statute miles (188 km) north of the project area. The project area is located approximately 14 statute miles (23 km) from the boundary of the designated *Sargassum* critical habitat for loggerhead sea turtles (**Figure 3**).

Leatherbacks are the species most likely to be present near the project area, as they feed on populations of gelatinous plankton, such as jellyfish and salps in all water depths. Loggerhead, green, hawksbill, and Kemp's ridley turtles are typically inner-shelf and nearshore species but may be found transiting in oceanic waters during seasonal migrations. Loggerheads are more likely to occur or be attracted to offshore structures than the other species. Hatchlings or juveniles of any of the sea turtle species may be present in deepwater areas, including the project area, where they may be associated with *Sargassum* spp. and other flotsam. All five sea turtle species in the Gulf of Mexico are migratory and use different marine habitats according to their life stage. These habitats include high-energy beaches for nesting females and emerging hatchlings and pelagic convergence zones for hatchling and juvenile turtles. As adults, green, hawksbill, and loggerhead turtles forage primarily in shallow, benthic habitats. Leatherback turtles are the most pelagic of the sea turtles, feeding primarily on jellyfish.

Sea turtle nesting in the northern Gulf of Mexico can be summarized by species as follows:

- Loggerhead turtles – Loggerhead turtles nest in significant numbers along the Florida Panhandle (Florida Fish and Wildlife Conservation Commission, 2018a) and, to a lesser extent, from Texas through Alabama (NMFS and USFWS, 2008).
- Green and leatherback turtles – Green and leatherback turtles infrequently nest on Florida Panhandle beaches (Florida Fish and Wildlife Conservation Commission, 2018b; c).
- Kemp's ridley turtles – The critically endangered Kemp's ridley turtle nests almost exclusively on a 16-mile (26-km) stretch of coastline near Rancho Nuevo in the Mexican state of Tamaulipas (NMFS, 2011). A much smaller population nests in Padre Island National Seashore, Texas, mostly as a result of reintroduction efforts (NMFS, 2011). As of early June 2020, a total of 216 Kemp's ridley turtle nests have been counted on Texas beaches for the 2020 nesting season. A total of 190 Kemp's ridley turtle nests were counted on Texas beaches during the 2019 nesting season and a total of 250 Kemp's ridley turtle nests were counted on Texas beaches during the 2018 nesting season. These are a decrease from the 353 Kemp's ridley turtle nests counted in the 2017 nesting season (Turtle Island Restoration Network, 2020). Padre Island National Seashore along the coast of Willacy, Kenedy, and Kleberg Counties in southern Texas, is the most important nesting location for this species in the United States, although there have been occasional reports of Kemp's ridleys nesting in Alabama (Share the Beach, 2016).
- Hawksbill turtles – Hawksbill turtles typically do not nest anywhere near the project area, with most nesting in the region located in the Caribbean Sea and on the beaches of the Yucatán Peninsula (U.S. Fish and Wildlife Service, 2016a).

IPFs that could potentially affect sea turtles include drilling rig presence, marine sound, and lights; support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges are likely to have negligible impacts on sea turtles due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges.

Though NMFS (2020) stated marine debris as an IPF, compliance with NTL BSEE 2015-G013 (See **Table 1**) and NMFS (2020) Appendix B will minimize the potential for marine debris-related impacts on sea turtles. NMFS (2020) estimated a small proportion of individual sea turtles would be adversely affected from exposure to marine debris. Therefore, marine debris is likely to have negligible impacts on sea turtles and is not further discussed (See **Table 2**).

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by sea turtles (Samuel et al., 2005, Popper et al., 2014). Potential impacts may include behavioral disruption and temporary or permanent displacement from the area near the sound source. There is scarce information regarding hearing and acoustic thresholds for marine turtles.

Sea turtles can hear low to mid-frequency sounds and they appear to hear best between 200 and 750 Hz; they do not respond well to sounds above 2,000 Hz, although primary hearing frequency ranges vary per species and life stage (Ketten and Bartol, 2005; Dow Piniak et al., 2012a,b; Martin et al., 2012; Piniak et al., 2016). The currently accepted hearing and response estimates are derived from fish hearing data rather than from marine mammal hearing data in combination with the limited experimental data available (Popper et al., 2014). There are no quantitative criteria for injury in sea turtles from non-impulsive sources, rather Popper et al. (2014) provide qualitative levels of potential risk based on how far an animal is from the source (i.e., near, intermediate, far). For behavior, Blackstock et al. (2018) suggested using an SPL_{rms} threshold of 175 dB re 1 µPa based on responses of sea turtles to airgun signals reported by McCauley et al., 2000). No distinction is made between impulsive and non-impulsive sources for these thresholds. Certain sea turtles, especially loggerheads, may be attracted to offshore structures (Lohoefener et al., 1990; Gitschlag et al., 1997) and thus may be more susceptible to impacts from sounds produced during routine drilling activities. Any impacts would likely be short-term behavioral changes such as diving and evasive swimming, disruption of activities, or departure from the area. Because of the limited scope and short duration of drilling activities, these short-term impacts are not expected to be biologically significant to sea turtle populations.

Artificial lighting can disrupt the nocturnal orientation of sea turtle hatchlings (Tuxbury and Salmon, 2005; Berry et al., 2013; Simões et al., 2017). However, hatchlings may rely less on light cues when they are offshore than when they are emerging on the beach (Salmon and Wyneken, 1990). NMFS (2007) concluded that the effects of lighting from offshore structures on sea turtles are insignificant.

NMFS (2020) stated sea turtles have the potential to be entangled or entrapped in moon pools, and though many sea turtles could exit the moon pool under their own volition, sublethal effects could occur. If the vessel is equipped with a moon pool, a trained crew member or company representative will monitor the moon pool area for sea turtles during operations. If a sea turtle is detected in the moon pool, it will be immediately reported to NMFS, BOEM, and BSEE.

Based on the moon pool entrapment cases of sea turtles reported and successful rescues and releases that have occurred, NMFS (2020) estimated approximately about one sea turtle will be sub lethally entrapped in moon pools every year. Therefore, no significant impacts are expected.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sea turtles, and there is also a risk of vessel collisions. Data show that vessel traffic is one cause of sea turtle mortality in the Gulf of Mexico (Lutcavage et al., 1997). While adult sea turtles are visible at the surface during the day and in clear weather, they can be difficult to spot from a moving vessel when resting below the water surface, during nighttime, or during periods of inclement weather. To reduce the potential for vessel collisions, BOEM issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for sea turtles and slow down or stop their vessel to avoid colliding with protected species, and requires operators to report sightings of any injured or dead protected species. When sea turtles are sighted, vessel operators and crews must, to the maximum extent possible, attempt to maintain a distance of 164 ft (50 m) or greater whenever possible (NMFS [2020] Appendix C). When sea turtles are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling). Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing sea turtles. Therefore, no significant impacts are expected.

Sound generated from support helicopter traffic also has the potential to disturb sea turtles. However, while flying offshore, helicopters maintain altitudes above 213 m (700 ft) during transit to and from the working area. This altitude is intended to minimize the potential for disturbing sea turtles, and no significant impacts are expected (NMFS, 2007; BOEM, 2012a).

Impacts of a Small Fuel Spill

Potential spill impacts on sea turtles are discussed by NMFS (2020) and BOEM (2017a). For this EP, there are no unique site-specific issues with respect to spill impacts on sea turtles.

The probability of a fuel spill is expected to be minimized by BP's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of BP's OSRP is expected to minimize potential impacts on sea turtles. EP Appendix G provides details on spill response measures. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and sound of response vessels and aircrafts (NMFS, 2014a). The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions. Therefore, due to the limited areal extent and short duration of water quality impacts from a small fuel spill, no significant impacts to sea turtles from direct or indirect exposure would be expected.

Loggerhead Critical Habitat – Nesting Beaches. A small fuel spill in the project area would be unlikely to affect sea turtle nesting beaches due to the distance from the nearest shoreline. Loggerhead turtle nesting beaches and nearshore reproductive habitat designated as critical habitat are located in Mississippi, Alabama, and the Florida Panhandle, at least 117 statute miles (188 km) from the project area. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to natural dispersion.

Loggerhead Critical Habitat – *Sargassum.* The project area is approximately 14 statute miles (23 km) from the designated *Sargassum* critical habitat for the loggerhead turtles (**Figure 3**). Due to the distance from the project area, a small diesel fuel spill is unlikely to affect *Sargassum* and juvenile turtles in this habitat. However, if juvenile sea turtles come into contact with or ingest diesel oil, impacts could include death, injury, or other sublethal effects. Effects of a small spill on *Sargassum* critical habitat for loggerhead turtles would be limited to the small area (0.5 to 5 ha [1.2 to 12 ac]) likely to be impacted by a small spill. An impact area of 5 ha (12 ac) would represent a negligible portion of the approximately 40,662,810 ha (100,480,000 ac) designated *Sargassum* critical habitat for loggerhead turtles in the northern Gulf of Mexico. However, if juvenile sea turtles are present in the area impacted, significant impacts to the regional population could occur.

Impacts of a Large Oil Spill

Impacts of oil spills on sea turtles can include direct impacts from oil exposure as well as indirect impacts due to response activities (e.g., vessel traffic, marine sound, and dispersant use). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes and smoke (e.g., from *in situ* burning of oil); ingestion of oil (and dispersants) directly or via contaminated food; and stress from the activities and marine sound of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing food availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (NOAA, 2010; NMFS, 2014a). In the unlikely event of a spill, implementation of BP's OSRP is expected to minimize the potential for these types of impacts on sea turtles. EP Appendix G provides further details on spill response measures.

Studies of oil effects on loggerhead turtles in a controlled setting (NOAA, 2010, Lutcavage et al., 1995) suggest that sea turtles show no avoidance behavior when they encounter an oil slick, and any sea turtle in an affected area would be expected to be exposed. Sea turtles' diving behaviors also put them at risk. Sea turtles rapidly inhale a large volume of air before diving and continually resurface over time, which may result in repeated exposure to volatile vapors and oiling (NMFS, 2007).

Loggerhead Critical Habitat – Nesting Beaches. If spilled oil reaches sea turtle nesting beaches, nesting sea turtles and egg development could be affected (NMFS, 2007). An oiled beach could affect nest site selection or result in no nesting at all (e.g., false crawls). Upon hatching and successfully reaching the water, hatchlings are subject to the same types of oil spill exposure hazards as adults. Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects, from acute toxicity to impaired movement and normal bodily functions (NMFS, 2007).

The 30-day OSRA results summarized in **Table 4** estimate that Louisiana, Mississippi, Alabama, and Florida shorelines that may support limited sea turtle nesting could be contacted within 30 days (1 to 21% conditional probability). Plaquemines Parish in Louisiana is the coastal area most likely to be affected (4% probability within 3 days; 14% probability within 10 days; and 21% probability within 30 days). The 60-day OSRA modeling (**Table 5**) predicts the conditional probability of contacting Mississippi, Alabama, and Florida Panhandle shorelines that support significant loggerhead sea turtle nesting is 24% or less. The nearest nearshore reproductive critical habitat for the loggerhead turtle in Baldwin County, Alabama is 85 miles (137 km) from the project area and is predicted by the 60-day OSRA model to have an 18% or less conditional probability of contact within 60 days of a spill.

<u>Loggerhead Critical Habitat – *Sargassum*</u>. The project area is approximately 14 statute miles (23 km) from the loggerhead turtle critical habitat designated as *Sargassum* habitat, which includes most of the Western and Central Planning Areas in the Gulf of Mexico and parts of the southern portion of the Eastern Planning Area (**Figure 3**) (NMFS, 2014b). Because of the large area covered by the designated *Sargassum* critical habitat for loggerhead turtles, a large spill could result in a substantial part of the *Sargassum* critical habitat in the northern Gulf of Mexico being oiled. However, the 2010 *Deepwater Horizon* spill affected approximately one-third of the *Sargassum* habitat in the northern Gulf of Mexico (BOEM, 2014). It is unlikely that the entire 40,662,810 ha (100,480,000 ac) of *Sargassum* critical habitat would be affected by a large spill. Because *Sargassum* spp. is a floating, pelagic species, it would only be affected by impacts that occur near the surface.

The effects of oiling on *Sargassum* spp. vary with spill severity, but moderate to heavy oiling that could occur during a large spill could cause complete mortality to *Sargassum* and its associated communities (BOEM, 2017a). *Sargassum* spp. also has the potential to sink during a large spill, thus temporarily removing the habitat and possibly being an additional pathway of exposure to the benthic environment (Powers et al., 2013). Lower levels of oiling may cause sub-lethal affects, including a reduction in growth, productivity, and recruitment of organisms associated with *Sargassum* spp. The *Sargassum* spp. algae itself could be less impacted by light to moderate oiling than associated organisms because of a waxy outer layer that might help protect it from oiling (BOEM, 2016b) *Sargassum* spp. has a yearly seasonal cycle of growth and a yearly cycle of migration from the Gulf of Mexico to the western Atlantic. A large spill could affect a large portion of the annual crop of the algae; however, because of its ubiquitous distribution and seasonal cycle, recovery of the *Sargassum* spp. community would be expected to occur within one to two years (BOEM, 2017a).

