UNITED STATES GOVERNMENT MEMORANDUM

August 12, 2024

To: Public Information

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

Subject: Public Information copy of plan

Control #	-	S-8160
Type	-	Supplemental Exploration Plan
Lease(s)	-	OCS-G16759 Block - 596 Green Canyon Area OCS-G16770 Block - 641 Green Canyon Area
Operator	-	Chevron U.S.A. Inc.
Description	–	IN-A,IN-B,IN-C,IN-D,RW-A & RW-B
Rig Type	-	Not Found

Attached is a copy of the subject plan.

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

Henry Emembolu
Plan Coordinator

R. G. Schneider
Assistant Secretary
Asset Development Land Manager

June 24, 2024

Bureau of Ocean Energy Management
GOM Plans Section (MS – GM 235D)
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Attention: Chief, Leasing and Plans

Re: Supplemental Exploration Plan
Green Canyon Area Blocks 596 and 641
Federal Leases OCS-G 16759 and 16770
Offshore Louisiana (Tahiti)

Ladies and Gentlemen:

Chevron U.S.A. Inc. submits for the Bureau of Ocean Energy Management's review and approval this Supplemental Exploration Plan (EP) for the activities involved in drilling, completing, and or abandoning an injector well in the Green Canyon Area, Blocks 596 and 641, OCS-G 16759 and 16770. Multiple locations are included in this EP for the planned drill to provide contingencies for potential re-spuds, sidetracks, and for future drill and completion opportunities. Two potential relief well locations are also included in the plan. We estimate operations on one of the wells listed in the EP could commence as early as September 1, 2024.

Covered are the following:

- One (1) Proprietary Copy in PDF format of the EP
- One (1) Public Information Copy in PDF format of the EP
- One (1) Digital Copy of the proprietary Site Clerance Letters:
- Site Clearance Letter, Proposed Wellsite IN, Block 596 (OCS-G-16759), Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc. ®, Project No. GHZ3246, June 7, 2024.
- Site Clearance Letter, Proposed Wellsite RW-B, Block 596 (OCS-G-16759), Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc. ®, Project No. GHZ3246, June 7, 2024.
- Site Clearance Letter, Proposed Wellsite RW-A, Block 641 (OCS-G-16770), Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc. ®, Project No. GHZ3246, June 7, 2024.
- Pay.gov Receipt included in Proprietary Copy of the EP

Should you have any questions or need additional information, please contact Philip Von Dullen, pvondullen@chevron.com, or call 832-854-3644.

Sincerely,
Chevron U.S.A. Inc.

R. G. Schneider

Assistant Secretary

Chevron U.S.A. Inc.
100 Northpark Blvd.
Covington, LA 70433
Tel 985-773-6996
ryanschneider@chevron.com

SUPPLEMENTAL EXPLORATION PLAN

CHEVRON U.S.A. INC.

GREEN CANYON BLOCK 596 and 641

OCS-G 16759 and 16770

OFFSHORE LOUISIANA

"TAHITI" PROJECT

SECTION A PLAN CONTENTS

SECTION B GENERAL INFORMATION

SECTION C GEOLOGICAL AND GEOPHYSICAL INFORMATION

SECTION D HYDROGEN SULFIDE (H_2S) INFORMATION

SECTION E BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION

SECTION F WASTE AND DISCHARGE INFORMATION

SECTION G AIR EMISSIONS INFORMATION

SECTION H OIL SPILLS INFORMATION

SECTION I ENVIRONMENTAL MONITORING INFORMATION

SECTION J LEASE STIPULATIONS INFORMATION

SECTION K ENVIRONMENTAL MITIGATION MEASURES INFORMATION

SECTION L SUPPORT VESSELS AND AIRCRAFT INFORMATION

SECTION M ONSHORE SUPPORT FACILITIES INFORMATION

SECTION N COASTAL ZONE MANAGEMENT ACT (CZMA) INFORMATION

SECTION O ENVIRONMENTAL IMPACT ANALYSIS (EIA)

SECTION P ADMINISTRATIVE INFORMATION

APPENDIX A ENVIRONMENTAL IMPACT ANALYSIS

PUBLIC INFORMATION

SECTION A PLAN CONTENTS

(a) PLAN INFORMATION FORM

Included at the end of this section is Form BOEM-0137 “OCS Plan Information Form”.

