UNITED STATES GOVERNMENT July 12, 2021
MEMORANDUM

To: Public Information (MS 5030)
From: Plan Coordinator, FO, Plans Section (MS 5231)

Subject: Public Information copy of plan

Control # - S-08047

Type - Supplemental Development Operations Coordinations Document

Lease(s) - OCS-G32504 Block - 432 Green Canyon Area
OCS-G35662 Block - 478 Green Canyon Area
OCS-G35864 Block - 389 Green Canyon Area
OCS-G35865 Block - 390 Green Canyon Area
OCS-G35867 Block - 433 Green Canyon Area

Operator - Murphy Exploration & Production Company - USA

Description - Platform A-KingsQuay & wells

Rig Type - Not Found

Attached is a copy of the subject plan.

It has been deemed submitted as of this date and is under review for approval.

Chiquita Hill
Plan Coordinator

Site Type/Name	Botm Lse/Area/Blk	Surface Location	Surf Lse/Area/Blk
FPSO/A-KINGSQ		2228 FSL, 1005 FEL	G35867/GC/433
WELL/SS001	G35865/GC/390	1200 FSL, 3520 FEL	G35864/GC/389
WELL/SS001	G35662/GC/478	6419 FNL, 5621 FEL	G35662/GC/478
WELL/SS002	G35864/GC/389	291 FSL, 3352 FEL	G35864/GC/389
WELL/SS002	G35865/GC/390	1197 FSL, 3602 FEL	G35864/GC/389
WELL/SS002	G35662/GC/478	5384 FNL, 4485 FEL	G35662/GC/478
WELL/SS003	G32504/GC/432	7692 FNL, 7114 FEL	G32504/GC/432
WELL/SS004	G32504/GC/432	7850 FSL, 7072 FEL	G32504/GC/432

PUBLIC INFORMATION

Supplemental Development Operations Coordination Document

GREEN CANYON BLOCKS 432, 433, 434, 389, 390 & 478

LEASES OCS-G 32504, 35867, 35868, 35864, 35865 & 35662

OFFSHORE LOUISIANA

Prepared by:
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October 2020

SECTION 1
PLAN CONTENTS

1.1 PLAN INFORMATION

Under this Joint Initial Development Operations Coordination Document, Murphy Exploration & Production Company – USA (Murphy) proposed to install Platform A, King's King in Lease OCS-G 35867, Green Canyon Block 434, the associated anchors will be place Green Canyon Blocks 433 (G35867), 434 (G35868) 478 (G35662) and 477 (unleased). Additionally, Murphy will install 17 lease term pipelines and place seven (7) well on production. The drilling and completion of the wells were provided for in the Exploration Plans identified listed in the table below.

Lease	Area	Block	Well	Plan Control No.
G32504	Green Canyon	432	SS003	S-7997
G32504	Green Canyon	432	SS004	S-7997
G35864	Green Canyon	389	SS002	S-8030
G35865	Green Canyon	390	SS001	N-9960
G35865	Green Canyon	390	SS002	N-9960
G35862	Green Canyon	478	SS001	N-9557
G35862	Green Canyon	478	SS002	N-9957

Murphy will submit a Right-of-Use and Easement under separate cover for the anchors located in the unleased Green Canyon Block 477.

The facility, pipelines and suction piles will be installed utilizing a dynamically position vessels. There will be no associated anchors during installation.

The OCS Plan Information Form BOEM-137 is included as **Attachment 1-A.**

1.2 LOCATION

The following are included in Appendix A.

- Form MMS 137 – OCS Plan Information Form
- Activity schedule
- Well Location Plats
- Cost Recovery Receipt
- Structure Drawing
- Overall Field Layout
- Suction Pile Schematic

1.3 SAFETY AND POLLUTION PREVENTION FEATURES

No additional drilling operations will be conducted under this plan.

Safety of personnel and protection of the environment during the proposed operations are of primary concern for Murphy.

as further clarified by BSEE Notices to Lessees, and current policy making invoked by the BSEE, Environmental Protection Agency (EPA) and the USCG.

Pollution prevention measures include installation of curbs, gutters, drip pans, and drains on drilling deck areas to collect all contaminants and debris.

1.4 STORAGE TANKS AND PRODUCTION VESSELS

The table below provides storage tanks with capacity of 25 barrels or more that will store fuels, oil and lubricants.

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (Average API)
Production	Dry/Wet Oil Tank	503	1	503	37
Production	Test Separator	46	1	46	50
Production	HP Oil Separator #1	46	1	46	51
Production	HP Oil Separator #2	46	1	46	54
Production	HP Oil Separator #3	46	1	46	44
Production	IP Separator	84	1	84	42
Production	LP Separator Degasser	66	1	66	40
Production	LP Separator	408	1	408	40
Production	Oil Treater Degasser	55	2	110	42
Production	Oil Treater	471	2	942	42
Production	HP Flare Scrubber	156	1	156	45
Production	LP Flare Scrubber	25	1	25	35
Production	Open Drain Sump	169	1	169	35
Production	Open Drain Sump	31	1	31	35
Production	Flotation Cell	130	1	130	11
Storage	Hull Diesel Tank	673	2	1346	35

1.5 POLLUTION PREVENTION MEASURES

These operations do not propose activities for which the State of Florida is an affected state.

1.6 ADDITIONAL MEASURES

Murphy does not propose any additional safety, pollution prevention, or early spill detection measures beyond those required by 30 CFR Part 250.

SECTION 2
GENERAL INFORMATION

2.1 APPLICATIONS AND PERMITS

No additional applications or permits are required to conduct the activities proposed herein.

The table below provides the additional applications to be filed covering operations proposed in this DOCD.

Application/Permit	Issuing Agency	Status
Surface Commingling Application	BSEE	Pending
Deepwater Operations Plan	BSEE	Pending
Conservation Information Document	BOEM	Pending
Lease Term Pipeline Application	BSEE	Pending
ROW Pipeline Application	BSEE	Pending
Structure Application	BSEE	Pending
Surface Safety System	BSEE	Pendng

2.2 DRILLING FLUIDS

No drilling operations are proposed in this DOCD.

2.3 PRODUCTION

Proprietary Information

2.4 OIL CHARACTERISTICS

Proprietary Information

2.5 NEW OR UNUSUAL TECHNOLOGY

No new or unusual technology is proposed in this DOCD as defined by 30 CFR 550.200.

2.6 BONDING STATEMENT

The bond requirements for the activities and facilities proposed in this DOCD are satisfied by a an area-wide bond, furnished and maintained according to 30 CFR 556 (b); NTL No. 2015-N01, "General Financial Assurance".

2.7 OIL SPILL FINANCIAL RESPONSIBILITY (OSFR)

Murphy Exploration & Production Company - USA (Company No. 02647) will demonstrate oil spill financial responsibility for the facilities proposed in this DOCD according to 30 CFR Part 553; and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities".

2.8 DEEPWATER WELL CONTROL STATEMENT

Murphy Exploration & Production Company - USA (Company No. 02647) has the financial capability to drill a relief well and conduct other emergency well control operations.

2.9 SUSPENSION OF PRODUCTION

Lease OCS-G 32504, Green Canyon Block 462 is currently held by a suspension of production through December 31, 2020. Murphy will be requesting an additional suspension to hold the lease through first production.

2.10 BLOWOUT SCENARIO AND WORST CASE DISCHARGE CALCULATIONS

There are no drilling operations proposed. The blowout scenario reviewed and approved under plan control number S-7997 has been included for reference in **Appendix B.**

SECTION 3
GEOLOGICAL AND GEOPHYSICAL INFORMATION

3.1 GEOLOGICAL DESCRIPTION
Proprietary Information

3.2 STRUCTURE CONTOUR MAPS
Proprietary Information

3.3 INTERPRETED SEISMIC LINES
Proprietary Information

3.4 GEOLOGICAL STRUCTURE CROSS-SECTIONS
Proprietary Information

3.5 SHALLOW HAZARDS REPORT
A shallow hazards report was conducted over the area and previously submitted to BOEM.

3.6 SHALLOW HAZARDS ASSESSMENT
A shallow hazards assessment has been included in **Appendix C**.

3.7 HIGH-RESOLUTION SEISMIC LINES
Proprietary Information

3.8 STRATIGRAPHIC COLUMN
Proprietary Information

3.9 TIME VS DEPTH TABLES
Proprietary Information

SECTION 4
HYDROGEN SULFIDE INFORMATION

4.1 CONCENTRATION

Murphy anticipates encountering 0 ppm H_2S during the proposed operations.

4.2 CLASSIFICATION

In accordance with Title 30 CFR 250.490(c), Green Canyon Blocks 433 (G35867), 434 (G35868) and 478 (G35662) have been classified as H2S absent.

4.3 H_2S CONTINGENCY PLAN

An H_2S Contingency Plan is not required for the activities proposed in this plan.

4.4 MODELING REPORT

Modeling reports are not required for the activities proposed in this plan.

SECTION 5
MINERAL RESOURCE CONSERVATION INFORMATION

5.1 TECHNOLOGY & RESERVOIR ENGINEERING PRACTICES AND PROCEDURES

Proprietary Information

5.2 TECHNOLOGY AND RECOVERY PRACTICES AND PROCEDURES

Proprietary Information

5.3 RESERVOIR DEVELOPMENT

Proprietary Information

SECTION 6
BIOLOGICAL, PHYSICAL AND SOCIOECONOMIC INFORMATION

6.1 DEEPWATER BENTHIC COMMUNITIES

The seafloor disturbing activities proposed in this plan are in water depths greater than 300 meters (984'). GEMS was contracted to provide an assessment of the shallow conditions at the proposed surface location of the facility. The purpose of the assessment was to address seafloor conditions that may impact operations within 2,000 feet of the proposed well site. Murphy will avoid all high-density deepwater benthic communities by 2,000 feet from each discharge location and 250 feet from the location of all other seafloor disturbances. As per NTL No. 2009-G40, "Deepwater Benthic Communities," a map showing the 2,000 foot radius around the anchors is included as **Attachment 6-A.**

6.2 TOPOGRAPHIC FEATURES (BANKS)

Activities proposed in this DOCD do not fall within 305 meters (1000 feet) of a topographic "No Activity Zone;" therefore, no map is required per NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas."

6.3 TOPOGRAPHIC FEATURES STATEMENT (SHUNTING)

Activities proposed under this DOCD will be conducted outside all Topographic Feature Protective Zones; therefore, shunting of drill cuttings and drilling fluids is not required per NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas."

6.4 LIVE-BOTTOMS (PINNACLE TREND FEATURES)

Green Canyon Blocks 433 (G35867), 434 (G35868) and 478 (G35662) are not located within 61 meters (200 feet) of any pinnacle trend feature; therefore, a separate bathymetric map is not required per NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas."

6.5 LIVE BOTTOMS (LOW RELIEF)

Green Canyon Blocks 433 (G35867), 434 (G35868) and 478 (G35662) are not located within 30 meters (100 feet) of any live bottom (low relief) feature with vertical relief equal to or greater than 8 feet; therefore, live bottom (low relief) maps are not required per NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas."

6.6 POTENTIALLY SENSITIVE BIOLOGICAL FEATURES

Green Canyon Blocks 433 (G35867), 434 (G35868) and 478 (G35662) are not located within 30 meters (100 feet) of potentially sensitive biological features. In accordance with NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas," biologically sensitive area maps are not required.

6.7 THREATENED AND ENDANGERED SPECIES, CRITICAL HABITAT AND MARINE MAMMAL INFORMATION

The federally listed endangered and threatened species potentially occurring in the lease area and along the Gulf Coast are provided in the table below:

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico
			Lease Area	Coastal	
Marine Mammals					
Manatee, West Indian	*Trichechus manatus latirostris*	E	--	X	Florida (peninsular)
Giant Manta Ray	*Manta birostris*	E	X	--	None
Whale, Blue	*Balaenoptera masculus*	E	X*	--	None
Whale, Finback	*Balaenoptera physalus*	E	X*	--	None
Whale, Humpback	*Megaptera novaeangliae*	E	X*	--	None
Whale, North Atlantic Right	*Eubalaena glacialis*	E	X*	--	None
Whale, Sei	*Balaenopiera borealis*	E	X*	--	None
Whale, Sperm	*Physeter catodon (=macrocephalus)*	E	X	--	None
Whale, Bryde's	*Balaenoptera edeni*	E	X	--	None
Terrestrial Mammals					
Mouse, Beach (Alabama, Choctawatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	-	X	Alabama, Florida (panhandle) beaches
Birds					
Plover, Piping	*Charadrius melodus*	T	-	X	Coastal Texas, Louisiana, Mississippi, Alabama and Florida (panhandle)
Crane, Whooping	*Grus Americana*	E	-	X	Coastal Texas
Reptiles					
Sea Turtle, Green	*Chelonia mydas*	T,E**	X	X	None
Sea Turtle, Hawksbill	*Eretmochelys imbricata*	E	X	X	None
Sea Turtle, Kemp's Ridley	*Lepidochelys kempli*	E	X	X	None
Sea Turtle, Leatherback	*Dermochelys coriacea*	E	X	X	None
Sea Turtle, Loggerhead	*Caretta caretta*	T	X	X	Texas, Louisiana, Mississippi, Alabama, Florida
Fish					
Sturgeon, Gulf	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	T	X	X	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)
Oceanic Whitetip Shark	*Carcharhinus longimanus*	E	X	--	None
Corals					
Coral, Elkhorn	*Acopora palmate*	T	-	X	Florida Keys and Dry Tortugas
Coral, Staghorn	*Acopora cervicornis*	T	-	X	Florida

Abbreviations: E = Endangered; T = Threatened

* The Blue Fin, Humpback, North Atlantic Right, and Sei Whales are rare or extralimital in the Gulf of Mexico and are unlikely to be present in the lease area.

** Green Sea turtle is threatened, except for the Florida breeding population, which is listed as endangered.

6.8 ARCHAEOLOGICAL REPORT

If Murphy should discover any findings of archaeological significance, operations will immediately cease and BOEM Regional office will be contacted for guidance.

6.9 AIR AND WATER QUALITY INFORMATION

Air and water quality information is not required to be included in this plan per NTL No. 2008-G04, "Information Requirements for Exploration Plans and Development Operations Coordination Documents."

6.10 SOCIOECONOMIC INFORMATION

Socioeconomic information is not required to be included in this plan per NTL No. 2008-G04, "Information Requirements for Exploration Plans and Development Operations Coordination Documents."

SECTION 7
WASTES AND DISCHARGES INFORMATION

7.1 PROJECTED GENERATED WASTES

"Wastes You Will Generate, Treat and Downhole Dispose or Discharge to the Gulf of Mexico" is included as **Appendix D.**

7.2 MODELING REPORT

Modeling reports are not required for the activities proposed in this plan.

SECTION 8
AIR EMISSIONS INFORMATION

8.1 EMISSIONS WORKSHEETS AND SCREENING QUESTIONS

Screen Questions for DOCD's	Yes	No
Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed development 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
Does or will the facility complex associated with your proposed development and production activities process production from eight or more wells?		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 in excess of the criteria set forth under 250.1105(a)(2) and (3)?		X
Do you propose to burn produced hydrocarbon liquids?		X
Are your proposed development and production activities located within 25 miles (40 kilometers) from shore?		X
Are your proposed development and production activities located within 124 miles (200 kilometers) of the Breton Wilderness Area?		X

8.2 SUMMARY INFORMATION

Included as **Appendix E** are Air Emission Worksheets which show the emissions calculations for the Plan Emissions.

SECTION 9
OIL SPILL INFORMATION

9.1 OIL SPILL

Murphy has a Regional OSRP prepared according to the guidance of NTL 2012-N06, :Guidance to Owners and Operators of Offshore Seaward of the Coastline Concerning Regional Oil Spill Response Plans." The Regional OSRP was last approved in December 2013 and last updated in February 2020

9.2 SPILL RESPONSE SITES

Primary Response Equipment Location	Preplanned Staging Location
Houma, LA	Houma, LA

9.3 OSRO INFORMATION

Murphy's primary equipment providers are Clean Gulf Associated (CGA) and Marine Spill Response Corporation (MSRC). Clean Gulf Associates Services, LLC (CGAS) will provide the closest personnel, as well as a CGAS supervisor to operate the equipment. MSRC personnel are responsible for operating MSRC equipment.

9.4 WORST-CASE DISCHARGE SCENARIO DETERMINATION

Category	Production	
	Regional OSRP WCD	DOCD WCD
Type of Activity	>10 Miles Production	>10 Miles Production
Facility location (Area/Block)	MC582	GC433
Facility designation	Platform A - Medusa	Platform A – King's Quay
Distance to nearest shoreline (miles)	36.8	108
Storage tanks & flowlines (bbl)		4,661
Lease term pipelines (bbl)		1,803
Uncontrolled blowout (bbl)		24,785
Total Volume (bbl)	**30,447**	**31,249**
Type of oil(s) (crude, condensate, diesel)	Crude	Crude
API gravity	25	28.5

Since Murphy has the capability to respond to the worst-case spill scenario included in our Regional OSRP approved on December 2013 and last updated in February 2020, and since the worst-case scenario determined for our DOCD does not replace the worst-case scenario in our Regional OSRP, Murphy hereby 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 this DOCD.

9.5 OIL SPILL RESPONSE DISCUSSION

The Oil Spill Response Discussion is included as **Appendix F.**

9.6 MODELING REPORT

Modeling reports are not required for the activities proposed in this plan.

SECTION 10
ENVIRONMENTAL MONITORING INFORMATION

10.1 MONITORING SYSTEMS

Murphy will monitor loop currents per the requirements as set forth in NTL No. 2009-G02, "Ocean Current Monitoring."

10.2 INCIDENTAL TAKES

There is no reason to believe that any of the endangered species or marine mammals as listed in the Endangered Species Act (ESA) will be "taken" as a result of the operations proposed under this plan.

It has been documented that the use of explosives and/or seismic devices can affect marine life. Operations proposed in this plan will not be utilizing either of these devices.

Murphy will adhere to the requirements as set forth in the following documents, as applicable, to avoid or minimize impacts to any of the species listed in the ESA as a result of the operations conducted herein:

- NTL No. 2015-BSEE-G03, "Marine Trash and Debris Awareness and Elimination"
- NTL No. 2016-JOINT-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
- NTL No. 2016-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program"

10.3 FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY

Green Canyon Blocks 433 (G35867), 434 (G35868) and 478 (G35662) are not located in the Flower Garden Banks National Marine Sanctuary; therefore, relevant information is not required in this DOCD.

10.4 NATIONAL MARINE FISHERIES SERVICE BIOLOGICAL OPINION OF MARCH 13, 2020

As follows:

- If using a rig or vessel that includes equipment with a potential for entanglement or entrapment (e.g., moon pool, flexible lines/ropes, or gear without turtle guards), your plan/application must describe in detail the equipment and procedures used. For example, if using a moon pool, procedures may include a dedicated contractor, crew member or company representative monitoring the moon pool area during the operations for sea turtles or other marine life. This information must be updated in the Environmental Monitoring and Environmental Mitigation Measures Sections. The Biological Opinion can be found here: https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-andgas-program-activities-gulf-mexico.

  The pipeline lay barge will be equipped with a moon pool. There will be a dedicated crew member watching the moon pool to ensure the absence of marine life during the operation.

- Will your operations utilize pile driving?

  No pile driving activities will be conducted.

- Are any new pipeline expected to make landfall?

  The proposed pipeline will not make landfall.

- Update of Environmental Monitoring, Mitigation Measures and Biological sections. Identified the threatened and/or endangered species, critical habitat, and marine mammal information reflects the requirements found in Appendices A, B, C, and J. The Appendices may be found here: (https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally- regulated-oil-and-gas-program-gulf-mexico).

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico
			Lease Area	Coastal	
Marine Mammals					
Manatee, West Indian	*Trichechus manatus latirostris*	E	--	X	Florida (peninsular)
Giant Manta Ray	*Manta birostris*	E	X	--	None
Whale, Blue	*Balaenoptera masculus*	E	X*	--	None
Whale, Finback	*Balaenoptera physalus*	E	X*	--	None
Whale, Humpback	*Megaptera novaeangliae*	E	X*	--	None
Whale, North Atlantic Right	*Eubalaena glacialis*	E	X*	--	None
Whale, Sei	*Balaenopiera borealis*	E	X*	--	None
Whale, Sperm	*Physeter catodon (=macrocephalus)*	E	X	--	None
Whale, Bryde's	*Balaenoptera edeni*	E	X	--	None
Terrestrial Mammals					
Mouse, Beach (Alabama, Choctawatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	-	X	Alabama, Florida (panhandle) beaches
Birds					
Plover, Piping	*Charadrius melodus*	T	-	X	Coastal Texas, Louisiana, Mississippi, Alabama and Florida (panhandle)
Crane, Whooping	*Grus Americana*	E	-	X	Coastal Texas
Reptiles					
Sea Turtle, Green	*Chelonia mydas*	T,E**	X	X	None
Sea Turtle, Hawksbill	*Eretmochelys imbricata*	E	X	X	None
Sea Turtle, Kemp's Ridley	*Lepidochelys kempli*	E	X	X	None

Sea Turtle, Leatherback	*Dermochelys coriacea*	E	X	X	None
Sea Turtle, Loggerhead	*Caretta caretta*	T	X	X	Texas, Louisiana, Mississippi, Alabama, Florida
Fish					
Sturgeon, Gulf	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	T	X	X	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)
Oceanic Whitetip Shark	*Carcharhinus longimanus*	E	X	--	None
Corals					
Coral, Elkhorn	*Acopora palmate*	T	-	X	Florida Keys and Dry Tortugas
Coral, Staghorn	*Acopora cervicornis*	T	-	X	Florida

SECTION 11
LEASE STIPULATIONS INFORMATION

11.5 MARINE PROTECTED SPECIES

In accordance with the Federal Endangered Species Act and the Marine Mammal Protection Act, Murphy will:

(a) Collect and remove flotsam resulting from activities related to exploration, development, and production of this lease;

(b) Post signs in prominent places on all vessels and platforms used as a result of activities related to exploration, development, and production of this lease detailing the reasons (legal and ecological) why release of debris must be eliminated;

(c) Observe for marine mammals and sea turtles while on vessels, reduce vessel speed to 10 knots or less when assemblages of cetaceans are observed, and maintain a distance of 90 meters or greater from whales, and a distance of 45 meters or greater from small cetaceans and sea turtles;

(d) Employ mitigation measures prescribed by BOEM/BSEE or the National Marine Fisheries Service (NMFS) for all seismic surveys, including the use of an "exclusion zone" based upon the appropriate water depth, ramp-up and shutdown procedures, visual monitoring, and reporting;

(e) Identify important habitats, including designated critical habitat, used by listed species (e.g., sea turtle nesting beaches, piping plover critical habitat), in oil spill contingency planning and require the strategic placement of spill cleanup equipment to be used only by personnel trained in less-intrusive cleanup techniques on beaches and bay shores; and

(f) Immediately report all sightings and locations of injured or dead protected species (e.g., marine mammals and sea turtles) to the appropriate stranding network. If oil and gas industry activity is responsible for the injured or dead animal (e.g., because of a vessel strike), the responsible parties should remain available to assist the stranding network. If the injury or death was caused by a collision with the lessee's vessel, the lessee must notify BOEM within 24 hours of the strike.

BOEM and BSEE issue Notices to Lessees (NTLs), which more fully describe measures implemented in support of the above-mentioned implementing statutes and regulations, as well as measures identified by the U.S. Fish and Wildlife Service and NMFS arising from, among others, conservation recommendations, rulemakings pursuant to the MMPA, or consultation. The lessee and its operators, personnel, and subcontractors, while undertaking activities authorized under this lease, must implement and comply with the specific mitigation measures outlined in NTL No. 2012-JOINT-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting;" NTL No. 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program;" and NTL No. 2015-BSEE-G03, "Marine Trash and

Debris Awareness and Elimination." At the lessee's option, the lessee, its operators, personnel, and contractors may comply with the most current measures to protect species in place at the time an activity is undertaken under this lease, including but not limited to new or updated versions of the NTLs identified in this paragraph. The lessee and its operators, personnel, and subcontractors will be required to comply with the mitigation measures, identified in the above referenced NTLs, and additional measures in the conditions of approvals for their plans or permits.

SECTION 12
ENVIRONMENTAL MITIGATION MEASURES INFORMATION

12.1 MEASURES TAKEN TO AVOID, MINIMIZE, AND MITIGATE IMPACTS

This plan does not propose activities for which the state of Florida is an affected state; therefore, mitigation information is not required for the activities proposed in this plan.

12.2 INCIDENTAL TAKES

Murphy will adhere to the requirements as set forth in the following documents, as applicable, to avoid or minimize impacts to any of the species listed in the Endangered Species Act (ESA) as a result of the operations conducted herein:

- NTL No. 2015-BSEE-G03, "Marine Trash and Debris Awareness and Elimination"
- NTL No. 2016-JOINT-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
- NTL No. 2016-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program"

12.3 NATIONAL MARINE FISHERIES SERVICE BIOLOGICAL OPINION OF MARCH 13, 2020

As follows:

- If using a rig or vessel that includes equipment with a potential for entanglement or entrapment (e.g., moon pool, flexible lines/ropes, or gear without turtle guards), your plan/application must describe in detail the equipment and procedures used. For example, if using a moon pool, procedures may include a dedicated contractor, crew member or company representative monitoring the moon pool area during the operations for sea turtles or other marine life. This information must be updated in the Environmental Monitoring and Environmental Mitigation Measures Sections. The Biological Opinion can be found here: https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-andgas-program-activities-gulf-mexico.

  The pipeline lay barge will be equipped with a moon pool. There will be a dedicated crew member watching the moon pool to ensure the absence of marine life during the operation.

- Will your operations utilize pile driving?

  No pile driving activities will be conducted.

- Are any new pipeline expected to make landfall?

  The proposed pipeline will not make landfall.

- Update of Environmental Monitoring, Mitigation Measures and Biological sections. Identified the threatened and/or endangered species, critical habitat, and marine mammal information reflects the requirements found in Appendices A, B, C, and J. The Appendices may be found here: (https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally- regulated-oil-and-gas-program-gulf-mexico).

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Marine Mammals					
Manatee, West Indian	*Trichechus manatus latirostris*	E	--	X	Florida (peninsular)
Giant Manta Ray	*Manta birostris*	E	X	--	None
Whale, Blue	*Balaenoptera masculus*	E	X*	--	None
Whale, Finback	*Balaenoptera physalus*	E	X*	--	None
Whale, Humpback	*Megaptera novaeangliae*	E	X*	--	None
Whale, North Atlantic Right	*Eubalaena glacialis*	E	X*	--	None
Whale, Sei	*Balaenopiera borealis*	E	X*	--	None
Whale, Sperm	*Physeter catodon (=macrocephalus)*	E	X	--	None
Whale, Bryde's	*Balaenoptera edeni*	E	X	--	None
Terrestrial Mammals					
Mouse, Beach (Alabama, Choctawatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	-	X	Alabama, Florida (panhandle) beaches
Birds					
Plover, Piping	*Charadrius melodus*	T	-	X	Coastal Texas, Louisiana, Mississippi, Alabama and Florida (panhandle)
Crane, Whooping	*Grus Americana*	E	-	X	Coastal Texas
Reptiles					
Sea Turtle, Green	*Chelonia mydas*	T,E**	x	x	None
Sea Turtle, Hawksbill	*Eretmochelys imbricata*	E	x	x	None
Sea Turtle, Kemp's Ridley	*Lepidochelys kempli*	E	x	x	None
Sea Turtle, Leatherback	*Dermochelys coriacea*	E	x	x	None
Sea Turtle, Loggerhead	*Caretta caretta*	T	X	X	Texas, Louisiana, Mississippi, Alabama, Florida
Fish					
Sturgeon, Gulf	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	T	X	X	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)
Oceanic Whitetip Shark	*Carcharhinus longimanus*	E	X	--	None
Corals					

Coral, Elkhorn	*Acopora palmate*	T	-	X	Florida Keys and Dry Tortugas
Coral, Staghorn	*Acopora cervicornis*	T	-	X	Florida

SECTION 13
RELATED FACILITIES AND OPERATIONS INFORMATION

13.1 RELATED OCS FACILITIES AND OPERATIONS

The subsea wells will tie back to the proposed platform via lease term flowlines. The proposed flowlines will transport produced hydrocarbons full well stream to the facility.

Murphy anticipates installing minimal processing equipment on this structure. All hydrocarbon handling equipment installed for testing and production operations will be designed, installed and operated to prevent pollution.

All hydrocarbon handling equipment installed for testing and production operations will be designed, installed and operated to prevent pollution.

13.2 TRANSPORTATION SYSTEM

A 16-inch oil export right-of-way pipeline will be installed to transport produced hydrocarbons from Platform A to an existing pipeline within Green Canyon Block 432. Produced gas will be transported through a new 16-inch right-of way pipeline from Platform A to an existing pipeline within Green Canyon Block 606. No new nearshore or onshore pipelines or facilities will be constructed.

13.3 PRODUCED LIQUID HYDROCARBONS TRANSPORTATION VESSELS

There will not be any transfers of liquid hydrocarbons other than via pipeline.

SECTION 14
SUPPORT VESSELS AND AIRCRAFT INFORMATION

14.1 GENERAL

The most practical, direct route from the shore base as permitted by weather and traffic conditions will be utilized. Information regarding the vessels and aircraft to be used to support the proposed activities is provided in the table below.

Type	Maximum Fuel Tank Capacity	Maximum Number in Area at Any Time	Trip Frequency or Duration
Tug boat	3000 bbl	3	30 days
Support Vessel	1500 bbl	2	30 days
Crew boat	500 bbl	1	Weekly
Lay barge	16,000 bbl	1	150 days
Support Vessel	500 bbl	2	2/week
MSV	15,000 bbls	1	120 days

14.2 DIESEL OIL SUPPLY VESSELS

Information regarding vessels to be used to supply diesel oil for fuel and other purposes is provided in the table below.

Size of Fuel Supply Vessel (ft)	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
180	1,500	Twice Monthly	Shortest route from Shorebase to GC433

14.3 DRILLING FLUID TRANSPORTATION

Drilling fluid transportation information is not required to be submitted with this plan.

14.4 SOLID AND LIQUID WASTE TRANSPORTATION

A table, "Wastes You Will Transport and/or Dispose of Onshore," is included as **Appendix D.**

4.5 VICINITY MAP

A vicinity map showing the location of the activities proposed herein relative to the shoreline with the distance of the proposed activities from the shoreline and the primary route of the support vessels and aircraft that will be used when traveling between the onshore support facilities and the platform is included in **Appendix G.** Vessels associated with the proposed operations will not traverse the Byrde's whale area.

SECTION 15
ONSHORE SUPPORT FACILITIES INFORMATION

15.1 GENERAL

The onshore facilities to be used to provide supply and service support for the proposed activities are provided in the table below.

Name	Location	Existing/New/Modified
Fourchon Service Base	Fourchon, Louisiana	Existing
TBD	Ingleside, Texas	Existing

15.2 SUPPORT BASE CONSTRUCTION OR EXPANSION

There will be no new construction of an onshore support base, nor will Murphy expand the existing shorebase as a result of the operations proposed in this DOCD.

15.3 SUPPORT BASE CONSTRUCTION OR EXPANSION TIMETABLE

A support base construction or expansion timetable is not required for the activities proposed in this plan.

15.4 WASTE DISPOSAL

A table, "Wastes You Will Transport and/or Dispose of Onshore," is included as **Appendix D.**

SECTION 16
COASTAL ZONE MANAGEMENT (CZM) INFORMATION

Under direction of the Coastal Zone Management Act (CZMA), the states of Louisiana, and Texas developed a Coastal Zone Management Programs (CZMP) to allow for the supervision of significant land and water use activities that take place within or that could significantly affect the Louisiana, Texas coastal zones.

Proposed activities are 108 miles from the Louisiana, 434 miles from the Texas shore. Measures will be taken to avoid or mitigate the probable impacts. Murphy will operate in compliance with existing federal and state laws, regulations, and resultant enforceable program policies in Louisiana's and Texas' Coastal Zone Management Programs.

The OCS related oil and gas exploratory and development activities having potential impact on the Louisiana, Texas Coastal Zones are based on the location of the proposed facilities, access to those sites, best practical techniques for drilling locations, drilling equipment guidelines for the prevention of adverse environmental effects, effective environmental protection, emergency plans and contingency plans.

The policies and corresponding sections within this Development Operations Coordination Document identified by the state of Texas Coastal Management Plan (TCMP) as being related to OCS Plans are provided in the table below.

Enforceable Program Policies of the Texas Coastal Management Plan (TCMP)

Policy	Plan Section	Evaluation
Category 2: Construction, Operation and Maintenance of Oil and Gas Exploration and Production Facilities	1 2	Proposed activities shall avoid to the maximum extent practicable significant impact to Texas submerged lands, critical areas, wetlands, beaches, or other coastal resources.
Category 3: Discharges of Wastewater and Disposal of Waste from Oil and Gas Exploration and Production Activities	7 14 15	All offshore discharges associated with the proposed activities, as summarized in Section 7, will be conducted in accordance with regulations implemented by the United States Environmental Protection Agency (USEPA), the U. S. Coast Guard (USCG), the Bureau of Ocean Energy Management (BOEM), and the Bureau of Safety and Environmental Enforcement (BSEE). All wastes generated during proposed activities that do not meet discharge regulations will be properly transported to Louisiana, and disposed of as summarized in Section 14.
Category 4: Construction and Operation of Solid Waste Treatment, Storage, and Disposal Facilities	15	No construction of solid waste facilities and no expansion of existing facilities are proposed in the Texas coastal zone.
Category 5: Prevention, Response, and Remediation of Oil Spills	2 9	Proposed activities will comply with all applicable laws and regulations concerning oil spill prevention, response, and remediation summarized in Section 9. The proposed activities will be covered under the Murphyapproved Regional Oil Spill Response Plan (OSRP).
Category 6: Discharge of Municipal and Industrial Waste Water to Coastal Waters	7	No discharges to Texas coastal waters are proposed. The proposed activities will be conducted in accordance with discharge regulations implemented by the USEPA, the USCG, BOEM, and BSEE.
Category 7: Non Point Source Pollution	7	The proposed activities do not include nonpoint sources of water pollution.

Policy	Plan Section	Evaluation
Category 8: Development in Critical Areas	6 11 12 15 17	No activities are proposed in critical areas. Proposed activities shall avoid to the maximum extent practicable significant impact to critical areas.
Category 9: Construction of Waterfront Facilities and Other Structures on Submerge lands	2 8 15 17	No construction of waterfront facilities or other structures on Texas submerged lands is proposed.
Category 10: Dredging and Dredged Material Disposal and Placement	15	No dredging or dredged material disposal or placement is proposed.
Category 11: Construction in the Beach / Dune System	15	No construction in the beach/dune system is proposed.
Category 12: Development in Coastal Hazard Area	15	No development in coastal hazard areas is proposed.
Category 13: Development within Coastal Barrier Resource	15	No development within the Texas coastal barrier resource system is proposed.
Category 14: Development in State Parks, Wildlife Management Areas or Preserves	15	No development in Texas state parks, wildlife management areas, or preserves is proposed.
Category 15: Alteration of Coastal Historic Areas	6 17	The proposed activities do not include any development that would alter or disturb coastal historic areas.
Category 16: Transportation Projects	15	No transportation construction or maintenance projects are proposed.
Category 17: Emission of Air Pollutants	8 17	Air emissions associated with project activities are summarized in Section 8. The proposed activities will be conducted in conformance with applicable air quality laws, standards, and regulations and shall avoid to the maximum extent practicable significant impact to onshore air quality.
Category 18: Appropriations of Water	15	No appropriations, impoundments, or diversions of water resources are proposed.
Category 19: Levee and Control Projects	15	No levee or flood control projects are proposed.

Policy	Plan Section	Evaluation
Category 20: Marine Fishery Management	17	Proposed activities shall avoid to the maximum extent practicable significant impact to marine fisheries.
Category 22: Policies for Major Actions	17	The proposed activities are not a “major action”.

A certificate of Coastal Zone Management Consistency for the state of Texas is included as **Attachment 16-A.**

SECTION 17
ENVIRONMENTAL IMPACT ANALYSIS (EIA)

The Environmental Impact Analysis is included as **Appendix I.**

SECTION 18
ADMINISTRATIVE INFORMATION

18.1 EXEMPTED INFORMATION DESCRIPTION

The proposed bottomhole locations of the planned well have been removed from the Public Information copy of the DOCD as well as any discussions of the target objectives, geologic or geophysical data, and any interpreted geology.