Impacts to sea turtles from a large oil spill and associated cleanup activities would depend on spill extent, duration, and season (relative to turtle nesting season); the amount of oil reaching the shore; the importance of specific beaches to sea turtle nesting; and the level of cleanup vessel and beach crew activity required. In the event of oil from a large spill, it is expected that impacts resulting in the injury or death of individual sea turtles would be adverse but not likely significant at the population level. In the event that spilled oil reached nesting beaches during nesting period(s), the level of mortality (and impact) would increase.

C.3.6 Piping Plover (Threatened)

The Piping Plover (*Charadrius melodus*) is a migratory shorebird that overwinters along the southeastern U.S. and Gulf of Mexico coasts. This Threatened species experienced declines in population as a result of hunting, habitat loss and modification, predation, and disease (U.S. Fish and Wildlife Service, 2003). However, as a result of intensive conservation and management, populations of Piping Plover appear to have been increasing since 1991 throughout its range (Bird Life International, 2018). Critical overwintering habitat has been designated, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida (**Figure 4**). Piping Plovers inhabit coastal sandy beaches and mudflats, feeding by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening (U.S. Fish and Wildlife Service, nd).

A large oil spill is the only IPF that potentially may affect Piping Plovers. There are no IPFs associated with routine project activities that could affect these birds. A small fuel spill in the project area would be unlikely to affect Piping Plovers because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Sound from helicopters would be unlikely to significantly affect piping plover populations, because it is assumed that helicopters will maintain an altitude of 305 m (1,000 ft) over unpopulated areas or across coastlines.

Impacts of a Large Oil Spill

The project area is approximately 66 statute miles (106 km) from the nearest shorelines designated as critical habitat for the Piping Plover (**Figure 4**). The 30-day OSRA modeling (**Table 4**) predicts that Piping Plover critical habitat in Plaquemines Parish, Louisiana, could be contacted within 3 days of a spill (4% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that during the fall, there is a 24% conditional probability that an oil spill from the project area would reach a shoreline designated as critical habitat for the Piping Plover within 60 days of a spill.

Plovers could physically oil themselves while foraging on oiled shores or secondarily contaminate themselves through ingestion of oiled intertidal sediments and prey (BOEM, 2017a). Piping Plovers congregate and feed along tidally-exposed banks and shorelines, following the tidal boundary and foraging at the water's edge. It is possible that some deaths of Piping Plovers could occur, especially if spills occur during winter months when plovers are most common along the coastal Gulf or if spills contacted critical habitat. Impacts could also occur from vehicular traffic on beaches and other activities associated with spill cleanup. BP has extensive resources available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

However, a large spill that contacts shorelines would not necessarily substantially impact Piping Plovers. In the aftermath of the *Deepwater Horizon* incident, Gibson et al. (2017) completed thorough surveys of coastal Piping Plover habitat in coastal Louisiana, Mississippi, and Alabama and found that only 0.89% of all observed Piping Plovers were visibly oiled, leaving the authors to conclude that the *Deepwater Horizon* incident did not substantially affect Piping Plover populations.

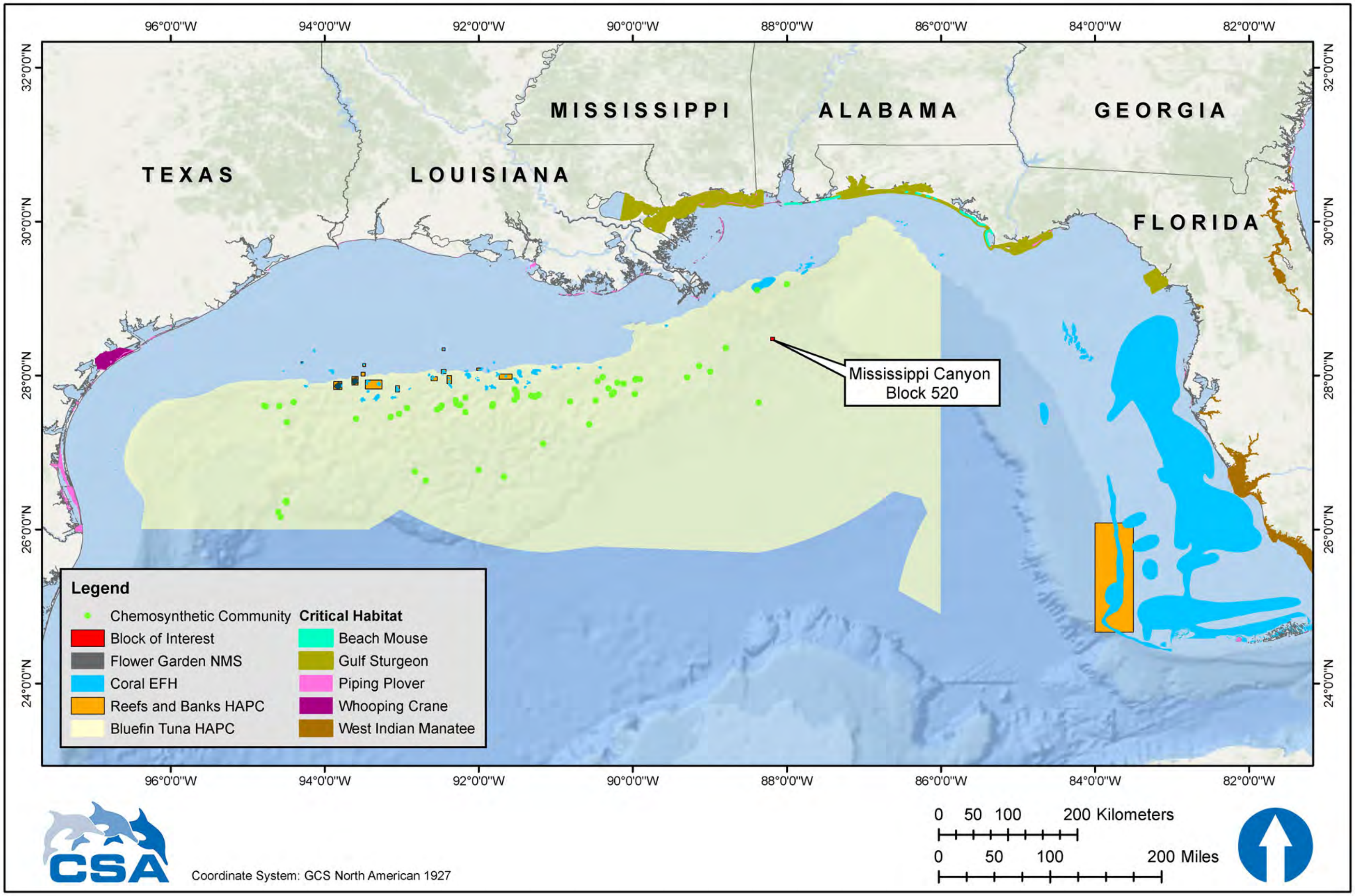

Figure 4. Location of selected environmental features in relation to the project area.

C.3.7 Whooping Crane (Endangered)

The Whooping Crane (*Grus americana*) is a large omnivorous wading bird listed as an endangered species. Three wild populations live in North America (National Wildlife Federation, 2016). One population overwinters along the Texas coast at Aransas NWR and summers at Wood Buffalo National Park in Canada. This population represents the majority of the world's population of free-ranging Whooping Cranes, reaching a record estimated population of 506 at Aransas NWR during the 2019 to 2020 winter (USFWS, 2020). A non-migrating population was reintroduced in central Florida, and another reintroduced population summers in Wisconsin and migrates to the southeastern U.S. for the winter (USFWS, 2015). Whooping Cranes breed, migrate, winter, and forage in a variety of habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields (U.S. Fish and Wildlife Service, 2007). About 9,000 ha (22,240 ac) of salt flats on Aransas NWR and adjacent islands comprise the principal wintering grounds of the Whooping Crane. Aransas NWR is designated as critical habitat for the species.

A large oil spill is the only IPF that potentially may affect Whooping Cranes. A small fuel spill in the project area would also be unlikely to affect Whooping Cranes, due to the distance from Aransas NWR. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior natural dispersion.

Impacts of a Large Oil Spill

A large oil spill is unlikely to affect Whooping Cranes as the project area is approximately 502 statute miles (808 km) from the Aransas NWR, which is the nearest designated critical habitat. The 30-day OSRA modeling (**Table 4**) predicts a <0.5% or less chance of oil contacting Whooping Crane critical habitat within 30 days of a spill. The 60-day OSRA model (**Table 5**) predicts that there is a <0.5% or less chance oil contacting Whooping Crane critical habitat within 60 days of a spill.

In the event of oil exposure, Whooping Cranes could physically oil themselves while foraging in oiled areas or secondarily contaminate themselves through ingestion of contaminated shellfish, frogs, and fishes. It is possible that some Whooping Crane deaths could occur, especially if a spill occurred during winter months when Whooping Cranes are most common along the Texas coast and if the spill contacts their critical habitat in Aransas NWR. Impacts could also occur from vehicular traffic on beaches and other activities associated with spill cleanup. In the event of a spill, BP would work with the applicable state and federal agencies to prevent impacts on Whooping Cranes. BP has extensive resources available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

C.3.8 Oceanic Whitetip Shark (Threatened)

The oceanic whitetip shark (*Carcharhinus longimanus*) was listed as Threatened under the ESA on 30 January 2018 (effective 30 March 2018) by NMFS (83 FR 4153). Oceanic whitetip sharks are found worldwide in offshore waters between approximately 30° N and 35° S latitude, and historically were one of the most widespread and abundant species of shark (Rigby et al., 2019). However, based on reported oceanic whitetip shark catches in several major long-line fisheries, the global population appears to have suffered substantial declines (Camhi et al., 2008) and the species is now only occasionally reported in the Gulf of Mexico (Rigby et al., 2019).

Oceanic whitetip shark management is complicated due to it being globally distributed, highly migratory, and overlapping in areas of high fishing; thus, leaving assessment of population trends on fishery dependent catch-and-effort data rather than scientific surveys (Young and Carlson, 2020). A comparison of historical shark catch rates in the Gulf of Mexico by Baum and Myers (2004) noted that most recent papers dismissed the oceanic whitetip shark as rare or absent in the Gulf of Mexico. NMFS (2018b) noted that there has been an 88% decline in abundance of the species in the Gulf of Mexico since the mid-1990s due to commercial fishing pressure.

IPFs that could affect the oceanic whitetip shark include drilling rig presence, sound, and lights, and a large oil spill. Though NMFS (2020) lists a small diesel fuel spill as an IPF, in the project area, a small diesel fuel spill would be unlikely to affect oceanic whitetip sharks due to rapid natural dispersion of diesel fuel and the low density of oceanic whitetip sharks potentially present in the project area. Therefore, no significant impacts are expected from small diesel fuel spills and they are not further discussed (**Table 2**).

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Offshore drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by sharks including the threatened oceanic whitetip shark. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013) which includes sensitivities for individual species to SPLs between approximately 134 to 148 dB re 1 µPa in nurse sharks (*Ginglymostoma cirratum*) at frequencies between 100 and 1,000 Hz (Casper and Mann, 2006). These frequencies overlap with sound pressure levels associated with drilling activities (typically 10 Hz to 10 kHz) (Hildebrand, 2005). Impacts from offshore drilling activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). However, because of the limited propagation distances of high sound pressure levels from the drilling rig, impacts would be limited in geographic scope. It is anticipated that animals would move away from the static sound source and avoid auditory injury or disturbances. Therefore, no population level impacts on oceanic whitetip sharks are expected.

Impacts of a Large Oil Spill

Information regarding the direct effects of oil on elasmobranchs, including the oceanic whitetip shark are largely unknown. However, in the event of a large oil spill, oceanic whitetip sharks could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Because oceanic whitetip sharks may be found in surface waters, they could be more likely to be impacted by floating oil than other species which only reside at depth.

It is possible that a large oil spill could affect individual oceanic whitetip sharks and result in injuries or deaths. However, due to the low density of oceanic whitetip sharks thought to exist in the Gulf of Mexico, it is unlikely that a large spill would result in population level effects.

C.3.9 Giant Manta Ray (Threatened)

The giant manta ray (*Mobula birostris*) is a Threatened elasmobranch species that is a slow-growing, migratory, planktivorous species than inhabits tropical, subtropical, and temperate bodies of water worldwide (NOAA, 2018). The giant manta ray became listed as Threatened under the ESA in 2018.

Commercial fishing is the primary threat to giant manta rays (NOAA, 2018). The species is targeted and caught as bycatch in several global fisheries throughout its range. Although protected in U.S. waters, protection of populations is difficult as they are highly migratory with sparsely distributed and fragmented populations throughout the world. Some estimated regional population sizes are small (between 100 to 1,500 individuals) (Marshall et al., 2018; NOAA, 2018). Stewart et al. (2018) recently reported that the Flower Garden Banks serves as nursery habitat for aggregations of juvenile manta rays. At least 74 unique individuals have been positively identified at the Flower Garden Banks based on unique underbelly coloration (Flower Garden Banks National Marine Sanctuary, 2018). Genetic and photographic evidence in the Flower Garden Banks over 25 years of monitoring showed that 95% of identified giant manta ray male individuals were smaller than mature size (Stewart et al., 2018).