This Supplemental Exploration Plan (EP) describes the proposed activities for Green Canyon (GC) Blocks 596 and 641, Leases OCS-G 16759 and 16770.

Chevron U.S.A. Inc. (Chevron) is the designated operator of the lease in this plan.

Green Canyon Block 596 is part of the GC 640 Unit, Unit Control Number 754306008.

The Tahiti Field discovery wells, GC 640 #1 and #1ST02BP01, were drilled and temporarily abandoned at location “D” in the initial EP N-7157. The GC 640 #1ST02BP01 was completed as the SS001 and produced under the initial Development Operations Coordination Document (DOCD) N-8406 and the revised DOCD R-5101. The GC 640 #1ST01BP00 was drilled and temporarily abandoned in GC Block 641 at location “A” in the initial EP N-7408. The GC 640 #2 ST00BP04 was drilled and temporarily abandoned at location “B” in the initial EP N-7157 and revised EP R-3837. The GC 640 #2 ST00BP04 was completed as the PS001 and produced under the initial DOCD N-8406 and the revised DOCD R-5101. The GC 596 #1 was drilled and temporarily abandoned at location “I” in the revised EP S-6016. The GC 596 #1 was completed as the PN001 and produced under the initial DOCD N-8406 and the revised DOCD R-5101. The remaining PN and PS wells at Tahiti were drilled and completed under initial EP N-7408, initial EP N-7479, supplemental EP S-6016, initial EP N-7157, supplemental EP S-5973, initial DOCD N-8406 and the revised DOCD R-5101.
The GC 640 and 641 Injector wells, IS001 through IS004 were drilled and completed under supplemental EP S-7399, revised EP R-5087, revised EP R-5825, and DOCD S-7447.
The GC 640 PS010 well was drilled and completed in 2016 under plan S-7778. Also under Plan S-7778, the Central Drill Center wells; PC001, PC002, PC003, and PC004, were drilled and completed in 2016 and 2017. The SS002 well was drilled and completed in 2017 and 2018 under Plan S-7839. GC 640 PS011 was drilled in 2019 under plan S-7956.

The Tahiti spar is located in GC 641. The Tahiti spar is not drilling capable.

Chevron plans to use a **Subsea BOP** in the drilling of the wells proposed in this plan.

The activities proposed in this plan will not utilize pile-driving nor is Chevron proposing any new pipelines expected to make landfall in this plan.

Under this Supplemental EP, Chevron proposes to drill and complete an injection well in GC 596, at one of the “IN” locations, IN-A, IN-B, IN-C or IN-D. The additional “IN” locations are for potential respuds, follow up wells or sidetracks. Two (2) additional well locations are included that could be drilled as relief wells if needed, the RW-A in GC 641 and RW-B in GC 596.

Proposed Schedule

The proposed schedule includes drilling, completing, and abandoning any of the IN wells during the time period from September 1, 2024 through December 31, 2029. Each well is anticipated to take no more than 200 days to drill, complete, and/or abandon.

(b) LOCATION
Included as attachment A-2 are location/bathymetry maps at a scale of 1”=2,000’, showing the surface locations and water depth for the proposed wells.

(c) SAFETY and POLLUTION PREVENTION FEATURES
Chevron plans to use dynamically positioned drillships to drill and complete the wells proposed in this plan. The wells will be drilled using a Subsea BOP system. Rig specifications will be provided with the Applications for Permit to Drill. If another rig type is used, any differences regarding air emissions, safety, drilling or pollution control equipment will be addressed in a revised Exploration Plan.

In accordance with 30 CFR 250.406, safety features will include well control, pollution prevention, welding procedure, and blowout prevention equipment and as further clarified by the Bureau of Safety and Environmental Enforcement (BSEE) and the Bureau of Ocean Energy Management (BOEM) Notices to Lessees (NTL’s) and current policy making invoked by BSEE and BOEM.