18.2 BIBLIOGRAPHY

Initial Exploration Plan, N-9960 – Approved December 27, 2016
Initial Exploration Plan, N-9957 – Approved December 9, 2016
Supplemental Exploration Plan, S-7997 – Approved September 11, 2020
Supplemental Exploration Plan, S8090 – Pending approval

APPENDIX A

OCS PLAN INFORMATION FORM

General Information

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

Company Name: Murphy Exploration & Production Co. - USA	BOEM Operator Number: 02647
Address: 9805 Katy Freeway	Contact Person: Cindy Kunkel
Suite G-200	Phone Number: (281) 647-5763
	E-Mail Address: cindy_kunkel@murphyoilcorp.com

If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid	$29,666	Receipt No.	26QA6CUP

Project and Worst Case Discharge (WCD) Information

Lease(s): G35864 and 35867	Area: GC	Block(s): 389, 433	Project Name (If Applicable): Khaleesi

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

Platform/Well Name: F	Total Volume of WCD: 28,690,090	API Gravity: 34
Distance to Closest Land (Miles): 106	Volume from uncontrolled blowout: 260,819 bbl/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	N-10054			
Do you propose to use new or unusual technology to conduct your activities?		Yes	X	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
Pipeline prelay	06/15/21	07/15/21	30
Subsea Installation	09/01/21	10/31/21	60
Install Platform	10/15/21	11/29/21	45
Pipeline hookup	02/15/22	03/07/22	20
Commence Production	04/01/22		

Description of Drilling Rig

	Jackup		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
X	Floating production system		Other (Attach Description)

Description of Lease Term Pipelines

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

From	To	Diameter	Length
GC432 PLEM	GC433 Platform A	6	22563
GC432 PLEM	GC433 Platform A	6	22760
GC378 PLEM	GC433 Platform A	6	15,131
GC378 PLEM	GC433 Platform A	6	15278
GC389 PLEM	GC433 Platform A	6	16771
GC389 PLEM	GC433 Platform A	6	17561
GC378 PLEM	GC378 PLEM	6	1236
GC389 002	GC389 PLEM	6	100
GC390 002	GC389 PLEM	6	100
GC389 PLEM	GC389 PLEM	6	100
GC478 002	GC478 PLEM	6	100
GC478 001	GC478 PLEM	6	100
GC478 PLEM	GC478 PLEM	6	100
GC432 004	GC432 PLEM	6	100
GC432 003	GC432 PLEM	6	100
GC432 PLEM	GC432 PLEM	6	100

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): SS001 ST00 BP01	Previously reviewed under an approved EP or DOCD?	X	Yes		No N-9960
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. 608114067901
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?		Yes	X	No	

WCD info	For wells, volume of uncontrolled blowout (Bbls/day):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid: 28.5	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 35864		OCS OCS
Area Name	Green Canyon		
Block No.	389		
Blockline Departures (in feet)	N/S Departure: 1,200' FSL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 3,520' FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,578,400		X: X: X:
	Y: 10,012,080		Y: Y: Y:
Latitude/ Longitude	Latitude: 27-33-37.6527		Latitude Latitude Latitude
	Longitude: -90-06-16.8288		Longitude Longitude Longitude
Water Depth (Feet): 3,604'			MD (Feet): MD (Feet): MD (Feet): / TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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 =	

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): SS002 ST01BP00				Previously reviewed under an approved EP or DOCD?	X	Yes		No N-9960
Is this an existing well or structure?	X	Yes		No	If this is an existing well or structure, list the Complex ID or API No.	608114068801		
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							Yes	X	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid:	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 35864		OCS OCS
Area Name	Green Canyon		
Block No.	389		
Blockline Departures (in feet)	N/S Departure: 1,197′ FSL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 3,602′ FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,578,317.07		X: X: X:
	Y: 10,012,077.88		Y: Y: Y:
Latitude/ Longitude	Latitude: 27-33-37.6509		Latitude Latitude Latitude
	Longitude: -90-06-17.7499		Longitude Longitude Longitude
Water Depth (Feet): 3,603′			MD (Feet): MD (Feet): MD (Feet): TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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 =	

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): SS001			Previously reviewed under an approved EP or DOCD?		Yes	X	No N-9557
Is this an existing well or structure?	X	Yes		No	If this is an existing well or structure, list the Complex ID or API No.	608114068000	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						Yes	X	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):		For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid:		

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 35662		OCS OCS
Area Name	Green Canyon		
Block No.	478		
Blockline Departures (in feet)	N/S Departure: 6,419' FNL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 5,621' FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,592,139		X: X: X:
	Y: 9,988,620		Y: Y: Y:
Latitude/ Longitude	Latitude: 27-29-42.3559		Latitude Latitude Latitude
	Longitude: -90-03-50.4910		Longitude Longitude Longitude
Water Depth (Feet): 3,801'			MD (Feet): MD (Feet): MD (Feet): TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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 =	

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): SS002 ST02BP00				Previously reviewed under an approved EP or DOCD?	X	Yes		No N-9957
Is this an existing well or structure?	X	Yes		No	If this is an existing well or structure, list the Complex ID or API No.	608114068901		
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							Yes	X	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid:	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 35662		OCS OCS
Area Name	Green Canyon		
Block No.	478		
Blockline Departures (in feet)	N/S Departure: 5,384′ FNL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 4,485′ FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,593,274		X: X: X:
	Y: 9,989,655		Y: Y: Y:
Latitude/ Longitude	Latitude" 27-29-52.3216		Latitude Latitude Latitude
	Longitude: -90-03-37.6238		Longitude Longitude Longitude
Water Depth (Feet): 3,760′			MD (Feet): MD (Feet): MD (Feet): TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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 =	

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): SS002				Previously reviewed under an approved EP or DOCD?	X	Yes	No S-8030
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):		For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid:		

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 35864		OCS OCS
Area Name	Green Canyon		
Block No.	389		
Blockline Departures (in feet)	N/S Departure: 291′ FSL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 3,352′ FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,578,568		X: X: X:
	Y: 10,012,282		Y: Y: Y:
Latitude/ Longitude	Latitude" 27-33-39.613		Latitude Latitude Latitude
	Longitude: -90-06-14.900		Longitude Longitude Longitude
Water Depth (Feet): 3,603′			MD (Feet): MD (Feet): MD (Feet): TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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 =	

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): SS004	Previously reviewed under an approved EP or DOCD?	X	Yes		No S-7997
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?		Yes	X	No	
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid:		

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 32504		OCS OCS
Area Name	Green Canyon		
Block No.	432		
Blockline Departures (in feet)	N/S Departure: 7,850′ FSL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 7,072′ FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,559,008		X: X: X:
	Y: 10,002,890		Y: Y: Y:
Latitude/ Longitude	Latitude" 27-32-11.1705		Latitude Latitude Latitude
	Longitude: -90-10-42.5468		Longitude Longitude Longitude
Water Depth (Feet): 3,444			MD (Feet): MD (Feet): MD (Feet): TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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 =	

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): SS003				Previously reviewed under an approved EP or DOCD?	X	Yes	No S-7997
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?						Yes	X No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):		For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid:		

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 32504		OCS OCS
Area Name	Green Canyon		
Block No.	432		
Blockline Departures (in feet)	N/S Departure: 7,692′ FNL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 7,114′ FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,558,965		X: X: X:
	Y: 10,003,187		Y: Y: Y:
Latitude/ Longitude	Latitude" 27-32-14.120		Latitude Latitude Latitude
	Longitude: -90-09-54.834		Longitude Longitude Longitude
Water Depth (Feet) 3,444:			MD (Feet): MD (Feet): MD (Feet): TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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 =	

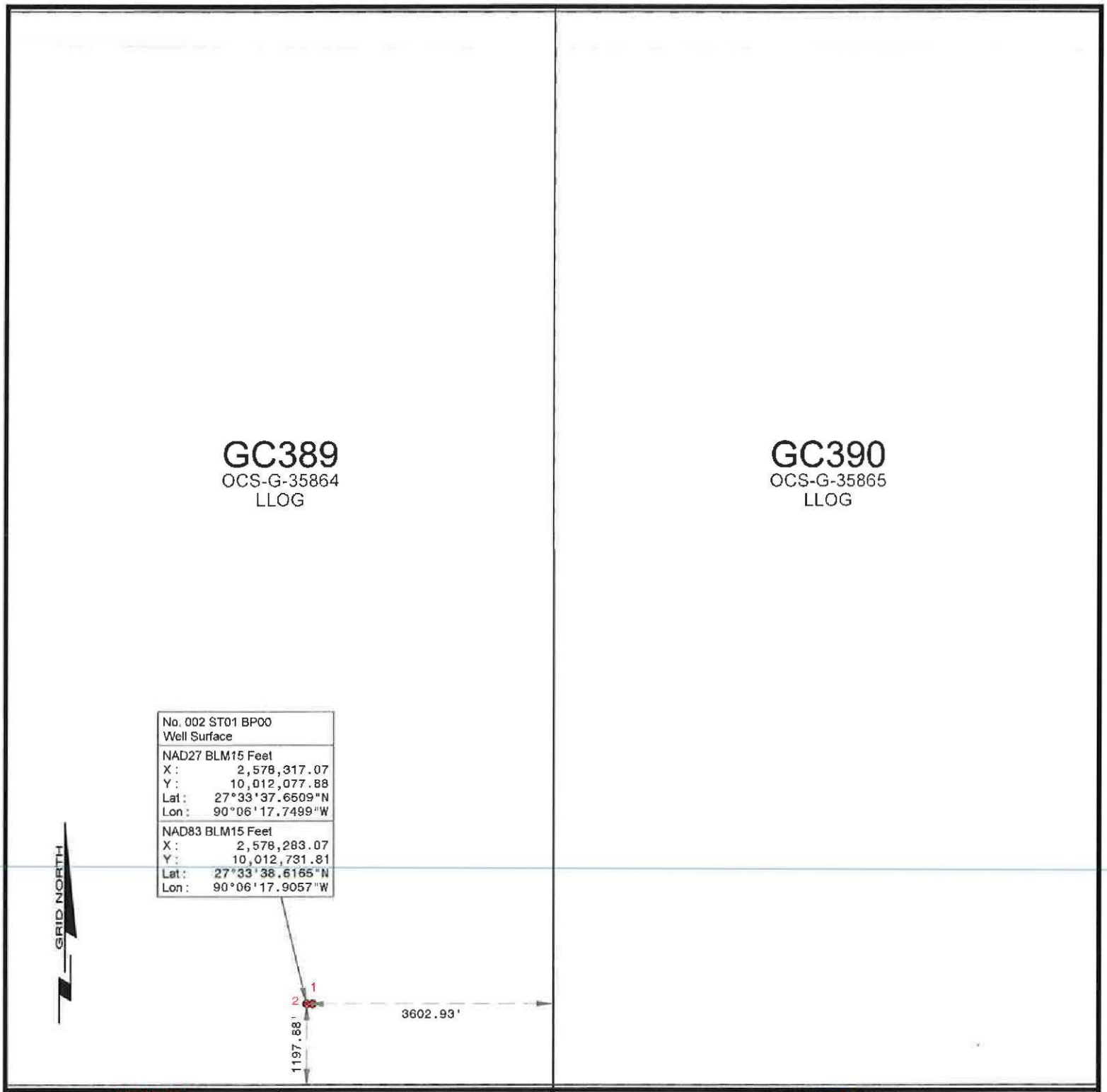
Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Platform A				Previously reviewed under an approved EP or DOCD?		Yes	X	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?						Yes	X	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid:		

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 35867		BO EM
Area Name	Green Canyon		
Block No.	433		
Blockline Departures (in feet)	N/S Departure: 2,228' FSL		N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: 1,005' FEL		E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 2,580,920		X: X: X:
	Y: 9,997,288		Y: Y: Y:
Latitude/ Longitude	Latitude" 27.51959		Latitude Latitude Latitude
	Longitude: -90.09799		Longitude Longitude Longitude
Water Depth (Feet): 3,706			MD (Feet): MD (Feet): MD (Feet): TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			

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
NE3	GC	434	X = 2,586,307.1	Y = 10,001,060.1	
NE2	GC	434	X = 2,585,570.3	Y = 10,001,938.3	
NE1	GC	434	X = 2,584,692.1	Y = 10,002,675.1	
NW3	GC	433	X = 2,577,147.9	Y = 10,002,675.1	
NW2	GC	433	X = 2,576,269.7	Y = 10,001,938.3	
NW1	GC	433	X = 2,575,532.9	Y = 10,001,060.1	
SW3	GC	477	X = 2,575,532.9	Y = 9,993,515.9	
SW2	GC	477	X = 2,576,269.7	Y = 9,992,637.7	
SW1	GC	477	X = 2,577,147.9	Y = 9,991,900.9	
SE3	GC	478	X = 2,584,692.1	Y = 9,991,900.9	
SE2	GC	478	X = 2,585,570.3	Y = 9,992,637.7	
SE1	GC	478	X = 2,586,307.1	Y = 9,993,515.9	



I HEREBY CERTIFY THAT THE ABOVE WELL SURFACE LOCATION IS CORRECT.

STATE OF LOUISIANA
JESSE L. THIBODEAUX
REG NO. 4729
REGISTERED PROFESSIONAL
LAND SURVEYOR

Jesse L. Thibodeaux 6-16-17

JESSE L. THIBODEAUX RPLS #4729
STATE OF LOUISIANA

NOTES

1. THIS PLAT WAS PREPARED FOR PERMIT PURPOSES ONLY, AND IS NOT A PROPERTY BOUNDARY SURVEY, AND AS SUCH DOES NOT COMPLY WITH THE "STANDARDS OF PRACTICE FOR BOUNDARY SURVEYS" AS ADOPTED BY THE LOUISIANA PROFESSIONAL ENGINEERING AND LAND SURVEYING BOARD.
2. COORDINATES TRANSFORMED USING NADCON (VER. 2.1).

PUBLIC INFORMATION

LLOG exploration

PROPOSED LOCATION
OCS-G-35865 WELL No. 002 ST01 BP00

BLOCK 390
GREEN CANYON AREA
GULF OF MEXICO

Geodetic Datum: NAD27
Projection: BLM 15 (NORTH)
Grid Units: US SURVEY FEET

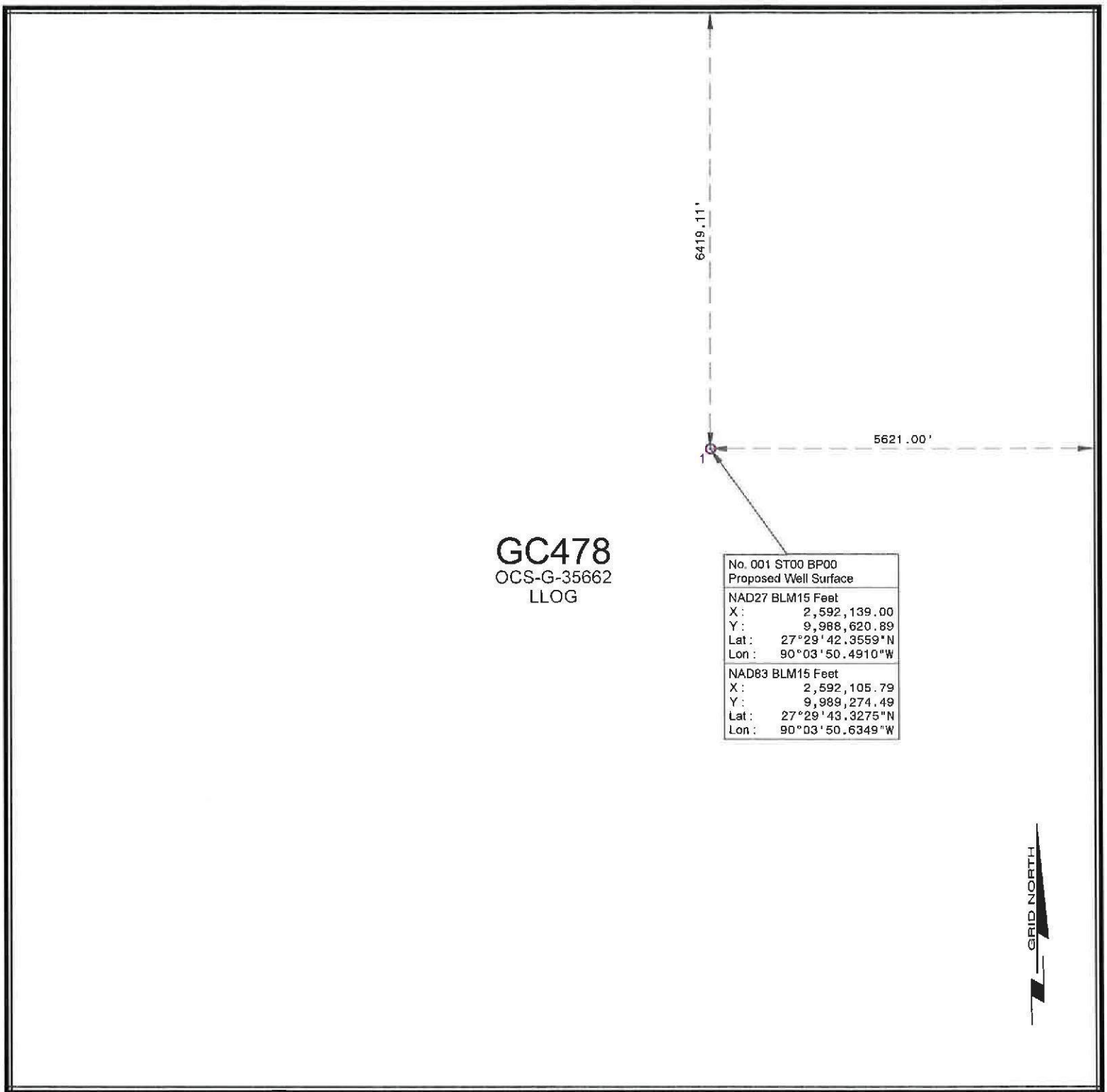
SCALE 1:24000 — 0 — 2000 FEET

FUGRO USA MARINE, INC.
200 Dulles Drive
Lafayette, Louisiana 70506
(337) 237-1300

Job No.: 17170262	Date: 6/16/2017	Drwn: BCN	Chart: 1 Of: 1

DWG File: H:\2017\17170262\DS\GIS\...\GC390_P_2ST1_G35865

6/16/2017



I HEREBY CERTIFY THAT THE ABOVE PROPOSED WELL SURFACE LOCATION IS CORRECT.

STATE OF LOUISIANA
RYAN H. CHAPMAN
License No. 5096
PROFESSIONAL
LAND SURVEYOR

RYAN H. CHAPMAN RPLS #5096
STATE OF LOUISIANA

NOTES

1. THIS PLAT WAS PREPARED FOR PERMIT PURPOSES ONLY, AND IS NOT A PROPERTY BOUNDARY SURVEY, AND AS SUCH DOES NOT COMPLY WITH THE "STANDARDS OF PRACTICE FOR BOUNDARY SURVEYS" AS ADOPTED BY THE LOUISIANA PROFESSIONAL ENGINEERING AND LAND SURVEYING BOARD.
2. COORDINATES TRANSFORMED USING NADCON (VER. 2.1).
3. SURFACE INFORMATION PROVIDED BY CLIENT AND DOES NOT REPRESENT A FUGRO FIELD SURVEY.

PUBLIC INFORMATION

LLOG exploration

PROPOSED LOCATION
OCS-G-35662 WELL No. 001 ST00 BP00

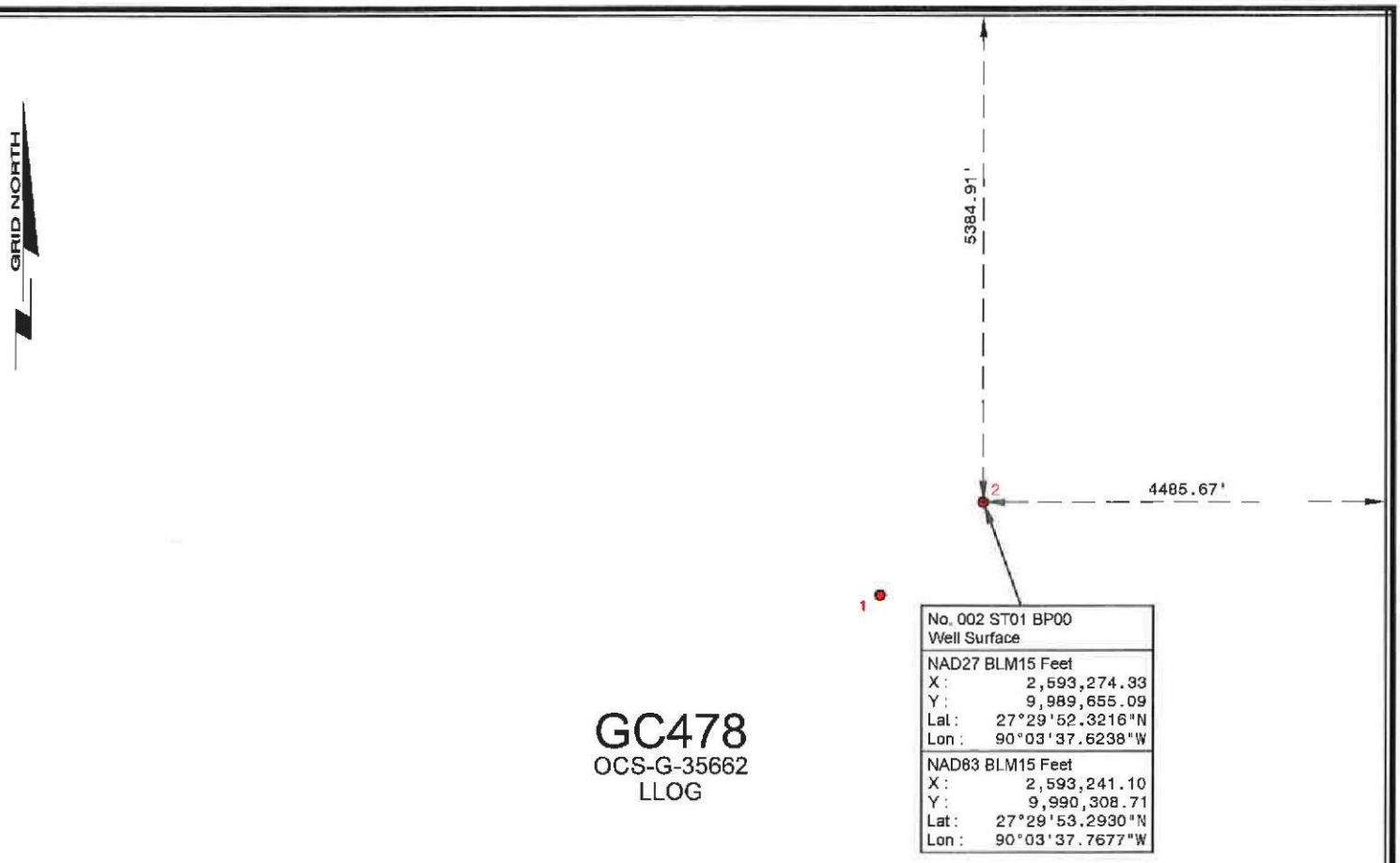
BLOCK 478
GREEN CANYON AREA
GULF OF MEXICO

Geodetic Datum: NAD27
Projection: BLM 15 (NORTH)
Grid Units: US SURVEY FEET

SCALE 1:24000 — 0 — 2000 FEET

FUGRO USA MARINE, INC.
200 Dulles Drive
Lafayette, Louisiana 70506
(337) 237-1300

Job No.: 1700096	Date: 2/8/2017	Drwn: BCN	Chart: 1 Of: 1
DWG File: H:\2017\1700096\GIS\1700...\GC478_P_1_G35662			2/08/2017



I HEREBY CERTIFY THAT THE ABOVE WELL SURFACE LOCATION IS CORRECT.

STATE OF LOUISIANA
STEPHEN R. HENRY
REG. No. 4903
REGISTERED PROFESSIONAL LAND SURVEYOR

Stephen Henry
STEPHEN R. HENRY RPLS #4903
STATE OF LOUISIANA 8-9-17

NOTES

1. THIS PLAT WAS PREPARED FOR PERMIT PURPOSES ONLY, AND IS NOT A PROPERTY BOUNDARY SURVEY.
2. COORDINATES TRANSFORMED USING NADCON (VER. 2.1).

PUBLIC INFORMATION

LLOG exploration

PROPOSED LOCATION
OCS-G-35662 WELL No. 002 ST01 BP00
BLOCK 478
GREEN CANYON AREA
GULF OF MEXICO

Geodetic Datum: NAD27
Projection: BLM 15 (NORTH)
Grid Units: US SURVEY FEET

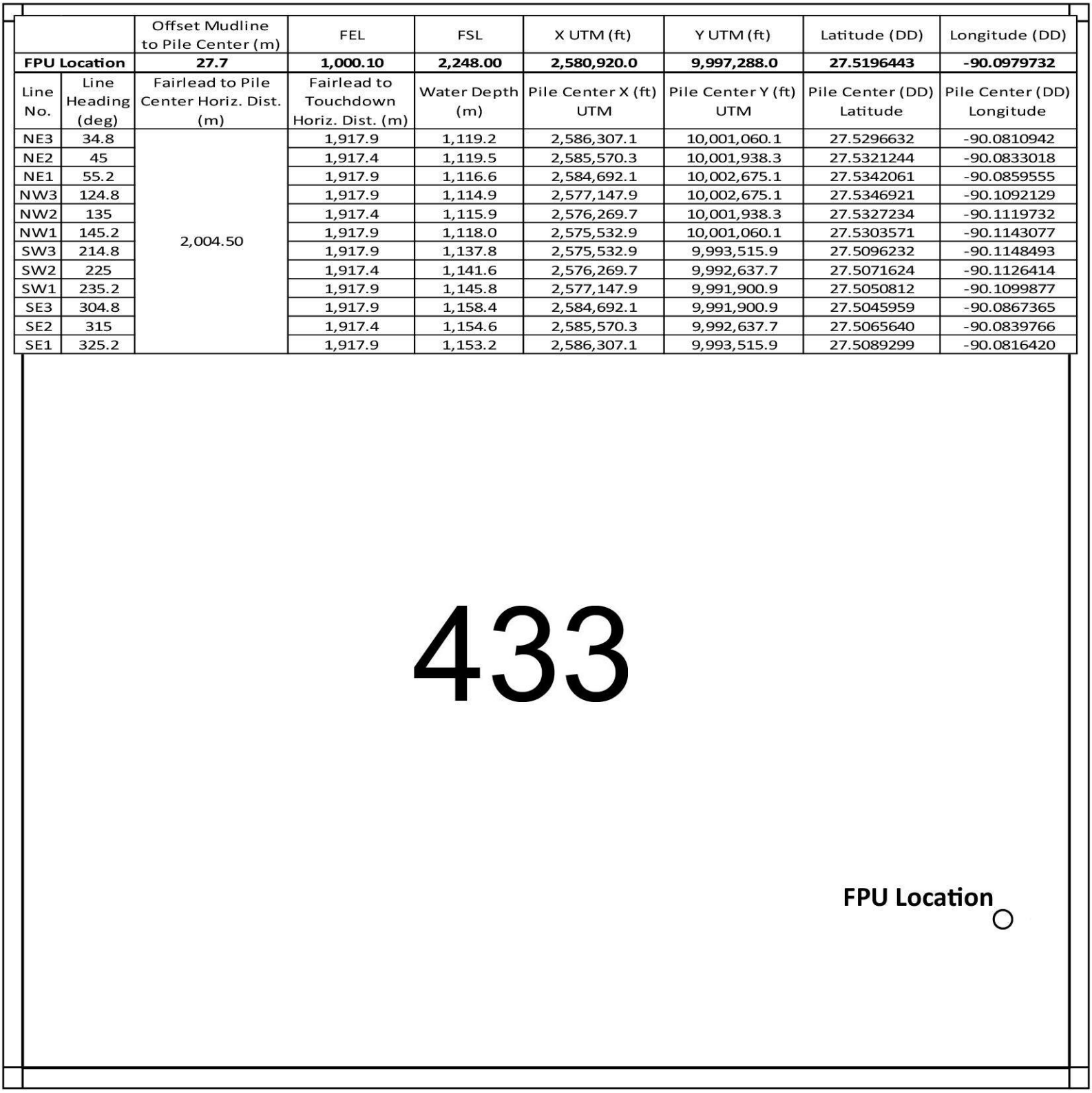
SCALE 1:24000 — 0 — 2000 FEET

FUGRO
FUGRO USA MARINE, INC.
200 Dulles Drive
Lafayette, Louisiana 70506
(337) 237-1300

Job No.: 17170435	Date: 8/9/2017	Drwn: MM	Chart: 1 Of: 1
DWG File: 1717043501_GC478_P_002			

A/09/2017

		Offset Mudline to Pile Center (m)	FEL	FSL	X UTM (ft)	Y UTM (ft)	Latitude (DD)	Longitude (DD)
FPU Location		**27.7**	**1,000.10**	**2,248.00**	**2,580,920.0**	**9,997,288.0**	**27.5196443**	**-90.0979732**
Line No.	Line Heading (deg)	Fairlead to Pile Center Horiz. Dist. (m)	Fairlead to Touchdown Horiz. Dist. (m)	Water Depth (m)	Pile Center X (ft) UTM	Pile Center Y (ft) UTM	Pile Center (DD) Latitude	Pile Center (DD) Longitude
NE3	34.8	2,004.50	1,917.9	1,119.2	2,586,307.1	10,001,060.1	27.5296632	-90.0810942
NE2	45		1,917.4	1,119.5	2,585,570.3	10,001,938.3	27.5321244	-90.0833018
NE1	55.2		1,917.9	1,116.6	2,584,692.1	10,002,675.1	27.5342061	-90.0859555
NW3	124.8		1,917.9	1,114.9	2,577,147.9	10,002,675.1	27.5346921	-90.1092129
NW2	135		1,917.4	1,115.9	2,576,269.7	10,001,938.3	27.5327234	-90.1119732
NW1	145.2		1,917.9	1,118.0	2,575,532.9	10,001,060.1	27.5303571	-90.1143077
SW3	214.8		1,917.9	1,137.8	2,575,532.9	9,993,515.9	27.5096232	-90.1148493
SW2	225		1,917.4	1,141.6	2,576,269.7	9,992,637.7	27.5071624	-90.1126414
SW1	235.2		1,917.9	1,145.8	2,577,147.9	9,991,900.9	27.5050812	-90.1099877
SE3	304.8		1,917.9	1,158.4	2,584,692.1	9,991,900.9	27.5045959	-90.0867365
SE2	315		1,917.4	1,154.6	2,585,570.3	9,992,637.7	27.5065640	-90.0839766
SE1	325.2		1,917.9	1,153.2	2,586,307.1	9,993,515.9	27.5089299	-90.0816420



MURPHY EXPLORATION & PRODUCTION COMPANY

King's Quay Prospect – Green Canyon 433

OCS-G-35867

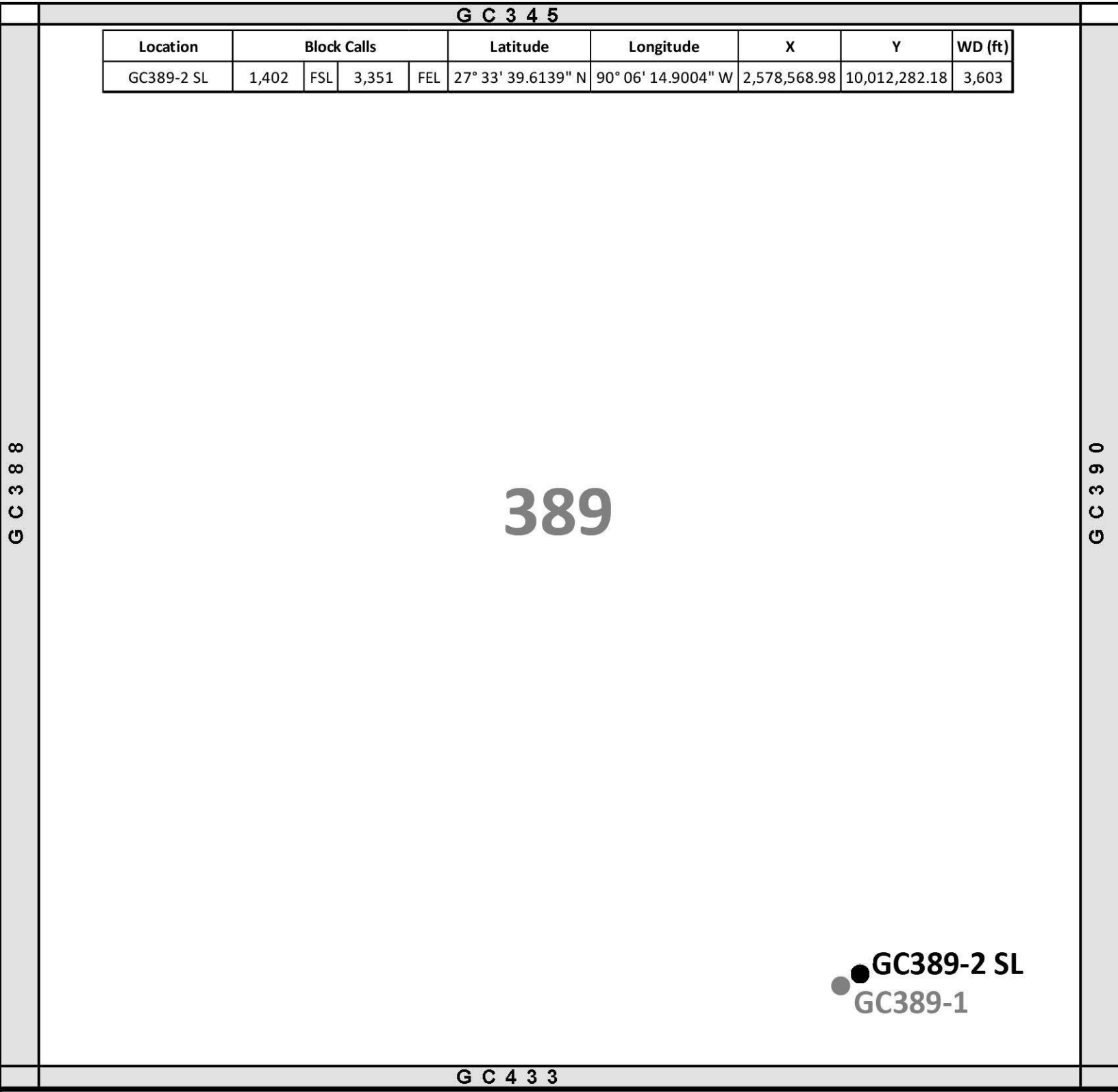
Location Plat

Scale: 1" = 2,000'

NAD 1927 BLM Zone 15N
WKID: 32065 Authority: EPSG

MURPHY
EXPLORATION & PRODUCTION CO.