IPFs that may impact giant manta rays include drilling rig presence, marine sound, and lights, and a large oil spill. Though NMFS (2020) lists a small diesel fuel spill as an IPF, in the project area a small diesel fuel spill would be unlikely to affect giant manta rays due to rapid natural dispersion of diesel fuel and the low density of giant manta rays potentially present in the project area. Therefore, no significant impacts are expected from small diesel fuel spills and they are not further discussed (See **Table 2**).

Drilling Rig Presence, Marine Sound, and Lights

Offshore drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by elasmobranchs including the threatened giant manta ray. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013). Studies indicate sensitivities to SPLs between approximately 139 and 153 dB re 1 µPa in yellow stingray (*Urobatis jamaicensis*) and SPLs between approximately 120 and 145 dB re 1 µPa in little skate (*Erinacea raja*) at frequencies from 100 to 1,000 Hz (Casper et al., 2003; Casper and Mann, 2006). These frequencies overlap with sound pressure levels associated with drilling activities (typically 10 Hz to 10 kHz) (Hildebrand, 2005). Impacts from offshore drilling activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). However, because of the limited propagation distances of high sound pressure levels from the drilling rig, impacts would be limited in geographic scope. It is anticipated that animals would move away from the static sound source and avoid auditory injury or disturbances. Therefore, no population level impacts on giant manta rays are expected.

Impacts of a Large Oil Spill

A large oil spill in the project area could reach coral reefs at the Flower Garden Banks which is the only known location of giant manta ray aggregations in the Gulf of Mexico, although individuals may occur anywhere in the Gulf. In the unlikely event of a large oil spill impacting areas with giant manta rays, individual rays could be affected by direct ingestion of oil which could cover their gill filaments or gill rakers, or by ingestion of oiled plankton. Giant manta rays typically feed in shallow waters of less than 10 m (33 ft) depth (NOAA, 2018). Because of this shallow water feeding behavior, giant manta rays would be more likely to be impacted by floating oil than other species which only reside at depth.

In the event of a large oil spill, due to the distance between the project area and the Flower Garden Banks, it is unlikely that oil would impact the threatened giant manta ray nursery habitat. It is possible that a large oil spill could contact individual giant manta rays, but due to the low density of individuals thought to occur in the Gulf of Mexico, there would not likely be any population-level impacts.

C.3.10 Gulf Sturgeon (Threatened)

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a Threatened fish species that inhabits major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida (Barkuloo, 1988; Wakeford, 2001). Sturgeon are anadromous fish that migrate from the ocean upstream into coastal rivers to spawn in freshwater.

The historic range of the species extended from the Mississippi River to Charlotte Harbor, Florida (Wakeford, 2001). This range has contracted to encompass major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida. Populations have been depleted or even extirpated throughout this range by fishing, shoreline development, dam construction, water quality changes, and other factors (Barkuloo, 1988; Wakeford, 2001). These declines prompted the listing of the Gulf sturgeon as a threatened species in 1991. The best-known populations occur in the Apalachicola and Suwannee Rivers in Florida (Carr, 1996; Sulak and Clugston, 1998), the Choctawhatchee River in Alabama (Fox et al., 2000), and the Pearl River in Mississippi/Louisiana (Morrow et al., 1998). Rudd et al. (2014) reconfirmed the spatial distribution and movement patterns of Gulf Sturgeon by surgically implanting acoustic telemetry tags. Critical habitat in the Gulf extends from Lake Borgne, Louisiana (St. Bernard Parish), to Suwannee Sound, Florida (Levy County) (NMFS, 2014c) (**Figure 4**). A species description is presented by BOEM (2012a) and in the recovery plan for this species (USFWS et al., 1995).

A large oil spill is the only IPF that potentially may affect Gulf sturgeon. There are no IPFs associated with routine project activities that could affect these fish. A small fuel spill in the project area would be unlikely to affect Gulf sturgeon because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Vessel collisions to Gulf sturgeon would be unlikely based on the location of the support vessel base and that NMFS (2020) estimated one non-lethal Gulf sturgeon collision in the 50 years of proposed action.

Impacts of a Large Oil Spill

Potential spill impacts on Gulf sturgeon are discussed by NMFS (2007) and BOEM (2012a; 2017a). For this EP, there are no unique site-specific issues with respect to this species.

The project area is approximately 117 statute miles (188 km) from the nearest Gulf sturgeon critical habitat. The 30-day OSRA modeling (**Table 4**) predicts that a spill in the project area has 1% or less conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 10 days of a spill and 3% or less conditional probability within 30 days. The 60-day OSRA modeling (**Table 5**) predicts that a spill in the project areas has a 19% or less conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 60 days of a spill.

In the event of oil reaching Gulf sturgeon habitat, the fish could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Based on the life history of this species, subadult and adult Gulf sturgeon would be most vulnerable to an estuarine or marine oil spill, and would be vulnerable from approximately October through April when this species is foraging in estuarine and shallow marine habitats (NMFS, 2020).

C.3.11 Nassau Grouper (Threatened)

The Nassau grouper (*Epinephelus striatus*) is a Threatened, long-lived reef fish typically associated with hard bottom structures such as natural and artificial reefs, rocks, and underwater ledges (NOAA, nd). Once one of the most common reef fish species in the coastal waters of the United States and Caribbean (Sadovy, 1997), the Nassau grouper been subject to overfishing and is considered extinct in much of its historical range. Observations of current spawning aggregations compared with historical landings data suggest that the Nassau grouper population is substantially smaller than its historical size (NOAA, nd). The Nassau Grouper was listed as Threatened under the ESA in 2016 (81 FR 42268).

Nassau groupers are found mainly in the shallow tropical and subtropical waters of eastern Florida, the Florida Keys, Bermuda, the Yucutan Peninsula, and the Caribbean, including the U.S. Virgin Island and Puerto Rico (NOAA, nd). There has been one confirmed sighting of Nassau grouper from the Flower Garden Banks in the Gulf of Mexico at a water depth of 36 m (118 ft) (Foley et al., 2007). Three additional unconfirmed reports (i.e. lacking photographic evidence) of Nassau grouper have also been documented from mooring buoys and the coral cap region of the West Flower Garden flats (Foley et al., 2007).

There are no IPFs associated with routine project activities that could affect Nassau grouper. A small fuel spill would not affect Nassau grouper because the fuel would float and dissipate on the sea surface and would not be expected to reach the Flower Garden Banks or Florida Keys. A large hydrocarbon spill is the only relevant IPF.

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 5**), a large hydrocarbon spill would be unlikely (<0.5% probability) to reach Nassau grouper habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the corals of the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks and the difference in water depth between the project area the Banks. While on the surface, hydrocarbons would not be expected to contact subsurface fish.

In the unlikely event that hydrocarbons contact Nassau grouper habitat, hydrocarbon droplets or contaminated sediment particles could come into contact with Nassau grouper present on the reefs. Individual fish could be affected by direct ingestion of hydrocarbons which could cover their gill filaments or gill rakers, result in ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills.

C.3.12 Smalltooth Sawfish (Endangered)

The smalltooth sawfish, named due to their flat, saw-like rostrum, is an elasmobranch ray which lives in shallow coastal tropical seas and estuaries where they feed on fish and invertebrates such as shrimp and crabs (NOAA Fisheries, nd). Once found along most of the northern Gulf of

Mexico coast from Texas to Florida, their current range in Gulf of Mexico is restricted to areas primarily in southwest Florida (Brame et al., 2019) where several areas of critical habitat have been designated (**Figure 4**). A species description is presented in the recovery plan for this species (NMFS, 2009b).

Listed as Endangered under the ESA in 2003, population numbers have drastically declined over the past century primarily due to accidental bycatch (Seitz and Poulakis, 2006). Although there are no reliable estimates for smalltooth sawfish population numbers throughout its range (NMFS, 2018c), data from 1989 to 2004 indicated a slight increasing trend in population numbers in Everglades National Park during that time period (Carlson et al., 2007). More recent data resulted in a similar conclusion, with indications that populations were stable or slightly increasing in southwest Florida (Carlson and Osborne, 2012).

There are no IPFs associated with routine project activities that could affect smalltooth sawfish. A small fuel spill would not affect smalltooth sawfish because the fuel would float and dissipate on the sea surface and would not be expected to reach smalltooth sawfish habitat in coastal areas (see **Section A.9.1**). A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

The project area is approximately 375 miles (604 km) from the nearest smalltooth sawfish critical habitat in Charlotte County, Florida. Based on the 30-day OSRA modeling (**Table 3**), coastal areas containing smalltooth sawfish critical habitat are unlikely to be affected within 30 days of a spill (<0.5% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts a <0.5% probability of shoreline contact within 60 days of a spill between to coastal areas containing smalltooth sawfish critical habitat in Collier and Monroe counties, Florida.

Information regarding the direct effects of oil on elasmobranchs, including the smalltooth sawfish are largely unknown. A recent study by Cave and Kajiura (2018) reported that when exposed the crude oil, the Atlantic stingray (*Hypanus sabinus*) experienced impaired olfactory function which could lead to decreased fitness. In the event of oil reaching smalltooth sawfish habitats, the smalltooth sawfish could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Based on the shallow, coastal habitats preferred by smalltooth sawfish, individuals in areas subject to coastal oiling could be more likely to be impacted than other species that reside at depth.

C.3.13 Beach Mice (Endangered)

Four subspecies of Endangered beach mouse occur on the barrier islands of Alabama and the Florida Panhandle: the Alabama (*Peromyscus polionotus ammobates*), Choctawhatchee (*P. p. allophrys*), Perdido Key (*P. p. trissyllepsis*), and St. Andrew beach mouse (*P. p. peninsularis*). Critical habitat has been designated for all four subspecies and is shown combined in **Figure 2**. One additional subspecies of *Peromyscus* beach mouse inhabiting dunes on the western Florida Panhandle, the Santa Rosa beach mouse (*P. p. leucocephalus*), is not listed under the ESA. A large oil spill is the only IPF that potentially may affect beach mice. There are no IPFs associated with routine project activities that could affect these animals due to the distance from shore and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect beach mice because a small fuel spill would not be expected to reach beach mice habitat prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Potential spill impacts on Endangered beach mice are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to these species that were not analyzed in these documents.

Beach mouse critical habitat in Baldwin County, Alabama, is approximately 119 statute miles (192 km) from the project area. The 30-day OSRA modeling (**Table 4**) predicts that a spill in the project area has 1% or less conditional probability of contacting any coastal areas containing beach mouse critical habitat within 30 days. The 60-day OSRA modeling (**Table 5**) predicts that a spill in the project area has an 18% or less conditional probability of contacting any coastal areas containing beach mouse critical habitat within 60 days of a spill.

In the event of oil contacting these beaches, beach mice could experience several types of direct and indirect impacts. Contact with spilled oil could cause skin and eye irritation and subsequent infection; matting of fur; irritation of sweat glands, ear tissues, and throat tissues; disruption of sight and hearing; asphyxiation from inhalation of fumes; and toxicity from ingestion of oil and contaminated food. Indirect impacts could include reduction of food supply, destruction of habitat, and fouling of nests. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. However, any such impacts are unlikely due to the distance from shore and response actions that would occur in the event of a spill.

C.3.14 Florida Salt Marsh Vole (Endangered)

The Florida salt marsh vole (*Microtus pennsylvanicus dukecampbelli*) is a small, dark brown or black rodent found only in saltgrass (*Distichlis spicata*) meadows in the Big Bend region of Florida that was listed as Endangered under the ESA in 1991. Only two populations of Florida salt marsh vole are known to exist: one near Cedar Key in Levy County, Florida and one in the Lower Suwanee National Wildlife Refuge in Dixie County, Florida (Florida Fish and Wildlife Conservation Commission, nd). No critical habitat has been established for the Florida salt marsh vole in part due to concerns over illegal trapping or trespassing if the location of the populations were publicly disclosed (U.S. Fish and Wildlife Service, 2001b).

A large oil spill is the only IPF that potentially may affect the Florida salt marsh vole. There are no IPFs associated with routine project activities that could affect these animals due to the distance from the project area to their habitat and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect the Florida salt marsh vole because a small fuel spill would not be expected to reach their habitat prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Florida salt marsh vole habitat in Levy and Dixie counties, Florida is approximately 308 miles (496 km) from the project area. The 30-day OSRA modeling (**Table 4**) predicts that a spill in the project area has <0.5% or less conditional probability of contacting any coastal areas containing Florida salt marsh voles within 30 days. The 60-day OSRA modeling (**Table 5**) predicts that a spill in the project area has 1% conditional probability of contacting any coastal areas containing beach mouse critical habitat within 60 days of a spill.

In the event of oil contacting beaches containing these animals, Florida salt marsh voles could experience several types of direct and indirect impacts. Contact with spilled oil could cause skin and eye irritation and subsequent infection; matting of fur; irritation of sweat glands, ear tissues, and throat tissues; disruption of sight and hearing; asphyxiation from inhalation of fumes; and toxicity from ingestion of oil and contaminated food. Indirect impacts could include reduction of food supply, destruction of habitat, and fouling of nests. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. Impacts associated with an extensive oiling of coastal habitat containing Florida salt marsh voles from a large oil spill are expected to be significant. Due to the extremely low population numbers, extensive oiling of Florida salt marsh vole habitat could result in the extinction of the species.