The rig will be monitored daily by a Chevron drilling representative and any waste or fuel resulting in pollution of the Gulf waters will be reported to the representative in charge for immediate isolation and correction of the problem. Any spill will be reported to governmental agencies in accordance with applicable laws, rules, and regulations. Chevron will comply with all BSEE and BOEM regulations during the course of the activities.

The rig is equipped with safety, fire fighting, and lifesaving equipment required for compliance with USCG, ABS, SOLAS, and IMO code requirements.
Chevron will comply with all pertinent regulations in 30 CFR 250.203, NTL’s, and all applicable federal and state requirements. Chevron will maintain compliance with the EPA NPDES Permit and lease agreement during these proposed activities.

(d) TABLE of STORAGE TANKS and PRODUCTION VESSELS
Information regarding the storage tanks that will be used to conduct the proposed activities in this plan that will store oil is provided in the table below. Only those tanks with a capacity of 25 barrels or more are included.

Storage Tank	Facility Type	Tank Capacity (bbls)	Tanks (no.)	Total Capacity (bbls)	Fluid Gravity (API)
Main Fuel Oil	Drillship	18,000	2	36,000	No. 2 diesel
Diesel Settling		837	2	1,674	
Diesel Day		837	2	1,674	
Emergency Diesel		100	1	100	
Diesel Overflow		823	1	823	
Diesel Oil Drain Aft		42	1	42	
Engine Oil Storage		182	1	182	26.2
Gear Oil Aft		62	1	62	27
Gear Oil Fwd		176	1	176	27
Hydraulic Oil Aft		84	1	84	31
Hydraulic Oil Fwd		87	1	87	31

(f) MEASURES to PREVENT DISCHARGE of OILS and GREASES DURING RAINFALL and ROUTINE OPERATIONS

The drillship is equipped with a comprehensive network of piping, drains and scuppers to minimize the risk that pollutants are discharged into the marine environment.

All drains and drain material are collected in various holding tanks and located in the ship and then processed by the oily water separator systems. Clean water, either from hazardous or nonhazardous sources, may be directed overboard according to regulatory requirements if the effluent discharge is within the environmental limits. Any remaining sludge and oil are directed to the necessary holding tanks for proper disposal according to regulatory requirements.

(g) ADDITIONAL SAFETY, POLLUTION PREVENTION, and EARLY SPILL DETECTION MEASURES

In addition to pollution prevention measures utilized by Chevron, the drillship has a comprehensive, proactive plan to address emergency situations that could result in an unanticipated oil/chemical release. The "Shipboard Oil Pollution Emergency Plan" has specific checklists and procedures to address accidental releases due to fuel/oil transfer, tank overflow, hull leakage, fire, explosion, collision and grounding. This plan is reviewed annually and oil pollution prevention drills are conducted as specified by MARPOL regulations. There is a fully stocked environmental equipment locker located on the main deck, forward of the Moon-pool and numerous spill kits located throughout the main deck. The decks of the drillship are fully contained, a comprehensive scupper management plan in place, and any spills on the deck would be immediately cleaned up using absorbents or permitted solvents.

ATTACHMENTS TO SECTION A

- **A-1-** Form BOEM-0137 "OCS Plan Information Form" – Public Information Copy
- **A-2-** Location/Bathymetry Plats, Scale: 1"=2,000'

OCS PLAN INFORMATION FORM

General Information

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

Company Name: Chevron U.S.A. Inc.	BOEM Operator Number: 00078
Address:	Contact Person: Philip Von Dullen
1500 Louisiana Street	Phone Number: (832) 854-3644
Houston, TX 77002	E-Mail Address: pvondullen@chevron.com

If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid	$13,044	Receipt No.	76753213595

Project and Worst Case Discharge (WCD) Information

Lease(s): G 16759,16770, 20082	Area: GC	Block(s): 596, [illegible]	Project Name (If Applicable): Tahiti

Objective(s)	x	Oil	x	Gas		Sulphur		Salt	Onshore Support Base(s): Leeville , Galliano & Fourchon LA