Location	Block Calls				Latitude	Longitude	X	Y	WD (ft)
GC389-2 SL	1,402	FSL	3,351	FEL	27° 33' 39.6139" N	90° 06' 14.9004" W	2,578,568.98	10,012,282.18	3,603



2,000 1,000 0 2,000 4,000 US Feet

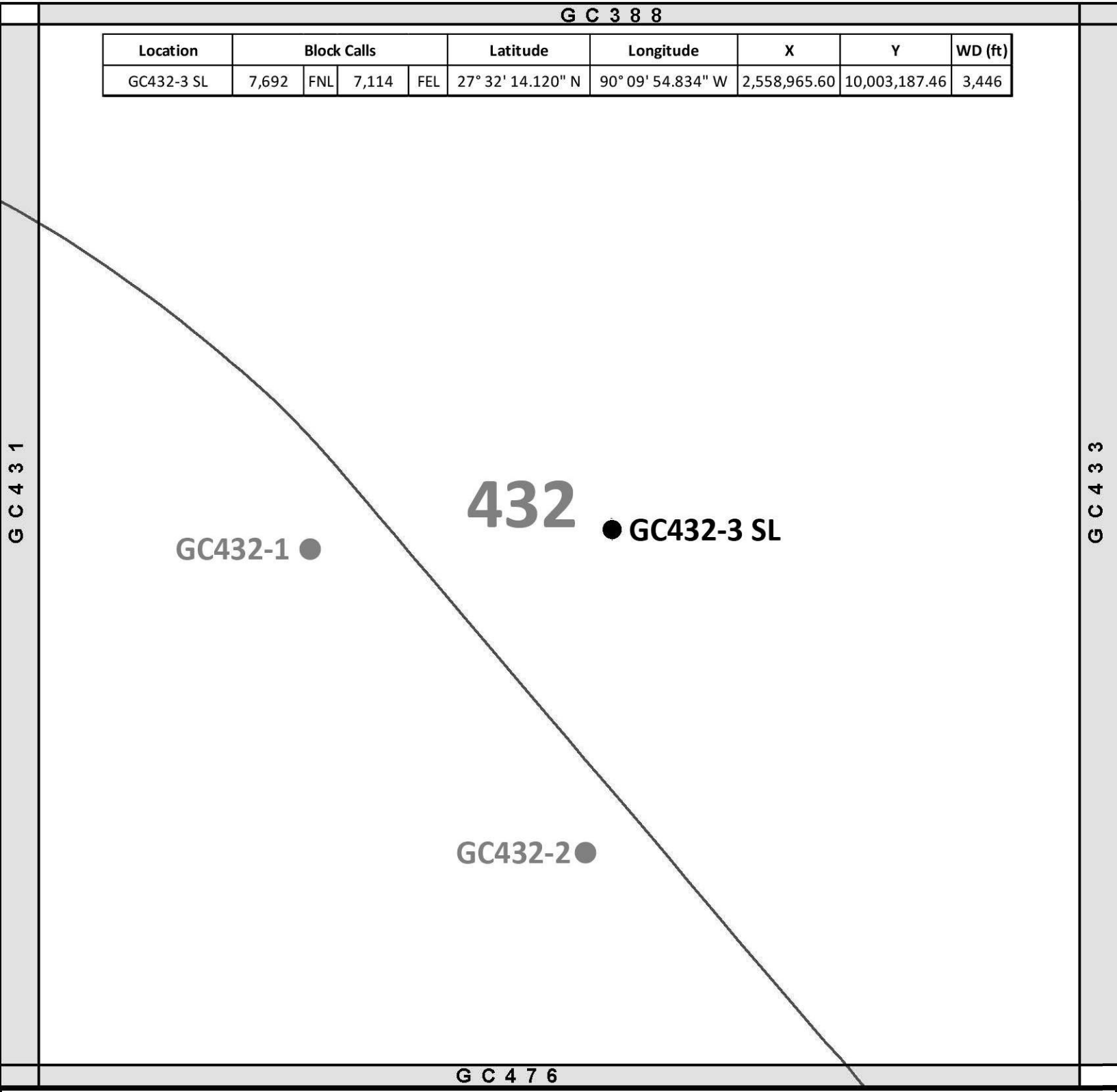
NAD 1927 UTM Zone 15N

MURPHY

Green Canyon Area
Block 389 OCS-G35864

Khaleesi
GC389-2
Locator Map
Public

Location	Block Calls				Latitude	Longitude	X	Y	WD (ft)
GC432-3 SL	7,692	FNL	7,114	FEL	27° 32' 14.120" N	90° 09' 54.834" W	2,558,965.60	10,003,187.46	3,446



2,000 1,000 0 2,000 4,000 US Feet

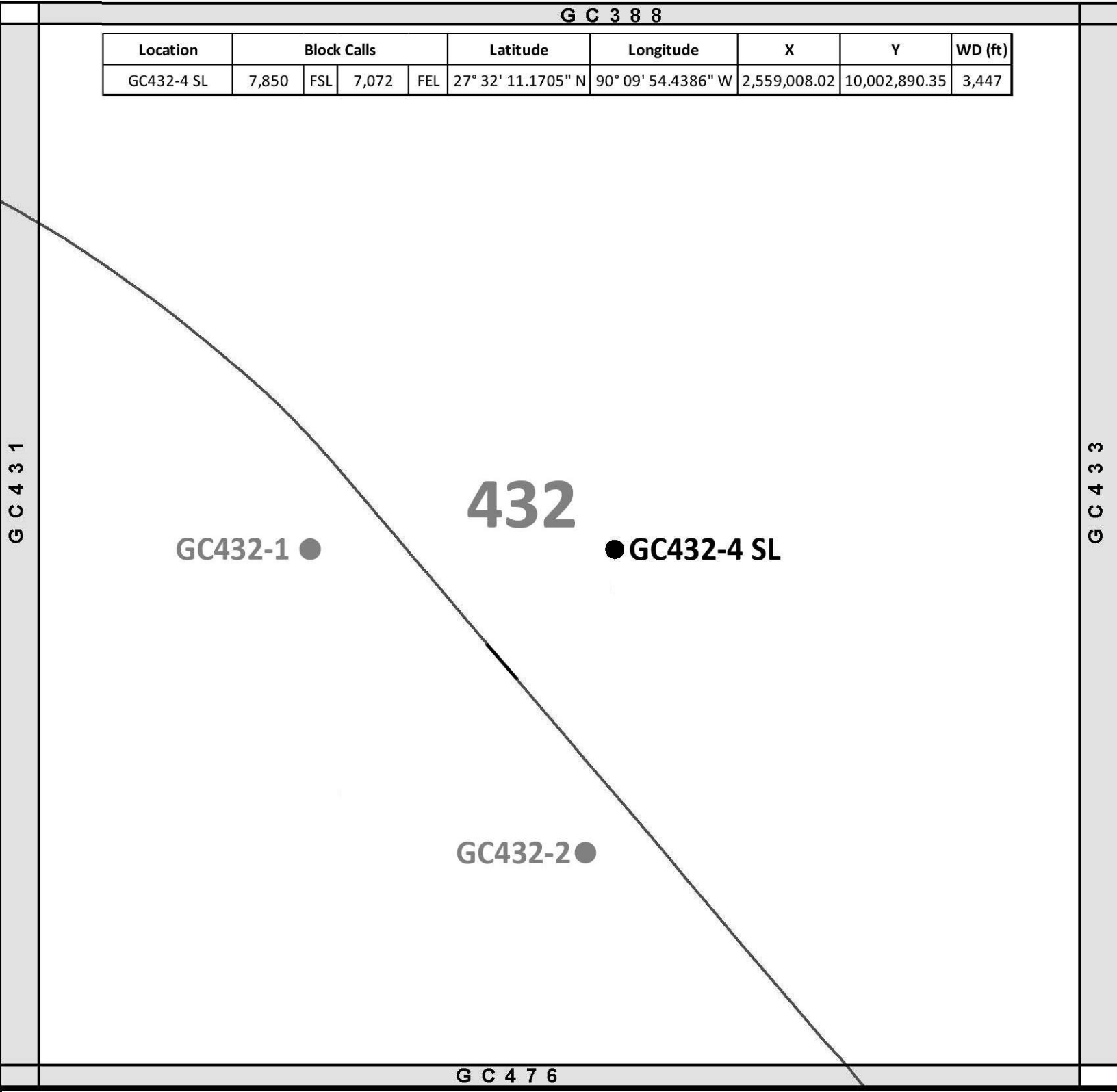
NAD 1927 UTM Zone 15N

MURPHY

Green Canyon Area
Block 432 OCS-G32504

Samurai
GC432-3
Locator Map
Public

Location	Block Calls				Latitude	Longitude	X	Y	WD (ft)
GC432-4 SL	7,850	FSL	7,072	FEL	27° 32' 11.1705" N	90° 09' 54.4386" W	2,559,008.02	10,002,890.35	3,447



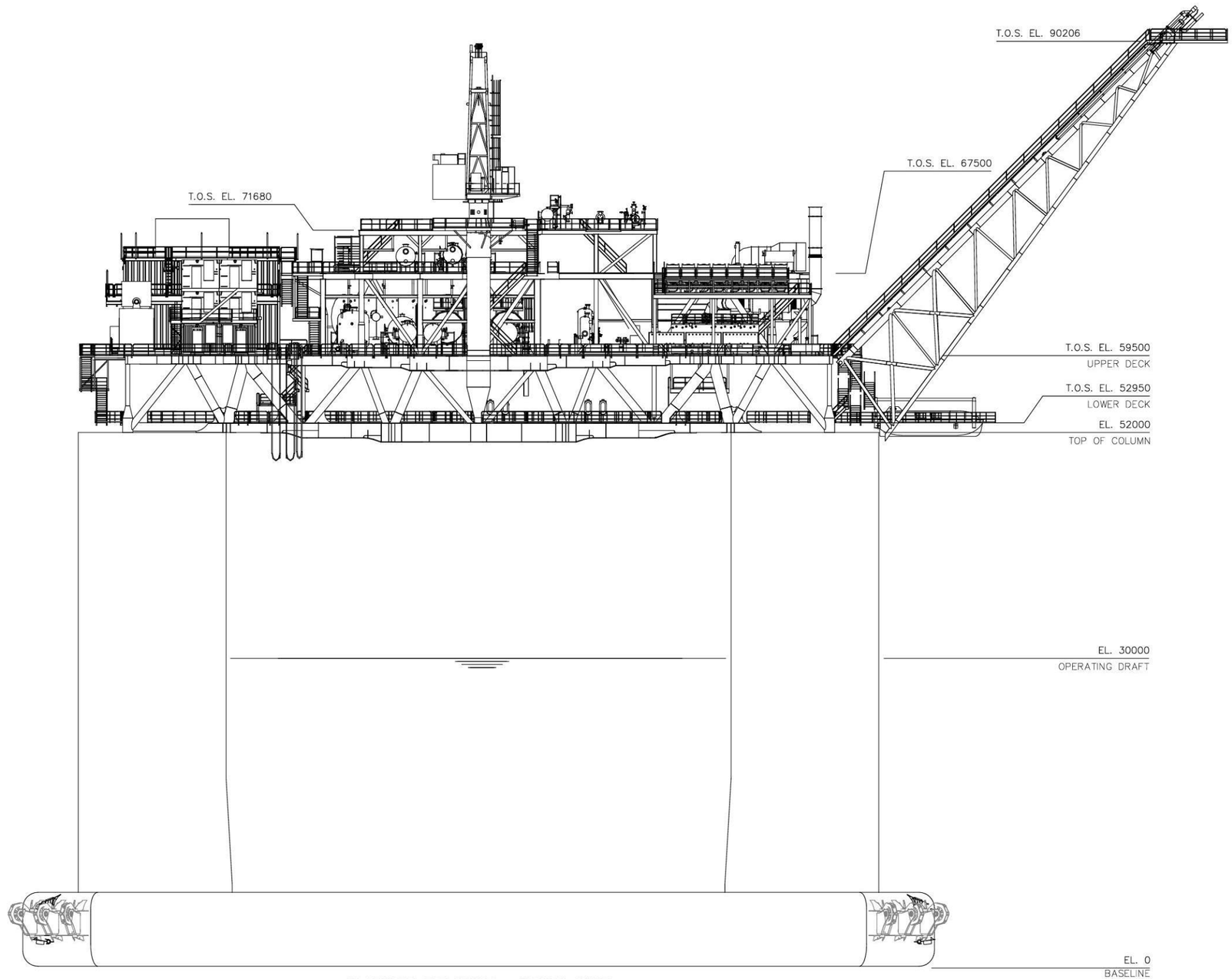
2,000 1,000 0 2,000 4,000 US Feet

NAD 1927 UTM Zone 15N

MURPHY

Green Canyon Area
Block 432 OCS-G32504

Samurai
GC432-4
Locator Map
Public



PLATFORM ELEVATION – FACING WEST

SCALE 1 : 200

ISSUED FOR CONSTRUCTION

NOTES

REFERENCE DRAWINGS

DWG. NO.	DESCRIPTION

REVISIONS

REV.	DESCRIPTION	DRWN	CHKD	APPRV	DATE
0	ISSUED FOR CONSTRUCTION	WTB	MRB	RTH	09OCT19

PROJECT INFO.

DRAWN BY: WTB	DATE: 01OCT18
AEC JOB NO.	018021
AFE/P.O. NO.	F17503004-1
CLIENT FILE NO.	
SCALE	NOTED

STATE OF LOUISIANA
MARK R. BLALOCK
License No. 36383
PROFESSIONAL ENGINEER
IN
MECHANICAL ENGINEERING
10/14/19

audubon Engineering
111 VETERANS BLVD.
SUITE 1200
METAIRIE, LA. 70005
PHONE: (504) 833-5669
LA REG. NO. EF.0005005

MURPHY EXPLORATION & PRODUCTION CO. — KING'S QUAY

TITLE: PLATFORM ELEVATION
FACING WEST
KING'S QUAY PRODUCTION FACILITY
PLATFORM "A" GREEN CANYON BLOCK 433

DWG. NO. GC433A-G1008 REV. 0

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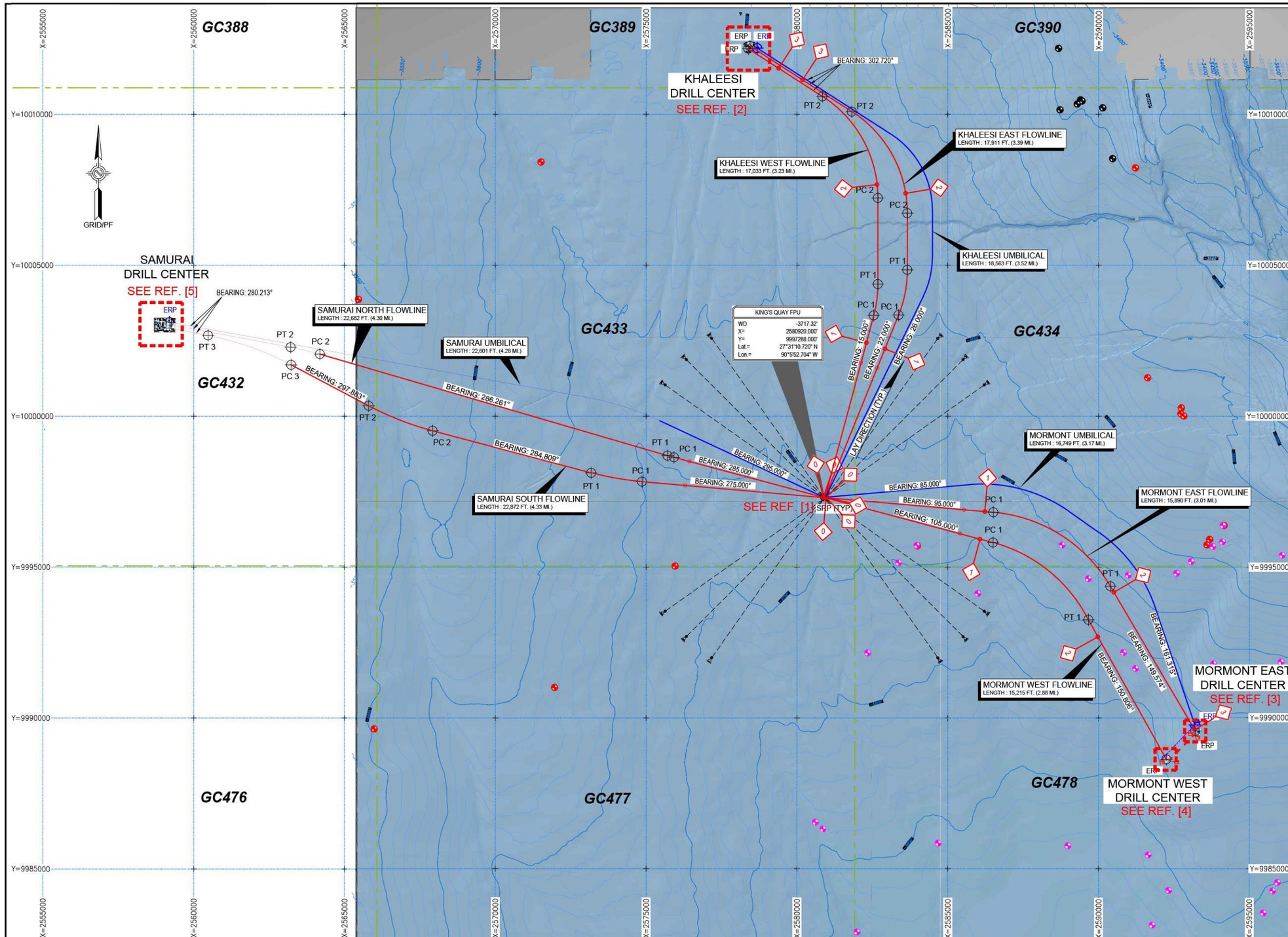

KHALEESI WEST FLOWLINE					
POINT	STA.	X (Feet)	Y (Feet)	BEARING	RADIUS
SRP	0+00.000	2580935.551	9997334.405		
RBGL ILS	45+93.176	2582124.353	10001771.073		
PC1	62+15.838	2582544.328	10003338.443	15.000°	
PI1		2582680.625	10003847.109		4000.000
PT1	72+63.035	2582680.625	10004373.719	0.000°	
PC2	101+17.124	2582680.625	10007227.808	0.000°	
PI2		2582680.625	10009412.282		4000.000
PT2	141+15.990	2580842.789	10010593.079	302.720°	
ERP	170+32.723	2578388.889	10012169.693		

KHALEESI EAST FLOWLINE					
POINT	STA.	X (Feet)	Y (Feet)	BEARING	RADIUS
SRP	0+00.000	2580940.362	9997334.406		
RBGL ILS	45+93.176	2582660.996	10001593.124		
PC1	64+85.844	2583370.002	10003347.976	22.000°	
PI1		2583661.266	10004068.881		4000.000
PT1	80+21.734	2583661.266	10004846.402	0.000°	
PC2	98+97.283	2583661.266	10006721.951	0.000°	
PI2		2583661.266	10008906.425		4000.000
PT2	138+96.149	2581823.430	10010087.222	302.720°	
ERP	179+11.350	2578445.370	10012257.603		

MORMONT EAST FLOWLINE					
POINT	STA.	X (Feet)	Y (Feet)	BEARING	RADIUS
SRP	0+00.000	2580966.437	9997298.787		
RBGL ILS	45+93.176	2585542.135	9996898.465		
PC1	55+68.967	2586514.213	9996813.420	95.000°	
PI1		2589083.654	9996588.623		5000.000
PT1	103+31.446	2590389.854	9994364.573	149.574°	
ERP	156+89.589	2593204.638	9989571.876		

MORMONT WEST FLOWLINE					
POINT	STA.	X (Feet)	Y (Feet)	BEARING	RADIUS
SRP	0+00.000	2580966.405	9997294.009		
RBGL ILS	45+93.176	2585403.073	9996105.207		
PC1	57+30.911	2586502.041	9995810.740	105.000°	
PI1		2588649.767	9995235.258		5000.000
PT1	99+15.272	2589660.965	9993255.009	152.949°	
ERP	152+14.714	2592245.234	9988628.386		

SAMURAI SOUTH FLOWLINE					
POINT	STA.	X (Feet)	Y (Feet)	BEARING	RADIUS
SRP	0+00.000	2580874.198	9997303.601		
RBGL ILS	45+93.176	2576298.500	9997703.923		
PC1	60+32.068	2574865.083	9997829.330	275.000°	
PI1		2574010.233	9997904.120		10000.000
PT1	77+44.104	2573180.623	9998123.456	284.809°	
PC2	131+82.417	2567922.959	9999513.498	284.809°	
PI2		2566815.188	9999806.375		10000.000
PT2	154+64.134	2565802.375	10000342.236	297.883°	
PC3	183+67.329	2563236.217	10001699.944	297.883°	
PI3		2561930.836	10002390.598		10000.000
PT3	212+99.789	2560481.540	10002674.433	281.081°	
ERP	228+72.081	2558938.559	10002976.616		

SAMURAI NORTH FLOWLINE					
POINT	STA.	X (Feet)	Y (Feet)	BEARING	RADIUS
SRP	0+00.000	2580675.161	9997308.406		
RBGL ILS	45+93.176	2576438.493	9998497.207		
PC1	51+25.993	2575923.832	9998635.111	285.000°	
PI1		2575817.497	9998663.603		10000.000
PT1	53+46.156	2575711.815	9998694.429	286.261°	
PC2	173+49.204	2564188.962	10002055.531	286.261°	
PI2		2563709.027	10002195.524		10000.000
PT2	183+48.242	2563217.523	10002286.950	280.537°	
ERP	226+81.760	2558957.086	10003079.450		

LEGEND

POINTS

- PC POINT OF CURVATURE
- PT POINT OF TANGENCY
- CP CENTER POINT
- PI POINT OF INTERSECTION
- SRP START REFERENCE POINT
- ERP END REFERENCE POINT

- R = RADIUS
- T = TANGENT LENGTH
- Δ = DELTA
- L = LENGTH
- MILE POST

PROP. 6" FLOWLINE
PROP. 6" INFIELD FLOWLINE
UMBILICAL
MOORING LINE
LEASE BLOCK
STEEL FLYING LEAD
ELEC./FO FLYING LEAD
CONTOUR LINE

RGBL LOCATION
COORDINATE POINT
GC435 BLOCK NUMBER

SONAR CONTACT
SONAR TESLA
SONAR JOB
MOORING ANCHOR

HORIZONTAL SCALE
1"=1500'
0 750 1500 3000

GEODETIC INFORMATION

PROJECTION:	UTM	DATUM:	NAD 27
ELLIPSOID:	NAD 27	CENTRAL MERIDIAN:	93° West
ZONE:	15N	GRID UNITS:	SURVEY FEET

NOTES:
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. ALL BEARINGS SHOWN RELATIVE TO UTM GRID NORTH ANGULAR CONVERGENCE IN THE ASSUMED DIRECTION OF INSTALLATION.
3. FLYING LEADS NOT SHOWN FOR PRE-FEED STAGE.
4. POWER CABLE UMBILICAL MAY BE COMBINED WITH CONTROL UMBILICAL.
5. PLETS, PLEMS AND TREES SHOWN FOR ILLUSTRATION PURPOSES ONLY.

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CONFIDENTIALITY CATEGORY: CONFIDENTIAL

REFERENCE DRAWINGS

DRAWING NUMBER	DRAWING TITLE
[1] 079671C001-000-DW-5516-1001	KINGS QUAY PLATFORM LAYOUT
[2] 079671C001-000-DW-5516-1002	KHALEESI DRILL CENTER LAYOUT
[3] 079671C001-000-DW-5516-1003	MORMONT EAST DRILL CENTER LAYOUT
[4] 079671C001-000-DW-5516-1004	MORMONT WEST DRILL CENTER LAYOUT
[5] 079671C001-000-DW-5516-1005	SAMURAI DRILL CENTER LAYOUT
[6] 079671C001-000-DW-5516-1100	MORMONT EAST AND WEST OVERALL DRILL CENTER LAYOUT
[7] 079671C001-000-DW-5616-2000	OVERALL FIELD LAYOUT UMBILICAL BASE CASE

REV	DATE	BY	DESCRIPTION	CHKD	ENG	APRVD
B	03-OCT-19	BER	ISSUED FOR REVIEW	EX	TT	AK
A	09-SEP-19	CJL	ISSUED FOR REVIEW	EX	TT	AK

Drawing size: ARCH D (24" x 36")

MURPHY
GENESIS

DRAWN	CHECKED	ENGINEER	SCALE
BKR			1" = 1500'
DATE	DATE	DATE	SHEET
23-AUG-19			1 OF 1

KHALEESI, MORMONT & SAMURAI FIELD DEVELOPMENT

OVERALL FIELD LAYOUT BASE CASE

CLIENT APPROVAL

GENESIS DRAWING NUMBER: 079671C001-000-DW-5516-1000

DRAWING NUMBER: UGM-KSQ-020-SUB-1057-00006

REV. B

PLOT: 10/3/2019 4:28 PM LAST SAVE: 10/3/2019 11:10 AM BY: EDDY.XIAO FILE NAME: R:\PROJECTS\079671C001-SAMURAI DEVELOPMENT FA PREFEED\PIPELINE_RISER\RIGID\DW_5516_FIELD_LAYOUTS\BASECASE\079671C001-000-DW-5516-1000.DWG

APPENDIX B

BLOWOUT SCENARIO (S-7997)

Murphy will drill to the objective sands outlined in Section C, Geological and Geophysical Information Section of this Plan utilizing a typical structural, conductor, surface and production casing program. If mandated by wellbore conditions, an intermediate casing string will be set prior to drilling through the objective sand. In the event of a blowout during the course of drilling the open hole in the objective sands, Murphy anticipates a rate of 198,000 STBP/D with an anticipated gravity of 31.4° API. The wellbore would most likely not bridge over. Murphy would immediately activate its Sub-Regional Oil Spill Response Plan and Spill Management Team to initiate potential recovery of liquid hydrocarbons on the receiving water and review potential well intervention options. In the event a relief well is initiated, Murphy does not anticipate any delays in acquiring a rig to conduct relief well operations. Dependent upon the interval the well was drilled to, it could take at least 30 days to mobilize equipment to the field and drill the relief well. Based on well intervention outlined in the potential worst-case discharge scenarios, the potential for drilling a relief well and a rig not being immediately available would be a total of 110 days and a potential total of 15.30 mmstb during that time span.

- Maximum duration of potential blowout (days): 110 days
- Total volume (bbls) (flow rate x duration): 21,780,000 STBL/D
- Likelihood for surface intervention to stop blowout: Assess well condition and mobilize 3rd party equipment and contractor.

1. Availability and Timing of a Rig to Drill a Relief Well
   - Rig type capable of drilling relief well at water depth and to TD: drillship or DP semi-submersible
   - Rig package constraints: DP that can drill in > 5000' water depth
   - There are 18-22 DP rigs that can operate in water depths > 5000'.
   - Time to acquire rig and move onsite: 30 days
   - Drilling time: 80 days
   - 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 no existing infrastructure in the vicinity of Green Canyon Block 432.

2. 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:
   - A positive and negative test will be performed before displacing marine riser to seawater.

3. Measures which Would Enhance the Ability to Conduct Early Intervention
   Measures to enhance the ability to conduct effective and early intervention in the event of a blowout in addition to the regulation and NTL requirements include:
   - The BOPs will be closed on the drill pipe when displacing riser to seawater and will be done in a two-step well control process. First, the riser will be displaced above the rams while monitoring the well below the rams. Then, the portion below the rams will be displaced up the choke or kill line, monitoring the volume going in versus the volume coming out. If the well started to flow, the kick would be detected early and kill weight mud would be pumped back into the well so intervention can be performed.

4. Other Measures
   All proposed activities and facilities in this EP will be covered by the GOM Regional OSRP filed by Murphy Exploration and Production Company - USA (Operator No. 02647) approved on December 2, 2013.

APPENDIX C

15810 Park Ten Place, Suite 100
Houston, Texas 77084
www.gemsinc.com

October 29, 2020

Project No.: 0620-2973

Rev 0: Final Issue

Murphy Exploration & Production Company
9805 Katy Freeway
Houston, TX 77024

Attention: Mr. Dave Mantei

Shallow Geohazards Assessment
Proposed King's Quay Mooring Anchor Pile Locations
Blocks 433-434 and 477-478
Green Canyon Area, Gulf of Mexico

Murphy Exploration & Production Company (Murphy) requested for Geoscience Earth & Marine Services (GEMS) to provide the following shallow geohazards assessment of the proposed King's Quay Floating Production Unit (FPU) mooring anchor pile locations in Blocks 433-434 and 477-478, Green Canyon (GC) Area, Gulf of Mexico (Map 1).

This report complies with the current Bureau of Ocean Energy Management (BOEM) Notices-to-Lessees (NTLs). The applicable NTLs present guidelines for filing exploration and development plans (NTL 2008-G04; MMS 2008a), geohazard assessments (NTL 2008-G05; MMS, 2008b), and the delineation of potential areas of high-density deepwater benthic communities (NTL 2009-G40; MMS, 2010).

This report references the Oceaneering International, Inc., (OII) archaeological assessment completed for LLOG Exploration (OII, 2018), using high-resolution geophysical data that satisfies the guidelines for assessing potential cultural resources in the Gulf of Mexico.

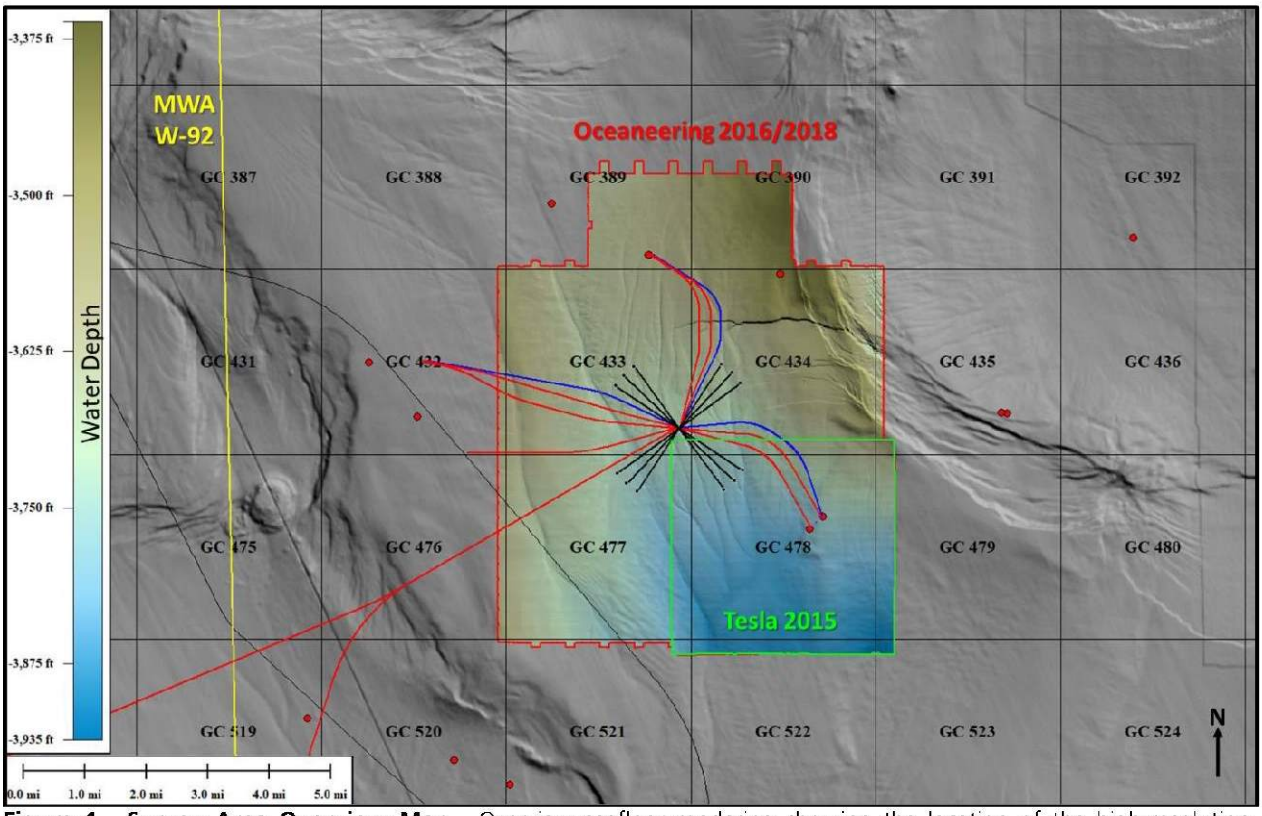


Figure 1. Survey Area Overview Map. Overview seafloor rendering showing the location of the high-resolution geophysical surveys. Existing wells are red circles and pipelines are black lines. The notional proposed infrastructure is shown in black (FPU mooring), red (tie-back flowlines and export pipelines), and blue (umbilicals). Military Warning Area (W-92) is located 4.4 miles west of the Survey Area.

Purpose

This letter provides a shallow geologic hazard assessment for the seafloor and the shallow stratigraphy at the proposed King's Quay FPU mooring anchor pile locations. This letter references a geohazard assessment completed by GEMS (GEMS, 2020a) using high-resolution geophysical data collected in the King's Quay development area. Our interpretations and letter comply with the United States Bureau of Ocean Energy Management's (BOEM) most recent applicable Notices-to-Lessees (NTLs):

- NTL 2008-G04: Information Requirements for Exploration Plans (MMS, 2008a),
- NTL 2008-G05: Shallow Hazards Program (MMS, 2008b), and
- NTL 2009-G40: Deepwater Benthic Communities (MMS, 2010).

This letter references an archaeological assessment completed by Oceaneering International, Inc., (OII, 2018) using the high-resolution geophysical data that satisfies the guidelines for assessing potential cultural resources in the Gulf of Mexico (NTL 2005-G07, MMS 2005).

Survey Coverage and Available Data

LLOG Exploration (LLOG) contracted Oceaneering International, Inc., (OII) and Tesla Offshore, LLC (Tesla), now Echo Offshore, LLC (Echo), to conduct high-resolution geophysical surveys covering the King's Quay development area. OII conducted an Autonomous Underwater Vehicle (AUV) survey in 2016 covering portions of GC 389-390 and 433-434 and in 2018 covering portions of GC 433-434 and 477 (OII, 2018). Tesla's 2015 survey covered GC 478. OII and Tesla completed separate archaeological assessment reports for each survey. The findings from the three archaeological assessments are included in OII's 2018 archaeological assessment covering the King's Quay development area (OII, 2018).

Details from the three surveys are provided below. All three surveys collected multibeam bathymetry, side-scan sonar, and subbottom profiler data. All data are very good to excellent quality. A geotechnical sampling program was also conducted within the Survey Area.

2016 OII AUV Survey. LLOG contracted OII for the 2016 geophysical data acquisition. The 2016 AUV survey consisted of 25 primary west-east tracklines at 200-m spacing and six north-south tie lines at 900-m spacing (OII, 2018). The data were collected with the *O-Surveyor III* AUV onboard the M/V *Ocean Project* in September 2016. The 2016 survey covered portions of GC 389-390 and 433-434.

2018 OII AUV Survey. LLOG contracted OII for the 2018 geophysical data acquisition. The 2018 AUV survey consisted of 49 primary west-east tracklines at 200-m spacing and 10 north-south tie lines at 900-m spacing (OII, 2018). The data were collected with the *O-Surveyor III* AUV onboard the M/V *Ocean Project* in September 2018. The 2018 survey covered portions of GC 433-434 and 477.

2015 Tesla AUV Survey. LLOG contracted Tesla for the 2015 geophysical data acquisition. The 2015 AUV survey consisted of 28 primary west-east tracklines at 200-m spacing and seven north-south tie lines at 900-m spacing (OII, 2018). The data were collected with the Bluefin-21 AUV onboard the R/V *Nikola* in September-October 2015. The 2015 survey covered GC 478.

Additional details on the geophysical data acquisition can be found in Appendix A of GEMS geohazard assessment (GEMS, 2020a) and in OII's archaeological assessment (OII, 2018).

Geotechnical and PCPT Data. TDI-Brooks International, Inc., (TDI) conducted a geotechnical sediment sampling and piezocone penetration test (PCPT) program in 2019. The sampling program consisted of jumbo piston cores (JPCs), PCPTs, as well as box cores and standard piston cores. These data were used to supplement this assessment. Details of the geotechnical and PCPT program are under a separate report (GEMS, 2020b).

Public Data. GEMS established the study's regional framework by referencing public sources such as BOEM and various published technical papers. GEMS has compiled a database of information including Federal lease blocks of reported chemosynthetic communities, shipwrecks, obstructions, and infrastructure (BOEM, 2020a). Regional bathymetry data shown on Figure 1 is from BOEM's deepwater bathymetry grid created from 3-D seismic surveys (BOEM, 2020b).

Project Responsibilities

The following personnel contributed to this study (Table 1):

Table 1. Project Contributors

Project Team Member Role	Personnel	Company
Project Principal	Daniel Lanier	GEMS
Sr. Geologist/Project Manager	Christopher Madere	GEMS
ACAD Specialist	Debra Adams	GEMS

Proposed Mooring Pile Locations

Murphy provided the following proposed mooring pile locations on October 13, 2020 (Table 2):

Table 2. Mooring Pile Locations

Mooring Pile No.	Block	X-Coordinate*	Y-Coordinate*
NE3	GC 434	2,586,307.1	10,001,060.1
NE2	GC 434	2,585,570.3	10,001,938.3
NE1	GC 434	2,584,692.1	10,002,675.1
NW3	GC 433	2,577,147.9	10,002,675.1
NW2	GC 433	2,576,269.7	10,001,938.3
NW1	GC 433	2,575,532.9	10,001,060.1
SW3	GC 477	2,575,532.9	9,993,515.9
SW2	GC 477	2,576,269.7	9,992,637.7
SW1	GC 477	2,577,147.9	9,991,900.9
SE3	GC 478	2,584,692.1	9,991,900.9
SE2	GC 478	2,585,570.3	9,992,637.7
SE1	GC 478	2,586,307.1	9,993,515.9

*NAD27, UTM15N, USFT

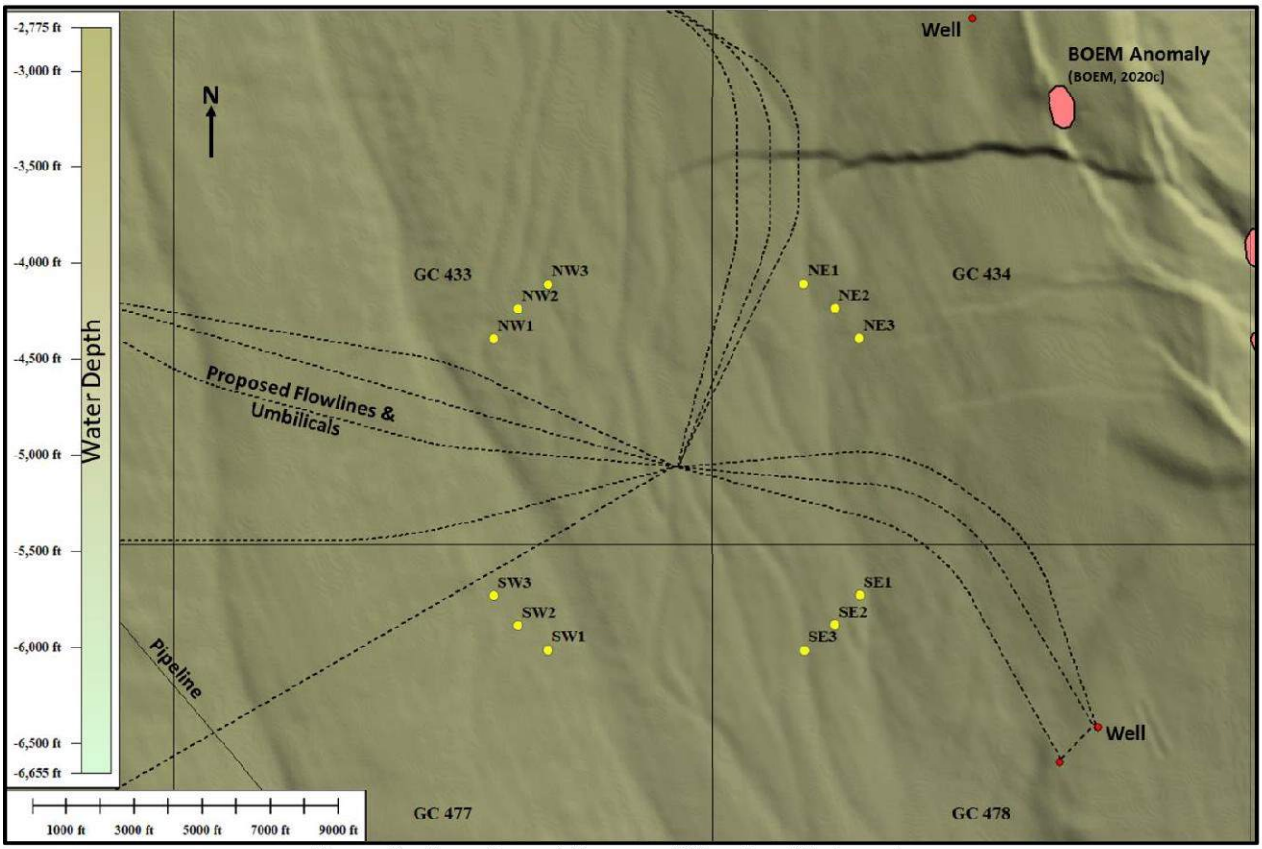


Figure 2. Overview of Proposed Mooring Pile Locations

Attachments

The following maps (1:12,000) are attached to this letter:

- Map 1: Bathymetry Map
- Map 2: Seafloor Features Map
- Map 3: Seafloor Gradient Map
- Map 4: Side-Scan Sonar Mosaic
- Map 5: Isopach Map, Seafloor to Horizon 10
- Map 6: Geologic Features Map

Shallow Geohazards Assessment

The available high-resolution geophysical data show the proposed mooring pile locations to be favorable for installation. There are no features within 75 m (245 ft) that are expected to impact anchoring at the proposed locations. No hardgrounds or high-density benthic communities are expected within 500 ft of the proposed mooring pile locations. There are no sonar contacts within 100 ft of the proposed mooring pile locations (Map 2). The nearest archaeological avoidance is located approximately 2,645 ft northwest of mooring pile SE1 (OII, 2018).

Northeast Cluster (Anchors NE1-NE3). The northeast anchor cluster lies in an area of smooth seabed interrupted by several linear features representing the seafloor expression of buried gullies or channels. No seafloor faults or other geologic hazards or constraints are located within 75 m (245 ft) of the mooring pile locations (Map 2).

Bathymetry and Seafloor Gradient. The water depth and seafloor gradient at the proposed northeast cluster mooring pile locations are summarized in Table 3 (Maps 2-3).