However, any such impacts are unlikely due to the distance from the project area to Florida salt marsh vole habitat and response actions that would occur in the event of a spill.

C.3.15 Threatened Coral Species

Seven Threatened coral species are known from the northern Gulf of Mexico: elkhorn coral, staghorn coral, lobed star coral, mountainous star coral, boulder star coral, pillar coral, and rough cactus coral. Elkhorn coral, lobed star coral, mountainous star coral, and boulder star coral have been reported from the coral cap region of the Flower Garden Banks (NOAA, 2014), but are unlikely to be present with a widespread distribution in the northern Gulf of Mexico because they typically inhabit coral reefs in shallow, clear tropical, or subtropical waters. Staghorn coral, pillar coral, and rough cactus coral are only known from the Florida Keys and Dry Tortugas (Florida Fish and Wildlife Conservation Commission, 2018d). Other Caribbean coral species evaluated by NMFS in 2014 (79 FR 53852) either do not meet the criteria for ESA listing or are not known from the Flower Garden Banks, Florida Keys, or Dry Tortugas. Critical habitat has been designated for elkhorn coral and staghorn coral in the Florida Keys (Monroe County, Florida) and Dry Tortugas, but none has been designated for the other threatened coral species included here. A species description of elkhorn coral is presented in the recovery plan for the species (NMFS, 2015).

There are no IPFs associated with routine project activities that could affect threatened corals in the northern Gulf of Mexico. A small fuel spill would not affect threatened coral species because the oil would float and dissipate on the sea surface. A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 5**), a large oil spill would be unlikely (<0.5% probability) to reach elkhorn coral critical habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the corals of the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks (approximately 330 statute miles [531 km]), and the difference in water depth between the project area (2,040 to 2,056 m [6,695 to 6,747 ft]) and the Banks (approximately 17 to 145 m [56 to 476 ft]). While on the surface, oil would not be expected to contact corals on the seafloor. Natural or chemical dispersion of oil could cause a subsurface plume which would have the possibility of contacting seafloor corals.

If a subsurface plume were to occur, impacts on the Flower Garden Banks would be unlikely due to the distance between the project area and corals within the Flower Garden Banks (approximately 330 statute miles [531 km]), and the shallow location of the coral cap of the

Banks. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge. Valentine et al. (2014) observed the spatial distribution of excess hopane, a crude oil tracer from *Deepwater Horizon* spill sediment core samples, to be in the deeper waters and not transported up the shelf, thus confirming that near-bottom currents flow along the isobaths.

In the unlikely event that a subsurface plume reached reefs at the Flower Garden Banks or other Gulf of Mexico reefs, oil droplets or oiled sediment particles could come into contact with reef organisms or corals. As discussed by BOEM (2017a), impacts could include loss of habitat, biodiversity, and live coral coverage; destruction of hard substrate; change in sediment characteristics; and reduction or loss of one or more commercial and recreational fishery habitats. Sub-lethal effects could be long-lasting and affect the resilience of coral colonies to natural disturbances (e.g., elevated water temperature and diseases) (BOEM, 2017a).

Due to the distance between the project area and coral habitats, there is a low chance of oil contacting threatened coral habitat in the event of a spill, and no significant impacts on threatened coral species are expected.

C.4 Coastal and Marine Birds

C.4.1 Marine Birds

Marine birds include seabirds and other species that may occur in the pelagic environment of the project area (Clapp et al., 1982a; Clapp et al., 1982b; 1983; Davis and Fargion, 1996; Davis et al., 2000). Seabirds spend much of their lives offshore over the open ocean, except during breeding season when they nest along the coast (on the mainland and on barrier islands). In addition, other birds such as waterfowl, marsh birds, and shorebirds may occasionally be present over open ocean areas. No Endangered or Threatened bird species are likely to occur at the project area due to the distance from shore. For a discussion of shorebirds and coastal nesting birds, see **Section C.4.2**.

Seabirds of the northern Gulf of Mexico were surveyed from ships during the GulfCet II program (Davis et al., 2000) which reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in deepwater areas of the Gulf of Mexico. From these surveys, four ecological categories of seabirds were documented in the deepwater areas of the Gulf: summer migrants (shearwaters, storm petrels, boobies); summer residents that breed in the Gulf (Sooty Tern, Least Tern, Sandwich Tern, Magnificent Frigatebird); winter residents (gannets, gulls, jaegers); and permanent resident species (Laughing Gulls, Royal Terns, Bridled Terns) (Davis et al., 2000).

Common marine bird species include Wilson's Storm-Petrel (*Oceanites oceanicus*), Magnificent Frigatebird (*Fregata magnificens*), Northern Gannet (*Morus bassanus*), Masked Booby (*Sula dactylatra*), Brown Booby (*Sula leucogaster*), Cory's Shearwater (*Calonectris diomedea*), Greater Shearwater (*Puffinus gravis*), and Audubon's Shearwater (*Puffinus lherminieri*). Seabirds are distributed Gulf-wide and are not specifically associated with the project area.

Relationships with hydrographic features were found for several marine bird species, possibly due to effects of hydrography on nutrient levels and productivity of surface waters where birds forage. The GulfCet II study did not estimate bird densities; however, Haney et al. (2014) indicated that marine bird densities over the open ocean were estimated to be 1.6 birds km^{-2}.

IPFs that potentially may affect marine birds include drilling rig presence, lighting, support vessel and helicopter traffic; and two types of accidents – a small fuel spill and a large oil spill. Effluent discharges permitted under the NPDES are likely to have negligible impacts on the birds due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these animals. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on birds. The IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Marine birds that frequent offshore drilling operations may be exposed to contaminants including air pollutants and routine discharges, but significant impacts are unlikely due to rapid dispersion. Birds migrating over water have been known to collide with offshore structures, resulting in injury and/or death (Wiese et al., 2001; Russell, 2005). Mortality of migrant birds at tall towers and other land-based structures has been reviewed extensively, and the mechanisms involved in rig collisions appear to be similar. In some cases, migrants simply do not see a part of the rig until it is too late to avoid it. In other cases, navigation may be disrupted by marine sound (Russell, 2005). On the other hand, offshore structures are suitable stopover perches for most trans-Gulf migrant species, and most of the migrants that stop over on rigs probably benefit from their stay, particularly in spring (Russell, 2005). Due to the limited scope and short duration of drilling activities described in this EP, any impacts on populations of either seabirds or trans-Gulf migrant birds are not expected to be significant.

Trans-Gulf migrant birds including shorebirds, wading birds, and terrestrial birds may also be present in the project area. Migrant birds may use offshore structures, including platforms and semisubmersibles for resting, feeding, or as temporary shelter from inclement weather (Russell, 2005). Some birds may be attracted to offshore structures because of the lights and the fish populations that aggregate around these structures. A study in the North Sea indicated that rig lighting causes circling behavior in various birds, especially on cloudy nights; apparently the birds' geomagnetic compass is upset by the red part of the spectrum from the lights currently in use (Van de Laar, 2007; Poot et al., 2008). The numbers varied greatly, from none to some tens of thousands of birds per night per rig, with an apparent effect radius of up to 3 miles (5 km) (Poot et al., 2008). A study in the Gulf of Mexico also noted the phenomenon but did not recommend mitigation (Russell, 2005). One factor to consider in evaluating this impact in the Gulf of Mexico would include the lower incidence of cloudy and foggy days in the Gulf of Mexico versus the North Sea. In laboratory experiments, Poot et al. (2008) found the magnetic compass of migratory birds to be wavelength dependent. Migratory birds require light from the blue-green part of the spectrum for magnetic compass orientation, whereas red light (visible long-wavelength) disrupts their magnetic orientation. They designed a field study to test if and how changing light color influenced migrating birds under field conditions. During field studies they found that nocturnally migrating birds were disoriented and attracted by red and white light (containing visible long-wavelength radiation), whereas they were clearly less disoriented by blue and green light (containing less or no visible long-wavelength radiation) (Poot et al., 2008). Overall, potential negative impacts to birds from drilling rig lighting, collisions, or other adverse effects are highly localized (considering the single structure) and may affect individual birds during migration periods. Marine sound generated from the drilling rig is not expected to impact marine birds. Therefore, these potential impacts are not expected to affect marine birds at the population or species level and are not significant.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters are unlikely to significantly disturb marine birds in open, offshore waters. Schwemmer et al. (2011) showed that several marine bird species showed behavioral responses and altered distribution patterns in response to ship traffic, which could potentially cause loss of foraging time and resting habitat. However, it is likely that individual birds would experience, at most, only short-term behavioral disruption, and the impact would not be significant.

Impacts of a Small Fuel Spill

Potential spill impacts on marine birds are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to spill impacts on these animals.

The probability of a fuel spill is expected to be minimized by BP's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of BP's OSRP is expected to reduce the potential for impacts on marine birds. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area and the expected short duration of a small fuel spill, the potential exposure period for marine birds would be brief.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

Marine birds exposed to oil on the sea surface could experience direct physical and physiological effects including skin irritation; chemical burns of skin, eyes, and mucous membranes; and inhalation of VOCs. Due to the limited areal extent and short duration of water quality impacts from a small fuel spill, secondary impacts due to ingestion of oil via contaminated prey or reductions in prey abundance are unlikely. Due to the low densities of birds in open ocean areas, the small area affected, and the brief duration of the surface slick, no significant impacts on pelagic birds would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine and pelagic birds are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to spill impacts on these animals.

Pelagic seabirds could be exposed to oil from a spill at the project area. Davis et al. (2000) reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in the deepwater Gulf of Mexico (>200 m). Haney et al. (2014) estimated that seabird densities over the open ocean were approximately 1.6 birds km^{-2}. The number of pelagic birds that could be affected in open, offshore waters would depend on the extent and persistence of the oil slick.

Data following the *Deepwater Horizon* incident provide relevant information about the species of pelagic birds that may be affected in the event of a large oil spill. Birds that were treated for oiling include several pelagic species such as the Northern Gannet, Magnificent Frigatebird, and Masked Booby (U.S. Fish and Wildlife Service, 2011). The Northern Gannet is among the species with the largest numbers of birds affected by the spill. Exposure of marine birds to oil can result in adverse health with severity, depending on the level of oiling. Effects can range from plumage damage and loss of buoyancy from external oiling to more severe effects, such as organ damage, immune suppression, endocrine imbalance, reduced aerobic capacity, and death as a result of oil inhalation or ingestion (NOAA, 2016b).

C.4.2 Coastal Birds

Threatened and Endangered bird species (Piping Plover and Whooping Crane) have been discussed previously in **Sections C.3.5** and **C.3.6**. Various species of non-endangered birds are also found along the northern Gulf Coast, including diving birds, shorebirds, marsh birds, wading birds, and waterfowl. Gulf Coast marshes and beaches also provide important feeding and nesting habitats. Species that nest on beaches, flats, dunes, bars, barrier islands, and similar coastal and nearshore habitats include the Sandwich Tern, Wilson's Plover, Black Skimmer, Forster's Tern, Gull-Billed Tern, Laughing Gull, Least Tern, and Royal Tern (U.S. Fish and Wildlife Service, 2010).

The Eastern Brown Pelican (*Pelecanus occidentalis*) was delisted from federal Endangered status in 2009 (U.S. Fish and Wildlife Service, 2016b). However, this species remains listed as endangered by Mississippi (Mississippi Natural Heritage Program, 2018). The Brown Pelican was delisted as a species of special concern by the State of Florida in 2017 (Florida Fish and Wildlife Conservation Commission, 2017). Brown Pelicans inhabit coastal habitats and forage within both coastal waters and waters of the inner continental shelf. Aerial and shipboard surveys, including GulfCet and GulfCet II, indicate that Brown Pelicans do not occur in deep offshore waters (Fritts and Reynolds, 1981; Davis and Fargion, 1996; Davis et al., 2000). Nearly half the southeastern population of Brown Pelicans lives in the northern Gulf Coast, generally nesting on protected islands (U.S. Fish and Wildlife Service, 2010).

The Southern Bald Eagle (*Haliaeetus leucocephalus*) was delisted from its Threatened status in the lower 48 states on 28 June 2007, but still receives protection under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940. The Bald Eagle is a terrestrial raptor widely distributed across the southern U.S., including coastal habitats along the Gulf of Mexico. The Gulf Coast is inhabited by both wintering migrant and resident Bald Eagles (Johnsgard, 1990; Ehrlich et al., 1992).

IPFs that potentially may affect shorebirds and coastal nesting birds include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the project area would be unlikely to affect shorebirds or coastal nesting birds, as the project area is 64 statute miles (103 km) from the nearest shoreline. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on shorebirds.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters will transit coastal areas near Port Fourchon and Houma, Louisiana, where shorebirds and coastal nesting birds may be found. These activities could periodically disturb individuals or groups of birds within coastal habitats (e.g., wetlands that may support feeding, resting, or breeding birds).

Vessel traffic may disturb some foraging and resting birds. Flushing distances vary among species and among individuals (Rodgers and Schwikert, 2002; Schwemmer et al., 2011). The disturbances will be limited to flushing birds away from vessel pathways; known distances are from 20 to 49 m (65 to 160 ft) for personal watercrafts and 23 to 58 m (75 to 190 ft) for outboard-powered boats (Rodgers and Schwikert, 2002). Support vessels will not approach nesting or breeding areas on the shoreline, so disturbances to nesting birds, eggs, and chicks is not expected. Vessel operators are expected to use designated navigation channels and comply with posted speed and wake restrictions while transiting sensitive inland waterways. Due to the limited scope and short duration of drilling activities, any short-term impacts are not expected to be significant to coastal bird populations.