Platform/Well Name: GC 640 PC004	Total Volume of WCD: 25,638,936 bbls	API Gravity: 31.8
Distance to Closest Land (Miles): 118	Volume from uncontrolled blowout: 338,500 bopd	

Have you previously provided information to verify the calculations and assumptions for your WCD?	x	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	S-07778			
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
Exploration drilling	09/01/2024	12/31/2029	200 days per well
Development drilling			Schedule in Section A of Plan
Well completion	x	x	
Well test flaring (for more than 48 hours)			
Installation or modification of structure			
Installation of production facilities			
Installation of subsea wellheads and/or manifolds			
Installation of lease term pipelines			
Commence production			
Other (Specify and attach description)			

Description of Drilling Rig

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

Drilling Rig Name (If Known):

Description of Structure

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

Description of Lease Term Pipelines

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): IN-A	Previously reviewed under an approved EP or DOCD?		Yes	X	No	
Is this an existing well or structure?		Yes		No X	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 16759	OCS	OCS OCS
Area Name	GREEN CANYON		
Block No.	596		
Blockline Departures (in feet)	N/S Departure: F S L 2537	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 3291	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2372709	X:	X: X: X:
	Y: 9934217	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 21 29.3096	Latitude	Latitude Latitude Latitude
	Longitude W 90 44 36.6025	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4012	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): IN-B	Previously reviewed under an approved EP or DOCD?		Yes	X	No

Is this an existing well or structure?		Yes		No X	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 16759	OCS	OCS OCS
Area Name	GREEN CANYON		
Block No.	596		
Blockline Departures (in feet)	N/S Departure: F S L 2537	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 3291	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2372709	X:	X: X: X:
	Y: 9934217	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 21 29.3096	Latitude	Latitude Latitude Latitude
	Longitude W 90 44 36.6025	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4012	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): IN-C	Previously reviewed under an approved EP or DOCD?		Yes	X	No	
Is this an existing well or structure?		Yes		No X	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 16759	OCS	OCS OCS
Area Name	GREEN CANYON		
Block No.	596		
Blockline Departures (in feet)	N/S Departure: F S L 2537	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 3291	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2372709	X:	X: X: X:
	Y: 9934217	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 21 29.3096	Latitude	Latitude Latitude Latitude
	Longitude W 90 44 36.6025	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4012	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): IN-D		Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	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 16759	OCS	OCS OCS
Area Name	GREEN CANYON		
Block No.	596		
Blockline Departures (in feet)	N/S Departure: F S L 2537	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 3291	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2372709	X:	X: X: X:
	Y: 9934217	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 21 29.3096	Latitude	Latitude Latitude Latitude
	Longitude W 90 44 36.6025	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4012	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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

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

OCS PLAN INFORMATION FORM (CONTINUED)

Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): RW-A	Previously reviewed under an approved EP or DOCD?		Yes	X	No

Is this an existing well or structure?		Yes		No X	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 16770	OCS	OCS OCS
Area Name	GREEN CANYON		
Block No.	641		
Blockline Departures (in feet)	N/S Departure: F N L 3375	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 1405	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2377405	X:	X: X: X:
	Y: 9928305	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 20 29.9422	Latitude	Latitude Latitude Latitude
	Longitude W 90 43 45.7362	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -3980	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): RW-B		Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	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