Table 3. Northeast Cluster Bathymetry and Seafloor Gradient

Mooring Pile No.	Water Depth (ft)	Seafloor Gradient (°)
NE3	-3,665	2.0
NE2	-3,665	2.7
NE1	-3,655	1.8

Seafloor Morphology and Features. The seabed at the northeast anchor cluster is generally smooth, interrupted by the seafloor expression of buried gully or channel features (Maps 2 and 6). The buried gully features are located 107 ft northeast of the proposed NE1 mooring pile location, 92 ft northeast of the proposed NE2 mooring pile location, and 42 ft northwest of the proposed NE3 mooring pile location (Maps 2 and 6). The seafloor gradient is generally less than 5° along the gullies (Map 3). The gullies are typically buried by at least 60 ft of normally deposited sediment and are considered inactive features but could potentially be preferred pathways for minor amounts of sediment transport (GEMS, 2020a). The gullies are not expected to impact mooring at the proposed pile locations.

The nearest seafloor fault is located 978 ft east-southeast of the proposed NE3 mooring pile location (Map 2). Seafloor faults are not expected to impact the proposed mooring pile locations.

A subtle anchor drag scar is located 165 along the proposed NE1 mooring pile (Maps 2 and 4). The anchor drag scar is not expected to impact anchoring at the proposed mooring pile location.

Benthic Communities. There are no potential hardgrounds within 500 ft of the proposed mooring pile locations (Maps 2 and 4). Features or areas suitable for benthic community attachment are not expected. No BOEM seabed anomalies lie within 500 ft of the proposed mooring pile locations (BOEM, 2020c).

Archaeological Conditions. There are no side-scan sonar contacts mapped within 100 ft of the proposed mooring pile locations (Maps 2, 4, and 6; OII, 2018). There are no archaeological avoidances near the proposed anchor cluster.

Shallow Stratigraphy. The subbottom profiler data show the shallow stratigraphic conditions at the proposed mooring locations to be normally deposited, parallel, continuous stratigraphy in the upper 150 ft to 188 ft below mudline (bml), see Figure 3. The base of the surficial drape unit (Horizon 10) is located approximately 15 ft bml (Map 5).

Thin mass-transport deposits (MTDs) may be encountered in the upper 150 ft to 188 ft bml but are beyond the resolution of the subbottom profiler data. Regional MTDs will be encountered below 150 ft at the NE1 mooring pile location, below 185 ft bml at the NE2 mooring pile location, and below 188 ft bml at the NE3 mooring pile location (Figure 3). The MTDs appear homogenous at NE1 and NE3, and are not expected to impact anchoring. At NE2, beneath 185 ft bml, there may be intact, layered blocks of sediment within the MTDs that may vary in geotechnical properties as compared to a homogenous MTD.

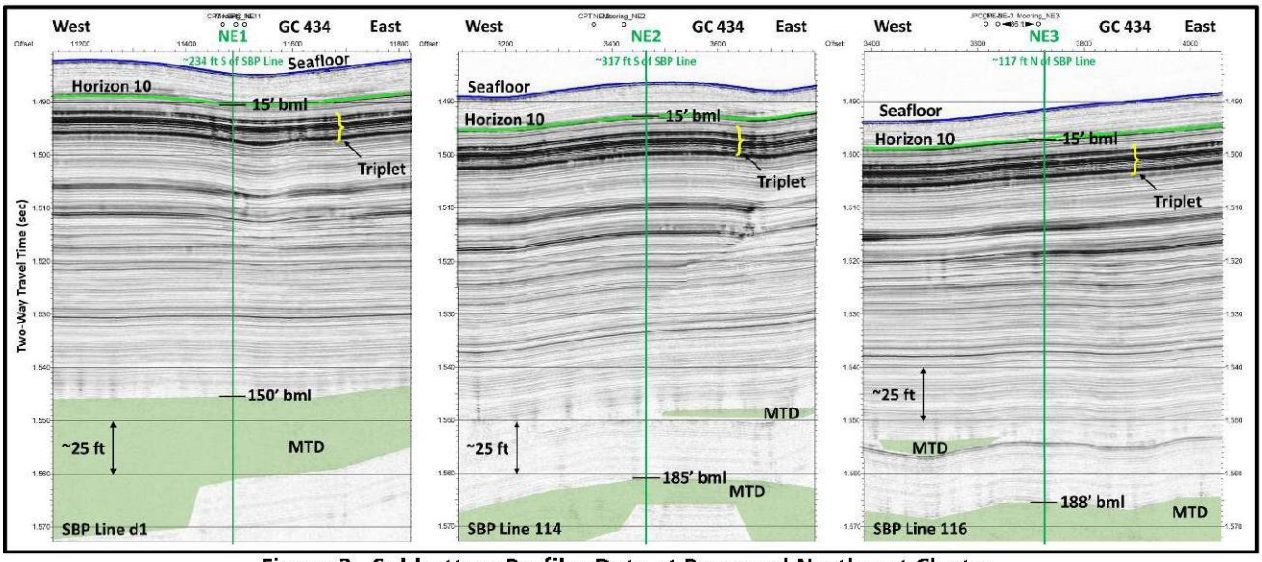


Figure 3. Subbottom Profiler Data at Proposed Northeast Cluster

Northwest Cluster (Anchors NW1-NW3). The northwest anchor cluster lies in an area of smooth seabed interrupted by several linear features representing the seafloor expression of buried gullies or channels. No seafloor faults or other geologic hazards or constraints are located within 75 m (245 ft) of the mooring pile locations (Map 2).

Bathymetry and Seafloor Gradient. The water depth and seafloor gradient at the proposed northwest cluster mooring pile locations are summarized in Table 4 (Maps 2-3).

Table 4. Northwest Cluster Bathymetry and Seafloor Gradient

Mooring Pile No.	Water Depth (ft)	Seafloor Gradient (°)
NW3	-3,650	0.7
NW2	-3,653	0.6
NW1	-3,660	0.6

Seafloor Morphology and Features. The seabed at the northwest anchor cluster is generally smooth, interrupted by the seafloor expression of buried gully or channel features (Maps 2 and 6). The buried gully features are located 311 ft west of the proposed NW1 mooring pile location and 228 ft west-southwest of the proposed NW3 mooring pile location (Maps 2 and 6). The seafloor gradient is generally less than 2° along the gullies (Map 3). The gullies are typically buried by at least 60 ft of normally deposited sediment and are considered inactive features but could potentially be preferred pathways for minor amounts of sediment transport (GEMS, 2020a). The gullies are not expected to impact mooring at the proposed pile locations.

Benthic Communities. There are no potential hardgrounds within 500 ft of the proposed mooring pile locations (Maps 2 and 4). Features or areas suitable for benthic community attachment are not expected. No BOEM seabed anomalies lie within 500 ft of the proposed mooring pile locations (BOEM, 2020c).

Archaeological Conditions. There are no side-scan sonar contacts mapped within 100 ft of the proposed mooring pile locations (Maps 2, 4, and 6; OII, 2018). There are no archaeological avoidances near the proposed anchor cluster.

Shallow Stratigraphy. The subbottom profiler data show the shallow stratigraphic conditions at the proposed mooring locations to be normally deposited, parallel, continuous stratigraphy in the upper 155 ft to 158 ft bml (Figure 4). The base of the surficial drape unit (Horizon 10) is located between 15 ft and 18 ft bml (Map 5).

Thin MTDs may be encountered in the upper 155 ft to 158 ft bml but are beyond the resolution of the subbottom profiler data. Regional MTDs will be encountered below 155 ft to 158 ft bml. The MTDs appear homogenous and are not expected to impact anchoring.

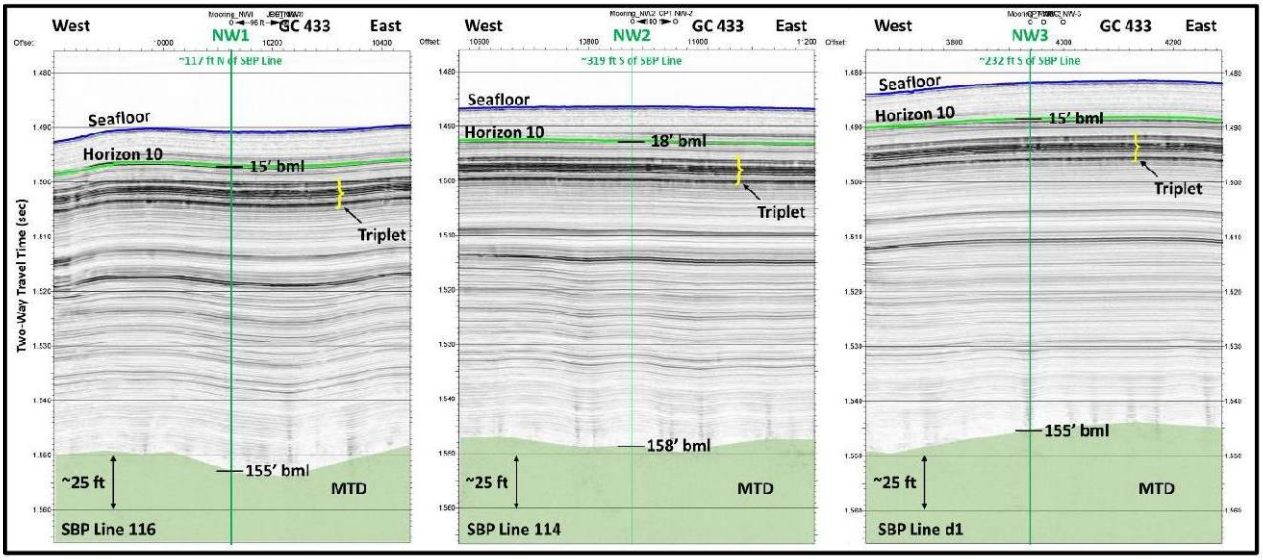


Figure 4. Subbottom Profiler Data at Proposed Northwest Cluster

Southwest Cluster (Anchors SW1-SW3). The southwest anchor cluster lies in an area of smooth seabed. No seafloor faults or other geologic hazards or constraints are located within 75 m (245 ft) of the mooring pile locations (Map 2).

Bathymetry and Seafloor Gradient. The water depth and seafloor gradient at the proposed southwest cluster mooring pile locations are summarized in Table 5 (Maps 2-3).

Table 5. Southwest Cluster Bathymetry and Seafloor Gradient

Mooring Pile No.	Water Depth (ft)	Seafloor Gradient (°)
SW3	-3,724	0.9
SW2	-3,737	1.0
SW1	-3,752	1.2

Seafloor Morphology and Features. The seabed at the southwest anchor cluster is generally smooth and featureless (Maps 2 and 6). The nearest feature is the seafloor expression of a buried gully or channel located 1,006 ft northeast of the proposed SW1 mooring pile location. The feature is not expected to impact the proposed pile.

Benthic Communities. There are no potential hardgrounds within 500 ft of the proposed mooring pile locations (Maps 2 and 4). Features or areas suitable for benthic community attachment are not expected. No BOEM seabed anomalies lie within 500 ft of the proposed mooring pile locations (BOEM, 2020c).

Archaeological Conditions. There are no side-scan sonar contacts mapped within 100 ft of the proposed mooring pile locations (Maps 2, 4, and 6; OII, 2018). There are no archaeological avoidances near the proposed anchor cluster.

Shallow Stratigraphy. The subbottom profiler data show the shallow stratigraphic conditions at the proposed mooring locations to be normally deposited, parallel, continuous stratigraphy in the upper 138 ft to 148 ft bml (Figure 5). The base of the surficial drape unit (Horizon 10) is located between 13 ft and 15 ft bml (Map 5). A thin MTD will be encountered at 143 ft bml at SW3, 148 ft bml at SW2, and 138 ft bml at SW1 (Figure 5).

Thin MTDs may be encountered in the upper 178 ft to 183 ft bml but are beyond the resolution of the subbottom profiler data. Regional MTDs will be encountered below 178 ft to 183 ft bml. The MTDs appear homogenous and are not expected to impact anchoring.

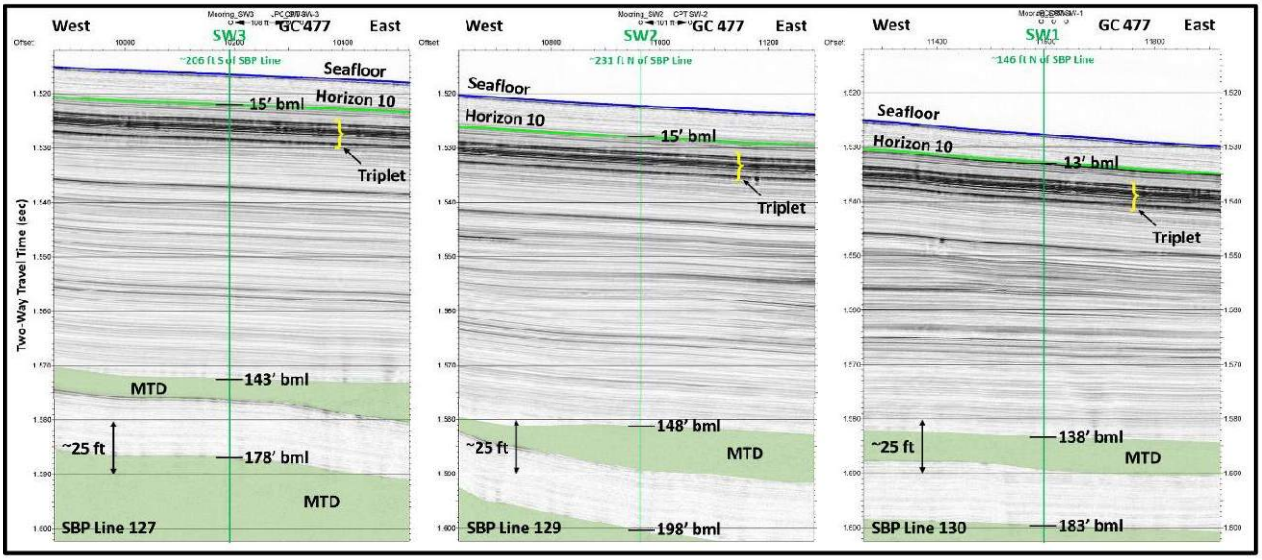


Figure 5. Subbottom Profiler Data at Proposed Southwest Cluster

Southeast Cluster (Anchors SE1-SE3). The southeast anchor cluster lies in an area of smooth seabed interrupted by several linear features representing the seafloor expression of buried gullies or channels. No seafloor faults or other geologic hazards or constraints are located within 75 m (245 ft) of the mooring pile locations (Map 2).

Bathymetry and Seafloor Gradient. The water depth and seafloor gradient at the proposed southeast cluster mooring pile locations are summarized in Table 6 (Maps 2-3).

Table 6. Southeast Cluster Bathymetry and Seafloor Gradient

Mooring Pile No.	Water Depth (ft)	Seafloor Gradient (°)
SE3	-3,795	1.4
SE2	-3,780	1.0
SE1	-3,776	1.9

Seafloor Morphology and Features. The seabed at the southeast anchor cluster is generally smooth, interrupted by the seafloor expression of buried gully or channel features (Maps 2 and 6). The buried gully features are located 193 ft east of the proposed SE1 mooring pile location, 305 ft east-northeast of the proposed SE2 mooring pile location, and 18 ft west of the proposed SE3 mooring pile location (Maps 2 and 6). The seafloor gradient is generally less than 3° along the gullies (Map 3). The gullies are typically buried by at least 60 ft of normally deposited sediment and are considered inactive features but could potentially be preferred pathways for minor amounts of sediment transport (GEMS, 2020a). The gullies are not expected to impact mooring at the proposed pile locations.

Benthic Communities. There are no potential hardgrounds within 500 ft of the proposed mooring pile locations (Maps 2 and 4). Features or areas suitable for benthic community attachment are not expected. No BOEM seabed anomalies lie within 500 ft of the proposed mooring pile locations (BOEM, 2020c).

Archaeological Conditions. There are no side-scan sonar contacts mapped within 100 ft of the proposed mooring pile locations (Maps 2, 4, and 6; OII, 2018). The nearest contact is Side-Scan Sonar Contact T45, located 678 ft northwest of the proposed SE1 mooring pile location. No archaeological avoidance was assigned

to this contact (OII, 2018). There are no archaeological avoidances near the proposed anchor cluster. A 500-ft archaeological avoidance is located approximately 2,682 ft northwest of the proposed SE1 pile location. The avoidance was recommended by Tesla Offshore surrounding Side-Scan Sonar Contact T47 (OII, 2018). Contact T47 is 7 ft x 4 ft x 1 ft and irregularly shaped. Caution should be used during mooring pre-lay and installation to ensure the 500 ft avoidance zone is not entered. Should any potentially historic materials such as textiles, wood, ceramics, or other items be uncovered during operations in the area, all operations must cease and BOEM be notified within 48 hours.

Shallow Stratigraphy. The subbottom profiler data show the shallow stratigraphic conditions at the proposed mooring locations to be normally deposited, parallel, continuous stratigraphy in the upper 150 ft to 155 ft bml (Figure 6). The base of the surficial drape unit (Horizon 10) is located between 15 ft and 18 ft bml (Map 5).

Thin MTDs may be encountered in the upper 150 ft to 155 ft bml but are beyond the resolution of the subbottom profiler data. Regional MTDs may be encountered below 150 ft to 155 ft bml.

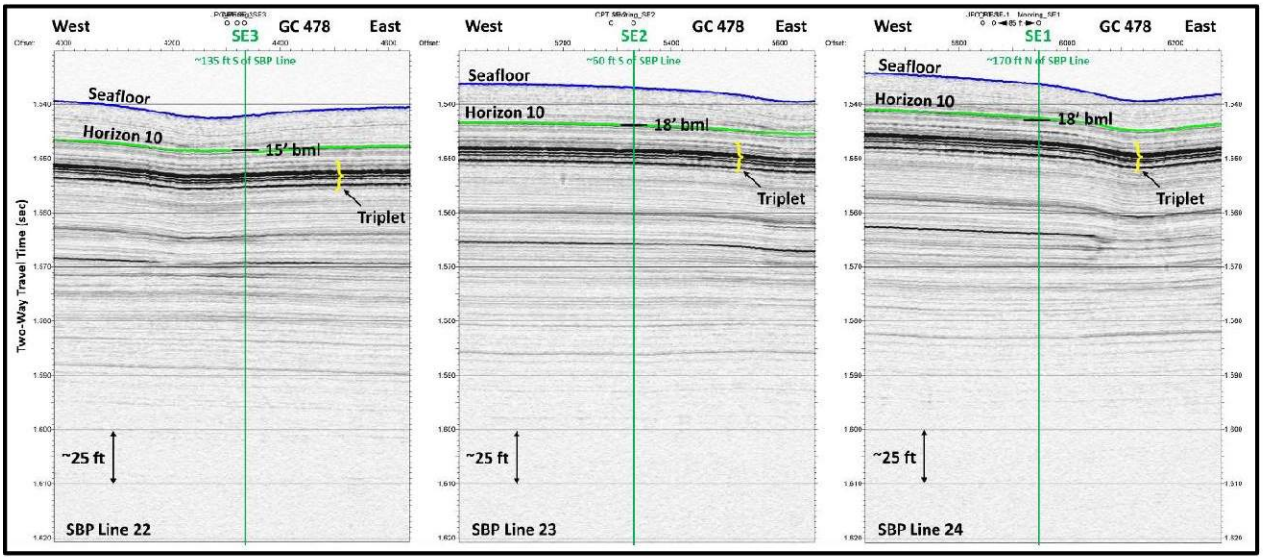


Figure 6. Subbottom Profiler Data at Proposed Southeast Cluster

Closing

We appreciate the opportunity to be of service to Murphy Exploration & Production Company and look forward to working with Murphy on future projects.

Sincerely,

GEOSCIENCE EARTH & MARINE SERVICES

Christopher Madere
Sr. Geologist/Project Manager

Daniel Lanier
President

Distribution:
Mr. Luc Chabot, Murphy Exploration & Production Company, Houston, TX *(Rev 0)*

Issue	Report Status	Prepared	Checked	Approved	Date
Rev A	Issued for Review	CM	CM	LC	10/15/20
Rev 0	Final Issue	CM	CM	LC	10/29/20

REFERENCES

Bureau of Ocean Energy Management (BOEM), 2020a, ASCII Data Files, published on the BOEM Gulf of Mexico Region Homepage, https://www.data.boem.gov/Main/Default.aspx.

Bureau of Ocean Energy Management (BOEM), 2020b, BOEM northern Gulf of Mexico deepwater bathymetry grid from 3D seismic, https://www.boem.gov/Gulf-of-Mexico-Deepwater-Bathymetry/.

Bureau of Ocean Energy Management (BOEM), 2020c, Seismic water bottom anomalies map gallery, published on the BOEM Gulf of Mexico Region web page, https://www.boem.gov/Seismic-Water-Bottom-Anomalies-Map-Gallery/.

GEMS, 2020a, Geohazard assessment for King's Quay Development Area, Blocks 433-434 and 477-478, and portions of Blocks 389-390, Green Canyon Area, Gulf of Mexico, Report No. 0720-2976, for Murphy Exploration & Production Company.

GEMS, 2020b, Geotechnical data report, FPU mooring anchors, Kings Quay Development, blocks 433, 434, 477, and 478, Green Canyon Area, Gulf of Mexico: GEMS Report No: 0119-2830b.

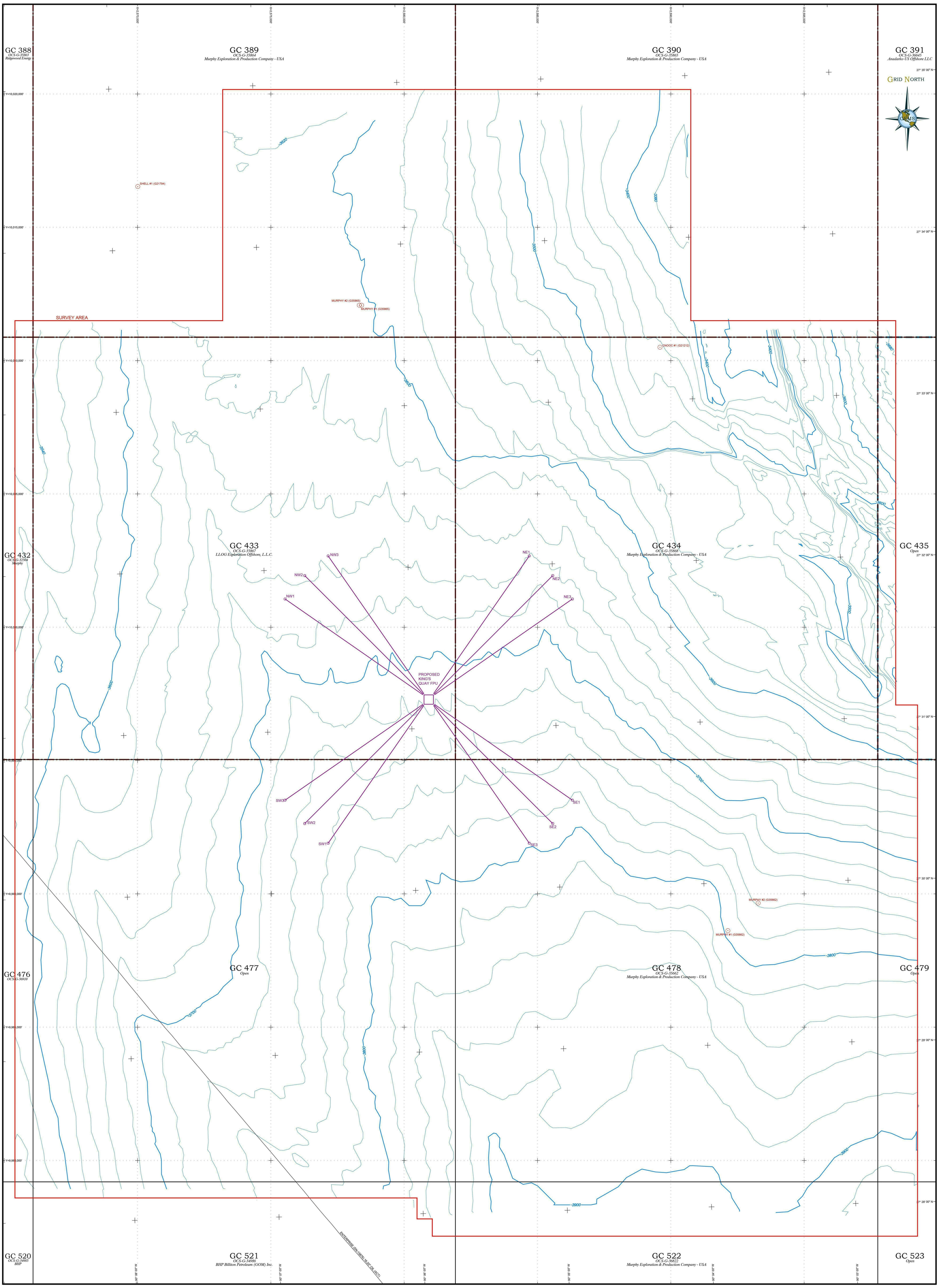
Minerals Management Service (MMS), 2005, Notice to lessees and operators of federal oil, gas, and sulphur leases and pipeline right-of-way holders in the outer continental shelf, Gulf of Mexico OCS region, archaeological resource surveys and reports. U. S. Department of the Interior, Minerals Management Service, Gulf of Mexico, NTL 2005-G07.

Minerals Management Service (MMS), 2008a, Notice to lessees and operators of federal oil, gas, and sulphur leases in the outer continental shelf, Gulf of Mexico OCS region, information requirements for exploration plans and development operations coordination documents: U. S. Department of the Interior, Minerals Management Service, Gulf of Mexico, NTL 2008-G04. Effective Date May 1, 2008.

Minerals Management Service (MMS), 2008b, Notice to lessees and operators of federal oil, gas, and sulphur leases and pipeline right-of-way holders in the outer continental shelf, Gulf of Mexico OCS region, shallow hazards program: U. S. Department of the Interior, Minerals Management Service, Gulf of Mexico, NTL 2008-G05. Effective Date May 1, 2008.

Minerals Management Service (MMS), 2010, Notice to lessees and operators of federal oil and gas leases in the outer continental shelf, Gulf of Mexico OCS region, deepwater benthic communities: U. S. Department of the Interior, Minerals Management Service, Gulf of Mexico, NTL 2009-G40. Effective Date: January 27, 2010.

Oceaneering International, Inc. (OII), 2018, Archaeological assessment, blocks 389, 390, 433, 434, 477, and 478, Green Canyon Area, report 194308-OII-RPT-AAA-01 submitted to LLOG Exploration on November 8, 2018.



MAP INFORMATION

- GEOGRAPHIC TICK REFERENCE.
- GEODETIC (LAT/LONG) TICK REFERENCE.
- PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATONS, AS PROVIDED BY MURPHY.
- EXISTING WELL LOCATION, AS REPORTED BY BOEM.
- EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
- DESIGNATED ARCHAEOLOGICAL BLOCK.
- DESIGNATED WATER FLOW BLOCK.
- WATER DEPTH CONTOUR IN FEET.

MAP SCALE

0 1000 2000 3000 4000

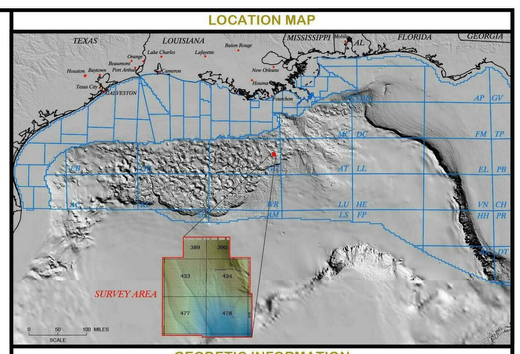
SCALE 1 : 12,000
SCALE 1" = 1,000'

NOTES

INFRASTRUCTURE INCLUDED ON THIS MAP IS BASED ON INFORMATION OBTAINED FROM THE BOEM DATABASE (BOEM, 2020a). FILE UPDATED JULY, 2020.

CONTOURS BASED ON MULTIBEAM EXTENTS.

LOCATION MAP



GEODETIC INFORMATION

DATUM:	NAD 27	ELLIPSOID:	CLARKE 1866	PROJECTION:	UTM	GRID UNITS:	US FEET
ZONE:	15	CENTRAL MERIDIAN:	93°00'00" W	FALSE EASTING:	164041.67 FT AT C.M.	FALSE NORTHING:	00000 FT 00° N

MAPPING INFORMATION

PROJECT NO.:	0620-2973b	INTERPRETER:	C. MADERE	ISSUE DATE:	29 OCTOBER 2020
FILE NAME:	2973_PILE.DWG	DRAFTED BY:	D. ADAMS	CHECKED BY:	C. MADERE
ISSUE NO.:	1	COMMENTS:			

GRID & CONTOUR INFORMATION

CONTOUR INTERVAL:	20 FT	VERTICAL DATUM:	SEA SURFACE	VELOCITY:	N/A
GRID SPACING:	10 FT X 10 FT	SEARCH RADIUS:	40 FT X 40 FT	GRID METHOD:	KRIGING

DISCLAIMER

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MURPHY EXPLORATION & PRODUCTION COMPANY - USA

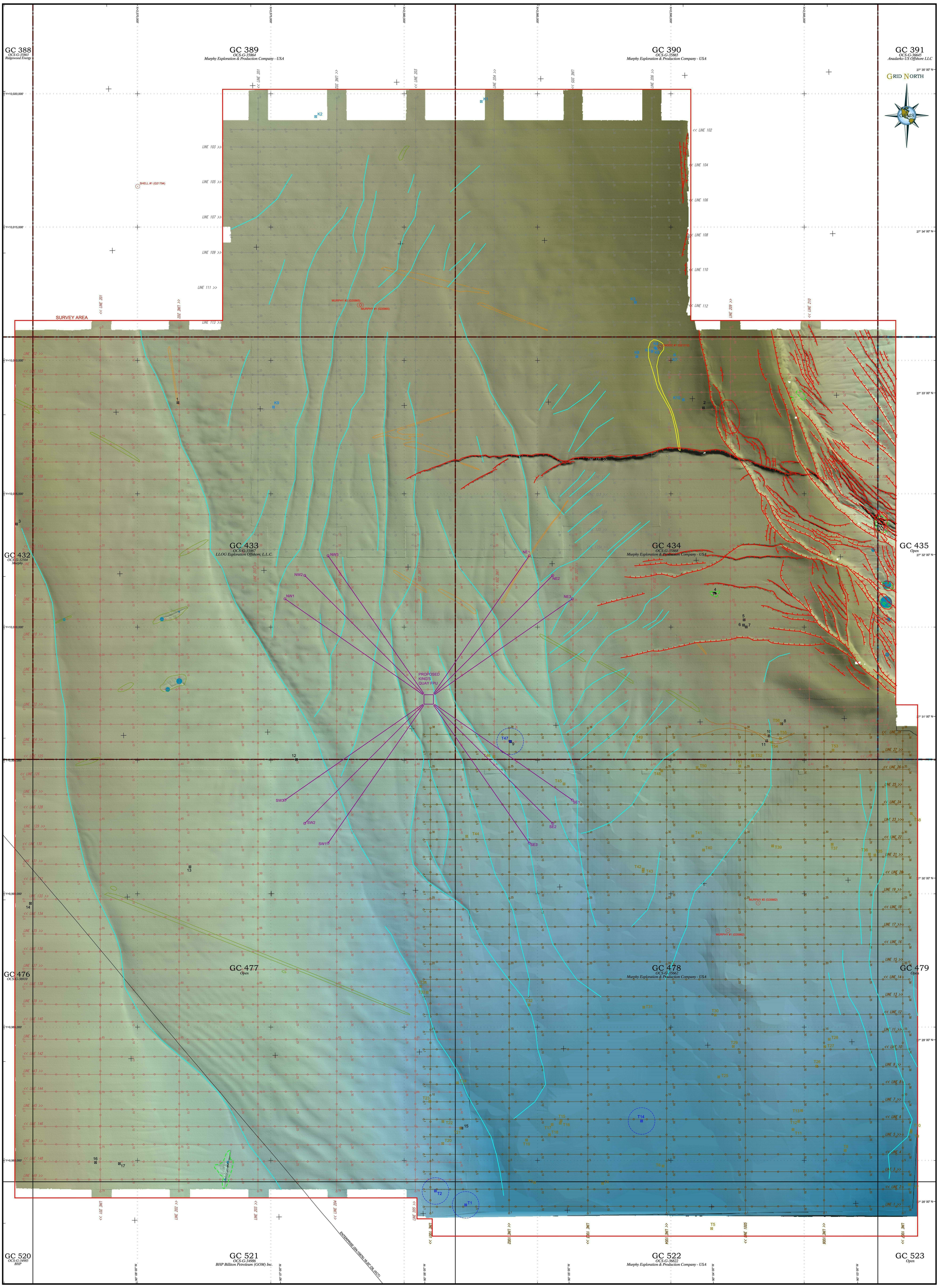
BATHYMETRY MAP

PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATIONS

BLOCKS 433-434 AND 477-478
GREEN CANYON AREA
GULF OF MEXICO

MAP NO. 1

GEOSCIENCE EARTH & MARINE SERVICES, INC.



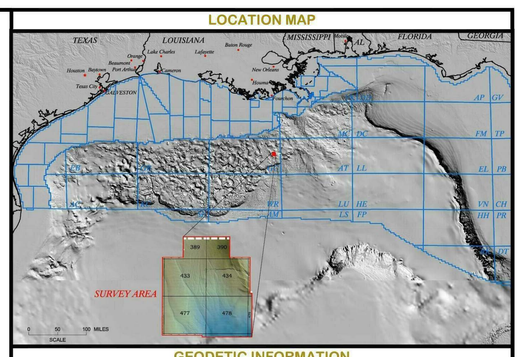
MAP INFORMATION

- GEOGRAPHIC TICK REFERENCE.
- GEODETIC (LAT/LONG) TICK REFERENCE.
- PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATONS, AS PROVIDED BY MURPHY.
- EXISTING WELL LOCATION, AS REPORTED BY BOEM.
- EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
- DESIGNATED ARCHAEOLOGICAL BLOCK.
- DESIGNATED WATER FLOW BLOCK.
- ANCHOR SCARS.
- DRILL CUTTINGS.
- SEAFLOOR STAINING EVENT ON SONAR MOSAIC.
- SEAFLOOR EXPRESSION OF BURIED GULLIES OR CHANNELS. LINE REPRESENTS GULLY AXIS.
- LINEAR MAN-MADE DEBRIS.
- POTENTIAL HARDGROUNDS.
- SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.
- SHALLOW GAS.
- AREAS OF POSITIVE ANOMALIES AS REPORTED BY BOEM (2020c).

FEATURES FROM OII, 2018

- << LINE 101 — Navigation trackline name and direction run (OII 2018 Survey)
- << LINE 101 — Navigation trackline name and direction run (OII 2016 Survey)
- << LINE 1 — Navigation trackline name and direction run (TESLA 2015 Survey)
- 1 — Sonar contact and reference number (OII 2018 Survey)
- K1 — Sonar contact and reference number (OII, 2016 Survey))
- T1 — Sonar contact and reference number (TESLA 2015 Survey)
- Potential archaeological area recommended for avoidance (TESLA 2015 Survey)

LOCATION MAP



GEODETIC INFORMATION

DATUM:	NAD 27	ELLIPSOID:	CLARKE 1866	PROJECTION:	UTM	GRID UNITS:	US FEET
ZONE:	15	CENTRAL MERIDIAN:	93°00'00" W	FALSE EASTING:	164041.67 FT AT C.M.	FALSE NORTHING:	00000 FT 00° N

MAPPING INFORMATION

PROJECT NO.:	0620-2973b	INTERPRETER:	C. MADERE	ISSUE DATE:	29 OCTOBER 2020
FILE NAME:	2973_PILE.DWG	DRAFTED BY:	D. ADAMS	CHECKED BY:	C. MADERE
ISSUE NO.:	1	COMMENTS:	KRIGING		

GRID & CONTOUR INFORMATION

CONTOUR INTERVAL:	N/A	VERTICAL DATUM:	SEAFLOOR	VELOCITY:	N/A
GRID SPACING:	10 FT X 10 FT	SEARCH RADIUS:	40 FT X 40 FT	GRID METHOD:	N/A

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RELATIVE WATER DEPTH

-3375 -3500 -3625 -3750 -3875 -3936

AZIMUTH = 45°
ELEVATION = 45°
V.E. = 2x

MAP SCALE

0 1000 2000 3000 4000

SCALE 1 : 12,000
SCALE 1" = 1,000'

NOTES

INFRASTRUCTURE INCLUDED ON THIS MAP IS BASED ON INFORMATION OBTAINED FROM THE BOEM DATABASE (BOEM, 2020a). FILE UPDATED JULY, 2020.