Helicopter traffic can cause some disturbance to birds onshore and offshore. Responses are highly dependent on the type of aircraft, the bird species, the activities that the animals were previously engaged in, and previous exposures to overflights (Efromyson et al., 2003). Helicopters seem to cause the most intense responses over other human disturbances (Bélanger and Bédard, 1989). The Federal Aviation Administration recommends (Advisory Circular No. 91-36D) that pilots maintain a minimum altitude of 610 m (2,000 ft) when flying over marine sound-sensitive areas such as parks, forest, primitive areas, wilderness areas, National Seashores, or National Wildlife Refuges, and maintain flight paths to reduce aircraft marine sound in these marine sound-sensitive areas. The 2,000-ft altitude minimum is greater than the distance (slant range) at which aircraft overflights have been reported to cause behavioral effects on most species of birds studied by Efroymson et al. (2000). It is assumed that adherence to these guidelines would reduce potential behavioral disturbances (such as temporary displacement or avoidance behavior) of individual birds in coastal and inshore areas. The potential impacts from helicopter traffic are not expected to be significant to coastal bird populations or species in the project area.

Impacts of Large Oil Spill

The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

Coastal birds can be exposed to oil as they float on the water surface, dive during foraging, or wade in oiled coastal waters. Oiled birds can lose the ability to fly, dive for food, or float on the water, which could lead to drowning (U.S. Fish and Wildlife Service, 2010). Oil interferes with the water repellency of feathers and can cause hypothermia in the right conditions. As birds groom themselves, they can ingest and inhale the oil on their bodies. Scavengers such as Bald Eagles and gulls can be exposed to oil by feeding on carcasses of contaminated fish and wildlife. While ingestion can kill animals immediately, more often it results in lung, liver, and kidney damage, which can lead to death (BOEM, 2017a). Bird eggs may be damaged if an oiled adult sits on the nest.

Brown and White Pelicans are especially at risk from direct and indirect impacts from spilled oil within inner shelf and inshore waters, such as embayments. The range of these species is generally limited to these waters and surrounding coastal habitats. Brown Pelicans feed on mid-sized fish that they capture by diving from above ("plunge diving") and then scooping the fish into their expandable gular pouch, while White Pelicans feed from the surface by dipping their beaks in the water. These behaviors make pelicans susceptible to plumage oiling if they feed in areas with surface oil or an oil sheen. They may also capture prey that has been physically contaminated with oil or has ingested oil. Issues for Brown and White Pelicans include direct contact with oil, disturbance by cleanup activities, and long-term habitat contamination (BOEM, 2017a).

The Bald Eagle may also be at risk from direct and indirect impacts from spilled oil. This species often captures fish within shallow water areas (snatching prey from the surface or wading into shallow areas to capture prey with their bill) and so may be susceptible to plumage oiling and, as with the Brown and White Pelicans, they may also capture prey that has been physically contaminated with oil or has ingested oil (BOEM, 2017a). It is expected that impacts to coastal birds from a large oil spill resulting in the death of individual birds would be adverse but not significant at population levels.

C.5 Fisheries Resources

C.5.1 Pelagic Communities and Ichthyoplankton

Biggs and Ressler (2000) reviewed the biology of pelagic communities in the deepwater environment of the northern Gulf of Mexico. The biological oceanography of the region is dominated by the influence of the Loop Current, whose surface waters are among the most oligotrophic in the world's oceans. Superimposed on this low-productivity condition are productive "hot spots" associated with entrainment of nutrient-rich Mississippi River water and mesoscale oceanographic features. Anticyclonic and cyclonic hydrographic features play an important role in determining biogeographic patterns and controlling primary productivity in the northern Gulf of Mexico (Biggs and Ressler, 2000).

Most fishes inhabiting shelf or oceanic waters of the Gulf of Mexico have planktonic eggs and larvae (Ditty, 1986; Ditty et al., 1988; Richards et al., 1989; Richards et al., 1993). A study by Ross et al. (2012) on midwater fauna to characterize vertical distribution of mesopelagic fishes in selected deepwater areas in the Gulf of Mexico substantiated high species richness but general domination by relatively few families and species.

IPFs that potentially may affect pelagic communities and ichthyoplankton include drilling rig presence, marine sound, and lights; effluent discharges; water intake; and two types of accidents (a small fuel spill and a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

The drilling rig, as a floating structure in the deepwater environment, will act as a fish aggregating device (FAD). In oceanic waters, the FAD effect would be most pronounced for epipelagic fishes such as tunas, dolphin, billfishes, and jacks, which are commonly attracted to fixed and drifting surface structures (Holland, 1990; Higashi, 1994; Relini et al., 1994). Positive fish associations with offshore rigs and platforms in the Gulf of Mexico are well documented

(Gallaway and Lewbel, 1982; Wilson et al., 2003; Wilson et al., 2006). The FAD effect could possibly enhance the feeding of epipelagic predators by attracting and concentrating smaller fish species. Drilling rig sound could potentially cause masking in fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). The only defined acoustic threshold levels for non-impulsive sounds are given by Popper et al. (2014) and apply only to species of fish with swim bladders that provide some hearing (pressure detection) function. Popper et al. (2014) estimated SPL_{rms} threshold levels of 170 dB re 1 µPa over a 48-hour period for onset of recoverable injury and 158 dB re 1 µPa over a 12-hour period for onset of temporary auditory threshold shifts. However, no quantitative behavioral thresholds for non-impulsive sources for fish have been established (Hawkins and Popper, 2014). Rather, Popper et al. (2014) provide qualitative criteria portraying risk of impact relative to the animal's distance from the source (i.e., near, intermediate, far). Sound may also influence fish behaviors, such as predator-avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010; Bruintjes and Radford, 2013; McLaughlin and Kunc, 2015). Fish aggregating is likely to occur to some degree due to the presence of the drilling rig, but the impacts would be limited in geographic scope and no population level impacts are expected.

Few data exist regarding the impacts of sound on pelagic larvae and eggs. Generally, it is believed that larval fish will have similar hearing sensitivities as adults, but may be more susceptible to barotrauma injuries associated with impulsive sounds as they are less mobile and unable to move away from the source (Popper et al., 2014). Larval fish were experimentally exposed to simulated impulsive sounds by Bolle et al. (2012). The controlled playbacks produced SEL_{cum} of 206 dB re 1 μPa^2 s but resulted in no increased mortality between the exposure and control groups. Non-impulsive sources (such as drilling rig operations) are expected to be far less injurious than impulsive sources. Because of the periodic and transient nature of ichthyoplankton and the stationary nature of the source, no impacts to these life stages are expected.

Impacts of Effluent Discharges

Muds and cuttings discharges may have a slight effect on the benthic environment near the wellsite, including a localized increase in water turbidity, the limited blanketing of seafloor sediments and slightly increased concentrations of hydrocarbons and metals. Treated cuttings are monitored for visible sheen prior to discharge. Contaminants released into the water column will be diluted rapidly within the open ocean environment. Minimal impacts on benthic organisms are anticipated.

Treated sanitary and domestic wastes may have a slight effect on the pelagic environment in the immediate vicinity of these discharges. These wastes may have elevated levels of nutrients, organic matter, and chlorine, but should be diluted rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Deck drainage may have a slight effect on the pelagic environment in the immediate vicinity of these discharges. Deck drainage from contaminated areas will be passed through an oil-and-water separator prior to release, and discharges will be monitored for visible sheen. The discharges may have slightly elevated levels of hydrocarbons but should be diluted rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Other discharges in accordance with the NPDES permit, such as desalination unit brine and uncontaminated cooling water, fire water, and ballast water, are expected to be diluted rapidly and have little or no impact on water column biota.

Impacts of Water Intake

Seawater will be drawn from the ocean for once-through, non-contact cooling of machinery on the drilling rig. The intake of seawater for cooling water will entrain plankton. The low intake velocity should allow most strong-swimming juvenile fishes and smaller adults to escape entrainment or impingement (Electric Power Research Institute, 2000). However, drifting plankton would not be able to escape entrainment with the exception of a few fast-swimming larvae of certain taxonomic groups. Those organisms entrained may be stressed or killed (Cada, 1990; Mayhew et al., 2000), primarily through changes in water temperature during the route from cooling intake structure to discharge structure and mechanical damage (turbulence in pumps and condensers). Due to the limited scope and short duration of drilling activities, any short-term impacts of entrainment are not expected to be significant to plankton or ichthyoplankton populations (BOEM, 2017a). The drilling rig ultimately chosen for this project is expected to be in compliance with all cooling water intake requirements.

Impacts of a Small Fuel Spill

Potential spill impacts on fisheries resources are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to spill impacts.

The probability of a fuel spill is expected to be minimized by BP's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of BP's OSRP is expected to mitigate the potential for impacts on pelagic communities, including ichthyoplankton. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would dissipate naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

A small fuel spill could have localized impacts on phytoplankton, zooplankton, and nekton. Due to the limited areal extent and short duration of water quality impacts, a small fuel spill would be unlikely to produce detectable impacts on pelagic communities and ichthyoplankton.

Impacts of a Large Oil Spill

Potential spill impacts on pelagic communities and ichthyoplankton are discussed by BOEM (2017a). A large oil spill could affect water column biota including phytoplankton, zooplankton, ichthyoplankton, and nekton. A large spill that persisted for weeks or months would be more likely to affect these communities. While adult and juvenile fishes may actively avoid a large spill, planktonic eggs and larvae would be unable to avoid contact. Eggs and larvae of fishes are especially vulnerable to oiling because they inhabit the upper layers of the water column, and they will die if exposed to certain toxic fractions of spilled oil. Impacts potentially would be greater if local-scale currents retained planktonic larval assemblages (and the floating oil slick) within the same water mass. Impacts to ichthyoplankton from a large spill would be greatest during spring and summer when shelf concentrations peak (BOEM, 2016b).

C.5.2 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. Under the Magnuson-Stevens Fishery Conservation and Management Act, as amended, federal agencies are required to consult on activities that may adversely affect EFH designated in Fishery Management Plans developed by the regional Fishery Management Councils.

The Gulf of Mexico Fishery Management Council (GMFMC) has prepared Fishery Management Plans for corals and coral reefs, shrimps, spiny lobster, reef fishes, coastal migratory pelagic fishes, and red drum. In 2005, the EFH for these managed species was redefined in Generic Amendment No. 3 to the various Fishery Management Plans (Gulf of Mexico Fishery Management Council, 2005). The EFH for most of these GMFMC-managed species is on the continental shelf in waters shallower than 183 m (600 ft). The shelf edge is the outer boundary for coastal migratory pelagic fishes, reef fishes, and shrimps. EFH for corals and coral reefs includes some shelf-edge topographic features on the Texas-Louisiana OCS located approximately 42 statute miles (68 km) northwest of the project area (**Figure 4**).

Highly migratory pelagic fishes, which occur as transients in the project area, are the only remaining group for which EFH has been identified in the deepwater Gulf of Mexico. Species in this group, including tunas, swordfishes, billfishes, and sharks, are managed by NMFS. **Table 8** lists the highly migratory fish species and their life stages with EFH at or near the project area.

Table 8. Migratory fish species with designated Essential Fish Habitat (EFH) at or near Mississippi Canyon Block 520 (MC 520), including life stage(s) potentially present within the project area (Adapted from National Marine Fisheries Service [NMFS], 2009b).

Common Name	Scientific Name	Life Stage(s) Potentially Present Within or Near the Project Area
Atlantic bluefin tuna	*Thunnus thynnus*	Spawning, eggs, larvae, adults
Bigeye tuna	*Thunnus obesus*	Juveniles, adults
Bigeye thresher shark	*Alopias superciliosus*	All
Blue marlin	*Makaira nigricans*	Juveniles, adults
Longbill spearfish	*Tetrapturus pfluegeri*	Juveniles, adults
Longfin mako shark	*Isurus paucus*	All
Oceanic whitetip shark	*Carcharhinus longimanus*	All
Skipjack tuna	*Katsuwonus pelamis*	Spawning, adults
Swordfish	*Xiphias gladius*	Larvae, juveniles, adults
Whale shark	*Rhincodon typus*	All
White marlin	*Tetrapturus albidus*	Juveniles, adults
Yellowfin tuna	*Thunnus albacares*	Spawning, juveniles, adults

Research indicates the central and western Gulf of Mexico may be important spawning habitat for Atlantic bluefin tuna (*Thunnus thynnus*), and (NMFS, 2009c) has designated a Habitat Area of Particular Concern (HAPC) for this species. The HAPC covers much of the deepwater Gulf of Mexico, including the project area (**Figure 4**). The areal extent of the HAPC is approximately 300,000 km^2 (115,831 mi^2). Atlantic bluefin tuna follow an annual cycle of foraging in June through March off the eastern U.S. and Canadian coasts, followed by migration to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009c). The Atlantic bluefin tuna has also been designated as a species of concern (NMFS, 2011). An amendment to the original EFH Generic Amendment was finalized in 2005 (Gulf of Mexico Fishery Management Council, 2005). One of the most significant proposed changes in this amendment reduced the extent of EFH relative to the 1998 Generic Amendment by removing the EFH description and identification from waters between 100 fathoms and the seaward limit of the Exclusive Economic Zone (EEZ). The Highly Migratory Species Fisheries Management Plan was amended in 2009 to update EFH and HAPC to include the bluefin tuna spawning area (NMFS, 2009c).