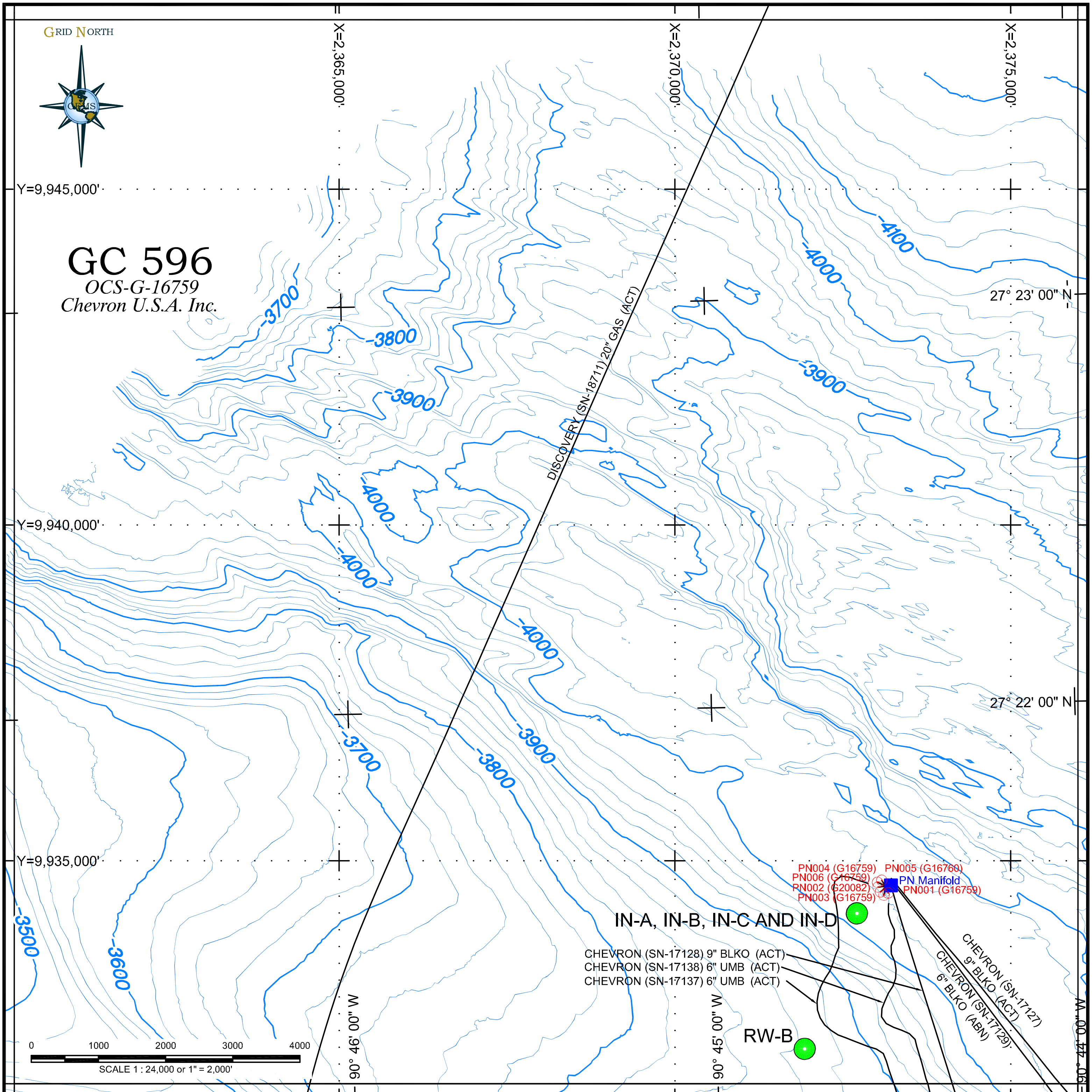
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 16759	OCS	OCS OCS
Area Name	GREEN CANYON		
Block No.	596		
Blockline Departures (in feet)	N/S Departure: F S L 520	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 4069	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2371931	X:	X: X: X:
	Y: 9932200	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 21 29.4825	Latitude	Latitude Latitude Latitude
	Longitude W 90 44 45.6319	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -3864	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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 LOCATION.

EXISTING SEAFLOOR STRUCTURE LOCATION, AS REPORTED BY BOEM.

EXISTING CHEVRON WELL LOCATION, AS REPORTED BY BOEM.

EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.

WATER DEPTH CONTOUR IN FEET. CONTOUR INTERVAL = 20 FEET.