MURPHY EXPLORATION & PRODUCTION COMPANY - USA

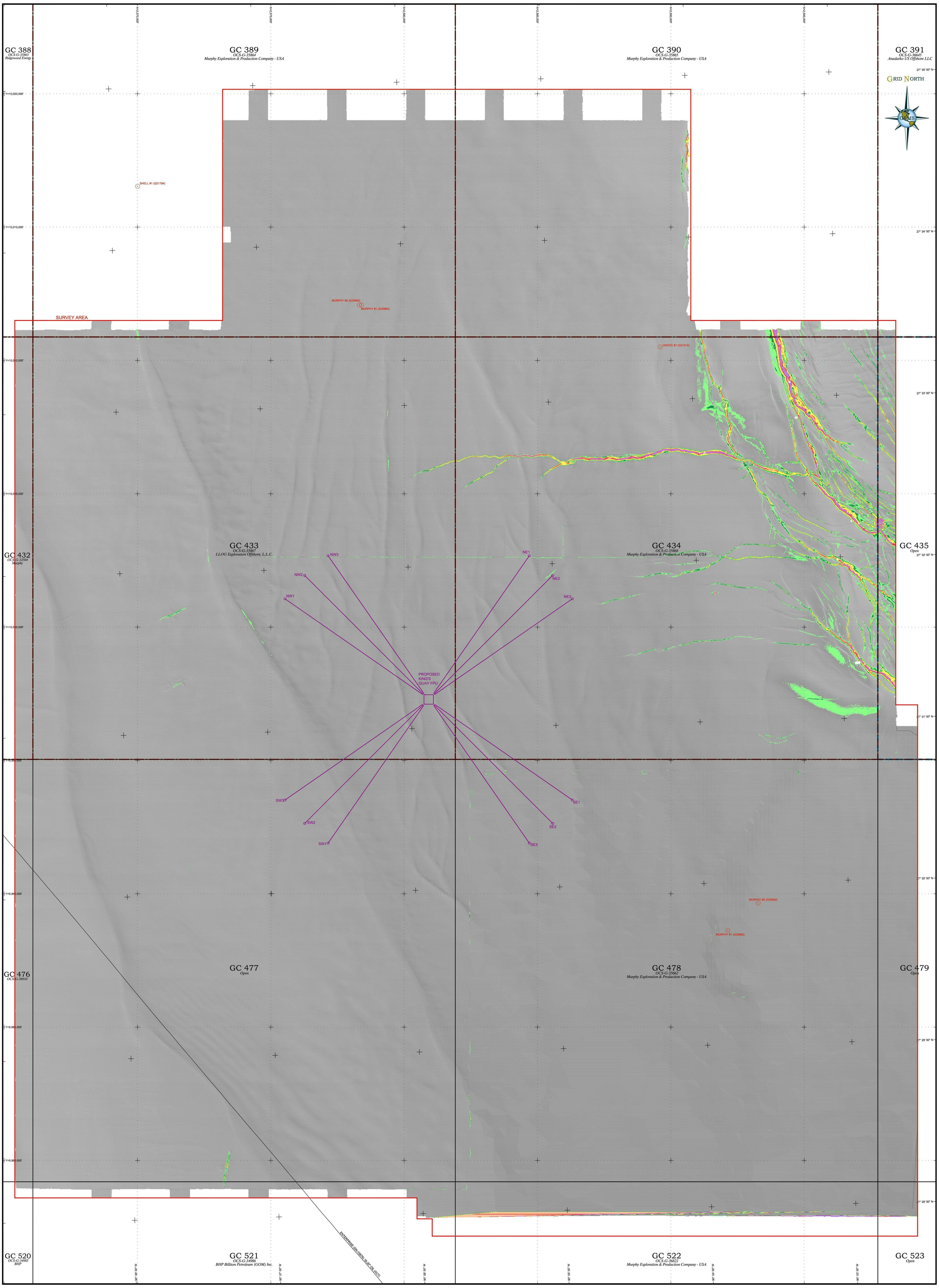
SEAFLOOR FEATURES MAP

PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATIONS

BLOCKS 433-434 AND 477-478 GREEN CANYON AREA GULF OF MEXICO

MAP NO. 2

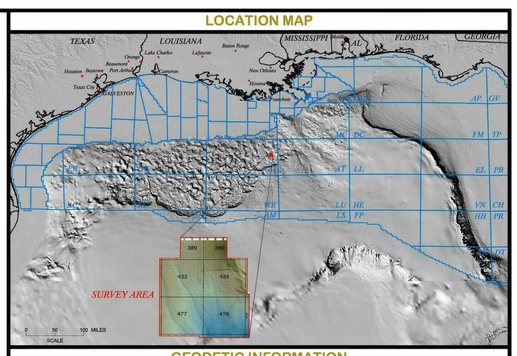
GEOSCIENCE EARTH & MARINE SERVICES, INC.



MAP INFORMATION

- GEOGRAPHIC TICK REFERENCE.
- GEODETIC (LAT/LONG) TICK REFERENCE.
- PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATONS, AS PROVIDED BY MURPHY.
- EXISTING WELL LOCATION, AS REPORTED BY BOEM.
- EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
- DESIGNATED ARCHAEOLOGICAL BLOCK.
- DESIGNATED WATER FLOW BLOCK.

LOCATION MAP



GEODETIC INFORMATION

DATUM:	NAD 27	ELLIPSOID:	CLARKE 1866	PROJECTION:	UTM	GRID UNITS:	US FEET
ZONE:	15	CENTRAL MERIDIAN:	93°00'00" W	FALSE EASTING:	164041667 FT AT C.M.	FALSE NORTHING:	00000 FT 00° N

MAPPING INFORMATION

PROJECT NO.:	0620-2973b	INTERPRETER:	C. MADERE	ISSUE DATE:	29 OCTOBER 2020
FILE NAME:	2973_PILE.DWG	DRAFTED BY:	D. ADAMS	CHECKED BY:	C. MADERE
ISSUE NO.:	1	COMMENTS:			

SLOPE IN DEGREES

0 5 10 15 20 30 40 50 60 65

MAP SCALE

0 1000 2000 3000 4000

SCALE 1 : 12,000
SCALE 1" = 1,000'

NOTES

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GRID & CONTOUR INFORMATION

CONTOUR INTERVAL:	N/A	VERTICAL DATUM:	SEAFLOOR	VELOCITY:	N/A
GRID SPACING:	10 FT X 10 FT	SEARCH RADIUS:	40 FT X 40 FT	GRID METHOD:	N/A

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MURPHY EXPLORATION & PRODUCTION COMPANY - USA

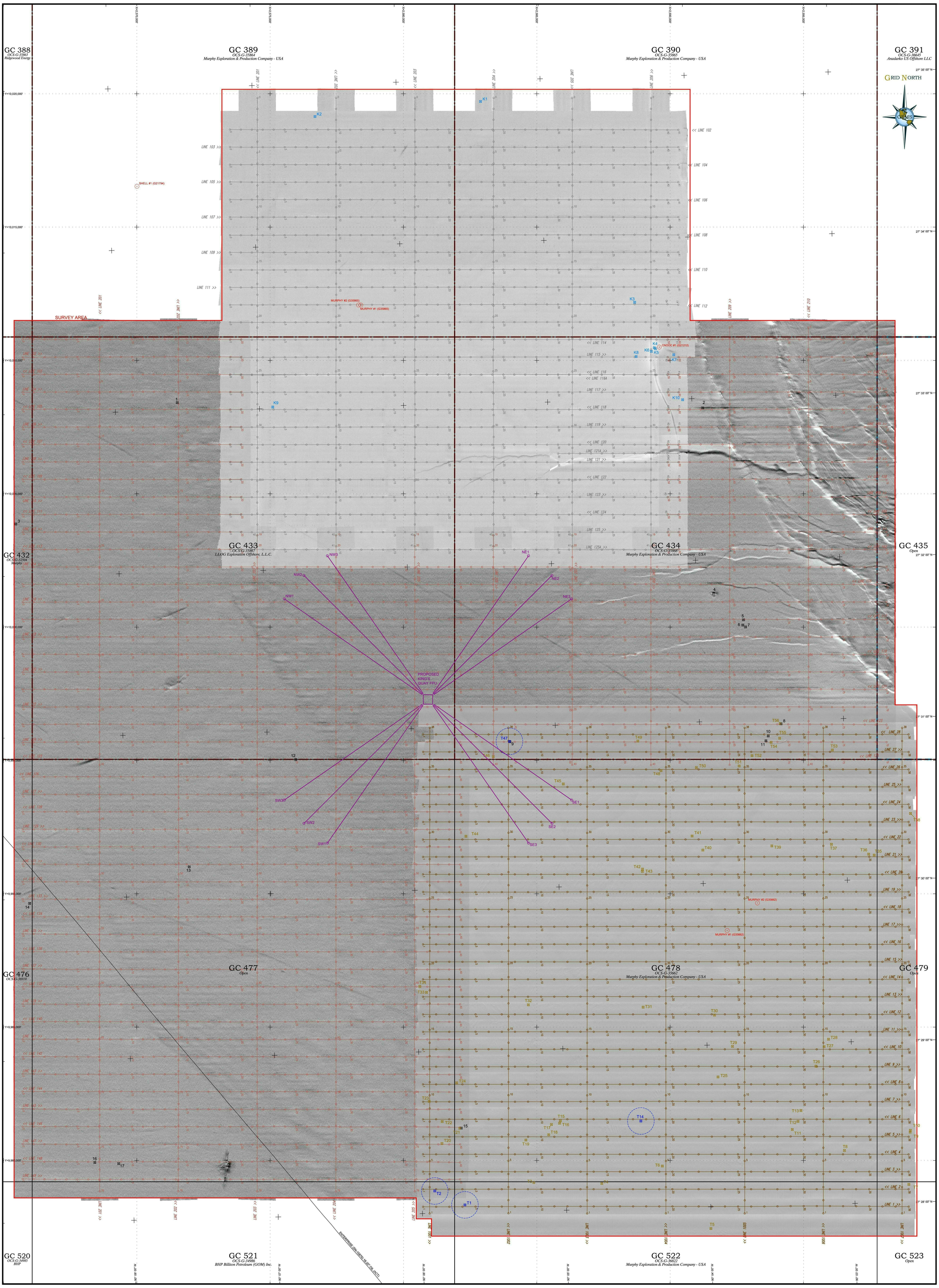
SEAFLOOR GRADIENT MAP

PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATIONS

BLOCKS 433-434 AND 477-478
GREEN CANYON AREA
GULF OF MEXICO

MAP NO. 3

GEOSCIENCE EARTH & MARINE SERVICES, INC.



MAP INFORMATION

- GEOGRAPHIC TICK REFERENCE.
- GEODETIC (LAT/LONG) TICK REFERENCE.
- PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATONS, AS PROVIDED BY MURPHY.
- EXISTING WELL LOCATION, AS REPORTED BY BOEM.
- EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
- DESIGNATED ARCHAEOLOGICAL BLOCK.
- DESIGNATED WATER FLOW BLOCK.

FEATURES FROM OII, 2018

- << LINE 101 — Navigation trackline name and direction run (OII 2018 Survey)
- << LINE 101 — Navigation trackline name and direction run (OII 2016 Survey)
- << LINE 1 — Navigation trackline name and direction run (TESLA 2015 Survey)
- 1 — Sonar contact and reference number (OII 2018 Survey)
- K1 — Sonar contact and reference number (OII, 2016 Survey))
- T1 — Sonar contact and reference number (TESLA 2015 Survey)
- Potential archaeological area recommended for avoidance (TESLA 2015 Survey)

MAP SCALE

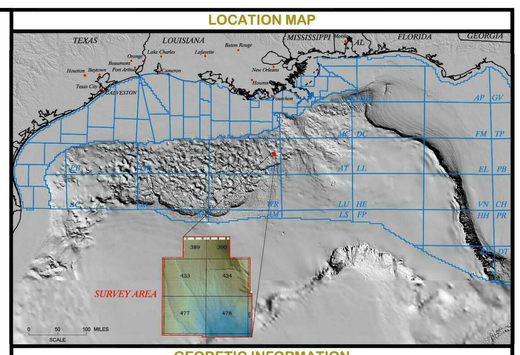
0 1000 2000 3000 4000

SCALE 1 : 12,000
SCALE 1" = 1,000'

NOTES

INFRASTRUCTURE INCLUDED ON THIS MAP IS BASED ON INFORMATION OBTAINED FROM THE BOEM DATABASE (BOEM, 2020a). FILE UPDATED JULY, 2020.

LOCATION MAP



GEODETIC INFORMATION

DATUM:	NAD 27	ELLIPSOID:	CLARKE 1866	PROJECTION:	UTM	GRID UNITS:	US FEET
ZONE:	15	CENTRAL MERIDIAN:	93°00'00" W	FALSE EASTING:	164041667 FT AT C.M.	FALSE NORTHING:	00000 FT 00° N

MAPPING INFORMATION

PROJECT NO.:	0620-2973b	INTERPRETER:	C. MADERE	ISSUE DATE:	29 OCTOBER 2020
FILE NAME:	2973_PILE.DWG	DRAFTED BY:	D. ADAMS	CHECKED BY:	C. MADERE
ISSUE NO.:	1	COMMENTS:			

GRID & CONTOUR INFORMATION

CONTOUR INTERVAL:	N/A	VERTICAL DATUM:	SEAFLOOR	VELOCITY:	N/A
GRID SPACING:	N/A	SEARCH RADIUS:	N/A	GRID METHOD:	N/A

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MURPHY EXPLORATION & PRODUCTION COMPANY - USA

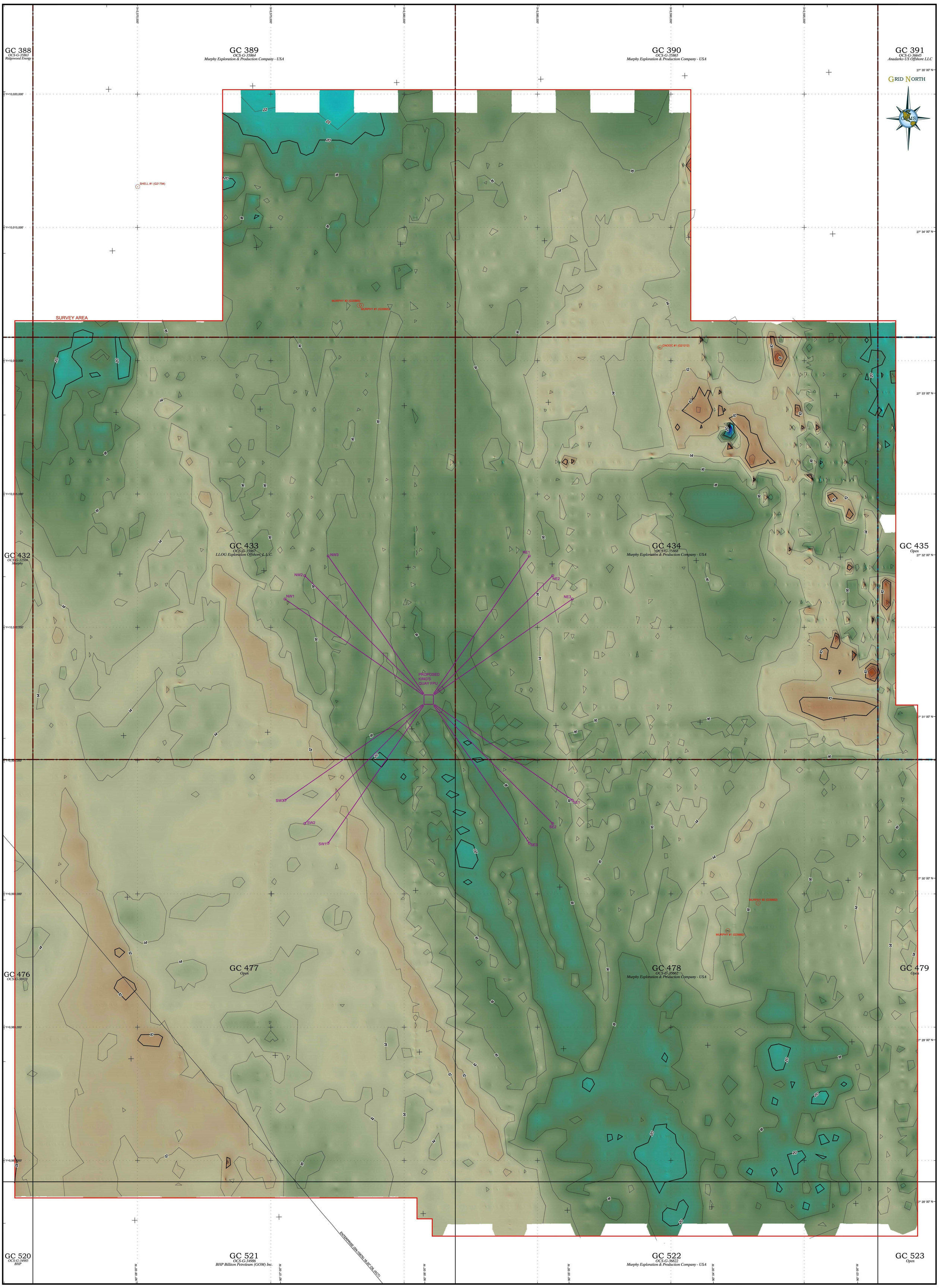
SIDE-SCAN SONAR MOSAIC

PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATIONS

BLOCKS 433-434 AND 477-478
GREEN CANYON AREA
GULF OF MEXICO

MAP NO. 4

GEOSCIENCE EARTH & MARINE SERVICES, INC.



MAP INFORMATION

- GEOGRAPHIC TICK REFERENCE.
- GEODETIC (LAT/LONG) TICK REFERENCE.
- PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATONS, AS PROVIDED BY MURPHY.
- EXISTING WELL LOCATION, AS REPORTED BY BOEM.
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- DESIGNATED ARCHAEOLOGICAL BLOCK.
- DESIGNATED WATER FLOW BLOCK.
- ISOPACH CONTOUR IN FEET.

THICKNESS IN FEET

2 5 10 15 20 25 30 33

MAP SCALE

0 1000 2000 3000 4000

SCALE 1 : 12,000
SCALE 1" = 1,000'

NOTES

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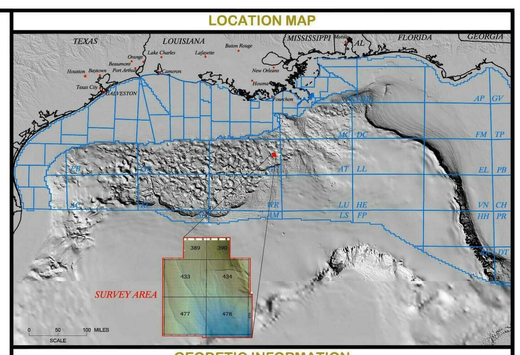
LOCATION MAP



GEODETIC INFORMATION

DATUM:	NAD 27	ELLIPSOID:	CLARKE 1866	PROJECTION:	UTM	GRID UNITS:	US FEET
ZONE:	15	CENTRAL MERIDIAN:	93°00'00" W	FALSE EASTING:	164041667 FT AT C.M.	FALSE NORTHING:	00000 FT 00° N

MAPPING INFORMATION

PROJECT NO.:	0620-2973b	INTERPRETER:	C. MADERE	ISSUE DATE:	29 OCTOBER 2020
FILE NAME:	2973_PILE.DWG	DRAFTED BY:	D. ADAMS	CHECKED BY:	C. MADERE
ISSUE NO.:	1	COMMENTS:			

GRID & CONTOUR INFORMATION

CONTOUR INTERVAL:	2 FT	VERTICAL DATUM:	SEAFLOOR	VELOCITY:	SEE APPENDIX A
GRID SPACING:	20 FT X 20 FT	SEARCH RADIUS:	600 FT X 600 FT	GRID METHOD:	KRIGING

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MURPHY EXPLORATION & PRODUCTION COMPANY - USA

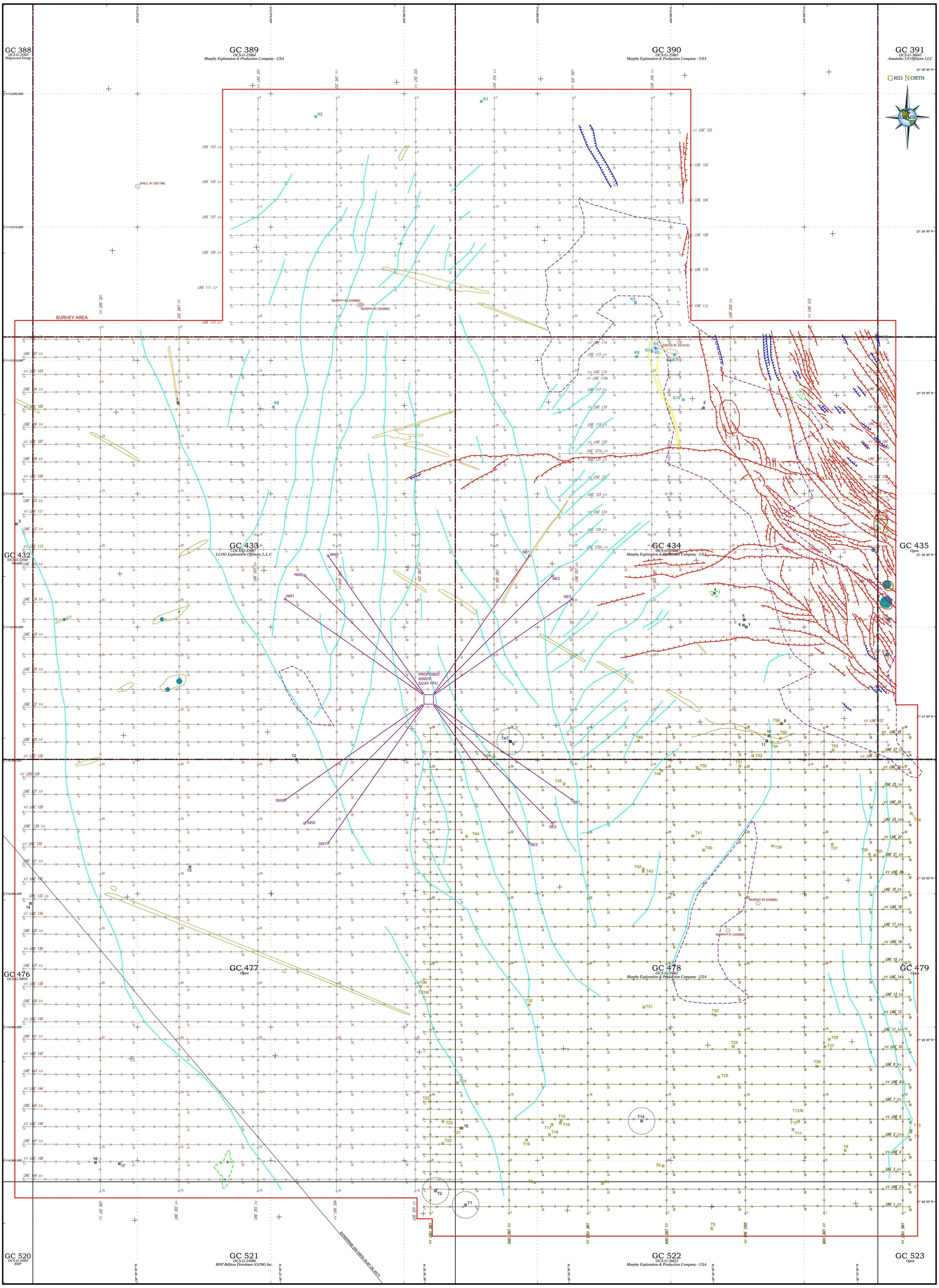
ISOPACH MAP

SEAFLOOR TO HORIZON 10
PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATIONS

BLOCKS 433-434 AND 477-478
GREEN CANYON AREA
GULF OF MEXICO

MAP NO. 5

GEOSCIENCE EARTH & MARINE SERVICES, INC.



MAP INFORMATION

- GEOGRAPHIC TICK REFERENCE.
- GEODETIC (LAT/LONG) TICK REFERENCE.
- PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATONS, AS PROVIDED BY MURPHY.
- LINE 101 >>> — AUV LINE NUMBER, HEADING AND FIXMARK.
- EXISTING WELL LOCATION, AS REPORTED BY BOEM.
- EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
- DESIGNATED ARCHAEOLOGICAL BLOCK.
- DESIGNATED WATER FLOW BLOCK.
- ANCHOR SCARS.
- DRILL CUTTINGS.
- SEAFLOOR STAINING EVENT ON SONAR MOSAIC.
- SEAFLOOR EXPRESSION OF BURIED GULLIES OR CHANNELS. LINE REPRESENTS GULLY AXIS.
- LINEAR MAN-MADE DEBRIS.
- POTENTIAL HARDGROUNDS.
- SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.
- AREAS OF POSITIVE ANOMALIES AS REPORTED BY BOEM (2020c).
- BURIED FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.
- BURIED MASS-TRANSPORT DEPOSITS.
- SHALLOW GAS.

FEATURES FROM OII, 2018

- << LINE 101 — Navigation trackline name and direction run (OII 2018 Survey)
- << LINE 101 — Navigation trackline name and direction run (OII 2016 Survey)
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MAP SCALE

0 1000 2000 3000 4000

SCALE 1 : 12,000
SCALE 1" = 1,000'

NOTES

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LOCATION MAP

TEXAS, LOUISIANA, MISSISSIPPI, ALABAMA, FLORIDA, GEORGIA

SURVEY AREA

GEODETIC INFORMATION

DATUM:	NAD 27	ELLIPSOID:	CLARKE 1866	PROJECTION:	UTM	GRID UNITS:	US FEET
ZONE:	15	CENTRAL MERIDIAN:	93°00'00" W	FALSE EASTING:	164041.67 FT AT C.M.	FALSE NORTHING:	00000 FT 00° N

MAPPING INFORMATION

PROJECT NO.:	0620-2973b	INTERPRETER:	C. MADERE	ISSUE DATE:	29 OCTOBER 2020
FILE NAME:	2973_PILE.DWG	DRAFTED BY:	D. ADAMS	CHECKED BY:	C. MADERE
ISSUE NO.:	1	COMMENTS:			

GRID & CONTOUR INFORMATION

CONTOUR INTERVAL:	N/A	VERTICAL DATUM:	N/A	VELOCITY:	N/A
GRID SPACING:	N/A	SEARCH RADIUS:	N/A	GRID METHOD:	N/A

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MURPHY EXPLORATION & PRODUCTION COMPANY - USA

GEOLOGIC FEATURES MAP

PROPOSED KING'S QUAY MOORING ANCHOR PILE LOCATIONS

BLOCKS 433-434 AND 477-478 GREEN CANYON AREA GULF OF MEXICO

MAP NO. 6

GEOSCIENCE EARTH & MARINE SERVICES, INC.

APPENDIX D

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

Projected generated waste			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 drilling fluid	N/A	N/A	N/A	N/A	No
Cuttings wetted with water-based fluid	N/A	N/A	N/A	N/A	No
Cuttings wetted with synthetic-based fluid	N/A	N/A	N/A	N/A	No
NO DRILLING PROPOSED					
Will humans be there? If yes, expect conventional waste					
Domestic waste	Misc waste generated during dailey operations of 50 man living quarters	36 bbls /day (with max personnel on board	1.5 bbls/hr	Remove oil & grease, oxidize & discharge overboard in accordance with USCG standards	No
Sanitary waste	Saniitation waste generated by 50 man quarters during daily operations	24 bbls/day (with max personnel	1.0 bbls/hr	Grind solids, electrolyze, hold 30 min to oxidize then discharge overboard in accordance with USCG standards	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Accumulated drainage due to rainfall	0 to 22,182 bbls/day	0 to 924 bbls/hr	Treat for oil & grease & discharge overboard	No
Will you conduct well treatment, completion, or workover?					
Well treatment fluids	NPDES approved treatment fluid used for well operations	24 bbls/well/day	5 bbls/hr/well	Test for oil & grease and dischage overboard	No
Well completion fluids	Clear Brine Type	100 bbls/well/4 years	25 bbl/yr/well	Most completion fluids will be recovered at a remote drill rig, excess returned to shore. Residual fluids recovered at the production facilitiy and discharged overboard.	No
Workover fluids	Clear Brine Type	100 bbls/well/4 years	25 bbl/yr/well	Most workover fluids will be recovered at a remote drill rig, excess returned to shore. Residual fluids recovered at the production facilitiy and discharged overboard.	No
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Desalinization unit discharge	Uncontaminated spent saltwater used for potable water generation unit	123 bbls/day	5.1 bbls/hr	Discharge overboard	No
Blowout prevent fluid	N/A	N/A	N/A	N/A	No

Projected generated waste			Projected Ocean Discharges		Downhole Disposal
Type of Waste	**Composition**	**Projected Amount**	**Discharge rate**	**Discharge Method**	**Answer yes or no**
Ballast water	Uncontaminated seawater	0 bbls/well	0 bbls/well	Fixed ballast system with water moved between tanks to trim the hull, no discharge	No
Bilge water	Uncontaminated freshwater and seawater overflow / leakage accumulated from machinery operation - NPDES allowed	0 to 0.4 bbls/day	0 to 0.4 bbls/day	treat for oil & grease & discharge overboard	No
Excess cement at seafloor	N/A	N/A	N/A	N/A	No
Fire water	Seawater	300 gal/min. continuous pump rate	10,000 bbls/day	Uncontaminated seawater discharged overboard	No
Cooling water	circulated by jockey pumps for cooler system	1400 gal/min. continuous pump rate	48,000 bbls/day	Uncontaminated seawater discharged overboard	No
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced water	Produced water	3000 bbls/day/well (average produced water rate/well over well life)	12,000 bbls/day max average	Treat for oil & grease, test and dischage overboard	No
Will you be covered by an individual or general NPDES permit ?	**General**				
NOTE: If you will not have a type of waste, enter NA in the row.					

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

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

	Projected generated waste		Solid and Liquid Wastes transportation	Waste Disposal		
	Type of Waste	**Composition**	**Transport Method**	**Name/Location of Facility**	**Amount**	**Disposal Method**
Will drilling occur ? If yes, fill in the muds and cuttings.						
	EXAMPLE: Synthetic-based drilling fluid or mud	*internal olefin, ester*	*Below deck storage tanks on offshore support vessels*	*Newport Environmental Services Inc., Ingleside, TX*	*X bbl/well*	*Recycled*
	Oil-based drilling fluid or mud	**N/A**	N/A	N/A	N/A	N/A
	Synthetic-based drilling fluid or mud	**N/A**	N/A	N/A	N/A	N/A
	Cuttings wetted with Water-based fluid	N/A	N/A	N/A	N/A	N/A
	Cuttings wetted with Synthetic-based fluid	N/A	N/A	N/A	N/A	N/A
	Cuttings wetted with oil-based fluids	N/A	N/A	N/A	N/A	N/A
Will you produce hydrocarbons? If yes fill in for produced sand.						
	Produced sand	Oil-contaminated produced sand	Loaded into 7 cubic yard skips and transported by supply vessel to LLOG Fourchon shorebase	PPM, Theodore, AL	200 lbs/year	Land farming
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.						
	Trash and Debris	Misc solid trash & debris from operations	Transported by supply vessel in storage bins to LLOG Fourchon Shorebase	Galliano Waste Co. picks up & transport to River Burch Landfill in Avondale, LA	80 tons/yr	Landfill
	Used oil	Spent oil from machinery	Transported by supply vessel in 25 bbl cutting boxes or mud tanks to LLOG Fourchon Shorebase	C-Port Stoine or Martin Energy Co. pick up & transport to American Recovery in Houma, LA	100 bbls/yr	Recycled
	Wash water	Wash water with sand blast material, residue and surfactants	Transported by supply vessel in 25 bbl cutting boxes	Galliano Waste Co. picks up & transport to River Burch Landfill in	200 bbls/yr	Landfill or approved disposal well injection
	Chemical product wastes	Spent treatment or damaged chemicals used in operations	Transported by supply vessel in chemical tote tanks	Returned to chemical supplier	10 bbls/yr	Recycled

NOTE: If you will not have a type of waste, enter NA in the row.

APPENDIX E

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

COMPANY	Murphy Exploration & Production
AREA	GC
BLOCK	432, 433, 434, 389, 390 & 478
LEASE	32504, 35867, 35868, 35864, 35865 & 35662
FACILITY	A
WELL	
COMPANY CONTACT	Cindy Kunkel
TELEPHONE NO.	281-647-5763
REMARKS	Install platform and pipelines and commence production. Rig emissions included for future well opertions

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:

YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2020	16	120
2021		
2022		
2023		
2024		
2025		
2026		
2027		
2028		
2029		

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/ttn/chief/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	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
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	
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	https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05_02-05-18.pdf
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	
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.apiwebstore.org/publications/item.cgi?9879d38a-8bc0-4abe-bb5c-9b623870125d
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	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
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	
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	

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	%

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

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS
Murphy Exploration & Production	GC	432, 433, 434, 389, 390 & 4	32504, 35867, 3	A		Cindy Kunkel	281-647-5763	Install platform and pipelines and commence production. Rig emissions included for future well opertions

OPERATIONS	EQUIPMENT	EQUIPMENT ID	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	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Installation- Diesel		45000	2315.07	55561.68	24	120	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	45.72	27.56	26.75	0.67	1095.29	31.49	0.00	171.79	0.32
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		78400	4033.3664	96800.79	24	45	55.31	33.37	32.37	0.81	1325.17	38.10	0.00	207.85	0.39	29.87	18.02	17.48	0.43	715.59	20.57	0.00	112.24	0.21
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Boiler					0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		BPD	SCF/HR	COUNT																				
	STORAGE TANK				0	0	0	–	–	–	–	–	#DIV/0!	–	–	–	–	–	–	–	–	0.00	–	–	–
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COLD VENT				0	0	0	–	–	–	–	–	#DIV/0!	–	–	–	–	–	–	–	–	0.00	–	–	–
	FUGITIVES				0	0	0	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	GLYCOL DEHYDRATOR				0	0	0	–	–	–	–	–	#DIV/0!	–	–	–	–	–	–	–	–	0.00	–	–	–
	WASTE INCINERATOR		0			0	0	–	0.00	0.00	0.00	0.00	–	–	0.00	–	–	0.00	0.00	0.00	0.00	–	–	0.00	–
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
ALASKA-SPECIFIC SOURCES	VESSELS		kW			HR/D	D/YR																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
2020	Facility Total Emissions							87.06	52.52	50.95	1.27	2,085.79	#DIV/0!	0.01	327.15	0.61	75.58	45.60	44.23	1.10	1,810.89	52.07	0.01	284.03	0.53
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES																3,529.80			3,529.80	3,529.80	3,529.80		76,152.27	
	106.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		5500	282.953	6790.87	24	240	3.88	2.34	2.27	0.06	92.96	2.67	0.00	14.58	0.03	11.17	6.74	6.54	0.16	267.74	7.70	0.00	41.99	0.08
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		10800	555.6168	13334.80	24	180	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05	16.46	9.93	9.63	0.24	394.31	11.34	0.00	61.85	0.12
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	On-Ice Equipment			GAL/HR	GAL/D																				
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																						
	VESSELS		kW			HR/D	D/YR																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	Non-Facility Total Emissions							11.50	6.94	6.73	0.17	275.51	7.92	0.00	43.21	0.08	27.63	16.67	16.17	0.40	662.04	19.04	0.00	103.84	0.19

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

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Murphy Exploration & Production	GC		432, 433, 434, 389, 390 & 43	32504, 35867, 3	A						Cindy Kuskei		281-647-6763		Install platform and pipelines and commence production. Rig emissions included for future well opertions										
OPERATIONS	EQUIPMENT	EQUIPMENT ID	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	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Installation- Diesel		45000	2315.07	55561.68	24	20	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP,<600hp Diesel		500	25.723	617.35	12	200	1.10	1.10	1.10	0.03	15.54	1.15	–	3.34	–	1.32	1.32	1.32	0.04	18.65	1.38	–	4.01	–
	RECIP,>600hp Diesel		2500	128.615	3086.76	24	274	1.76	1.00	0.98	0.03	60.08	1.60	–	13.78	–	5.80	3.30	3.23	0.10	197.53	5.26	–	45.31	–
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP, 2 Cycle Lean Natural Gas		6500	46428.571	1114285.71	24	274	–	1.85	1.85	0.03	94.58	5.85	–	5.33	–	–	6.09	6.09	0.09	310.96	19.23	–	17.53	–
	RECIP, 2 Cycle Lean Natural Gas		6500	46428.571	1114285.71	24	274	–	1.85	1.85	0.03	94.58	5.85	–	17.21	–	–	6.09	6.09	0.09	310.96	19.23	–	56.58	–
	RECIP, 4 Cycle Lean Natural Gas		20000	142857.14	3428571.43	24	9	–	0.01	0.01	0.09	127.05	17.70	–	16.40	–	–	0.00	0.00	0.01	13.72	1.91	–	1.77	–
	RECIP, 4 Cycle Rich Natural Gas		20000	142857.14	3428571.43	24	9	–	1.43	1.43	0.09	340.50	4.50	–	52.95	–	–	0.15	0.15	0.01	36.77	0.49	–	5.72	–
	RECIP, 4 Cycle Lean Natural Gas		20000	142857.14	3428571.43	24	9	–	0.01	0.01	0.09	127.05	17.70	–	83.55	–	–	0.00	0.00	0.01	13.72	1.91	–	9.02	–
	RECIP, 4 Cycle Rich Natural Gas		20000	142857.14	3428571.43	24	9	–	1.43	1.43	0.09	340.50	4.50	–	526.50	–	–	0.15	0.15	0.01	36.77	0.49	–	56.86	–
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		BPD	SCF/HR	COUNT																				
	STORAGE TANK				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COLD VENT				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	FUGITIVES				0	0	0	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	GLYCOL DEHYDRATOR				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	WASTE INCINERATOR		0			0	0	–	0.00	0.00	0.00	0.00	–	–	0.00	–	–	0.00	0.00	0.00	0.00			0.00	
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
ALASKA-SPECIFIC SOURCES	VESSELS		kW			HR/D	D/YR																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
2021	Facility Total Emissions							34.61	27.84	27.24	0.93	1,960.49	80.71	0.00	838.36	0.22	14.74	21.71	21.50	0.47	1,121.65	65.14	0.00	226.43	0.05
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES																3,529.80			3,529.80	3,529.80	3,529.80		76,152.27	
	106.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	On-Ice Equipment			GAL/HR	GAL/D																				
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																						
	VESSELS		kW			HR/D	D/YR																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	Non-Facility Total Emissions							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS
Murphy Exploration & Production	GC	432, 433, 434, 389, 390 & 43	32504, 35867, 3	A		Cindy Kunkel	281-647-0763	Install platform and pipelines and commence production. Rig emissions included for future well opertions

OPERATIONS	EQUIPMENT	EQUIPMENT ID	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	VESSELS- Drilling - Propulsion Engine - Diesel		61800	3179.3628	76304.71	24	120	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	62.78	37.88	36.74	0.91	1504.21	43.25	0.00	235.93	0.44
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	16		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		500	25.723	617.35	12	400	1.10	1.10	1.10	0.03	15.54	1.15	--	3.34	--	2.65	2.65	2.65	0.07	37.30	2.75	--	8.02	--
	RECIP.>600hp Diesel		2500	128.615	3086.76	24	365	1.76	1.00	0.98	0.03	60.08	1.60	--	13.78	--	7.73	4.39	4.30	0.13	263.13	7.00	--	60.35	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		6500	46428.571	1114285.71	24	365	--	1.85	1.85	0.03	94.58	5.85	--	5.33	--	--	8.11	8.11	0.13	414.24	25.62	--	23.35	--
	RECIP. 2 Cycle Lean Natural Gas		6500	46428.571	1114285.71	24	365	--	1.85	1.85	0.03	94.58	5.85	--	17.21	--	--	8.11	8.11	0.13	414.24	25.62	--	75.37	--
	RECIP. 4 Cycle Lean Natural Gas		20000	142857.14	3428571.43	24	12	--	0.01	0.01	0.09	127.05	17.70	--	16.40	--	--	0.00	0.00	0.01	18.30	2.55	--	2.36	--
	RECIP. 4 Cycle Rich Natural Gas		20000	142857.14	3428571.43	24	12	--	1.43	1.43	0.09	340.50	4.50	--	52.95	--	--	0.21	0.21	0.01	49.03	0.65	--	7.62	--
	RECIP. 4 Cycle Lean Natural Gas		20000	142857.14	3428571.43	24	12	--	0.01	0.01	0.09	127.05	17.70	--	83.55	--	--	0.00	0.00	0.01	18.30	2.55	--	12.03	--
	RECIP. 4 Cycle Rich Natural Gas		20000	142857.14	3428571.43	24	12	--	1.43	1.43	0.09	340.50	4.50	--	526.50	--	--	0.21	0.21	0.01	49.03	0.65	--	75.82	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		BPD	SCF/HR	COUNT																					
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	VESSELS		kW			HR/D	D/YR																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2022-2040	Facility Total Emissions							46.46	34.99	34.17	1.11	2,244.46	88.88	0.00	882.90	0.30	73.15	61.56	60.33	1.42	2,767.77	110.64	0.00	500.85	0.44
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES																3,529.80			3,529.80	3,529.80	3,529.80		76,152.27	
	106.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	On-Ice Equipment			GAL/HR	GAL/D																				
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																						
	VESSELS		kW			HR/D	D/YR																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-2040	Non-Facility Total Emissions							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
Murphy Exploration & Production	432, 433, 434, 3	32504, 35867, 3	A			

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2020	75.58	45.60	44.23	1.10	1810.89	52.07	0.01	284.03	0.53
2021	14.74	21.71	21.50	0.47	1121.65	55.14	0.00	225.43	0.05
2022-2040	73.15	61.56	60.33	1.42	2767.77	110.64	0.00	500.85	0.44
Allowable	3529.80			3529.80	3529.80	3529.80		76152.27	

APPENDIX F

SPILL RESPONSE DISCUSSION

For the purpose of NEPA and Coastal Zone Management Act analysis, the largest spill volume originating from the proposed activity would be a well blowout during production operations, estimated to be 31,249 barrels of crude oil with an API gravity of 28.5°.