NTLs 2009-G39 and 2009-G40 that provide guidance and clarification of the regulations with respect to biologically sensitive underwater features and areas and benthic communities that are considered EFH. As part of an agreement between BOEM and NMFS to complete a new programmatic EFH consultation for each new Five-Year Program, an EFH consultation was initiated between BOEM's Gulf of Mexico Region and NOAA's Southeastern Region during the preparation, distribution, and review of BOEM's 2017-2022 WPA/CPA Multisale EIS (BOEM, 2017a). The EFH assessment was completed and there is ongoing coordination among NMFS, BOEM, and BSEE, including discussions of mitigation (BOEM, 2016c).

Other HAPCs have been identified by the Gulf of Mexico Fishery Management Council (2005). These include the Florida Middle Grounds, Madison-Swanson Marine Reserve, Tortugas North and South Ecological Reserves, Pulley Ridge, and several individual reefs and banks of the northwestern Gulf of Mexico. Madison Swanson Marine Reserve is the HAPC located nearest to the project area (approximately 145 statute miles [233 km]).

IPFs that potentially may affect EFH include drilling rig presence, marine sound, and lights; effluent discharges; water intake; and two types of accidents (a small fuel spill and a large oil spill).

Impacts of Drilling Rig Presence, Marine Sound, and Lights

The drilling rig, as a floating structure in the deepwater environment, will act as a FAD. In oceanic waters, the FAD effect would be most pronounced for epipelagic fishes such as tunas, dolphin, billfishes, and jacks, which are commonly attracted to fixed and drifting surface structures (Holland, 1990; Higashi, 1994; Relini et al., 1994). The FAD effect would likely attract and concentrate smaller fish species and thus enhance feeding of epipelagic predators.

Drilling rig vessel sound could potentially cause acoustic masking for fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). Sound may also influence fish behaviors such as predator avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010; Bruintjes and Radford, 2013; McLaughlin and Kunc, 2015). The only defined acoustic threshold levels for non-impulsive sources are given by Popper et al. (2014) and apply only to species of fish with swim bladders that provide some hearing (pressure detection) function. Popper et al. (2014) estimated SPL_{rms} threshold levels of 170 dB re 1 µPa accumulated over a 48-hour period for onset of recoverable injury and 158 dB re 1 µPa accumulated over a 12-hour period for onset temporary auditory threshold shifts. No quantitative behavioral thresholds for non-impulsive sources for fish have been established. Rather, Popper et al. (2014) provide qualitative criteria portraying risk of impact relative to the animal's distance from the source (i.e., near, intermediate, far). Because the drilling rig is a temporary structure, any impacts on EFH for managed species are considered minor.

Impacts of Effluent Discharges

Other effluent discharges affecting EFH by diminishing ambient water quality include drilling muds and cuttings, treated sanitary and domestic wastes, deck drainage, and miscellaneous discharges such as desalination unit brine and uncontaminated cooling water, fire water, and ballast water. Impacts on water quality have been discussed previously. No significant impacts on EFH for managed species are expected from these discharges.

Impacts of Water Intake

As noted previously, cooling water intake will cause entrainment and impingement of plankton, including fish eggs and larvae (ichthyoplankton). Due to the limited scope and short duration of drilling activities, any short-term impacts on EFH for highly migratory pelagic fishes are not expected to be biologically significant. The recent lease sale EIS (BOEM, 2017a) discusses cooling water discharge. Water with an elevated temperature may accumulate around the discharge pipe. However, the warmer water should be diluted rapidly to ambient temperature levels within 100 m (328 ft) of the discharge pipe. Any impacts to pelagic species would be extremely localized and brief (BOEM, 2014).

Impacts of a Small Fuel Spill

Potential spill impacts on EFH are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to spill impacts.

The probability of a fuel spill is expected to be minimized by BP's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of BP's OSRP is expected to help diminish the potential for impacts on EFH. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be dissipated naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

A small fuel spill could have localized impacts on EFH for highly migratory pelagic fishes, including tunas, swordfishes, billfishes, and sharks. These species occur as transients in the project area. A spill would also produce short-term impact on water quality in the HAPC for spawning bluefin tuna, which covers much of the deepwater Gulf of Mexico. The areal extent of the affected area would represent a negligible portion of the HAPC.

A small fuel spill would likely not affect EFH for corals and coral reefs, the nearest EFH being the topographic features located approximately 42 statute miles (68 km) northwest of the project area. A small fuel spill would float and dissipate on the sea surface and would not contact these features.

Impacts of a Large Oil Spill

Potential spill impacts on EFH are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to EFH.

An oil spill in offshore waters would temporarily increase hydrocarbon concentrations on the water surface and potentially in the subsurface as well. Given the extent of EFH designations in the Gulf of Mexico (Gulf of Mexico Fishery Management Council, 2005; NMFS, 2009c), some impact on EFH would be unavoidable.

A large spill could affect EFH for many managed species including shrimps, stone crab, spiny lobster, reef fishes, coastal migratory pelagic fishes, and red drum. It would result in adverse impacts on water quality and water column biota including phytoplankton, zooplankton, and nekton. In coastal waters, sediments could be contaminated and result in persistent degradation of the seafloor habitat for managed demersal fish and shellfish species.

The project area is within the HAPC for spawning Atlantic bluefin tuna (NMFS, 2009c). A large spill could temporarily degrade the HAPC due to increased hydrocarbon concentrations in the water column, with the potential for lethal or sublethal impacts on spawning tuna. Potential impacts would depend in part on the timing of a spill, as this species migrates to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009c).

The topographic features located 42 statute miles (68 km) northwest of the project area are designated as EFH under the corals and coral reefs management plan (Gulf of Mexico Fishery Management Council, 2005). An accidental spill would be unlikely to affect this area, since a surface slick would be unlikely to reach these features due to their depth.

C.6 Archaeological Resources

C.6.1 Shipwreck Sites

The project area is on the list of archaeology survey blocks with a high potential for historic shipwrecks (BOEM, 2011). The archeological assessment identified no archaeologically significant artifacts or shipwrecks within 610 m (2,000 ft) of the proposed wellsites based on an autonomous underwater vehicle (AUV) survey (BP, 2019a; b). BP and its contractors will abide by the applicable requirements of NTL 2005-G07 and 30 CFR 550.194(c), which stipulate that work be stopped at the project site if any previously undetected archaeological resource is discovered after work has begun until appropriate surveys and evaluations have been completed.

Because there are no shipwreck sites within 610 m (2,000 ft) of the proposed wellsite, there are no routine IPFs that are likely to affect shipwrecks. Impacts of a large oil spill are the only IPFs considered. A small fuel spill would not affect shipwrecks because the oil would float and dissipate on the sea surface. These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of a Large Oil Spill

The 2017-2025 Lease Sale EIS (BOEM, 2017a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 300-m (984-ft) radius. Because there are no historic shipwrecks within a 300-m radius of the proposed wellsite, this impact would not be relevant. Should there be any indication that potential shipwreck sites could be affected, in accordance with NTL 2005-G07, BP will immediately halt drilling or other project operations, take steps to ensure that the site is not disturbed in any way, and contact the BOEM Regional Supervisor, Leasing and Environment, within 48 hours of its discovery. BP would cease all operations within 305 m (1,000 ft) of the site until the Regional Supervisor provides instructions on steps to take to assess the site's potential historic significance and protect it.

Beyond this radius, there is the potential for impacts from oil, dispersants, and depleted oxygen levels. These impacts could include chemical contamination, alteration of the rates of microbial activity (BOEM, 2017a), and reduced biodiversity at shipwreck-associated sediment microbiomes (Hamdan et al., 2018). During the *Deepwater Horizon* incident, subsurface plumes were reported at a water depth of about 1,100 m (3,600 ft), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). While the behavior and impacts of subsurface plumes are not well known, a subsurface plume could have the potential to contact shipwreck sites beyond the 300-m (984-ft) radius estimated by BOEM (2012a), depending on its extent, trajectory, and persistence.

A spill entering shallow coastal waters could conceivably contaminate an undiscovered or known coastal shipwreck site. BOEM (2012a) stated that if an oil spill contacted a coastal historic site, such as a fort or a lighthouse, the major impact would be a visual impact from oil contact and contamination of the site and its environment.

C.6.2 Prehistoric Archaeological Sites

With water depths at the locations of the proposed wellsites ranging from approximately 2,040 to 2,056 m (6,695 to 6,747 ft) (BP, 2019a; b), the proposed wellsites are well beyond the 60-m (197-ft) depth contour used by BOEM as the seaward extent for potential prehistoric archaeological sites in the Gulf of Mexico. Because prehistoric archaeological sites are not found in the project area, the only relevant IPF is a large oil spill. A small fuel spill would not affect prehistoric archaeological resources because the oil would float and dissipate on the sea surface.

Impacts of a Large Oil Spill

Because prehistoric archaeological sites are not found in the project area, they would not be affected by the physical effects of a subsea blowout. BOEM (2012a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 300-m (984-ft) radius.

Along the northern Gulf Coast, prehistoric sites exist along the barrier islands and mainland coast and along the margins of bays and bayous (BOEM, 2017a). The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

If a spill did reach a prehistoric site along these shorelines, it could coat fragile artifacts or site features and compromise the potential for radiocarbon dating organic materials in a site (although other dating methods are available and it is possible to decontaminate an oiled sample for radiocarbon dating). Coastal prehistoric sites could also be damaged by spill cleanup operations (e.g., by destroying fragile artifacts and disturbing the provenance of artifacts and site features).

C.7 Coastal Habitats and Protected Areas

Coastal habitats in the northeastern Gulf of Mexico that may be affected by oil and gas activities are described by BOEM (2017a). Coastal habitats inshore of the project area include barrier beaches and dunes, wetlands, oyster reefs and submerged seagrass beds. Generally, most of the northeastern Gulf is fringed by barrier beaches, with wetlands, oyster reefs and/or submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries.

Due to the distance from shore, the only IPF associated with routine activities in the project area that potentially may affect beaches and dunes, wetlands, oyster reefs, seagrass beds, coastal wildlife refuges, wilderness areas, or any other managed or protected coastal area is support vessel traffic. The support bases at Port Fourchon and Houma, Louisiana, are not in wildlife refuges or wilderness areas. Potential impacts of support vessel traffic are addressed briefly below.

Impacts of support vessel traffic and a large oil spill are the only IPFs analyzed for coastal habitats and protected areas. A small fuel spill in the project area would be unlikely to affect coastal habitats, as the project area is 64 statute miles (103 km) from the nearest shoreline (Louisiana). As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Support Vessel Traffic

Support operations, including crew boats and supply boats as detailed in EP Section 12, may have a minor incremental impact on barrier beaches and dunes, wetlands, oyster reefs and protected areas. Over time, with a large number of vessel trips, vessel wakes can erode shorelines along inlets, channels, and harbors, resulting in localized land loss. Impacts to barrier beaches and dunes, wetlands, oyster reefs and protected areas will be minimized by following the speed and wake restrictions in harbors and channels.

Support operations, including crew boats and supply boats are not anticipated to have a significant impact on submerged seagrass beds. While submerged seagrass beds could be uprooted, scarred, or lost due to direct contact from vessels, use of navigation channels and adherence to local requirements and implemented programs will decrease the likelihood of impacts to these resources (BOEM, 2017a).

Impacts of a Large Oil Spill

Potential spill impacts on coastal habitats are discussed by BOEM (2017a). Coastal habitats inshore of the project area include barrier beaches and dunes, wetlands, oyster reefs and submerged seagrass beds. For this EP, there are no unique site-specific issues with respect to coastal habitats.

The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

The shorelines within the geographic range predicted by the OSRA modeling (**Tables 4** and **5**) include extensive barrier beaches and wetlands, oyster reefs with submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries. NWRs and other protected areas along the coast are discussed in BOEM (2017a) and BP's OSRP. Coastal and near-coastal wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts based on the 30-day OSRA model (**Table 4**) are presented in **Table 9**.

The level of impacts from oil spills on coastal habitats depends on many factors, including the oil characteristics, the geographic location of the landfall, and the weather and oceanographic conditions at the time (BOEM, 2017a; b).

Table 9. Wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts after 30 days of a hypothetical spill from Launch Area 57 based on the 30-day OSRA model.