Well Designation and Block	Cartesian Coordinates UTM Zone 15 (ft)		Geographic Coordinates C1866, NAD 1927 (deg., min., sec.)		Block Calls (ft)	
	X	Y	Latitude	Longitude		
IN-A, IN-B, IN-C, IN-D	2,372,709	9,934,217	27° 21' 29.3096" N	90° 44' 36.6025" W	2537 FSL	3291 FWL
RW-B	2,371,931	9,932,200	27° 21' 09.4825" N	90° 44' 45.6319" W	520 FSL	4069 FEL

DATE : 12 JUNE 2024
GRID UNITS: US FEET

PROJECTION: UTM
ZONE: 15 NORTH

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866

PROJECT NO.: GHZ3246

FILE NAME: 3246_PLAT.DWG

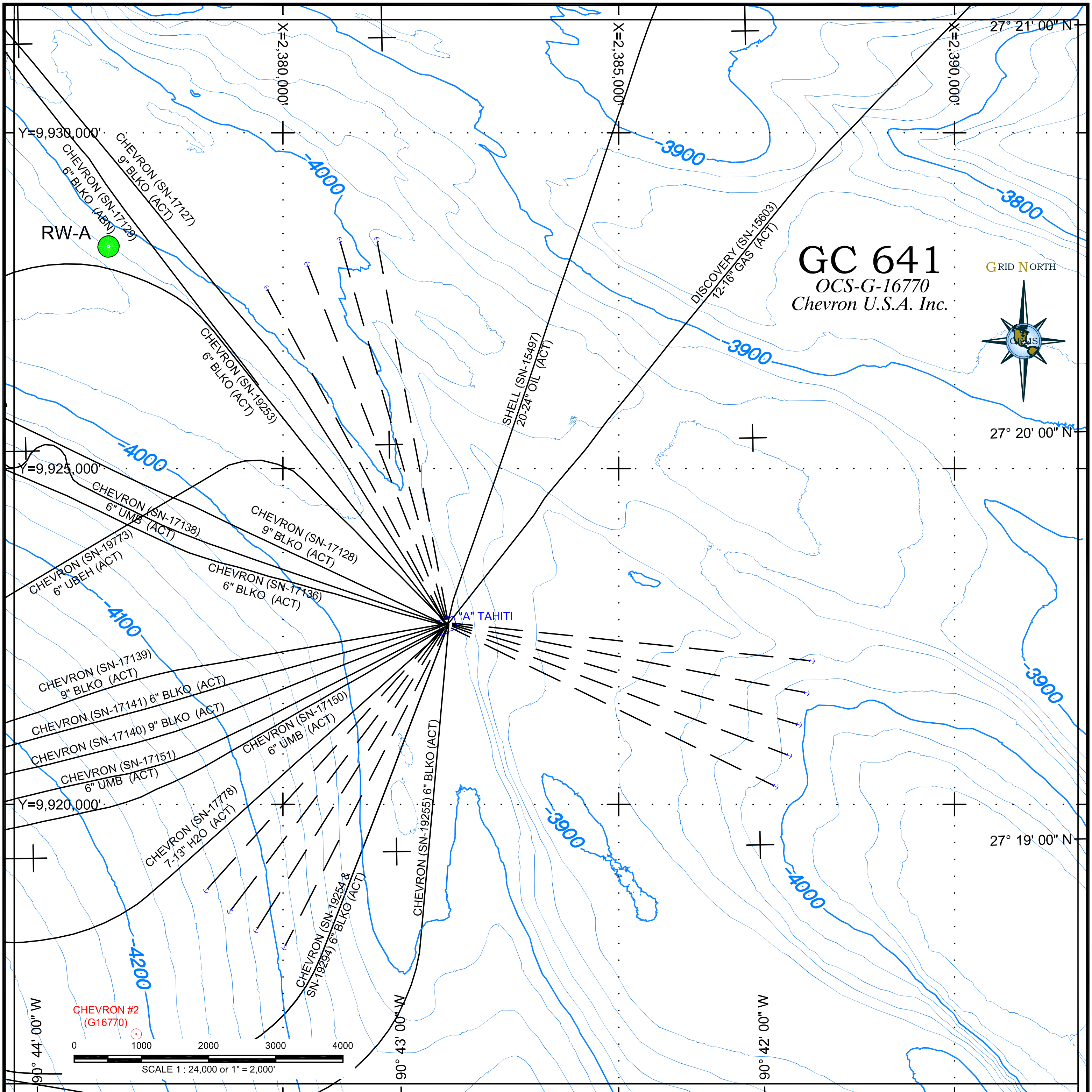
CHEVRON U.S.A. INC.