Land Segment and Resource Identification

Trajectories of a spill and the probability of it impacting a land segment have been projected utilizing information in 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.** The BOEM OSRAM identifies a 5% probability of impact to the shorelines of Cameron Parish, Louisiana within 30 days. Cameron Parish includes the east side of Sabine Lake, Sabine National Wildlife Refuge, Calcasieu Lake, Lacassine National Wildlife Refuge (inland) and Grand Lake. Cameron Parish also includes the area along the coastline from Sabine Pass to Big Constance Lake in Rockefeller Wildlife Refuge. This region is composed of open public beaches, marshlands and swamps. It serves as a habitat for numerous birds, finfish and other animals, including several rare, threatened and endangered species.

Response

Murphy will make every effort to respond to the Worst Case Discharge as effectively as practicable. A description of the response equipment under contract to contain and recover the Worst Case Discharge is shown in **Figure 2.**

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 20% or approximately 6,250 barrels of crude oil would be evaporated/dispersed within 24 hours, with approximately 24,999 barrels remaining.

Natural Weathering Data: GC 433, Platform A	**Barrels of Oil**
WCD Volume	31,249
Less 20% natural evaporation/dispersion	6,250
Remaining volume	24,999

Figure 2 outlines equipment, personnel, materials and support vessels as well as temporary storage equipment available to respond to the worst case discharge. The volume accounts for the amount remaining after evaporation/dispersion at 24 hours. The list estimates individual times needed for procurement, load out, travel time to the site and deployment. **Figure 2** also indicates how operations will be supported.

Murphy'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 aerial dispersants are utilized, 8

sorties (9,600 gallons) from two of the DC-3 aircrafts and 4 sorties (8,000 gallons) from the Basler aircraft would provide a daily dispersant capability of 7,540 barrels. If the conditions are favorable for in-situ burning, the proper approvals have been obtained and the proper planning is in place, in-situ burning of oil may be attempted. Slick containment boom would be immediately called out and on-scene as soon as possible. Offshore response strategies may include attempting to skim utilizing CGA spill response equipment, with a total derated skimming capacity of 189,080 barrels. Temporary storage associated with skimming equipment equals 5,996 barrels. If additional storage is needed, various storage barges with a total capacity 191,000+ bbls may be mobilized and centrally located to provide temporary storage and minimize off-loading time. **Safety is first priority. Air monitoring will be accomplished and operations deemed safe prior to any containment/skimming attempts.**

If the spill went unabated, shoreline impact in Cameron Parish, Louisiana would depend upon existing environmental conditions. Shoreline protection would include the use of CGA near shore and shallow water skimmers with a totaled derated skimming capacity of 109,773 barrels. Temporary storage associated with skimming equipment equals 1,531 barrels. If additional storage is needed, various storage barges with a total capacity 110,000 bbls 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. A Master Service Agreement with OMI Environmental will ensure access to 34,800 feet of 18" shoreline protection boom. **Figure 2** outlines individual times needed for procurement, load out, travel time to the site and deployment. Strategies would 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), and Unified Command (UC) will be consulted to ensure that environmental and special economic resources are correctly identified and prioritized to ensure optimal protection. Shoreline protection strategies 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 Tactics discussion of this Appendix. 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. Murphy's contract Spill Management Team has access to the applicable ACP(s) and GRP(s).

Based on the anticipated worst case discharge scenario, Murphy can be onsite with 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 an estimated 60 hours (based on the equipment's Effective Daily Recovery Capacity (EDRC)).

Initial Response Considerations
Actual actions taken during an oil spill response will be based on many factors to include but not be limited to:

- Safety
- Weather
- Equipment and materials availability
- Ocean currents and tides
- Location of the spill
- Product spilled
- Amount spilled
- Environmental risk assessments
- Trajectory and product analysis
- Well status, i.e., shut in or continual release

Murphy will take action to provide a safe, aggressive response to contain and recover as much of the spilled oil as quickly as it is safe to do so. In an effort to protect the environment, response actions will be designed to provide an "in-depth" protection strategy meant to recover as much oil as possible as far from environmentally sensitive areas as possible. 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.). The SIMOPS group leader reports to the Source Control Section Chief.

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

Upon notification of a spill, the following actions will be taken:

- Information will be confirmed
- An assessment will be made and initial objectives set
- OSROs and appropriate agencies will be notified
- ICS 201, Initial Report Form completed
- Initial Safety plan will be written and published
- Unified Command will be established
    - Overall safety plan developed to reflect the operational situation and coordinated objectives
    - Areas of responsibility established for Source Control and each surface operational site
    - On-site command and control established

Offshore Response Actions

Equipment Deployment

Surveillance

- Surveillance Aircraft: within two hours of QI notification, or at first light
- Provide trained observer to provide on site status reports
- Provide command and control platform at the site if needed
- Continual surveillance of oil movement by remote sensing systems, aerial photography and visual confirmation
- Continual monitoring of vessel assets using vessel monitoring systems

Dispersant application assets

- Put ASI on standby
- With the FOSC, conduct analysis to determine appropriateness of dispersant application (refer to Section 18)
- Gain FOSC approval for use of dispersants on the surface
- Deploy aircraft in accordance with a plan developed for the actual situation
- Coordinate movement of dispersants, aircraft, and support equipment and personnel
- Confirm dispersant availability for current and long range operations
- Start ordering dispersant stocks required for expected operations

Containment boom

- Call out early and expedite deployment to be on scene ASAP
- Ensure boom handling and mooring equipment is deployed with boom
- Provide continuing reports to vessels to expedite their arrival at sites that will provide for their most effective containment
- Use Vessels of Opportunity (VOO) to deploy and maintain boom

Oceangoing Boom Barge

- Containment at the source
- Increased/enhanced skimmer encounter rate
- Protection booming

In-situ Burn assets

- Determine appropriateness of in-situ burn operation in coordination with the FOSC and affected SOSC
- Determine availability of fire boom and selected ignition systems
- Start ordering fire boom stocks required for expected operations
- Contact boom manufacturer to provide training & tech support for operations, if required
- Determine assets to perform on water operation
- Build operations into safety plan
- Conduct operations in accordance with an approved plan
- Initial test burn to ensure effectiveness

Dedicated off-shore skimming systems
General

- Deployed to the highest concentration of oil
- Assets deployed at safe distance from aerial dispersant and in-situ burn operations

CGA HOSS Barge

- Use in areas with heaviest oil concentrations
- Consider for use in areas of known debris (seaweed, and other floating materials)

CGA 95' Fast Response Vessels (FRVs)

- Designed to be a first vessel on scene
- Capable of maintaining the initial Command and Control function for on water recovery operations
- 24 hour oil spill detection capability
- Highly mobile and efficient skimming capability
- Use as far off-shore as safely possible

CGA FRUs

- To the area of the thickest oil
- Use as far off-shore as allowed
- VOOs 140' – 180' in length
- VOOs with minimum of 18' x 38' or 23' x 50' of optimum deck space
- VOOs in shallow water should have a draft of <10 feet when fully loaded

T&T Koseq Skimming Systems

- To the area of the thickest oil
- Use as far off-shore as allowed
- VOOs with a minimum of 2,000 bbls storage capacity
- VOOs at least 200' in length
- VOOs with deck space of 100' x 40' to provide space for arms, tanks, and crane
- VOOs for shallow water should be deck barges with a draft of <10 feet when fully loaded

Storage Vessels

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

Vessels of Opportunity (VOO)

- Use Murphy's contracted resources as applicable
- Industry vessels are ideal for deployment of Vessel of Opportunity Skimming Systems (VOSS)
- Acquire additional resources as needed
- Consider use of local assets, i.e. fishing and pleasure craft for ISB operations or boom tending
- Expect mission specific and safety training to be required
- Plan with the US Coast Guard for vessel inspections
- Place VOOs in Division or Groups as needed
- Use organic on-board storage if appropriate
- Maximize non-organic storage appropriate to vessel limitations
- Decant as appropriate after approval to do so has been granted
- Assign bulk storage barges to each Division/Group
- Position bulk storage barges as close to skimming units as possible
- Utilize large skimming vessel (e.g. barges) storage for smaller vessel offloading
- Maximize skimming area (swath) to the optimum width given sea conditions and available equipment
- Maximize use of oleophilic skimmers in all operations, but especially offshore
- Nearshore, use shallow water barges and shuttle to skimming units to minimize offloading time
- Plan and equip to use all offloading capabilities of the storage vessel to minimize offloading time

Adverse Weather Operations:

In adverse weather, when seas are $\geq$ 3 feet, the use of larger recovery and storage vessels, oleophilic skimmers, and large offshore boom will be maximized. KOSEQ Arm systems are built for rough conditions, and they should be used until their operational limit (9.8' seas) is met. Safety will be the overriding factor in all operations and will cease at the order of the Unified Command, vessel captain, or in an emergency, "stop work" may be directed by any crew member.

Surface Oil Recovery Considerations and Tactics
(Offshore and Near-shore Operations)

Maximization of skimmer-oil encounter rate

- Place barges in skimming task forces, groups, etc., to reduce recovered oil offloading time
- Place barges alongside skimming systems for immediate offloading of recovered oil when practicable
- Use two vessels, each with heavy sea boom, in an open-ended "V" configuration to funnel surface oil into a trailing skimming unit's organic, V-shaped boom and skimmer (see page 7, *CGA Equipment Guide Book and Tactic Manual* (CGATM)

- Use secondary vessels and heavy sea boom to widen boom swath beyond normal skimming system limits (see page 15, CGATM)
- Consider night-time operations, first considering safety issues
- Utilize all available advanced technology systems (IR, X-Band Radar, etc.) to determine the location of, and move to, recoverable oil
- Confirm the presence of recoverable oil prior to moving to a new location

Maximize skimmer system efficiency

- Place weir skimming systems in areas of calm seas and thick oil
- Maximize the use of oleophilic skimming systems in heavier seas
- Place less mobile, high EDRC skimming systems (e.g. HOSS Barge) in the largest pockets of the heaviest oil
- Maximize onboard recovered oil storage for vessels.
- Obtain authorization for decanting of recovered water as soon as possible
- Use smaller, more agile skimming systems to recover streamers of oil normally found farther from the source. Place recovered oil barges nearby

Recovered Oil Storage

- Smaller barges in larger quantities will increase flexibility for multi-location skimming operations
- Place barges in skimming task forces, groups, etc., to reduce recovered oil offloading time
- Procure and deploy the maximum number of portable tanks to support Vessel of Opportunity Skimming Systems if onboard storage is not available
- Maximize use of the organic recovered oil storage capacity of the skimming vessel

Command, Control, and Communications (C^3)

- Publish, implement, and fully test an appropriate communications plan
- Design an operational scheme, maintaining a manageable span of control
- Designate and mark C^3 vessels for easy aerial identification
- Designate and employ C^3 aircraft for task forces, groups, etc.
- Use reconnaissance air craft and Rapid Response Teams (RAT) to confirm the presence of recoverable oil

On Water Recovery Group
When the first skimming vessel arrives on scene, a complete site assessment will be conducted before recovery operations begin. Once it is confirmed that the air monitoring readings for O2, LEL, H2S, CO, VOC, and Benzene are all within the permissible limits, oil recovery operations may begin.

As skimming vessels arrive, they will be organized to work in areas that allow for the most efficient vessel operation and free vessel movement in the recovery of oil. Vessel groups will vary in structure as determined by the Operations Section of the Unified Command, but will generally consist, at a minimum, of the following dedicated assets:

- 3 to 5 – Offshore skimming vessels (recovery)
- 1 – Tank barge (temporary storage)
- 1 – Air asset (tactical direction)
- 2 – Support vessels (crew/utility for supply)
- 6 to 10 – Boom vessels (enhanced booming)

***Example** (**Note:** Actual organization of TFs will be dependent on several factors including, asset availability, weather, spilled oil migration, currents, etc.)*

The 95' FRV Breton Island out of Venice arrives on scene and conducts an initial site assessment. Air monitoring levels are acceptable and no other visual threats have been observed. The area is cleared for safe skimming operations. The Breton Island assumes command and control (CoC) of on-water recovery operations until a dedicated non-skimming vessel arrives to relieve it of those duties.

A second 95' FRV arrives and begins recovery operations alongside the Breton Island. Several more vessels begin to arrive, including a third 95' FRV out of Galveston, the HOSS Barge (High Volume Open Sea Skimming System) out of Harvey, a boom barge (CGA 300) with 25,000' of 42" auto boom out of Leeville, and 9 Fast Response Units (FRUs) from the load-out location at C-Port in Port Fourchon.

As these vessels set up and begin skimming, they are grouped into task forces (TFs) as directed by the Operations Section of the Unified Command located at the command post.

Initial set-up and potential actions:

- A 1,000 meter safety zone has been established around the incident location for vessels involved in Source Control
- The HOSS Barge is positioned facing the incident location just outside of this safety zone or at the point where the freshest oil is reaching the surface
- The HOSS Barge engages its Oil Spill Detection (OSD) system to locate the heaviest oil and maintains that ability for 24-hour operations

- The HOSS Barge deploys 1,320' of 67" Sea Sentry boom on each side, creating a swath width of 800'
- The Breton Island and H.I. Rich skim nearby, utilizing the same OSD systems as the HOSS Barge to locate and recover oil
- Two FRUs join this group and it becomes TF1
- The remaining 7 FRUs are split into a 2 and 3 vessel task force numbered TF2 and TF3
- A 95' FRV is placed in each TF
- The boom barge (CGA 300) is positioned nearby and begins deploying auto boom in sections between two utility vessels (1,000' to 3,000' of boom, depending on conditions) with chain-link gates in the middle to funnel oil to the skimmers
- The initial boom support vessels position in front of TF2 and TF3
- A 100,000+ barrel offshore tank barge is placed with each task force as necessary to facilitate the immediate offload of skimming vessels

The initial task forces (36 hours in) may be structured as follows:

TF 1

- 1 – 95' FRV
- 1 – HOSS Barge with 3 tugs
- 2 – FRUs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 8 – 500' sections of auto boom with gates
- 8 – Boom-towing vessels
- 2 – Support vessels (crew/utility)

TF 2

- 1 – 95' FRV
- 4 – FRUs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 10 – 500' sections of auto boom with gates
- 10 – Boom-towing vessels
- 2 – Support vessels (crew/utility)

TF 3

- 1 – 95' FRV
- 3 – FRUs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 8 – 500' sections of auto boom with gates
- 8 – Boom-towing vessels
- 2 – Support vessels (crew/utility)

Offshore skimming equipment continues to arrive in accordance with the ETA data listed in figure H.3a; this equipment includes 2 AquaGuard skimmers and 11 sets of Koseq Rigid Skimming Arms. These high volume heavy weather capable systems will be divided into functional groups and assigned to specific areas by the Operations Section of the Unified Command.

At this point of the response, the additional TFs may assume the following configurations:

TF 4

- 2 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – AquaGuard Skimmer
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 6 – 500' sections of auto boom with gates
- 6 – Boom-towing vessels

TF 5

- 3 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – AquaGuard Skimmer
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 8 – 500' sections of auto boom with gates
- 8 – Boom-towing vessels

TF 6

- 3 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 6 – 500' sections of auto boom with gates
- 6 – Boom-towing vessels

TF 7

- 3 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 6 – 500' sections of auto boom with gates
- 6 – Boom-towing vessels

CGA Minimum Acceptable Capabilities for Vessels of Opportunity (VOO)
Minimum acceptable capabilities of Petroleum Industry Designed Vessels (PIDV) for conducting Vessel of Opportunity (VOO) skimming operations are shown in the table below. PIDVs are "purpose-built" to provide normal support to offshore oil and gas operators. They include but are not limited to utility boats, offshore supply vessels, etc. They become VOOs when tasked with oil spill response duties.

Capability	FRU	KOSEQ	AquaGuard
Type of Vessel	Utility Boat	Offshore Supply Vessel	Utility Boat
Operating parameters			
Sea State	3-5 ft max	9.8 ft max	3-5 ft max
Skimming speed	≤1 kt	≤3 kts	≤1 kt
Vessel size			
Minimum Length	100 ft	200 ft	100 ft
Deck space for: • Tank(s) • Crane(s) • Boom Reels • Hydraulic Power Units • Equipment Boxes	18x32 ft	100x40 ft	18x32 ft
Communication Assets	Marine Band Radio	Marine Band Radio	Marine Band Radio

Tactical use of Vessels of Opportunity (VOO): Murphy will take all possible measures to maximize the oil-to-skimmer encounter rate of all skimming systems, to include VOOs, as discussed in this section. VOOs will normally be placed within an On-water recovery unit as shown in figures below.

Skimming Operations: PIDVs are the preferred VOO skimming platform. OSROs are more versed in operating on these platforms and the vessels are generally large enough with crews more likely versed in spill response operations. They also have a greater possibility of having on-board storage capacity and the most likely vessels to be under contract, and therefore more readily available to the operator. These vessels would normally be assigned to an on-water recovery group/division (see figure below) and outfitted with a VOSS suited for their size and capabilities. Specific tactics used for skimming operations would be dependent upon many parameters which include, but are not limited to, safety concerns, weather, type VOSS on board, product being recovered, and area of oil coverage. Planners would deploy these assets with the objective of safely maximizing oil- to-skimmer encounter rate by taking actions to minimize non-skimming time and maximizing boom swath. Specific tactical configurations are shown in figures below.

The Fast Response Unit (FRU): A self-contained, skid based, skimming system that is deployed from the right side of a vessel of opportunity (VOO). An outrigger holds a 75' long section of air inflatable boom in place that directs oil to an apex for recovery via a Foilex 250 weir skimmer. The outrigger creates roughly a 40' swath width dependent on the VOO beam. The lip of the collection bowl on the skimmer is placed as close to the oil and water interface as possible to maximize oil recovery and minimize water retention. The skimmer then pumps all fluids recovered to the storage tank where it is allowed to settle, and with the approval of the Coast Guard, the water is decanted from the bottom of the tank back into the water ahead of the containment boom to be recycled through the system. Once the tank is full of as much pure recovered oil as possible it is offloaded to a storage barge for disposal in accordance with an approved disposal plan. A second 100 barrel storage tank can be added if the appropriate amount of deck space is available to use as secondary storage.

Tactical Overview

Mechanical Recovery – The FRU is designed to provide fast response skimming capability in the offshore and nearshore environment in a stationary or advancing mode. It provides a rated daily recovery capacity of 4,100 barrels. An additional boom reel with 440' of offshore boom can be deployed along with the FRU, and a second support vessel for boom towing, to extend the swath width when attached to the end of the fixed boom. The range and sustainability offshore is dependent on the VOO that the unit is placed on, but generally these can stay offshore for extended periods. The FRU works well independently or assigned with other on-water recovery assets in a task force. In either case, it is most effective when a designated aircraft is assigned to provide tactical direction to ensure the best placement in recoverable oil.
Maximum Sea Conditions – Under most circumstances the FRU can maintain standard oil spill recovery operations in 2' to 4' seas. Ultimately, the Coast Guard licensed Captain in charge of the VOO (with input from the CGAS Supervisor assigned) will be responsible to determine when the sea conditions have surpassed the vessel's safe operating capabilities.

Possible Task Force Configuration (Multiple VOOs can be deployed in a task force)
1 – VOO (100' to 165' Utility or Supply Vessel)
1 – Boom reel w/support vessel for towing
1 – Tank barge (offshore) for temporary storage
1 – Utility/Crewboat (supply)
1 – Designated spotter aircraft

The VOSS (yellow) is being deployed and connected to an out-rigged arm. This is suitable for collection in both large pockets of oil and for recovery of streaming oil. The oil-to-skimmer encounter rate is limited by the length of the arm. Skimming pace is ≤ 1 knot.

Through the use of an additional VOO, and using extended sea boom, the swath of the VOSS is increased therefore maximizing the oil-to-skimmer encounter rate. Skimming pace is ≤ 1 knot.

The Koseq Rigid Sweeping Arm: A skimming system deployed on a vessel of opportunity. It requires a large Offshore or Platform Supply Vessel (OSV/PSV), greater than 200' with at least 100' x 50' of free deck space. On each side of the vessel, a 50' long rigid framed Arm is deployed that consists of pontoon chambers to provide buoyancy, a smooth nylon face, and a hydraulically adjustable mounted weir skimmer. The Arm floats independently of the vessel and is attached by a tow bridle and a lead line. The movement of the vessel forward draws the rubber end seal of the arm against the hull to create a collection point for free oil directed to the weir by the Arm face. The collection weir is adjusted to keep the lip as close to the oil water interface as possible to maximize oil recovery while attempting to minimize excess water collection. A transfer pump (combination of positive displacement, screw type and centrifuge suited for highly viscous oils) pump the recovered liquid to portable tanks and/or dedicated fixed storage tanks onboard the vessel. After being allowed to sit and separate, with approval from the Coast Guard, the water can be decanted (pumped off) in front of the collection arm to be reprocessed through the system. Once full with as much pure recovered oil as possible, the oil is transferred to a temporary storage barge where it can be disposed of in accordance with an approved disposal plan.

Tactical Overview

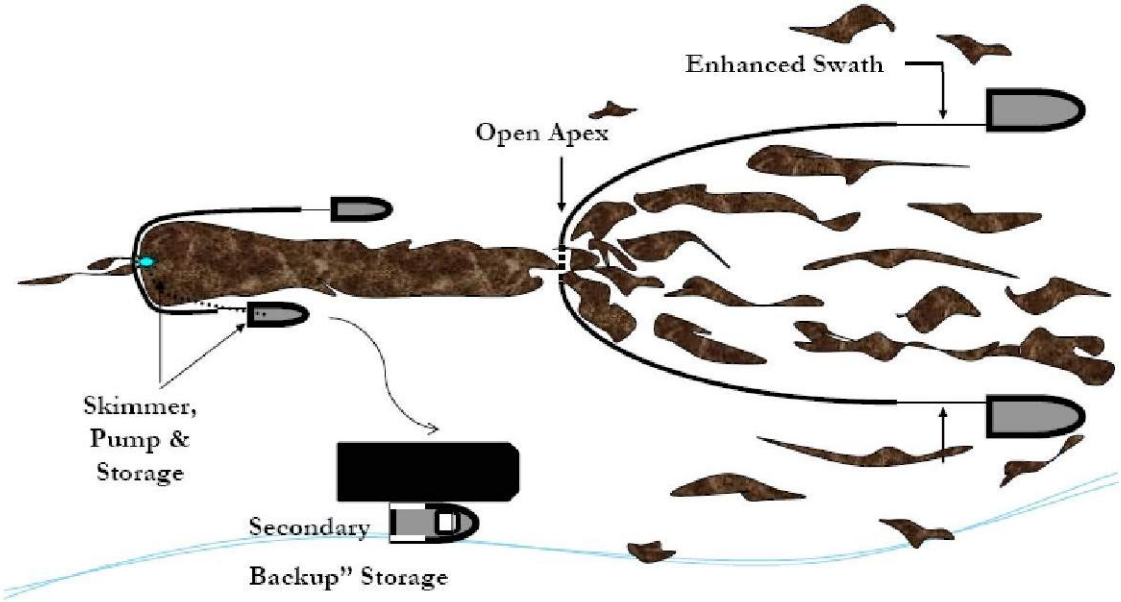
Mechanical Recovery – Deployed on large vessels of opportunity (VOO) the Koseq Rigid Sweeping Arms are high volume surge capacity deployed to increase recovery capacity at the source of a large oil spill in the offshore and outer nearshore environment of the Gulf of Mexico. They are highly mobile and sustainable in rougher sea conditions than normal skimming vessels (9.8' seas). The large Offshore Supply Vessels (OSV) required to deploy the Arms are able to remain on scene for extended periods, even when sea conditions pick up. Temporary storage on deck in portable tanks usually provides between 1,000 and 3,000 bbls. In most cases, the OSV will be able to pump 20% of its deadweight into the liquid mud tanks in accordance with the vessels Certificate of Inspection (COI). All storage can be offloaded utilizing the vessels liquid transfer system.

Maximum Sea Conditions - Under most circumstances the larger OSVs are capable of remaining on scene well past the Skimming Arms maximum sea state of 9.8'. Ultimately it will be the decision of the VOO Captain, with input from the T&T Supervisor onboard, to determine when the sea conditions have exceeded the safe operating conditions of the vessel.

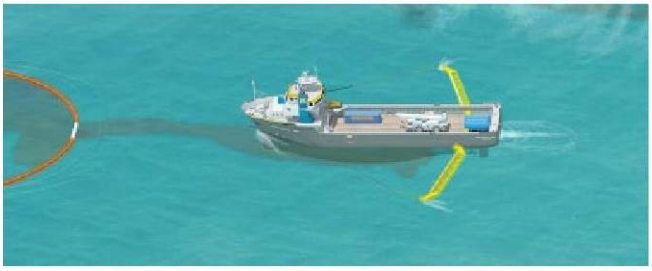
Command and Control – The large OSVs in many cases have state of the art communication and electronic systems, as well as the accommodations to support the function of directing all skimming operations offshore and reporting back to the command post.

Possible Task Force Configuration (Multiple Koseq VOOs can be deployed in a task force)

1 – ≥ 200' Offshore Supply Vessels (OSV) with set of Koseq Arms
2 to 4 portable storage tanks (500 bbl)
1 – Modular Crane Pedestal System set (MCPS) or 30 cherry picker (crane) for deployment
1 – Tank barge (offshore) for temporary storage
1 – Utility/Crewboat (supply)
1 – Designated spotter aircraft
4 – Personnel (4 T&T OSRO)



Scattered oil is "caught" by two VOO and collected at the apex of the towed sea boom. The oil moves thought a "gate" at that apex, forming a larger stream of oil which moves into the boom of the skimming vessel. Operations are paced at >1. A recovered oil barge stationed nearby to minimize time taken to offload recovered oil.



This is a depiction of the same operation as above but using KOSEQ Arms. In this configuration, the collecting boom speed dictates the operational pace at ≥ 1 knot to minimize entrainment of the oil.

Clean Gulf Associates (CGA) Procedure for Accessing Member-Contracted and other Vessels of Opportunity (VOOs) for Spill Response

- CGA has procedures in place for CGA member companies to acquire vessels of opportunity (VOOs) from an existing CGA member's contracted fleet or other sources for the deployment of CGA portable skimming equipment including Koseq Arms, Fast Response Units (FRUs) and any other portable skimming system(s) deemed appropriate for the response for a potential or actual oil spill, WCD oil spill or a Spill of National Significance (SONS).

- CGA uses Port Vision, a web-based vessel and terminal interface that empowers CGA to track vessels through Automatic Identification System (AIS) and terminal activities using a Geographic Information System (GIS). It provides live AIS/GIS views of waterways showing current vessel positions, terminals, created vessel fleets, and points-of-interest. Through this system, CGA has the ability to get instant snapshots of the location and status of all vessels contracted to CGA members, day or night, from any web-enabled PC.

Near Shore Response Actions

Timing

- Put near shore assets on standby and deployment in accordance with planning based on the actual situation, actual trajectories and oil budgets
- VOO identification and training in advance of spill nearing shoreline if possible
- Outfitting of VOOs 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 VOOs
- Distance of surf zone from shoreline

Surveillance

- Provide trained observer to direct skimming operations
- Continual surveillance of oil movement by remote sensing systems, aerial photography and visual confirmation
- Continual 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)

Dedicated Near Shore skimming systems

- FRVs
- Egmopol and Marco SWS
- Operate with aerial spotter directing systems to observed oil slicks

VOO

- Use Murphy's contracted resources as applicable
- Industry vessel are usually best for deployment of Vessel of Opportunity Skimming Systems (VOSS)
- Acquire additional resources as needed
- Consider use of local assets, i.e. fishing and pleasure craft
- Expect mission specific and safety training to be required
- Plan with the US Coast Guard for vessel inspections
- Operate with aerial spotter directing systems to oil patches

Shoreline Protection Operations

Response Planning Considerations

- Review appropriate Area Contingency Plan(s)
- Locate and review appropriate Geographic Response and Site Specific Plans
- Refer to appropriate Environmentally Sensitive Area Maps
- Capability for continual analysis of trajectories run periodically during the response
- Environmental risk assessments (ERA) to determine priorities for area protection
- Time to acquire personnel and equipment and their availability
- Refer to the State of Louisiana Initial Oil Spill Response Plan, Deep Water Horizon, dated 2 May 2010, as a secondary reference
- Aerial surveillance of oil movement
- Pre-impact beach cleaning and debris removal
- Shoreline Cleanup Assessment Team (SCAT) operations and reporting procedures
- Boom type, size and length requirements and availability
- Possibility of need for In-situ burning in near shore areas
- Current wildlife situation, especially status of migratory birds and endangered species in the area
- Check for Archeological sites and arrange assistance for the appropriate state agency when planning operations the 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 to move oil into those areas
- 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

- Use of a 10 mile go/no go line to determine timing of beach cleaning
- SCAT reports and recommendations
- Determination of archeological sites and gaining authority to enter
- Monitoring of tide tables and weather to determine extent of high tides
- Pre cleaning of beaches by moving waste above high tide lines to minimize waste
- Determination of logistical requirements and arranging of waste removal and disposal

- Staging of equipment and housing of response personnel as close to the job site as possible to maximize on-site work time
- Boom tending, repair, replacement and security (use of local assets may be advantageous)
- Constant awareness of weather and oil movement for resource re-deployment as necessary
- Earthen berms and shoreline protection boom may be considered to protect sensitive inland areas
- Requisitioning of earth moving equipment
- Plan for efficient and safe use of personnel, ensuring:
    - A continual supply of the proper Personal Protective Equipment
    - Heating or cooling areas when needed
    - Medical coverage
    - Command and control systems (i.e. communications)
    - Personnel accountability measures
- Remediation requirements, i.e., replacement of sands, rip rap, etc.
- Availability of surface washing agents and associated protocol requirements for their use (see National Contingency Plan Product Schedule for list of possible agents)
- Discussions 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 the 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 cutting or moving vessels through vegetation
- Discuss use of vessels that may disturb wildlife, i.e, airboats
- 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:
    - Placement of recovered oil or waste storage as near to vessels or beach cleanup crews as possible.
    - Planning for stockage of high use items for expeditious replacement
    - Housing of personnel as close to the work site as possible to minimize travel time
    - Use of shallow water craft
    - Use of communication systems appropriate ensure command and control of assets
    - Use of appropriate boom in areas that I can offer effective protection
    - Planning of waste collection and removal to maximize cleanup efficiency
- Consideration or on-site remediation of contaminated soils to minimize replacement operations and impact on the area

Decanting Strategy

Recovered oil and water mixtures will typically separate into distinct phases when left in a quiescent state. When separation occurs, the relatively clean water phase can be siphoned or decanted back to the recovery point with minimal, if any, impact. Decanting therefore increases the effective on-site oil storage capacity and equipment operating time. FOSC/SOSC approval will be requested prior to decanting operations. This practice is routinely used for oil spill recovery.

CGA 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 in 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. As was seen in the Deepwater Horizon (DWH) oil spill response, vessel skimming operations ceased when seas reached 5-6 feet and vessels were often recalled to port when those conditions were exceeded. Systems below are some of the most up-to-date systems available and were employed during the DWH spill.

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

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. 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.

FIGURE 1
TRAJECTORY BY LAND SEGMENT

Trajectory of a spill and the probability of it impacting a land segment have been projected utilizing Murphy's WCD and information in the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico available on the BOEM website using 30 day impact. The results are tabulated below.