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Cameron, Louisiana	Sabine National Wildlife Refuge
	Rockefeller State Wildlife Refuge and Game Preserve
	Peveto Woods Sanctuary
Vermilion, Louisiana	Paul J. Rainey Wildlife Refuge and Game Preserve
	Rockefeller State Wildlife Refuge and Game Preserve
	State Wildlife Refuge
Terrebonne, Louisiana	Isles Dernieres Barrier Islands Refuge
	Pointe aux Chenes Wildlife Management Area
Lafourche, Louisiana	East Timbalier Island National Wildlife Refuge
	Pointe aux Chenes Wildlife Management Area
	Wisner Wildlife Management Area (Includes Picciola Tract)
Plaquemines, Louisiana	Breton National Wildlife Refuge
	Delta National Wildlife Refuge
	Pass a Loutre Wildlife Management Area
St. Bernard, Louisiana	Biloxi Wildlife Management Area
	Breton National Wildlife Refuge
	Saint Bernard State Park
Hancock and Harrison, Mississippi	Buccaneer State Park
	Grand Bayou Preserve
	Jourdan River Preserve
	Hancock County Marshes Preserve
	Bayou Portage Preserve

Table 9. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Hancock and Harrison, Mississippi (cont'd)	Biloxi River Marshes Preserve
	Cat Island Preserve
	Deer Island Preserve
	Gulf Islands National Seashore
	Hiller Park Recreation Area
	Sandhill Crane Refuge Preserve
	Ship Island Preserve
	Wolf River Preserve
Jackson, Mississippi	Bellefontaine Marsh Preserve
	Davis Bayou Preserve
	Escatawpa River Marsh Preserve
	Grand Bay National Estuarine Research Reserve
	Grand Bay Savanna Preserve
	Graveline Bay Preserve
	Gulf Islands National Seashore
	Gulf Islands Wilderness
	Horn Island Preserve
	Old Fort Bayou Preserve
	Pascagoula River Marsh Preserve
	Petit Bois Island Preserve
	Round Island Preserve
	Shepard State Park
Mobile, Alabama	Grand Bay National Wildlife Refuge
	Grand Bay Savanna State Nature Preserve
	Mobile-Tensaw Delta WMA
	Penalver Park
	The Grand Bay Savanna Tract (and Addition Tract)
	W.L. Holland WMA
Baldwin, Alabama	Betty and Crawford Rainwater Perdido River Nature Preserve
	Bon Secour NWR
	Gulf State Park
	Meaher State Park
	Mobile-Tensaw Delta CIAP Parcel State Habitat Area
	Mobile-Tensaw Delta WMA
	Perdido River Water Management Area
	W.L. Holland WMA
	Weeks Bay Harris and Worcester Tracts
	Weeks Bay National Estuarine Research Reserve
	Weeks Bay Reserve Addition - Beck Tract
	Betty and Crawford Rainwater Perdido River Nature Preserve

Table 9. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Escambia, Florida	Bayou Marcus Wetlands
	Big Lagoon State Park
	Blue Angel Recreation Park
	Bay Bluffs Park
	Ft. Pickens Aquatic Preserve
	Gulf Islands National Seashore
	Mallory Heights Park #3
	Perdido Bay/Crown Pointe Preserve
	Perdido Key State Park
	Tarkiln Bayou Preserve State Park
	USS Massachusetts (BB-2) Underwater Archaeological Preserve
	Wayside Park
Okaloosa, Florida	Eglin Beach Park
	Fred Gannon Rocky Bayou State Park
	Gulf Islands National Seashore
	Henderson Beach State Park
	Rocky Bayou Aquatic Preserve
	Yellow River Wildlife Management Area
Walton, Florida	Choctawhatchee River Delta Preserve
	Choctawhatchee River Water Management Area
	Deer Lake State Park
	Grayton Beach State Park
	Point Washington State Forest
	Topsail Hill Preserve State Park
Bay, Florida	Camp Helen State Park
	SS Tarpon Underwater Archaeological Preserve
	St. Andrews Aquatic Preserve
	St. Andrews State Park
	Vamar Underwater Archaeological Preserve

Coastal wetlands are highly sensitive to oiling and can be significantly affected because of the inherent toxicity of hydrocarbon and non-hydrocarbon components of the spilled substances (Beazley et al., 2012; Lin and Mendelssohn, 2012; Mendelssohn et al., 2012). Numerous variables such as oil concentration and chemical composition, vegetation type and density, season or weather, preexisting stress levels, soil types, and water levels may influence the impacts of oil exposure on wetlands. Light oiling could cause plant die back, followed by recovery in a fairly short time. Vegetation exposed to oil that persists in wetlands could take years to recover (BOEM, 2017a). In addition to the direct impacts of oil, cleanup activities in marshes may accelerate rates of erosion and retard recovery rates (BOEM, 2017a). Impacts associated with an extensive oiling of coastal wetland habitat from a large oil spill are expected to be significant.

A review of studies by BOEM (2012a) determined that effects of oil on marsh vegetation depend on the type of oil, the type of vegetation, and environmental factors of the area. Impacts to slightly oiled vegetation are considered short term and reversible as recent studies suggest that they will experience plant die-back, followed by recovery without replanting (BOEM, 2012a). Vegetation coated with oil experiences the highest mortality rates due to decreased photosynthesis (BOEM, 2012a). A recent review of the literature and new studies indicated that oil spill impacts to seagrass beds are often limited and may be limited to when oil is in direct contact with these plants (Fonseca et al., 2017).

C.8 Socioeconomic and Other Resources

C.8.1 Recreational and Commercial Fishing

Potential impacts to recreational and commercial fishing are analyzed by BOEM (2017a). The main commercial fishing activity in deep waters of the northern Gulf of Mexico is pelagic longlining for tunas, swordfishes, and other billfishes (Continental Shelf Associates, 2002; Beerkircher et al., 2009). Pelagic longlining has occurred historically in the project area, primarily during spring and summer. In August 2000, the federal government closed two areas in the northeastern Gulf of Mexico to longline fishing (65 FR 47214). The lease is outside of the closure areas.

Longline gear consists of monofilament line deployed from a moving vessel and generally allowed to drift for 4 to 5 hours (Continental Shelf Associates, 2002). As the mainline is put out, baited leaders and buoys are clipped in place at regular intervals. It takes 8 to 10 hours to deploy a longline and about the same time to retrieve it. Longlines are often set near oceanographic features such as fronts or downwellings, with the aid of sophisticated on-board temperature sensors, depth finders, and positioning equipment. Vessels typically are 10 to 30 m (33 to 98 ft) long, and their trips last from about 1 to 3 weeks.

It is unlikely that any commercial fishing activity other than longlining occurs at or near the project area. Benthic species targeted by commercial fishers occur on the upper continental slope, well inshore of the project area. Royal red shrimp (*Pleoticus robustus*) are caught by trawlers in water depths of about 250 to 550 m (820 to 1,804 ft) (Stiles et al., 2007). Tilefishes (primarily *Lopholatilus chamaeleonticeps*) are caught by bottom longlining in water depths from about 165 to 450 m (540 to 1,476 ft) (Continental Shelf Associates, 2002).

Most recreational fishing activity in the region occurs in water depths less than 200 m (656 ft) (Continental Shelf Associates, 1997; 2002; Keithly and Roberts, 2017). In deeper water, the main attraction to recreational fishers would be petroleum platforms offshore Texas and Louisiana. Due to the distance from shore, it is unlikely that recreational fishing activity is occurring in the project area.

The only IPFs associated with routine operations that potentially may affect fisheries is drilling rig presence which may present an entanglement risk for longline fisheries. Two types of potential accidents are also addressed below (a small fuel spill and a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig Presence

There is a slight possibility of pelagic longlines drifting into and becoming entangled in the drilling rig. For example, in January 1999, a portion of a pelagic longline snagged on the acoustic Doppler current profiler of a drillship working in the Gulf of Mexico (Continental Shelf Associates, 2002). The line was removed without incident. Generally, longline fishers use radar and are aware of offshore structures and ships when placing their sets. Therefore, little or no impact on pelagic longlining is expected.

Because it is unlikely that any recreational fishing activity is occurring in the project area, no adverse impacts are anticipated. Other factors such as effluent discharges are likely to have negligible impacts on commercial or recreational fisheries due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges.

Impacts of a Small Fuel Spill

The probability of a fuel spill is expected to be minimized by BP's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of BP's OSRP is expected to potentially mitigate and reduce the potential for impacts. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

Pelagic longlining activities in the project area, if any, could be interrupted in the event of a small fuel spill. The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions (see **Section A.9.1**). Fishing activities could be interrupted due to the activities of response vessels operating in the project area. A small fuel spill would not affect coastal water quality because the spill would not be expected to make landfall or reach coastal waters prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Potential spill impacts on fishing activities are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to this activity.

Pelagic longlining activities in the project area and other fishing activities in the northern Gulf of Mexico could be interrupted in the event of a large oil spill. A spill may or may not result in fishery closures, depending on the duration of the spill, the oceanographic and meteorological conditions at the time, and the effectiveness of spill response measures. The *Deepwater Horizon* incident provides information about the maximum potential extent of fishery closures in the event of a large oil spill in the Gulf of Mexico (NMFS, 2010a). At its peak on 12 July 2010, closures encompassed 217,821 km^2 (84,101 mi^2), or 34.8% of the U.S. Gulf of Mexico EEZ.

According to BOEM (2012a; 2017a), the potential impacts on commercial and recreational fishing activities from an accidental oil spill are anticipated to be minimal because the potential for oil spills is very low, the most typical events are small and of short duration, and the effects are so localized that fishes are typically able to avoid the affected area. Fish populations may be affected by an oil spill event should it occur, but they would be primarily affected if the oil reaches the productive shelf and estuarine areas where many fishes spend a portion of their life cycle (BOEM, 2012a). The probability of an offshore spill affecting these nearshore environments is also low. Should a large oil spill occur, economic impacts on commercial and recreational fishing activities would likely occur, but are difficult to predict because impacts would differ by fishery and season (BOEM, 2016b).

C.8.2 Public Health and Safety

There are no IPFs associated with routine operations that are expected to affect public health and safety. Impacts of a small fuel spill and a large oil spill are addressed below. A small fuel spill would be unlikely to cause any impacts on public health and safety because it would affect only a small area of the open ocean 64 statute miles (103 km) from the nearest shoreline, and nearly all of the diesel fuel would evaporate or disperse naturally within 24 hours (see **Section A.9.1**).

Impacts of a Large Oil Spill

In the event of a large spill from a blowout, the main safety and health concerns are those of the offshore personnel involved in the incident and those responding to the spill. Once released into the water column, crude oil weathers rapidly (National Research Council, 2003a). Depending on many factors such as spill rate and duration, the physical/chemical characteristics of the oil, meteorological, and oceanographic conditions at the time, and the effectiveness of spill response measures, weathered oil may remain present on the sea surface and reach coastal shorelines.

Based on data collected during the Deepwater Horizon Incident, the health risks resulting from a large oil spill appear to be minimal (Centers for Disease Control and Prevention, 2010). Health risks for spill responders and wildlife rehabilitation workers responding to a major oil spill are similar to the health risks incurred by response personnel during any large-scale emergency or disaster response (U.S. Department of Homeland Security, 2014), which includes the following:

- Possible accidents associated with response equipment;
- Hand, shoulder, or back pain, along with scrapes and cuts;
- Itchy or red skin or rashes due to potential chemical exposure;
- Heat or cold stress depending upon the working environment; and
- Possible upper respiratory symptoms due to potential dust inhalation, allergies, or potential chemical exposure.

C.8.3 Employment and Infrastructure

There are no IPFs associated with routine operations that are expected to affect employment and infrastructure. The project involves drilling with support from existing shorebase facilities in Louisiana. No new or expanded facilities will be constructed, and no new employees are expected to move permanently into the area. The project will have a negligible impact on socioeconomic conditions such as local employment, existing offshore and coastal infrastructure (including major sources of supplies, services, energy, and water), and minority and lower income groups. Impacts of a large oil spill are addressed below. A small fuel spill that dissipates within a few days would have little or no economic impact as the spill response would use existing facilities, resources, and personnel.

Impacts of a Large Oil Spill

Potential socioeconomic impacts of an oil spill are discussed by BOEM (2017a). For the EIA, there are no unique site-specific issues with respect to employment and coastal infrastructure. A large spill could cause economic impacts in several ways: it could result in extensive fishery closures that put fishermen out of work; it could result in temporary employment as part of the response effort (including the establishment of spill response staging areas); it could result in adverse publicity that affects employment in coastal recreation and tourism industries; and it could result in suspension of OCS drilling activities, including service and support operations that are an important part of local economies.

C.8.4 Recreation and Tourism

There are no known recreational uses of the project area. Recreational resources and tourism in coastal areas would not be affected by any routine activities due to the distance from shore. Compliance with NTL BSEE-2015-G03 is intended to minimize the chance of trash or debris being lost overboard from the drilling rig and subsequently washing up on beaches. A small fuel spill in the project area would be unlikely to affect recreation and tourism because, as explained in **Section A.9.1**, it would not be expected to make landfall or reach coastal waters prior to dispersing naturally.

Impacts of a Large Oil Spill

Potential impacts of an oil spill on recreation and tourism are discussed by BOEM (2017a). For this EP, there are no unique site-specific issues with respect to these impacts.

Impacts on recreation and tourism would vary depending on the duration of the spill and its fate including the effectiveness of response measures. A large spill that reached coastal waters and shorelines could adversely affect recreation and tourism by contaminating beaches and wetlands, resulting in negative publicity that encourages people to stay away. The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

According to BOEM (2017a), should an oil spill occur and contact a beach area or other recreational resource, it could cause some disruption during the impact and cleanup phases of the spill. In the unlikely event that a spill occurs that is sufficiently large to affect large areas of the coast and, through public perception, have effects that reach beyond the damaged area, effects to recreation and tourism could be significant (BOEM, 2012a).

C.8.5 Land Use

Land use along the northern Gulf coast is discussed by BOEM (2017a). There are no routine IPFs that potentially may affect land use. The project will use existing onshore support facilities in Louisiana. The land use at the existing shorebase sites is industrial. The project will not involve any new construction or changes to existing land use and, therefore, will not have any impacts. Levels of boat and helicopter traffic as well as demand for goods and services including scarce coastal resources, will represent a small fraction of the level of activity occurring at the shorebases.

A large oil spill is the only relevant IPF. A small fuel spill should not have any impacts on land use, as the response would be staged out of existing shorebases and facilities.

Impacts of a Large Oil Spill

The initial response for a large oil spill would be staged out of existing facilities, with no expected effects on land use. A large spill could have limited temporary impacts on land use along the coast if additional staging areas were needed. For example, during the *Deepwater Horizon* incident, temporary staging areas were established in Louisiana, Mississippi, Alabama, and Florida for spill response and cleanup efforts. In the event of a large spill in the project area, similar temporary staging areas could be needed. These areas would eventually return to their original use as the response is demobilized. It is not expected that a large oil spill and subsequent cleanup would substantially reduce available space in nearby landfills or decrease their usable life (BOEM, 2014).

An accidental oil spill is not likely to significantly affect land use and coastal infrastructure in the region, in part because an offshore spill would have a small probability of contacting onshore resources. BOEM (2016b) states that landfill capacity would probably not be an issue at any phase of an oil spill event or the long-term recovery. In the case of the *Deepwater Horizon* incident and response, the USEPA reported that existing landfills receiving oil spill waste had plenty of capacity to handle waste volumes; the wastes that were disposed of in landfills represented less than 7% of the total daily waste normally accepted at these landfills (USEPA, 2016).

C.8.6 Other Marine Uses

The project area is not located within any USCG-designated fairway or shipping lane or Military Warning Area. BP and its contractors intend to comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft. The site clearance letters for the proposed wellsites identified existing seafloor infrastructure in the vicinity of the proposed wellsites but no impacts on existing infrastructure are expected. The archaeological survey reported no archaeologically significant sonar contacts were identified within 610 m (2,000 ft) of the proposed wellsites (BP, 2019a,b).

There are no IPFs from routine project activities that are likely to affect other marine uses of the project area. A large oil spill is the only relevant accident IPF. A small fuel spill would not have any impacts on other marine uses because spill response activities would be mainly within the project area and the duration would be brief.

Impacts of a Large Oil Spill

An accidental spill would be unlikely to significantly affect shipping or other marine uses. The block is not located within any USCG-designated fairway or shipping lane. In the event of a large spill requiring numerous response vessels, coordination would be required to manage the vessel traffic for safe operations. BP and its contractor intend to comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft.

In the event of a large spill requiring numerous vessels in the area, coordination would be required to ensure that no anchoring or seafloor-disturbing activities occur near the existing infrastructure.

C.9 Cumulative Impacts

For purposes of the National Environmental Policy Act, a cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Any single activity or action may have a negligible impact(s) by itself, but when combined with impacts from other activities in the same area and/or time period, substantial impacts may result.

Prior Studies. BOEM prepared a multi-lease sale EIS in which it analyzed the environmental impact of activities that might occur in the multi-lease sale area. The level and types of activities planned in BP's EP are within the range of activities described and evaluated by BOEM in the 2017 to 2022 Programmatic Environmental Impact Statement for the Outer Continental Shelf (OCS) Oil and Gas Leasing Program (BOEM, 2016a), and the Final Programmatic EIS for Gulf of Mexico OCS Oil and Gas Lease Sales 2017-2022 (BOEM, 2017a). Past, present, and reasonably foreseeable activities were identified in the cumulative effects scenario of these documents, which are incorporated by reference. The proposed action should not result in any additional impacts beyond those evaluated in the multi-lease sale and Final EISs (BOEM, 2012a; 2013; 2014; 2015; 2016b; 2017a).

Description of Activities Reasonably Expected to Occur in the Vicinity of Project Area. Other exploration and development activities may occur in the vicinity of the project area. BP does not anticipate other projects in the vicinity of the project area beyond the types of projects analyzed in the lease sale and Supplemental EISs (BOEM, 2012a; 2013; 2014; 2015; 2016b; 2017a).

Cumulative Impacts of Activities in this EP. The BOEM (2017a) Final EIS included a discussion of cumulative impacts, which analyzed the incremental environmental and socioeconomic impacts of the 10 proposed lease sales, in addition to all activities (including non-OCS activities) projected to occur from past, proposed, and future lease sales. The EISs considered exploration, delineation, and development wells; platform installation; service vessel trips; and oil spills. The EISs examined the potential cumulative effects on each specific resource for the entire Gulf of Mexico.

The level and type of activity proposed in BP's EP are within the range of activities described and evaluated in the recent lease sale EISs. The EIA incorporates and builds on these analyses by examining the potential impacts on physical, biological, and socioeconomic resources from the work planned in this EP, in conjunction with the other reasonably foreseeable activities expected to occur in the Gulf of Mexico. For all impacts, the incremental contribution of BP's proposed actions to the cumulative impacts analysis in these prior analyses are not expected to be significant.

D. Environmental Hazards

D.1 Geologic Hazards

The site clearance letter provided by BP concluded that the proposed wellsites are generally favorable for exploratory drilling (BP, 2019a; b). See EP Section 3 for supporting geological and geophysical information.

D.2 Severe Weather

Under most circumstances, weather is not expected to have any effect on the proposed activities. Extreme weather, including high winds, strong currents, and large waves, was considered in the design criteria for the drilling rig selected for this project. High winds and limited visibility during a severe storm could disrupt support activities (vessel and helicopter traffic) and make it necessary to suspend some activities on the drilling rig for safety reasons until the storm or weather event passes. BP has several contingency plans in place to address unexpected conditions. In the event of severe weather, guidance as outlined in BP's and/or BP's drilling contractor's site specific EEP, its site-specific hurricane preparation checklist, and the Gulf of Mexico Region Severe Weather Contingency Plan would be adhered to.

D.3 Currents and Waves

Metocean conditions such as sea states, wind speed, ocean currents, etc. will be continuously monitored. Under most circumstances, physical oceanographic conditions are not expected to have any effect on the proposed activities. Strong currents (e.g., caused by Loop Current eddies and intrusions) and large waves were considered in the design criteria for the drilling rig selected for this project. High waves during a severe storm could disrupt support activities (i.e., vessel and helicopter traffic), and risks to the drilling program brought on by such conditions would be closely monitored and managed by the team managing the project. In some cases, it may be necessary to suspend some activities on the drilling rig for safety reasons until the storm or weather event passes.

E. Alternatives

No formal alternatives were evaluated in the EIA for the proposed project. However, various technical and operational options, including the location of the wellsite and the selection of a potential drilling unit, were considered by BP. The activity being proposed is the result of a rigorous screening and right-scoping process. It was selected as the best design candidate to reduce risk and optimize deliverability, chosen from numerous options with varying well locations, trajectories, construction designs, and drilling strategies, amongst other variables.

F. Mitigation Measures

The proposed program includes numerous processes and actions that are intended to mitigate potential impact to the environment. The project is expected to comply with applicable federal, state, and local requirements concerning air pollutant emissions, discharges to water, and waste management. In addition, BP and its drilling contractor intend to implement the following specific measures to prevent marine pollution:

- Proper job planning is an important overall mitigation measure. The fundamental concept and discussion in the pre-tour and pre-job safety meetings is the prevention of harm to people and the environment. Personnel are reminded daily to inspect work areas for safety issues as well as potential pollution issues.
- Per Safety and Environmental Management System (SEMS) requirements, the skills and knowledge of personnel are assessed prior to working offshore for BP.
- Equipment transferred to and from the drilling rig will be inspected to ensure pollution pans have been cleaned and to confirm that plugs have been installed prior to leaving the dock and prior to loading on the boat.
- Preventive maintenance of rig and vessel equipment and other service equipment, including visual inspection of hydraulic lines and reservoirs, will be conducted on a scheduled basis.
- Items deemed safety and environmentally critical are listed and managed on a schedule recommended by the manufacturer/operator.
- Waste generation and storage will be managed as per the BP Gulf of Mexico Waste Management procedures and/or the drilling contractor's established waste management procedures. Wastes are expected to be categorized, packaged, labeled, stored, manifested, and shipped to an appropriately permitted disposal site.
- Drums will be stored in containment areas, and fuel vents will have containment boxes.
- Trash containers will be kept covered. Trash will be disposed of in a compactor and shipped to shore via a rig support vessel.
- Tank overflow, discharge overflow spill prevention fittings as well as quick disconnect hoses will be installed on hydrocarbon-based fluid hoses and liquid mud hoses to ensure isolation of any hose failures.
- On site spill kits are inspected regularly and re-stocked as needed.
- Drills are conducted regularly, often engaging the IMT onshore to measure the effectiveness and quality of processes deployed to address oil spill scenarios.
- Fuel hoses and SBM hoses will be changed based on the maintenance schedule of the MODU.

G. Consultation

No persons or agencies other than those listed as Preparers (**Section H**) were consulted during the preparation of the EIA.

H. Preparers

The EIA was prepared by CSA Ocean Sciences Inc. Contributors included:

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Appendix J: New Technology

MPD for GoM Exploration Wells

Context

Managed Pressure Drilling (MPD) is defined by the International Association of Drilling Contractors (IADC) as "An adaptive drilling process used to precisely control the annular pressure profile throughout the wellbore." The ability to control the annular pressure profile facilitates remaining within the downhole pressure limits imposed by the well's Pore Pressure Fracture Gradient (PPFG) and including additional factors like wellbore stability and trip margin. A study conducted by the Drilling Engineers Association on behalf of the U.S. Department of Interior Minerals Management Service concluded "MPD is as safe as or safer than conventional offshore drilling" (Malloy, 2008).

Background

BP has been using Surface Back Pressure (SBP) MPD to successfully deliver complex High Pressure High Temperature (HPHT) exploration wells in Egypt since 2007. This MPD method has many advantages for this environment, where geological uncertainty and associated challenges often lead to high Non-Productive Time (NPT) or inability to deliver exploration objectives. BP has also used this method to successfully deliver a shallow water deep gas exploration well in the GoM in 2009. The advantages of this method in exploration wells have long been established.

It is worth mentioning that the SBP method is not limited to exploration and appraisal wells, and it has been used successfully within BP to drill development wells where the high mud weight required for wellbore stability leads to a narrow drilling window and an increased risk of losses in depleted sands.

SBP MPD Theory

SBP MPD, often referred to within the industry as Constant Bottom Hole Pressure (CBHP), uses surface pressure to supplement a lighter than conventional mud weight to maintain an overbalanced condition. This technique enables maintaining a near constant pressure throughout the open hole well bore when both dynamic and static. This prevents the pressure cycling experienced by the open hole well bore which can cause well bore fatigue and lead to underbalanced conditions (i.e. kicks taken at pumps off events). The ability to apply SBP reduces the well control risk of allowing an influx during pumps off events and on trips. The system also provides an early kick and loss detection capability through the use of pressure monitoring and high accuracy flow rate monitors such as a Coriolis meter.

Benefits of SBP MPD for Exploration wells in GoM

GoM deepwater exploration wells, particularly sub-salt, face many challenges such as:

1. PPFG uncertainty, particularly with poor seismic imaging sub-salt.
2. Tight operating window between Pore Pressure and Fracture Gradient, which may potentially increase the risk of losses or well control issues.

3. Equivalent Circulating Density (ECD) management.
4. Risk and time associated with riser gas events.
5. Wellbore ballooning.
6. Challenges associated with salt exit uncertainty
7. Difficulty tripping out or pumping of hole due to narrow window and swabbing / losses.

SBP MPD allows managing and mitigating these challenges through the ability to control bottomhole pressure and maintain it near constant. Benefits of SBP MPD for exploration wells may include:

1. Early Kick/Loss detection.
2. Fast and Precise control of BHP.
3. Constant BHP reduces or eliminates ballooning. Unmanageable wellbore ballooning is a common cause for high NPT and failure to reach Total Depth (TD) objectives in exploration and HPHT environments.
4. Allows identification of operating window boundaries. A dynamic Formation Integrity Test (FIT) can be quickly carried out to test wellbore integrity prior to making any changes to mud weight.
5. Allows tripping out with surface pressure to mitigate swabbing effects, instead of pumping out or raising Mud Weight (MW).
6. The SBP system provides a safer and more efficient well and riser degassing method for floating operations.

BP use of SBP MPD for Exploration wells in GoM

The SBP MPD method is the MPD method which is most suitable to address the drilling challenges encountered in GoM exploration, as it is more suited to deal with well challenges such as geological uncertainty, tight PPFG window, well bore ballooning and well bore stability with rapid response capabilities to react to changing down hole conditions by adjusting the BHP precisely and quickly. In addition, the SBP MPD system provides additional techniques to examine the well bore boundaries of the PPFG by performing well bore bleed downs and dynamic FITs.

SBP MPD equipment for Exploration wells in GoM

The SBP MPD equipment package will be detailed in a technology permit submitted and approval sought from BSEE for each each rig equipped with MPD.