Area/Block	OCS-G	Launch Area	Land Segment and/or Resource	Conditional Probability (%)
GC 433, Platform A	G35867	C44	Matagorda, TX	1
			Galveston, TX	2
			Jefferson, TX	1
108 miles from shore			**Cameron, LA**	**5**
			Vermilion, LA	2
			Terrebonne, LA	2
			Lafourche, LA	1
			Jefferson, LA	1
			Plaquemines, LA	4

WCD Scenario– <u>BASED ON WELL BLOWOUT DURING PRODUCTION OPERATIONS</u> (108 miles from shore)
24,999 bbls of crude oil (Volume considering natural weathering)
API Gravity 28.5°

FIGURE 2 – Equipment Response Time to GC 433, Platform A

Dispersants / Surveillance

Dispersant/Surveillance	Dispersant Capacity (gal)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI							
Basler 67T	2000	2	Houma	2	2	0.8	4.8
DC 3	1200	2	Houma	2	2	1	5
DC 3	1200	2	Houma	2	2	1	5
Aero Commander	NA	2	Houma	2	2	0.8	4.8
MSRC							
C-130 Spray AC	4,125	2	Kiln	4	0	0.6	4.6
King Air BE90 Spray AC	250	2	Kiln	4	0	1	5

Offshore Response

Offshore Equipment Pre-Determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
HOSS Barge	76285	4000	3 Tugs	8	Harvey	6	0	12	13	2	33
95' FRV	22885	249	NA	6	Galveston	2	0	2	15	1	20
95' FRV	22885	249	NA	6	Leeville	2	0	2	6	1	11
95' FRV	22885	249	NA	6	Venice	2	0	3	5	1	11
95' FRV	22885	249	NA	6	Vermilion	2	0	3	7	1	13
Boom Barge (CGA-300) 42" Auto Boom (25000')	NA	NA	1 Tug 50 Crew	4 (Barge) 2 (Per Crew)	Leeville	8	0	4	16	2	30
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2603	NA	25000	1 Tug	6	Amelia	23	0	6	18	1	48
CTCo 2604	NA	20000	1 Tug	6	Amelia	23	0	6	18	1	48
CTCo 2608	NA	23000	1 Tug	6	Amelia	23	0	6	18	1	48
CTCo 2609	NA	23000	1 Tug	6	Amelia	23	0	6	18	1	48
Kirby Offshore (available through contract with CGA)											
RO Barge	NA	100000+	1 Tug	6	Venice	42	0	4	13	1	60

Staging Area: Fourchon

Offshore Equipment With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
CGA											
FRU (3) + 100 bbl Tank (6)	12753	600	3 Utility	18	Leeville	2	6	2	9	1	20
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Venice	2	6	5	9	1	23
Hydro-Fire Boom	NA	NA	8 Utility	40	Harvey	0	24	3	9	6	42

Nearshore Response

Nearshore Equipment Pre-determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
Mid-Ship SWS	22885	249	NA	4	Leeville	2	0	N/A	48	1	51
Trinity SWS	21500	249	NA	4	Leeville	2	0	N/A	48	1	51
46' FRV	15257	65	NA	4	Leeville	2	0	2	2	1	7
46' FRV	15257	65	NA	4	Vermilion	2	0	2	3	1	8
46' FRV	15257	65	NA	4	Venice	2	0	2	2.5	1	7.5
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2605	NA	20000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 2606	NA	20000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 2607	NA	23000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 5001	NA	47000	1 Tug	6	Amelia	26	0	6	15	1	48

Staging Area: Cameron

Nearshore Equipment With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
SWS Egmopol	1810	100	NA	3	Galveston	2	2	12.7	2	1	19.7
SWS Egmopol	1810	100	NA	3	Leeville	2	2	4.4	2	1	11.4
SWS Marco	3588	20	NA	3	Vermilion	2	2	4	2	1	11
SWS Marco	3588	34	NA	3	Leeville	2	2	4.4	2	1	11.4
SWS Marco	3588	34	NA	3	Venice	2	2	2	2	1	9
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Vermilion	4	12	4	2	2	24
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Galveston	4	12	12.7	2	2	32.7
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Harvey	4	12	2.1	2	2	22.1
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Vermilion	2	2	4	2	1	11
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Harvey	2	2	2.1	2	1	9.1
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Vermilion	2	2	4	2	1	11
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Harvey	2	2	2.1	2	1	9.1

Shoreline Protection

Staging Area: Cameron

Shoreline Protection Boom	VOO	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment Site	Hrs to Deploy	Total Hrs
OMI Environmental (available through MSA)									
3,800' 18" Boom	2 Crew	4	New Iberia, LA	1	1	4	2	3	11
11,000' 18" Boom	5 Crew	10	La Marque, TX	1	1	4	2	3	11
20,000' 18" Boom	6 Crew	12	Port Arthur, TX	1	1	2	2	3	9

Wildlife Response	EDRC	Storage Capacity	VOO	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	2	2	7	1	2	14
Bird Scare Guns (24)	NA	NA	NA	2	Harvey	2	2	7	1	2	14
Bird Scare Guns (12)	NA	NA	NA	2	Galveston	2	2	5	1	2	12
Bird Scare Guns (12)	NA	NA	NA	2	Aransas Pass	2	2	9.5	1	2	16.5
Bird Scare Guns (48)	NA	NA	NA	2	Lake Charles	2	2	2	1	2	9
Bird Scare Guns (24)	NA	NA	NA	2	Leeville	2	2	7	1	2	14

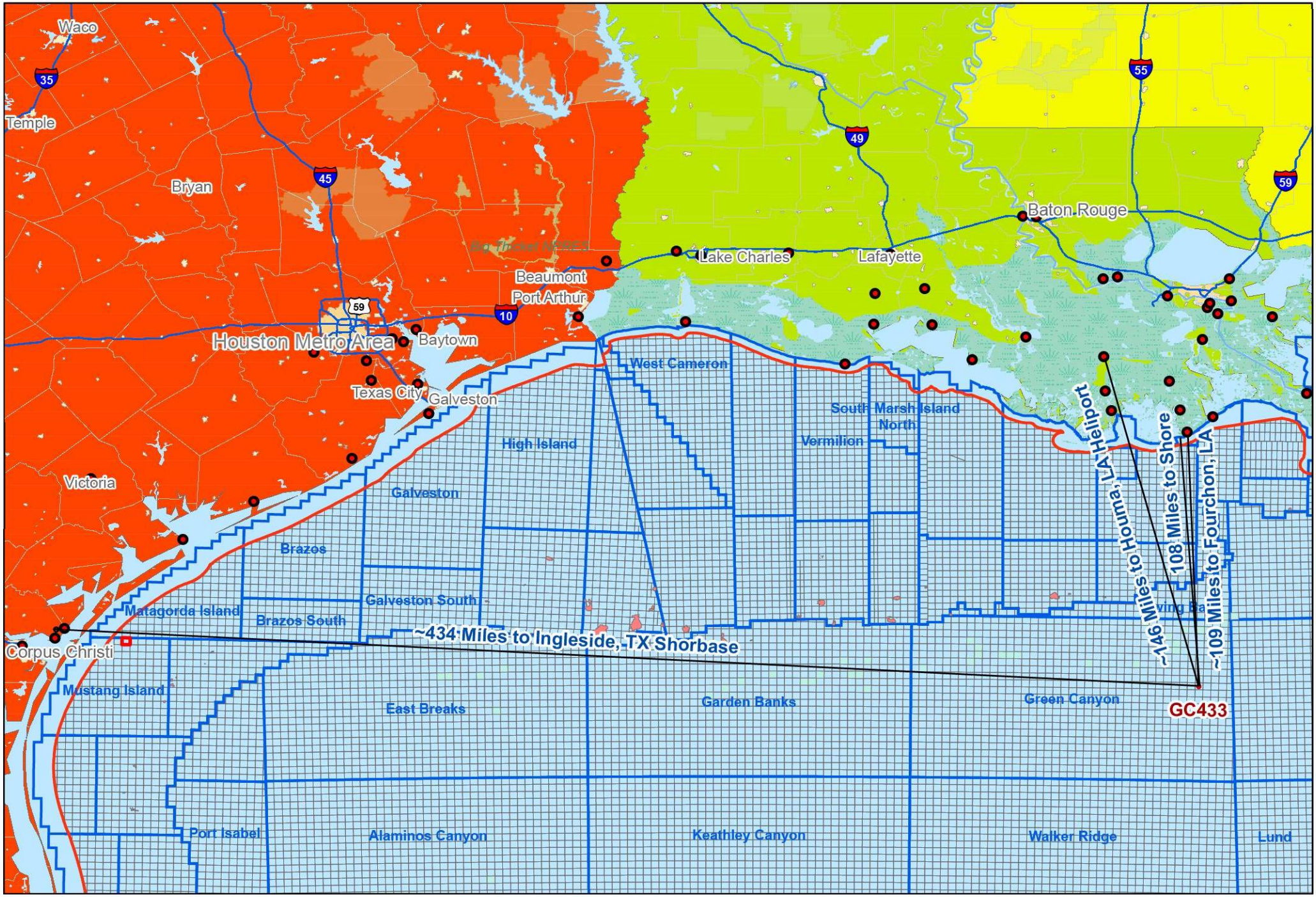
Response Asset	Total
Offshore EDRC	189,080
Offshore Recovered Oil Capacity	196,996+
Nearshore / Shallow Water EDRC	109,773
Nearshore / Shallow Water Recovered Oil Capacity	111,531

APPENDIX G

APPENDIX H

Murphy Exploration & Production Co.

Vicinity Map
Green Canyon 433



Consistency Certification

Initial Development Operations Coordination Document

Green Canyon Blocks 432, 433, 434, 389, 390 & 478

Leases OCS-G 32504, 35867, 35868, 35864, 35865 & 35662

Relevant enforceable policies were considered in certifying consistency for Louisiana. The proposed activities described in this PCS Plan comply with Louisiana's approved Coastal Management Program and will be conducted in a manner consistent with such Program.

Murphy Exploration & Production Company – USA

Cindy Munkel

Certifying Official

1-5-21

Date

COASTAL ZONE MANAGEMENT

CONSISTENCY CERTIFICATION

DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

GREEN CANYON BLOCKS 389, 390, 432, 433 & 478

LEASE OCS-G 35864, 35865, 32504, 35867 & 35662

The proposed activity complies with the enforceable policies of the Texas approved management program and will be conducted in a manner consistent with such program.

Murphy Exploration & Production Company - USA
Lessee or Operator

Cindy Munkel
Certifying Official

6/22/2021
Date

APPENDIX I

Murphy Exploration & Production Company – USA (Murphy)

Initial Development Operations Coordination Document
Green Canyon Block 389, 432, and 478
OCS-G 35864, 32504, and 35662

(A) IMPACT PRODUCING FACTORS

ENVIRONMENTAL IMPACT ANALYSIS WORKSHEET

Environment Resources	Impact Producing Factors (IPFs) Categories and Examples Refer to recent GOM OCS Lease Sale EIS for a more complete list of IPFs					
	Emissions (air, noise, light, etc.)	Effluents (muds, cutting, other discharges to the water column or seafloor)	Physical disturbances to the seafloor (rig or anchor emplacements, etc.)	Wastes sent to shore for treatment or disposal	Accidents (e.g., oil spills, chemical spills, H_2S releases)	Discarded Trash & Debris
Site-specific at Offshore Location						
Designated topographic features		(1)	(1)		(1)	
Pinnacle Trend area live bottoms		(2)	(2)		(2)	
Eastern Gulf live bottoms		(3)	(3)		(3)	
Benthic communities			(4)			
Water quality			X		X	
Fisheries			X		X	
Marine Mammals	X(8)				X(8)	X
Sea Turtles	X(8)				X(8)	X
Air quality	X(9)					
Shipwreck sites (known or potential)			(7)			
Prehistoric archaeological sites			(7)		X	
Vicinity of Offshore Location						
Essential fish habitat			X		X(6)	
Marine and pelagic birds	X				X	X
Public health and safety					(5)	
Coastal and Onshore						
Beaches					X(6)	X
Wetlands					X(6)	
Shore birds and coastal nesting birds					X(6)	X
Coastal wildlife refuges					X	
Wilderness areas					X	

Footnotes for Environmental Impact Analysis Matrix

1) Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well or platform site or any anchors will be on the seafloor within the:
   - 4-mile zone of the Flower Garden Banks, or the 3-mile zone of Stetson Bank;
   - 1000-m, 1-mile or 3-mile zone of any topographic feature (submarine bank) protected by the Topographic Features Stipulation attached to an OCS lease;
   - Essential Fish Habitat (EFH) criteria of 500 feet from any no-activity zone; or
   - Proximity of any submarine bank (500 foot buffer zone) with relief greater than two meters that is not protected by the Topographic Features Stipulation attached to an OCS lease.
2) Activities with any bottom disturbance within an OCS lease block protected through the Live Bottom (Pinnacle Trend) Stipulation attached to an OCS lease.
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.
4) Activities on blocks designated by the BOEM as being in water depths 300 meters or greater.
5) Exploration or production activities where H_2S concentrations greater than 500 ppm might be encountered.
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.
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 a prehistoric site that no impact would occur, the EIA can note that in a sentence or two.
8) All activities that you determine might have an adverse effect on endangered or threatened marine mammals or sea turtles or their critical habitats.
9) Production activities that involve transportation of produced fluids to shore using shuttle tankers or barges.

TABLE 1: THREATENED AND ENDANGERED SPECIES, CRITICAL HABITAT, AND MARINE MAMMAL INFORMATION

The federally listed endangered and threatened species potentially occurring in the lease area and along the Gulf Coast are provided in the table below

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico	Gulf of Mexico Range
			Lease Area	Coastal		
Marine Mammals						
Manatee, West Indian	*Trichechus manatus latirostris*	T	--	X	Florida (peninsular)	Coastal Louisiana, Mississippi, Alabama, and Florida
Whale, Blue	*Balaenoptera masculus*	E	X*	--	None	GOM
Whale, Bryde's	*Balaenoptera edeni*	E	X	--	None	Eastern GOM
Whale, Fin	*Balaenoptera physalus*	E	X*	--	None	GOM
Whale, Humpback	*Megaptera novaeangliae*	E	X*	--	None	GOM
Whale, North Atlantic Right	*Eubalaena glacialis*	E	X*	--	None	GOM
Whale, Sei	*Balaenopiera borealis*	E	X*	--	None	GOM
Whale, Sperm	*Physeter catodon (=macrocephalus)*	E	X	--	None	GOM
Terrestrial Mammals						
Mouse, Beach (Alabama, Choctawatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	-	X	Alabama, Florida (panhandle) beaches	Alabama, Florida (panhandle) beaches
Birds						
Plover, Piping	*Charadrius melodus*	T	-	X	Coastal Texas, Louisiana, Mississippi, Alabama and Florida (panhandle)	Coastal GOM
Crane, Whooping	*Grus Americana*	E	-	X	Coastal Texas	Coastal Texas and Louisiana
Crane, Mississippi sandhill	*Grus canadensis pulla*	E	-	X	Coastal Mississippi	Coastal Mississippi
Curlew, Eskimo	*Numenius borealis*	E	-	X	none	Coastal Texas
Falcon, Northern Aplomado	*Falco femoralis septentrionalis*	E	-	X	none	Coastal Texas
Knot, Red	*Calidris canutus rufa*	T	-	X	None	Coastal GOM
Stork, Wood	*Mycteria americana*	T	-	X	None	Coastal Alabama and Florida

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico	Gulf of Mexico Range
			Lease Area	Coastal		
Reptiles						
Sea Turtle, Green	*Chelonia mydas*	T/E***	X	X	None	GOM
Sea Turtle, Hawksbill	*Eretmochelys imbricata*	E	X	X	None	GOM
Sea Turtle, Kemp's Ridley	*Lepidochelys kempli*	E	X	X	None	GOM
Sea Turtle, Leatherback	*Dermochelys coriacea*	E	X	X	None	GOM
Sea Turtle, Loggerhead	*Caretta caretta*	T	X	X	Texas, Louisiana, Mississippi, Alabama, Florida	GOM
Fish						
Sturgeon, Gulf	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	T	X	X	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)
Shark, Oceanic Whitetip	Carcharhinus longimanus	E	X	_	None	GOM
Sawfish, Smalltooth	Pristis pectinata	E	-	X	None	Florida
Grouper, Nassau	Epinephelus striatus	T	-	X	None	Florida
Ray, Giant Manta	Manta birostris	E	X	--	None	GOM
Corals						
Coral, Elkhorn	*Acopora palmate*	T	X**	X	Florida Keys and Dry Tortugas	Flower Garden Banks, Florida, and the Caribbean
Coral, Staghorn	*Acopora cervicornis*	T	X	X	Florida	Flower Garden Banks, Florida, and the Caribbean
Coral, Boulder Star	*Orbicella franksi*	T	X	X	none	Flower Garden Banks and Florida
Coral, Lobed Star	*Orbicella annularis*	T	X	X	None	Flower Garden Banks and Caribbean
Coral, Mountainous Star	*Orbicella faveolata*	T	X	X	None	Flower Garden Banks and Gulf of Mexico
Coral, Rough Cactus	*Mycetophyllia ferox*	T	-	X	None	Florida and Southern Gulf of Mexico

Abbreviations: E = Endangered; T = Threatened

* The Blue, Fin, Humpback, North Atlantic Right, and Sei Whales are rare or extralimital in the Gulf of Mexico and are unlikely to be present in the lease area.

** According to the 2017 EIS, Elkhorn Coral, while uncommon, has been found in the Flower Garden Banks. (BOEM 2017-009)

*** Green Sea Turtles are considered threatened throughout the Gulf of Mexico; however, the breeding population off the coast of Florida is considered endangered.

(B) ANALYSIS

Site-Specific at Green Canyon Blocks 389, 432, and 478

Proposed operations consist of the installation of the FPS and commencement of production for seven wells, along with the installation of 17 lease term pipelines. Surface Hole Locations are Green Canyon Blocks 389, 432, and 478; Bottom Hole Locations are Green Canyon Blocks 390, 433, 434, and 477. The operations will be conducted with a Pipeline installation vessel with a moon pool. The moon pool will be monitored continuously with a CCTV system during the proposed operations to ensure the safety of marine life.

There are no seismic surveys, pile driving, or pipelines making landfall associated with the operations covered by this Plan.

1. Designated Topographic Features

Potential IPFs on topographic features include physical disturbances to the seafloor and accidents.

Physical disturbances to the seafloor: Green Canyon Blocks 389, 432, and 478 are more than 49.7 miles from the closest designated Topographic Features Stipulation Block (Diaphus Bank); therefore, no adverse impacts are expected.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed activities (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to benthic organisms only if the oil contacts the organisms. Oil from a surface spill can be driven into the water column; measurable amounts have been documented down to a 10 meter depth. At this depth, the oil is found only at concentrations several orders of magnitude lower than the amount shown to have an effect on corals. Because the crests of topographic features in the Northern Gulf of Mexico are found below 10 meters, oil from a surface spill is not expected to reach their sessile biota. Oil from a subsurface spill is not applicable due to the distance of these blocks from a topographic area. The activities proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. Dispersants have been utilized in previous spill response efforts and were used extensively in the response to the Deepwater Horizon oil spill, with both surface and sub-surface applications. Reports on dispersant usage on surface oil indicate that a majority of the dispersed oil remains in the top 10 meters of the water column, with 60 percent of the oil in the top two meters of water (McAuliffe et al, 1981; Lewis and Aurand, 1997; OCS Report BOEM 2017-007). Lubchenco et al. (2010) report that most chemically dispersed surface oil from the Deepwater Horizon explosion and oil spill remained in the top six meters of the water column

where it mixed with surrounding waters and biodegraded (BOEM 2017-007). None of the topographic features or potentially sensitive biological features in the GOM are shallower than 10 meters (33 feet), and only the Flower Garden Banks are shallower than 20 meters (66 feet).

In one extraordinary circumstance with an unusual combination of meteorological and oceanographic conditions, a tropical storm forced a large volume of Deepwater Horizon oil spill-linked surface oil/dispersant mixture to as deep as 75 meters (246 feet), causing temporary exposure to mesophotic corals in the Pinnacle Trend area and leading to some coral mortality and sublethal impacts (Silva et al., 2015; BOEM 2017-007).

Additionally, concentrations of dispersed and dissolved oil in the Deepwater Horizon oil-spill subsea plume were reported to be in the parts per million range or less and were generally lower away from the water's surface and away from the well head (Adcroft et al., 2010; Haddad and Murawski, 2010; Joint Analysis Group, 2010; Lubchenco et al, 2010; BOEM 2017-007).

In the case of subsurface spills like a blowout or pipeline leak, dispersants may be injected at the seafloor. This will increase oil concentrations near the source but tend to decrease them further afield, especially at the surface. Marine organisms in the lower water column will be exposed to an initial increase of water-soluble oil compounds that will dilute in the water column over time (Lee et al., 2013a; NAS 2020).

Dispersant application involves a trade-off between decreasing the risk to the surface and shoreline habitat and increasing the risk beneath the surface. The optimal trade-off must account for various factors, including the type of oil spilled, the spill volume, the weather and sea state, the water depth, the degree of turbulence, and the relative abundance and life stages of organisms (NRC, 2005; NAS 2020).

Chemical dispersants may increase the risk of toxicity to subsurface organisms by increasing bioavailability of the oil. However, it is important to note that at the 1:20 dispersant-to-oil ratio recommended for use during response operations, the dispersants currently approved for use are far less acutely toxic than oil is. Toxicity of chemically dispersed oil is primarily due to the oil itself and its enhanced bioavailability (Lee et al., 2015; NAS 2020).

With the exception of special Federal management areas or designated exclusion areas, dispersants have been preapproved for surface use, which provides the USCG On-Scene Coordinator with the authority to approve the use of dispersants. However, that approval would only be granted upon completion of the protocols defined in the appropriate Area Contingency Plan (ACP) and the Regional Response Team (RRT) Dispersant Plan. The protocols include conducting an environmental benefit analysis to determine if the dispersant use will prevent a substantial threat to the public health or welfare or minimize serious environmental

damage. The Regional Response Team would be notified immediately to provide technical support and guidance in determining if the dispersant use meets the established criteria and provide an environmental benefit. Additionally, there is currently no preapproval for subsea dispersant injection and the USCG On-Scene Coordinator must approve use of this technology before any subsea application. Due to the unprecedented volume of dispersants applied for an extended period of time, the U.S. National Response Team has developed guidance for atypical dispersant operations to ensure that planning and response activities will be consistent with national policy (BOEM 2017-007).

Dispersants were used extensively in the response to the Deepwater Horizon oil spill, both surface and sub-surface applications. However, during a May 2016 significant oil spill (approximately 1,926 barrels) in the Gulf of Mexico dispersants were not utilized as part of the response. The Regional Response Team was consulted and recommended that dispersants not be used, despite acknowledging the appropriate protocols were correctly followed and that there was a net environmental benefit in utilizing dispersants. This demonstrates that the federal authorities (USCG and RRT) will be extremely prudent in their decision-making regarding dispersant use authorizations.

Due to the distance of these blocks from a topographic area and the coverage of the activities proposed in this plan by Murphy's Regional OSRP (refer to information submitted in **Section 9**), impacts to topographic features from surface or sub-surface oil spills are not expected.

There are no other IPFs (including emissions, effluents, and wastes sent to shore for treatment or disposal) from the proposed activities that are likely to impact topographic features.

2. Pinnacle Trend Area Live Bottoms

Potential IPFs on pinnacle trend area live bottoms include physical disturbances to the seafloor, emissions (noise / sound), and accidents.

Physical disturbances to the seafloor: Green Canyon Blocks 389, 432, and 478 are more than 149 miles from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms. Although there is little information available on sound detection and sound-mediated behaviors for marine invertebrates, the overall impacts on

pinnacle and low-relief feature communities from anthropogenic noise are expected to be negligible (BOEM 2017-009). Additionally, Green Canyon Blocks 389, 432, and 478 are more than 149 miles from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed operations (refer to statistics in **Item 5**, Water Quality). Oil spills have the potential to foul benthic communities and cause lethal and sublethal effects on live bottom organisms. Oil from a surface spill can be driven into the water column; measurable amounts have been documented down to a 10 meter depth. At this depth, the oil is found only at concentrations several orders of magnitude lower than the amount shown to have an effect on marine organisms. Oil from a subsurface spill is not expected to impact pinnacle trend area live bottoms due to the distance of these blocks from a live bottom (pinnacle trend) area. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. A detailed discussion on dispersants, their usage during the Deepwater Horizon oil spill, and their impacts on different levels of benthic communities can be found in **Item 1**.

There are no other IPFs (including effluents and wastes sent to shore for treatment or disposal) from the proposed operations which could impact a live bottom (pinnacle trend) area.

3. Eastern Gulf Live Bottoms

Potential IPFs on Eastern Gulf live bottoms include physical disturbances to the seafloor, emissions (noise / sound), and accidents.

Physical disturbances to the seafloor: Green Canyon Blocks 389, 432, and 478 are not located in an area characterized by the existence of live bottoms, and these leases do not contain a Live-Bottom Stipulation requiring a photo documentation survey and survey report.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms. Although there is little information available on sound detection and sound-mediated behaviors for marine invertebrates, the overall impacts on pinnacle and low-relief feature communities from anthropogenic noise are expected to be negligible (BOEM 2017-009). Additionally, Green Canyon Blocks 389, 432, and 478 are not

located in an area characterized by the existence of live bottoms; therefore, no adverse impacts are expected.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed operations (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to live bottom organisms only if the oil contacts the organisms. Oil from a surface spill can be driven into the water column; measurable amounts have been documented down to a 10 meter depth. At this depth, the oil is found only at concentrations several orders of magnitude lower than the amount shown to have an effect on marine invertebrates. Oil from a subsurface spill is not expected to impact Eastern Gulf live bottoms due to the distance of these blocks from a live bottom area and coverage of the operations proposed in this plan by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. A detailed discussion on dispersants, their usage during the Deepwater Horizon oil spill, and their impacts on different levels of benthic communities can be found in **Item 1**.

There are no other IPFs (including effluents and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact an Eastern Gulf live bottom area.

4. Deepwater Benthic Communities

There are no IPFs (including emissions (noise / sound), effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, and accidents) from the proposed operations that could cause impacts to deepwater benthic communities.

Green Canyon Blocks 389, 432, and 478 are located in water depths of 984 feet (300 meters) or greater. At such depth high-density, deepwater benthic communities may sometimes be found. However, Green Canyon Blocks 389, 432, and 478 are more than 11.4 miles from a known deepwater benthic community site (Green Canyon Block 216), listed in NTL 2009-G40. Therefore, Murphy's proposed operations in Green Canyon Blocks 389, 432, and 478 are not likely to impact deepwater benthic communities.

Deepwater benthic communities would potentially be subject to detrimental effects from a catastrophic seafloor blowout due to sediment and oiled sediment from the initial event (BOEM 2017-007). However, this is unlikely due to the distancing requirements described in NTL 2009-G40. Additionally, the potential impacts would be localized due to the directional movement of oil plumes by water currents and the scattered, patchy distribution of sensitive habitats. Although widely dispersed, biodegraded particles of a passing oil plume might impact patchy habitats, no significant impacts would be expected to the Gulfwide population. Most deepwater benthic communities are expected to experience no impacts from a catastrophic

seafloor blowout due to the directional movement of oil plumes by the water currents and their scattered, patchy distribution. Impacts may be expected if a spill were to occur close to a deepwater benthic habitat, however, beyond the localized area of impact particles would become increasingly biodegraded and dispersed. Localized impacts to deepwater benthic organisms would be expected to be mostly sublethal (BOEM 2017-007).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. A detailed discussion on dispersants, their usage during the Deepwater Horizon oil spill, and their impacts on different levels of benthic communities can be found in **Item 1**.

5. Water Quality

Potential IPFs that could result in water quality degradation from the proposed operations in Green Canyon Blocks 389, 432, and 478 include physical disturbances to the seafloor and accidents.

Physical disturbances to the seafloor: Bottom area disturbances resulting from the emplacement of rigs and the installation of platforms and pipelines would increase water-column turbidity and re-suspension of any accumulated pollutants, such as trace metals and excess nutrients. This would cause short-lived impacts on water quality conditions in the immediate vicinity of the emplacement operations.

Accidents: Impact-producing factors related to OCS oil- and gas-related accidental events primarily involve chemical spills, and oil spills.

Chemical Spills

Accidental chemical spills could result in temporary localized impacts on water quality, primarily due to changing pH. Chemicals spills are generally small volume compared with spills of oil and drilling fluids. During the period of 2007 to 2014, small chemical spills occurred at an average annual volume of 28 barrels, while large chemical spills occurred at an average annual volume of 758 barrels. These chemical spills normally dissolve in water and dissipate quickly through dilution with no observable effects. Also, many of these chemicals are approved to be commingled in produced water for discharge to the ocean, which is a permitted activity. Therefore, impacts from chemical spills are considered to be minor and do not typically require mitigation because of technical feasibility and low toxicity after dilution (BOEM 2017-009).

Oil Spills

Oil spills have the greatest potential of all OCS oil-and gas-related activities to affect water quality. Small spills (<1,000 barrels) are not expected to substantially impact water quality in coastal or offshore waters because the oil dissipates quickly through dispersion and weathering while still at sea. Reasonably foreseeable larger spills (≥1,000 barrels), however, could impact

water quality in coastal and offshore waters (BOEM 2017-007). However, based on data provided in the BOEM 2016 Update of Occurrence Rates for Offshore Oil Spills, it is unlikely that an accidental surface or subsurface spill of a significant volume would occur from the proposed operations. Between 2001 and 2015 OCS operations produced eight billion barrels of oil and spilled 0.062 percent of this oil, or one barrel for every 1,624 barrels produced. (The overall spill volume was almost entirely accounted for by the 2010 Deepwater Horizon blowout and subsequent discharge of 4.9 million barrels of oil. Additional information on unlikely scenarios and impacts from very large oil spills are discussed in the Catastrophic Spill Event Analysis white paper (BOEM 2017-007).

If a spill were to occur, the water quality of marine waters would be temporarily affected by the dissolved components and small oil droplets. Dispersion by currents and microbial degradation would remove the oil from the water column and dilute the constituents to background levels. Historically, changes in offshore water quality from oil spills have only been detected during the life of the spill and up to several months afterwards. Most of the components of oil are insoluble in water and therefore float. Dispersants will only be used if approved by the Regional Response Team in coordination with the RRT Dispersant Plan and RRT Biological Assessment for Dispersants.

Oil spills, regardless of size, may allow hydrocarbons to partition into the water column in a dissolved, emulsion, and/or particulate phase. Therefore, impacts from reasonably foreseeable oil spills are considered moderate. Mitigation efforts for oil spills may include booming, burning, and the use of dispersants (BOEM 2017-009).

These methods may cause short-term secondary impacts to water quality, such as the introduction of additional hydrocarbon into the dissolved phase through the use of dispersants and the sinking of hydrocarbon residuals from burning. Since burning and the use of dispersants put additional hydrocarbons into the dissolved phase, impacts to water quality after mitigation efforts are still considered to be moderate, because dissolved hydrocarbons extend down into the water column. This results in additional exposure pathways via ingestion and gill respiration and may result in acute or chronic effects to marine life (BOEM 2017-009).

Most oil-spill response strategies and equipment are based upon the simple principle that oil floats. However, as evident during the Deepwater Horizon explosion, oil spill, and response, this is not always true. Sometimes it floats and sometimes it suspends within the water column or sinks to the seafloor (BOEM 2017-009).

Oil that is chemically dispersed at the surface move into the top six meters (20 feet) of the water column where it mixes with surrounding waters and begins to biodegrade (U.S. Congress, Office of Technology Assessment, 1990). Dispersant use, in combination with natural processes,

breaks up oil into smaller components that allows them to dissipate into the water and degrade more rapidly (Nalco, 2010). Dispersant use must be in accordance with an RRT Preapproved Dispersant Use Manual and with any conditions outlined within a RRT's site-specific, dispersant approval given after a spill event. Consequently, dispersant use must be in accordance with the restrictions for specific water depths, distances from shore, and monitoring requirements. At this time, neither the Region IV nor the Region VI RRT dispersant use manuals, which cover the GOM region, give preapproval for the application of dispersant use subsea (BOEM 2017-009).

The operations proposed in this plan will be covered by Murphy's Regional Oil Spill Response Plan, which discusses potential response actions in more detail (refer to information submitted in **Section 9**).

There are no other IPFs (including emissions, effluents, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact water quality.

6. Fisheries

There are multiple species of fish in the Gulf of Mexico, including the endangered and threatened species listed in **Table 1** at the beginning of this Environmental Impact Assessment. More information regarding the endangered Gulf sturgeon (**Item 20.2**), oceanic whitetip shark (**Item 20.3**), and giant manta ray (**Item 20.4**) can be found below. Potential IPFs on fisheries as a result of the proposed operations in Green Canyon Blocks 389, 432, and 478 include physical disturbances to the seafloor, emissions (noise / sound), and accidents.

Physical disturbances to the seafloor: The emplacement of a structure or rig results in minimal loss of bottom trawling area to commercial fishermen. Pipelines cause gear conflicts which result in losses of trawls and shrimp catch, business downtime, and vessel damage. Most financial losses from gear conflicts are covered by the Fishermen's Contingency Fund (FCF). The emplacement and removal of facilities are not expected to cause significant adverse impacts to fisheries.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms by stimulating behavioral response, masking biologically important signals, causing temporary or permanent hearing loss (Popper et al., 2005; Popper et al., 2014), or causing physiological injury (e.g., barotrauma) resulting in mortality (Popper and Hastings, 2009). The potential for anthropogenic sound to affect any individual organism is dependent on the proximity to the source, signal characteristics, received

peak pressures relative to the static pressure, cumulative sound exposure, species, motivation, and the receiver's prior experience. In addition, environmental conditions (e.g., temperature, water depth, and substrate) affect sound speed, propagation paths, and attenuation, resulting in temporal and spatial variations in the received signal for organisms throughout the ensonified area (Hildebrand, 2009).

Sound detection capabilities among fishes vary. For most fish species, it is reasonable to assume hearing sensitivity to frequencies below 500 Hertz (Hz) (Popper et al., 2003 and 2014; Popper and Hastings, 2009; Slabbekoorn et al., 2010; Radford et al., 2014). The band of greatest interest to this analysis, low-frequency sound (30-500 Hz), has come to be dominated by anthropogenic sources and includes the frequencies most likely to be detected by most fish species. For example, the noise generated by large vessel traffic typically results from propeller cavitation and falls within 40-150 Hz (Hildebrand, 2009; McKenna et al., 2012). This range is similar to that of fish vocalizations and hearing and could result in a masking effect.

Masking occurs when background noise increases the threshold for a sound to be detected; masking can be partial or complete. If detection thresholds are raised for biologically relevant signals, there is a potential for increased predation, reduced foraging success, reduced reproductive success, or other effects. However, fish hearing and sound production may be adapted to a noisy environment (Wysocki and Ladich, 2005). There is evidence that fishes are able to efficiently discriminate between signals, extracting important sounds from background noise (Popper et al., 2003; Wysocki and Ladich, 2005). Sophisticated sound processing capabilities and filtering by the sound sensing organs essentially narrows the band of masking frequencies, potentially decreasing masking effects. In addition, the low-frequency sounds of interest propagate over very long distances in deep water, but these frequencies are quickly lost in water depths between ½ and ¼ the wavelength (Ladich, 2013). This would suggest that the potential for a masking effect from low-frequency noise on behaviors occurring in shallow coastal waters may be reduced by the receiver's distance from sound sources, such as busy ports or construction activities.

Pulsed sounds generated by OCS oil-and gas-related activities (e.g., impact-driven piles and airguns) can potentially cause behavioral response, reduce hearing sensitivity, or result in physiological injury to fishes and invertebrate resources. However, there are no pulsed sound generation operations proposed for these operations.

Support vessel traffic, production facilities, and other sources of continuous sounds contribute to a chronic increase in background noise, with varying areas of effect that may be influenced by the sound level, frequencies, and environmental factors (Hildebrand, 2009; Slabbekoorn et al., 2010; McKenna et al., 2012). These sources have a low potential for causing physiological injury or injuring hearing in fishes and invertebrates (Popper et al., 2014). However, continuous

sounds have an increased potential for masking biologically relevant sounds than do pulsed signals. The potential effects of masking on fishes and invertebrates is difficult to assess in the natural setting for communities and populations of species, but evidence indicates that the increase to background noise as a result of OCS oil and gas operations would be relatively minor. Therefore, it is expected that the cumulative impact to fishes and invertebrate resources would be minor and would not extend beyond localized disturbances or behavioral modification.

Despite the importance of many sound-mediated behaviors and the potential biological costs associated with behavioral response to anthropogenic sounds, many environmental and biological factors limit potential exposure and the effects that OCS oil-and gas-related sounds have on fishes and invertebrate resources. The overall impact to fishes and invertebrate resources due to anthropogenic sound introduced into the marine environment by OCS oil-and gas-related routine activities is expected to be minor.

Accidents: Collisions between support vessels and ESA-listed fish would be unusual events; however, should one occur, death or injury to ESA-listed fish is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question. The operations will be conducted with a Pipeline installation vessel with a moon pool. The moon pool will be monitored continuously with a CCTV system during the proposed operations to ensure the safety of marine life.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, Murphy may call BSEE at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be

reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

An accidental oil spill has the potential to cause some detrimental effects on fisheries; however, it is unlikely that such an event would occur from the proposed operations (refer to **Item 5**, Water Quality). The effects of oil on mobile adult finfish or shellfish would likely be sublethal and the extent of damage would be reduced to the capacity of adult fish and shellfish to avoid the spill, to metabolize hydrocarbons, and to excrete both metabolites and parent compounds. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

There are no other IPFs (including effluents and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to cause impacts to fisheries.

7. Marine Mammals

The latest population estimates for the Gulf of Mexico revealed that cetaceans of the continental shelf and shelf-edge were almost exclusively bottlenose dolphin and Atlantic spotted dolphin. Squid eaters, including dwarf and pygmy killer whale, Risso's dolphin, rough-toothed dolphin, and Cuvier's beaked whale, occurred most frequently along the upper slope in areas outside of anticyclones. The Bryde's whale is the only commonly occurring baleen whale in the northern Gulf of Mexico and has been sighted off western Florida and in the De Soto Canyon region. Florida manatees have been sighted along the entire northern GOM but are mainly found in the shallow coastal waters of Florida, which are unassociated with the proposed actions. A complete list of all endangered and threatened marine mammals in the GOM may be found in **Table 1** at the beginning of this Environmental Impact Assessment. More information regarding the endangered Gulf of Mexico Bryde's whale can be found in **Item 20.1** below. Potential IPFs that could cause impacts to marine mammals as a result of the proposed operations in Green Canyon Blocks 389, 432, and 478 include emissions, discarded trash and debris, and accidents.

Emissions (noise / sound): Noises from construction activities, support vessels and helicopters (i.e. non-impulsive anthropogenic sound) may elicit a startle reaction from marine mammals. This reaction may lead to disruption of marine mammals' normal activities. Stress may make them more vulnerable to parasites, disease, environmental contaminants, and/or predation (Majors and Myrick, 1990). Responses to sound exposure may include lethal or nonlethal injury,

temporary hearing impairment, behavioral harassment and stress, or no apparent response. Noise-induced stress is possible, but it is little studied in marine mammals. Tyack (2008) suggests that a more significant risk to marine mammals from sound are these less visible impacts of chronic exposure. There is little conclusive evidence for long-term displacements and population trends for marine mammals relative to noise.

Vessels are the greatest contributors to increases in low-frequency ambient sound in the sea (Andrew et al. 2011). Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Cetacean responses to aircraft depend on the animals' behavioral state at the time of exposure (e.g., resting, socializing, foraging or traveling) as well as the altitude and lateral distance of the aircraft to the animals (Luksenburg and Parsons 2009). The underwater sound intensity from aircraft is less than produced by vessels, and visually, aircraft are more difficult for whales to locate since they are not in the water and move rapidly (Richter et al. 2006). Perhaps not surprisingly then, when aircraft are at higher altitudes, whales often exhibit no response, but lower flying aircraft (e.g., approximately 500 meters or less) have been observed to elicit short-term behavioral responses (Luksenburg and Parsons 2009; NMFS 2017b; NMFS 2017f; Patenaude et al. 2002; Smultea et al. 2008a; Wursig et al. 1998). Thus, aircraft flying at low altitude, at close lateral distances and above shallow water elicit stronger responses than aircraft flying higher, at greater lateral distances and over deep water (Patenaude et al. 2002; Smultea et al. 2008a). Routine OCS helicopter traffic would not be expected to disturb animals for extended periods, provided pilots do not alter their flight patterns to more closely observe or photograph marine mammals. Helicopters, while flying offshore, generally maintain altitudes above 700 feet during transit to and from a working area, and at an altitude of about 500 feet between platforms. The duration of the effects resulting from a startle response is expected to be short-term during routine flights, and the potential effects will be insignificant to sperm whales and Bryde's whales. Therefore, we find that any disturbance that may result from aircraft associated with the proposed action is not likely to adversely affect ESA-listed whales.

Construction and production noise would contribute to increases in the ambient noise environment of the GOM, but they are not expected in amplitudes sufficient to cause either hearing or behavioral impacts (BOEM 2017-009). There is the possibility of short-term disruption of movement patterns and/or behavior caused by vessel noise and disturbance; however, these are not expected to impact survival and growth of any marine mammal populations in the GOM. Additionally, the National Marine Fisheries Service published a final recovery plan for the sperm whale, which identified anthropogenic noise as either a low or unknown threat to sperm whales in the GOM (USDOC, NMFS, 2010b). Sirenians (i.e. manatees) are not located within the area of operations. Additionally, there were no specific noise impact

factors identified in the latest BOEM environmental impact statement for sirenians related to GOM OCS operations (BOEM 2017-009). See **Item 20.1** for details on the Bryde's whale.

The National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion Appendix C explains how operators must implement measures to minimize the risk of vessel strikes to protected species and report observations of injured or dead protected species. This guidance should also minimize the chance of marine mammals being subject to the increased noise level of a service vessel in very close proximity.

Impulsive sound impacts (i.e. pile driving, seismic surveys) are not included among the operations proposed under this plan.

Discarded trash and debris: Both entanglement in, and ingestion of debris have caused the death or serious injury of marine mammals (Laist, 1997; MMC, 1999). The limited amount of marine debris, if any, resulting from the proposed operations is not expected to substantially harm marine mammals. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

Accidents: Collisions between support vessels and marine mammals, including cetaceans, would be unusual events, however, should one occur, death or injury to marine mammals is possible. Contract vessel operators can avoid marine mammals and reduce potential deaths by maintaining a vigilant watch for marine mammals and maintaining a safe distance of 500 meters or greater from baleen whales, 100 meters or greater from sperm whales, and a distance of 50 meters or greater from all other aquatic protected species, with the exception of animals that approach the vessel. If unable to identify the marine mammal, the vessel will act as if it were a baleen whale and maintain a distance of 500 meters or greater. If a manatee is sighted, all vessels in the area will operate at "no wake/idle" speeds in the area, while maintaining proper distance. When assemblages of cetaceans are observed, including mother/calf pairs, vessel speeds will be reduced to 10 knots or less. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Vessel personnel must report sightings of any injured or dead protected marine mammal species immediately, regardless of whether the injury or death is caused by their vessel, to the NMFS Southeast Marine Mammal Stranding Hotline at (877) WHALE-HELP (877-942-5343). Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

These proposed operations will utilize a moon pool(s) to conduct various subsea activities. The moon pool will be monitored continuously with a CCTV system during the proposed operations to ensure the safety of marine life. If any marine mammal is detected in the moon pool, Murphy will cease operations and contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov and 985-722-7902 for additional guidance and incidental report information.

Oil spills have the potential to cause sublethal oil-related injuries and spill-related deaths to marine mammals. However, it is unlikely that an accidental oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Oil spill response activities may increase vessel traffic in the area, which could impact cetacean behavior and/or distribution, thereby causing additional stress to the animals. The effect of oil dispersants on cetaceans is not known. Removing oil from the surface would reduce the likelihood of oil adhering to marine mammals. Laboratory experiments have shown that the dispersants used during the Deepwater Horizon response are cytotoxic to sperm whale cells; however, it is difficult to determine actual exposure levels in the GOM. Therefore, dispersants will only be used if approved by the Regional Response Team in coordination with the RRT Dispersant Plan and RRT Biological Assessment for Dispersants. The acute toxicity of oil dispersant chemicals included in Murphy's OSRP is considered to be low when compared with the constituents and fractions of crude oils and diesel products. The operations proposed in this plan will be covered by Murphy's OSRP (refer to information submitted in accordance with **Section 9**).

The NMFS Office of Protected Resources coordinates agency assessment of the need for response and leads response efforts for spills that may impact cetaceans. If a spill may impact cetaceans, NMFS Protected Resources Contacts should be notified (see contact details below), and they will initiate notification of other relevant parties.

NMFS Protected Resources Contacts for the Gulf of Mexico:

- Marine mammals – Southeast emergency stranding hotline 1-877-433-8299
- Other endangered or threatened species – ESA section 7 consulting biologist: nmfs.ser.emergency.consult@noaa.gov

There are no other IPFs (including physical disturbances to the seafloor and effluents) from the proposed operations that are likely to impact marine mammals.

8. Sea Turtles

GulfCet II studies sighted most loggerhead, Kemp's ridley and leatherback sea turtles over shelf waters. Historically these species have been sighted up to the shelf's edge. They appear to be more abundant east of the Mississippi River than they are west of the river (Fritts et al., 1983b; Lohoefener et al., 1990). Deep waters may be used by all species as a transitory habitat. A complete list of endangered and threatened sea turtles in the GOM may be found in **Table 1** at the beginning of this Environmental Impact Assessment. Additional details regarding the loggerhead sea turtle's critical habitat in the GOM are located in **Item 20.5**. Potential IPFs that could cause impacts to sea turtles as a result of the proposed operations include discarded trash and debris, and accidents.

Discarded trash and debris: Both entanglement in, and ingestion of, debris have caused the death or serious injury of sea turtles (Balazs, 1985). The limited amount of marine debris, if any, resulting from the proposed operations is not expected to substantially harm sea turtles. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

Accidents: Collisions between support vessels and sea turtles would be unusual events, however, should one occur, death or injury to sea turtles is possible. Contract vessel operators can avoid sea turtles and reduce potential deaths by maintaining a vigilant watch for sea turtles and maintaining a safe distance of 50 meters or greater when they are sighted, with the exception of sea turtles that approach the vessel. Vessel crews should use a reference guide to help identify the five species of sea turtles that may be encountered in the Gulf of Mexico OCS as well as other marine protected species (i.e. Endangered Species Act listed species). Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Vessel crews must report sightings of any injured or dead protected sea turtle species immediately, regardless of whether the injury or death is caused by their vessel, to the State Coordinators for the Sea Turtle Stranding and Salvage Network (STSSN) at http://www.sefsc.noaa.gov/species/turtles/stranding_coordinators.htm (phone numbers vary by state). Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

These proposed operations will utilize a moon pool(s) to conduct various subsea activities. The moon pool will be monitored continuously with a CCTV system during the proposed operations to ensure the safety of marine life. If any sea turtle is detected in the moon pool, Murphy will cease operations and contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov and 985-722-7902 for additional guidance and incidental report information. The procedures found in Appendix J of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion will be employed to free entrapped or entangled marine life safely.

All sea turtle species and their life stages are vulnerable to the harmful effects of oil through direct contact or by fouling of their food. Exposure to oil can be fatal, particularly to juveniles and hatchlings. However, it is unlikely that an accidental oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Oil spill response activities may increase vessel traffic in the area, which could add to the possibility of collisions with sea turtles. The operations proposed in this plan will be covered by Murphy's Regional Oil Spill Response Plan (refer to information submitted in accordance with **Section 9**).

The NMFS Office of Protected Resources coordinates agency assessment of the need for response and leads response efforts for spills that may impact sea turtles. If a spill may impact sea turtles, the following NMFS Protected Resources Contacts should be notified, and they will initiate notification of other relevant parties.

- Dr. Brian Stacy at brian.stacy@noaa.gov and 352-283-3370 (cell); or
- Stacy Hargrove at stacy.hargrove@noaa.gov and 305-781-7453 (cell)

There are no other IPFs (including emissions, physical disturbances to the seafloor and effluents) from the proposed operations that are likely to impact sea turtles.

9. Air Quality

Potential IPFs on air quality as a result of the proposed operations include accidents.

The projected air emissions identified in **Section 8** are not expected to affect the OCS air quality primarily due to distance to the shore or to any Prevention of Significant Deterioration Class I air quality area such as the Breton Wilderness Area. Green Canyon Blocks 389, 432, and 478 are beyond the 200 kilometer (124 mile) buffer for the Breton Wilderness Area and are 106 miles from the coastline. Therefore, no special mitigation, monitoring, or reporting requirements apply with respect to air emissions.

Accidents and blowouts can release hydrocarbons or chemicals, which could cause the emission of air pollutants. However, these releases should not impact onshore air quality because of the prevailing atmospheric conditions, emission height, emission rates, and the distance of Green Canyon Blocks 389, 432, and 478 from the coastline. There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact air quality.

10. Shipwreck Sites (known or potential)

In accordance with BOEM NTL 2005-G07, Murphy will submit an archaeological resource report per 30 CFR 550.194 if directed to do so by the Regional Director.

Potential IPFs on known or unknown shipwreck sites as a result of the proposed operations in Green Canyon Blocks 389, 432, and 478 include accidents and disturbances to the seafloor. Green Canyon Blocks 389, 432, and 478 are not located in or adjacent to an OCS block designated by BOEM as having a high probability for occurrence of shipwrecks. Should Murphy discover any evidence of a shipwreck, they will immediately halt operations within a 1000 foot radius, report to BOEM within 48 hours, and make every reasonable effort to preserve and protect that cultural resource.

Physical Disturbances to the seafloor: Green Canyon Blocks 389, 432, and 478 are not located in or adjacent to an OCS block designated by BOEM as having a high probability for occurrence of shipwrecks; therefore, no adverse impacts are expected.

Accidents: An accidental oil spill has the potential to cause some detrimental effects to shipwreck sites if the release were to occur subsea. However, it is unlikely that an accidental oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by Murphy's Regional Oil Spill Response Plan (refer to information submitted in accordance with **Section 9**).

There are no other IPFs (including emissions, effluents, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to cause impacts to shipwreck sites.

11. Prehistoric Archaeological Sites

In accordance with BOEM NTL 2005-G07, Murphy will submit an archaeological resource report per 30 CFR 550.194 if directed to do so by the Regional Director.

Potential IPFs on prehistoric archaeological sites as a result of the proposed operations in Green Canyon Blocks 389, 432, and 478 are disturbances to the seafloor and accidents (oil spills). Should Murphy discover any object of prehistoric archaeological significance, they will immediately halt operations within a 1000 foot radius, report to BOEM within 48 hours, and make every reasonable effort to preserve and protect that cultural resource.

Physical disturbances to the seafloor: Green Canyon Blocks 389, 432, and 478 are located inside the Archaeological Prehistoric high probability lines. Murphy will report to BOEM the discovery of any object of prehistoric archaeological significance and make every reasonable effort to preserve and protect that cultural resource.

Accidents: An accidental oil spill has the potential to cause some detrimental effects to prehistoric archaeological sites if the release were to occur subsea. However, it is unlikely that an accidental oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by Murphy's Regional Oil Spill Response Plan (refer to information submitted in accordance with **Section 9**).

There are no other IPFs (including emissions, effluents, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to cause impacts to prehistoric archaeological sites.

Vicinity of Offshore Location

12. Essential Fish Habitat (EFH)

Potential IPFs on EFH as a result of the proposed operations in Green Canyon Blocks 389, 432, and 478 include physical disturbances to the seafloor and accidents. EFH includes all estuarine and marine waters and substrates in the Gulf of Mexico.

Physical disturbances to the seafloor: Turbidity and sedimentation resulting from the bottom disturbing activities included in the proposed operations would be short term and localized. Fish are mobile and would avoid these temporarily suspended sediments. Additionally, the Live Bottom Low Relief Stipulation, the Live Bottom (Pinnacle Trend) Stipulation, and the Eastern Gulf Pinnacle Trend Stipulation have been put in place to minimize the impacts of bottom

disturbing activities. Therefore, the bottom disturbing activities from the proposed operations would have a negligible impact on EFH.

Accidents: An accidental oil spill has the potential to cause some detrimental effects on EFH. Oil spills that contact coastal bays and estuaries, as well as OCS waters when pelagic eggs and larvae are present, have the greatest potential to affect fisheries. However, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

There are no other IPFs (including emissions, effluents, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact essential fish habitat.

13. Marine and Pelagic Birds

Potential IPFs on marine birds as a result of the proposed operations include emissions (air, noise / sound), accidents, and discarded trash and debris from vessels and the facilities.

Emissions:

Air Emissions

Emissions of pollutants into the atmosphere from these operations are far below concentrations which could harm coastal and marine birds.

Noise / Sound Emissions

The OCS oil-and gas-related helicopters and vessels have the potential to cause noise and disturbance. However, flight altitude restrictions over sensitive habitat, including that of birds, may make serious disturbance unlikely. Birds are also known to habituate to noises, including airport noise. It is an assumption that the OCS oil-and gas-related vessel traffic would follow regular routes; if so, seabirds would find the noise to be familiar. Therefore, the impact of OCS oil-and gas-related noise from helicopters and vessels to birds would be expected to be negligible.

The use of explosives for decommissioning activities may potentially kill one or more birds from barotrauma if a bird (or several birds because birds may occur in a flock) is present at the location of the severance. For the impact of underwater sound, a threshold of 202 dB sound exposure level (SEL) for injury and 208 dB SEL for barotrauma was recommended for the Brahyramphus marmoratus, a diving seabird (USDOI, FWS, 2011). However, the use of explosive severance of facilities for decommissioning are not included in these proposed operations, therefore these impacts are not expected.

Accidents: An oil spill would cause localized, low-level petroleum hydrocarbon contamination. However, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Marine and pelagic birds feeding at the spill location may experience chronic, nonfatal, physiological stress. It is expected that few, if any, coastal and marine birds would actually be affected to that extent. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Marine and pelagic birds could become entangled and snared in discarded trash and debris, or ingest small plastic debris, which can cause permanent injuries and death. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE. Debris, if any, from these proposed operations will seldom interact with marine and pelagic birds; therefore, the effects will be negligible.

ESA bird species: Seven species found in the GOM are listed under the ESA. BOEM consults on these species and requires mitigations that would decrease the potential for greater impacts due to small population size.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact marine and pelagic birds.

14. Public Health and Safety Due to Accidents.

There are no IPFs (including emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, and accidents, including an accidental H_2S release) from the proposed operations which could cause impacts to public health and safety. In accordance with NTL No.'s 2008-G04, 2009-G27, and 2009-G31, sufficient information is included in **Section 4** to justify our request that our proposed operations be classified by BSEE as H_2S absent.

Coastal and Onshore

15. Beaches

Potential IPFs from the proposed operations that could cause impacts to beaches include accidents and discarded trash and debris.

Accidents: Oil spills contacting beaches would have impacts on the use of recreational beaches and associated resources. Due to the distance from shore (106 miles) and the response capabilities that would be implemented, no significant adverse impacts are expected. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Trash on the beach is recognized as a major threat to the enjoyment and use of beaches. There will only be a limited amount of marine debris, if any, resulting from the proposed operations. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact beaches.

16. Wetlands

Potential IPFs on wetlands from the proposed operations include accidents and discarded trash and debris.

Accidents: Oil spills could cause impacts to wetlands; however, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Due to the distance from shore (106 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: There will only be a limited amount of marine debris, if any, resulting from the proposed operations. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact wetlands.

17. Shore Birds and Coastal Nesting Birds

Potential IPFs on shore birds and coastal nesting birds as a result of the proposed operations include accidents and discarded trash and debris.

Accidents: Oil spills could cause impacts to shore birds and coastal nesting birds. However, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Given the distance from shore (106 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Coastal and marine birds are highly susceptible to entanglement in floating, submerged, and beached marine debris: specifically plastics. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on vessels and every facility that has sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact shore birds and coastal nesting birds.

18. Coastal Wildlife Refuges

Potential IPFs on coastal wildlife refuges as a result of the proposed operations include accidents and discarded trash and debris.

Accidents: An accidental oil spill from the proposed operations could cause impacts to coastal wildlife refuges. However, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Due to the distance from shore (106 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act and regulations imposed by various agencies including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on vessels and every facility that has sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact coastal wildlife refuges.

19. Wilderness Areas

Potential IPFs on wilderness areas as a result of the proposed operations include accidents and discarded trash and debris.

Accidents: An accidental oil spill from the proposed operations could cause impacts to wilderness areas. However, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Due to the distance from the nearest designated Wilderness Area (139.2 miles) and the response capabilities that would be implemented, no significant adverse impacts are expected. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9).**

Discarded trash and debris: Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act and regulations imposed by various agencies including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on vessels and every facility that has sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact wilderness areas.

20. Other Environmental Resources Identified

20.1 – Bryde's Whale

The Bryde's whale is the only commonly occurring baleen whale in the northern Gulf of Mexico and has been sighted off western Florida and in the De Soto Canyon region. The Bryde's whale area is over 156.5 miles from the proposed operations. Additionally, vessel traffic associated with the proposed operations will not flow through the Bryde's whale area. Therefore, there are no IPFs from the proposed operations that are likely to impact the Bryde's whale. Additional information on marine mammals may be found in **Item 7**.

20.2 – Gulf Sturgeon

The Gulf sturgeon resides primarily in inland estuaries and rivers from Louisiana to Florida and a small population of the species enters the Gulf of Mexico seasonally in western Florida. Potential IPFs on the Gulf sturgeon from the proposed operations include accidents , emissions (noise / sound), and discarded trash and debris. Additional information on ESA-listed fish may be found in **Item 6**.

Accidents: Collisions between support vessels and the Gulf sturgeon would be unusual events; however, should one occur, death or injury to the Gulf sturgeon is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question. The operations will be conducted with a Pipeline installation vessel with a moon pool. The moon pool will be monitored continuously with a CCTV system during the proposed operations to ensure the safety of marine life.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, Murphy may call BSEE at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

Due to the distance from the nearest identified Gulf sturgeon critical habitat (159.8 miles) and the response capabilities that would be implemented during a spill, no significant adverse impacts are expected to the Gulf sturgeon. Considering the information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, the location of this critical habitat in relation to proposed operations, the likely dilution of oil reaching nearshore areas, and the on-going weathering and dispersal of oil over time, we do not anticipate the effects from oil spills will appreciably diminish the value of Gulf sturgeon designated critical habitat for the conservation of the species. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9)**.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms**.** The National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion found that construction and operational sounds

other than pile driving will have insignificant effects on Gulf sturgeon (NMFS, 2020). There are no pile driving activities associated with the proposed operations, therefore noise impacts are not expected to significantly affect Gulf sturgeon.

Discarded trash and debris: Trash and debris are not expected to impact the Gulf sturgeon. There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact the Gulf sturgeon.

20.3 – Oceanic Whitetip Shark

Oceanic whitetip sharks may be found in tropical and subtropical waters around the world, including the Gulf of Mexico (Young 2016). According to the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, Essential Fish Habitat (EFH) for the oceanic whitetip shark includes localized areas in the central Gulf of Mexico and Florida Keys. Oceanic whitetip sharks were listed as threatened under the Endangered Species Act in 2018

due to worldwide overfishing. Oceanic whitetip sharks had an abundant worldwide population, which has been threatened in recent years by inadequate regulatory measures governing fisheries; therefore, there is little research regarding the impact of oil and gas operations on oceanic whitetip sharks (NMFS, 2020). IPFs that have been determined by NMFS to be discountable to oceanic whitetip sharks include vessel strike, emissions (noise / sound), discharges, entanglement and entrapment, and marine debris. Potential IPFs on oceanic whitetip sharks as a result of the proposed operations in Green Canyon Blocks 389, 432, and 478 include accidents. Additional information on ESA-listed fish may be found in **Item 6**.

Accidents: Collisions between support vessels and the oceanic whitetip shark would be unusual events, however, should one occur, death or injury to the oceanic whitetip shark is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question. The operations will be conducted with a Pipeline installation vessel with a moon pool. The moon pool will be monitored continuously with a CCTV system during the proposed operations to ensure the safety of marine life.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, Murphy may call BSEE at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the

responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

There is little information available on the impacts of oil spills or dispersants on oceanic whitetip sharks. It is expected that exposure of oil or dispersants to oceanic whitetip sharks would likely result in effects similar to other marine species, including fitness reduction and the possibility of mortality (NMFS, 2020). Due to the sparse population in the Gulf of Mexico, it is possible that a small number of oceanic whitetip sharks could be impacted by an oil spill. However, it is unlikely that such an event would occur from the proposed operations (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: There is little available information on the effects of marine debris on oceanic whitetip sharks. Since these sharks are normally associated with surface waters, they may be susceptible to entanglement. However, due to the small, widely dispersed, and highly mobile population in the Gulf of Mexico, and the localized and patchy distribution of marine debris, it is extremely unlikely that oceanic whitetip sharks would be impacted by marine debris.

There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore

personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to cause impacts to oceanic whitetip sharks.

20.4 – Giant Manta Ray

According to the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, the giant manta ray lives in tropical, subtropical, and temperate oceanic waters and productive coastlines throughout the Gulf of Mexico. While uncommon in the Gulf of Mexico, there is a population of approximately 70 giant manta rays in the Flower Garden Banks National Marine Sanctuary (Miller and Klimovich 2017). Giant manta rays were listed as threated under the Endangered Species Act in 2018 due to worldwide overfishing. Giant manta rays had an abundant worldwide population, which has been threatened in recent years by inadequate regulatory measures governing fisheries; therefore, there is little research regarding the impact of oil and gas operations on giant manta rays (NMFS, 2020). IPFs that have been determined by NMFS to be discountable to giant manta rays include vessel strike, emissions (noise / sound), discharges, entanglement and entrapment, and marine debris. Potential IPFs on the giant manta rays as a result of the proposed operations in Green Canyon Blocks 389, 432, and 478 include accidents. Additional information on ESA-listed fish may be found in **Item 6**.

Accidents: Collisions between support vessels and the giant manta ray would be unusual events, however, should one occur, death or injury to the giant manta ray is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question. The operations will be conducted with a Pipeline installation vessel with a moon pool. The moon pool will be monitored continuously with a CCTV system during the proposed operations to ensure the safety of marine life.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, Murphy may call BSEE at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

There is little information available on the impacts of oil spills or dispersants on giant manta rays. It is expected that exposure of oil or dispersants to giant manta rays would likely result in effects similar to other marine species, including fitness reduction and the possibility of mortality (NMFS, 2020). It is possible that a small number of giant manta rays could be impacted by an oil spill in the Gulf of Mexico. However, due to the distance to the Flower Garden Banks (115.2 miles), the low population dispersed throughout the Gulf of Mexico, and the response capabilities that would be implemented during a spill, no significant adverse impacts are expected to impact giant manta rays. Additionally, it is unlikely that such an event would occur from the proposed operations (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: There is little available information on the effects of marine debris on giant manta rays. Since these sharks are normally associated with surface waters, they may be susceptible to entanglement. However, due to the small, widely dispersed, and highly mobile population in the Gulf of Mexico, and the localized and patchy distribution of marine debris, it is extremely unlikely that oceanic whitetip sharks would be impacted by marine debris.

There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations

imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

Murphy will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. Murphy will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from Murphy management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact giant manta rays.

20.5 – Loggerhead Sea Turtle

The loggerhead sea turtles are large sea turtles that inhabit continental shelf and estuarine environments throughout the temperate and tropical regions of the Atlantic Ocean, with nesting beaches along the northern and western Gulf of Mexico. NMFS issued a Final Rule in 2014 (79 FR 39855) designating a critical habitat including 38 marine areas within the Northwest Atlantic Ocean, with seven of those areas residing within the Gulf of Mexico. These areas contain one or a combination of habitat types: nearshore reproductive habitats, winter areas, breeding areas, constricted migratory corridors, and/or *Sargassum* habitats.

There are multiple IPFs that may impact loggerhead sea turtles (see **Item 8**). However, the closest loggerhead critical habitat is located 200.7 miles from Green Canyon Blocks 389, 432, and 478; therefore, no adverse impacts are expected to the critical habitat from the proposed operations. Additionally, considering the information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, we do not expect the

proposed operations to affect the ability of *Sargassum* to support adequate prey abundance and cover for loggerhead turtles.

20.6 - Protected Corals

Protected coral habitats in the Gulf of Mexico range from Florida, the Flower Garden Banks National Marine Sanctuary, and into the Caribbean, including Puerto Rico, the U.S. Virgin Islands, and Navassa Island. Four counties in Florida (Palm Beach, Broward, Miami-Dade, and Monroe Counties) were designated as critical habitats for elkhorn (Acropora palmata) and staghorn (Acropora cervicornis) corals. These coral habitats are located outside of the planning area and are not expected to be impacted by the proposed actions. Elkhorn coral can also be found in the Flower Garden Banks along with three additional coral species, boulder star coral (Orbicella franksi), lobed star coral (Orbicella annularis), and mountainous star coral (Orbicella faveolatta). Potential IPFs on protected corals include accidents.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed operations (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to corals only if the oil contacts the organisms. Due to the distance from the Flower Garden Banks (115.2 miles) and other critical coral habitats, no adverse impacts are expected. The operations proposed in this plan will be covered by Murphy's Regional OSRP (refer to information submitted in **Section 9**).

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact protected corals.

20.7 - Endangered Beach Mice

There are four subspecies of endangered beach mouse that are found in the dune systems along parts of Alabama and northwest Florida. Due to the location of Green Canyon Blocks 389, 432, and 478 and the beach mouse critical habitat (above the intertidal zone), there are no IPFs that are likely to impact endangered beach mice.

20.8 - Navigation

The current system of navigation channels around the northern GOM is believed to be generally adequate to accommodate traffic generated by the future Gulfwide OCS Program. As exploration and development activities increase on deepwater leases in the GOM, port channels may need to be expanded to accommodate vessels with deeper drafts and longer ranges. However, current navigation channels will not be changed, and new channels will not be required as a result of the activities proposed in this plan.

(C) IMPACTS ON PROPOSED ACTIVITIES

The site–specific environmental conditions have been taken into account for the proposed operations. No impacts are expected on the proposed operations from site-specific environmental conditions.

(D) ENVIRONMENTAL HAZARDS

During the hurricane season, June through November, the Gulf of Mexico is impacted by an average of ten tropical storms (39-73 mph winds), of which six become hurricanes (> 74 mph winds). Due to their location in the Gulf, Green Canyon Blocks 389, 432, and 478 may experience hurricane and tropical storm force winds and related sea currents. These factors can adversely impact the integrity of the operations covered by this plan. A significant storm may present physical hazards to operators and vessels, damage exploration or production equipment, or result in the release of hazardous materials (including hydrocarbons). Additionally, the displacement of equipment may disrupt the local benthic habitat and pose a threat to local species.

The following preventative measures included in this plan may be implemented to mitigate these impacts:

1. Platform / structure Installation
   Operator will not conduct platform / structure installation operations during Tropical Storm or Hurricane threat.

2. Pipeline Installation
   Operator will not conduct pipeline installation operations during Tropical Storm or Hurricane threat.

(E) ALTERNATIVES

No alternatives to the proposed operations were considered to reduce environmental impacts.

(F) MITIGATION MEASURES

No mitigation measures other than those required by regulation will be employed to avoid, diminish, or eliminate potential impacts on environmental resources.

(G) CONSULTATION

No agencies or persons were consulted regarding potential impacts associated with the proposed operations. Therefore, a list of such entities has not been provided.

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(I) References

Authors:

ABS Consulting Inc. 2016. 2016 Update of Occurrence Rates for Offshore Oil Spills. July 13, 2016. Contract #E15PX00045, Deliverable 7 (ABS, 2016)

Adcroft, A., R. Hallberg, J.P. Dunne, B.L. Samuels, J. A. Galt, C.H. Barker, and B. Payton. 2010. Simulations of underwater plumes of dissolved oil in the Gulf of Mexico. Geophysical Research Letters, Vol. 37, L18605, 5 pp. doi: 10.1029/2010GL044689. (Adcroft et al., 2010)

American Petroleum Institute (API). 1989. Effects of offshore petroleum operations on cold water marine mammals: a literature review. Washington, DC: American Petroleum Institute. 385 pp.

Andrew, R. K., B. M. Howe, and J. A. Mercer. 2011. Long-time trends in ship traffic noise for four sites off the North American West Coast. Journal of the Acoustical Society of America 129(2):642-651.

Balazs, G.H. 1985. Impact of ocean debris on marine turtles: entanglement and ingestion. In: Shomura, R.S. and H.O. Yoshida, eds. Proceedings, Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, HI. U.S. Dept. of Commerce. NOAA Tech. Memo. NOAA-TM-NMFS-SWFC-54. Pp 387-429.

Burke, C.J. and J.A. Veil. 1995. Potential benefits from regulatory consideration of synthetic drilling muds. Environmental Assessment Division, Argonne National Laboratory, ANL/EAD/TM-43.

Catastrophic Spill Event Analysis: High-Volume, Extended-Duration Oil Spill Resulting from Loss of Well Control on the Gulf of Mexico Outer Continental Shelf, 1st Revision (BOEM 2017-007)

Daly, J.M. 1997. Controlling the discharge of synthetic-based drilling fluid contaminated cuttings in waters of the United States. U.S. Environmental Protection Agency, Office of Water. Work Plan, June 24, 1997.

Engås, A., S. Løkkeborg, E. Ona, and A.V. Soldal. 1996. Effects of seismic shooting on local abundance and catch rates of cod (Gadus morhua) and haddock (Melanogrammusaeglefinus). Canadian Journal of Fisheries and Aquatic Science 53:2238-2249 (Engås et al., 1996)

GOM Deepwater Operations and Activities. Environmental Assessment. BOEM 2000-001.

GOM Central and Western Planning Areas Sales 166 and 168 Final Environmental Impact Statement. BOEM 96-0058.

Gulf of Mexico OCS Oil & Gas Lease Sales: 2017-2022, Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261, Final Multisale Environmental Impact Statement. (BOEM 2017-009)

Haddad, R. and S. Murawski. 2010. Analysis of hydrocarbons in samples provided from the cruise of the R/V Weatherbird II, May 23-26, 2010. U.S. Dept. of Commerce, National Oceanographic and Atmospheric Administration, Silver Spring, MD. 14 pp. (Haddad and Murawski, 2010)

Hansen, D.J. 198l. The relative sensitivity of seabird populations in Alaska to oil pollution. U.S. Dept. of the Interior, Bureau of Land Management, Alaska OCS Region, Anchorage. BLM-YK-ES-81-006-1792.

Hildebrand, J.A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series 395:5-20. Internet website: http://www.int-res.com/articles/theme/m395p005.pdf. (Hildebrand, 2009)

Joint Analysis Group. 2010. Review of R/V Brooks McCall data to examine subsurface oil. 58 pp. (Joint Analysis Group, 2010)

Ladich, F. 2013. Effects of noise on sound detection and acoustic communication in fishes. In: Brumm, H., ed. Animal communication and noise. Berlin Heidelberg: Springer-Ver lag. Pp. 65- (Ladich, 2013)

Laist, D.W. 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe, J.M. and D.B. Rogers, eds. Marine debris: sources, impacts, and solutions. New York, NY: Springer-Verlag. Pp. 99-139.

Lee, K., T. Nedwed, R. C. Prince, and D. Palandro. 2013a. Lab tests on the biodegradation of chemically dispersed oil should consider the rapid dilution that occurs at sea. Marine Pollution Bulletin 73(1):314-318. DOI: 10.1016/j.marpolbul.2013.06.005. (Lee et al., 2013a)

Lee, K., M. Boufadel, B. Chen, J. Foght, P. Hodson, S. Swanson, and A. Venosa. 2015. The Behaviour and Environmental Impacts of Crude Oil Released into Aqueous Environments. https://www.cepa.com/wp-content/uploads/2014/01/OIWReport.compressed.pdf. (Lee et al., 2015)

Lewis, A. and D. Aurand. 1997. Putting dispersants to work: Overcoming obstacles. 1997 International Oil Spill Conference. API 4652A. Technical Report IOSC-004. (Lewis and Aurand, 1997)

Løkkeborg, S., E. Ona, A. Vold, and A. Salthaug. 2012. Sounds from seismic air guns: gear-and species specific effects on catch rates and fish distribution. Canadian Journal of Fisheries and Aquatic Sciences 69:1,278-1,291. (Løkkeborg et al., 2012)

Lubchenco, J., M. McNutt, B. Lehr, M. Sogge, M. Miller, S. Hammond, and W. Conner. 2010. BP Deepwater Horizon oil budget: What happened to the oil? 5 pp. (Lubchenco et al. 2010)

Luksenburg, J. and E. Parsons, 2009. The effects of aircraft on cetaceans: implications for aerial whale watching. Proceedings of the 61st Meeting of the International Whaling Commission.

Majors, A.P. and A.C. Myrick, Jr. 1990. Effects of noise on animals: implications for dolphins exposed to seal bombs in the eastern tropical Pacific purse-seine fishery–an annotated bibliography. NOAA Administrative Report LJ-90-06.

Marine Mammal Commission. 1999. Annual report to Congress – 1998.

McAuliffe, C.D., B.L. Steelman, W.R. Leek, D.F. Fitzgerald, J. P. Ray, and C.D. Barker. 1981. The 1979 southern California dispersant treated research oil spills. In: Proceedings 1981 Oil Spill Conference. March 2-5, 1981, Atlanta, GA. Washington, DC: American Petroleum Institute. Pp. 269-282. (McAuliffe et al, 1981)

McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America 131(1):92-103. (McKenna et al., 2012)

Miller, M. H., and C. Klimovich. 2017. Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi). NMFS.

National Academies of Sciences, Engineering, and Medicine 2020. The Use of Dispersants in Marine Oil Spill Response. Washington, DC: The National Academies Press. https://doi.org/10.17226/25161. (NAS 2020)

National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (NMFS, 2020)

NMFS. 2017b. Biological and Conference Opinion on the Issuance of Permit No. 20465 to NMFS Alaska Fisheries Science Center Marine Mammal Laboratory for Research on Cetaceans. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2017-9186, Silver Spring, Maryland.

NMFS. 2017f. Letter of concurrence on the issuance of Permit No. 20527 to Ann Pabst for vessel and aerial surveys of blue, fin, North Atlantic right, sei, and sperm whales. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2017-9199, Silver Spring, Maryland.

NRC. 2005. Oil Spill Dispersants: Efficacy and Effects. Washington, DC: The National Academies Press. (NRC, 2005)

Patenaude, N. J., W. J. Richardson, M. A. Smultea, W. R. Koski, G. W. Miller, B. Wursig, and C. R. Greene. 2002. Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea. Marine Mammal Science 18(2):309-335.

Piatt, J.F., C.J. Lensink, W. Butler, M. Kendziorek, and D.R. Nysewander. 1990. Immediate impact of the Exxon Valdez oil spill on marine birds. The Auk. 107 (2): 387-397.

Popper, A.N., R.R. Fay, C. Platt, and O. Sand. 2003. Sound detection mechanisms and capabilities of teleost fishes. In: Collin, S.P. and N.J. Marshall, eds. Sensory processing in aquatic environments. New York, NY: Springer-Verlag. Pp. 3-3 (Popper et al., 2003)

Popper, A.N., M.E. Smith, P.A. Cott, B.W. Hanna, A.O. MacGillivray, M.E. Austin, and D.A. Mann. 2005. Effects of exposure to seismic airgun use on hearing of three fish species. Journal of the Acoustical Society of America 117(6):3958-3971. (Popper et al., 2005)

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D.G. Zeddies, and W.N. Tavolga. 2014. ASA S3/SC1. 4 TR -2014 sound exposure guidelines for fishes and sea turtles.

A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI. New York, NY: Springer. 78 pp. (Popper et al., 2014)

Popper, A.N. and M.C. Hastings. 2009. Effects of anthropogenic sources of sound on fishes. Journal of Fish Biology 75:455-498 (Popper and Hastings, 2009)

Radford, A.N., E. Kerridge, and S.D. Simpson. 2014. Acoustic communication in a noisy world: Can fish compete with anthropogenic noise? Behavioral Ecology 00(00):1-9. doi:10.1093/beheco/aru029 (Radford et al., 2014)

Richter, C., S. Dawson, and E. Slooten. 2006. Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand. Marine Mammal Science 22(1):46-63. (Richter et al. 2006)

Silva, M., P.J. Etnoyer, and I.R. MacDonald. 2015. Coral injuries observed at mesophotic reefs after the Deepwater Horizon oil discharge. Deep Sea Research Part II: Topical studies in oceanography. doi: 10.1016/j.dsr2.2015.05.013. (Silva et al., 2015)

Slabbekoorn, H., N. Bouton, I. van Opzeeland, A. Coers, C. ten Cate, and A.N. Popper. 2010. A noisy spring: The impact of globally rising underwater sound levels on fish. Trends in Ecology & Evolution 25:419-427. (Slabbekoorn et al., 2010)

Smultea, M. A., J. J. R. Mobley, D. Fertl, and G. L. Fulling. 2008a. An unusual reaction and other observations of sperm whales near fixed-wing aircraft. Gulf and Caribbean Research 20:75-80.

Tyack, P.L. 2008. Implications for marine mammals of large-scale changes in the marine acoustic environment. Journal of Mammology 89(3):549-558 (Tyack, 2008)

U.S. Dept. of Commerce. National Marine Fisheries Service. 2010b. Final recovery plan for the sperm whale (Physeter macrocephalus). U.S. Dept. of Commerce, National Marine Fisheries Service, Silver Spring, MD. 165 pp. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/recovery/final_sperm_whale_recovery_plan_21dec.pdf (USDOC, NMFS, 2010b)

U.S. Dept. of the Interior. Fish and Wildlife Service. 2011. Endangered Species Act – Section 7 consultation on the construction of a second explosive handling wharf at Bangor Navy Base, Kitsap County. Conducted by the U.S. Dept. of the Interior, Fish and Wildlife Service, Lacey, WA. 137 pp. (USDOI, FWS, 2011)

Vauk , G., E. Hartwig, B. Reineking, and E. Vauk-Hentzelt. 1989. Losses of seabirds by oil pollution at the German North Sea coast. Topics in Marine Biology. Ros, J.D, ed. Scient. Mar. 53 (2-3): 749-754.

Vermeer, K. and R. Vermeer, 1975 Oil threat to birds on the Canadian west coast. The Canadian Field-Naturalist. 89:278-298.

Wardle, C.S., T.J. Carter, G.G. Urquhart, A.D.F. Johnstone, A.M. Ziolkowski, G. Hampson, and D. Mackie. 2001. Effects of seismic air guns on marine fish. Continental Shelf Research21(8):1005-1027 (Wardle et al., 2001)

Wursig, B., S. K. Lynn, T. A. Jefferson, and K. D. Mullin. 1998. Behaviour of cetaceans in the northern Gulf of Mexico relative to survey ships and aircraft. Aquatic Mammals 24(1):41-50.

Wysocki, L.E. and F. Ladich. 2005. Hearing in fishes under noise conditions. Journal of the Association for Research in Otolaryngology 6:28-36. (Wysocki and Ladich, 2005)

Young, C. N., Carlson, J., Hutchinson, M., Hutt, C., Kobayashi, D., McCandless, C.T., Wraith, J. 2016. Status Review Report: oceanic whitetip shark (Carcharhinius longimanus). Final report to the National Marine Fisheries Service, Office of Protected Resourses.:162.

Although not cited, the following were utilized in preparing this EIA:

- Hazard Surveys