SURFACE LOCATION PLAT

BLOCK 596
GREEN CANYON AREA
GULF OF MEXICO

GEOSCIENCE EARTH & MARINE SERVICES, INC.
A Geosyntec Company

LOCATION MAP



PROPOSED WELL LOCATION.

EXISTING SEAFLOOR STRUCTURE LOCATION, AS REPORTED BY BOEM.

EXISTING CHEVRON (G20082) WELL LOCATION, AS REPORTED BY BOEM.

EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.

EXISTING ANCHOR AND MOORING LINE.

WATER DEPTH CONTOUR IN FEET. CONTOUR INTERVAL = 20 FEET.

Well Designation and Block	Cartesian Coordinates UTM Zone 15 (ft)		Geographic Coordinates C1866, NAD 1927 (deg., min., sec.)		Block Calls (ft)	
	X	Y	Latitude	Longitude		
RW-A	2,377,405	9,928,305	27° 20' 29.9422 " N	90° 43' 45.7362 " W	3375 FNL	1405 FWL

DATE : 12 JUNE 2024
GRID UNITS: US FEET

PROJECTION: UTM
ZONE: 15 NORTH

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866

PROJECT NO.: GHZ3246

FILE NAME: 3246_PLAT.DWG

CHEVRON U.S.A. INC.

SURFACE LOCATION PLAT

BLOCK 641
GREEN CANYON AREA
GULF OF MEXICO

GEOSCIENCE EARTH & MARINE SERVICES, INC.
A Geosyntec Company

LOCATION MAP

SECTION B GENERAL INFORMATION

(a) APPLICATIONS AND PERMITS
In the table below, information is provided on the filing or approval status of the Federal, State, and local application approvals or permits that must be obtained to conduct the proposed activities. Only those individual or site-specific application approvals that must be obtained are listed.

Application/Permit	Issuing Agency	Status
NPDES Permit	EPA	Approved
EEP	U.S. Coast Guard	To be submitted
APD	BSEE	To be submitted

(b) DRILLING FLUIDS
(1) Information on the types (including chemical constituents) and amounts of the drilling fluids planned for use in drilling the proposed wells:

Type of Drilling Fluid	Est. Volume of Drilling Fluid (bbls/well)
Water based (seawater, brine, freshwater)	44,875
Synthetic based (internal olefin, ester)	28,000
Oil based (diesel, mineral oil)	0

(2) Major Components of Synthetic-based drilling fluid listed above:

Product Name	Amount to be Used	Reference Number	Haz Mat No
Lime (Calcium Hydroxide)	5,955 50-lb bags	SAP # 210265	HM001002
Calcium Chloride	4,230 50-lb bags	SAP # 201174	HM000142
Adapta	2555 50-lb bags	SAP # 388827	HM004609
Suspension Package 1	3,946 50-lb bags	SAP # 102164339	HM007356
Aquagel Gold Seal	50.3 tons	SAP # 200584	HM003470
LE Supermul	52,711 gals	SAP # 201732	HM003680
Rhemod-L	5,392 gals	SAP # 101289484	HM004610
BaraVis 568	7,167 gals	SAP # 1008562	HM003503
Barite 325	5,006 tons	SAP # 959712	HM008002
Encore Base	12,059 bbls	SAP # 377938	HM005313
Baracarb	8,776 50-lb bags	SAP # 201312	HM003484
Barofibre O	1,913 25-lb bags	SAP # 101655984	HM006401
Barofibre	1,521 50-lb bags	SAP # 201600	HM003539
Steelseal	2,474 50-lb bags	SAP # 101618889	HM003768

(e) NEW OR UNUSUAL TECHNOLOGY

No new or unusual technology will be used to carry out the activities proposed in this plan.

(f) BONDING STATEMENT

The bond requirements for the activities and facilities proposed in this EP are satisfied by an area-wide bond, furnished and maintained according to 30 CFR part 556, subpart I (Bonding or Other Financial Assurance). Should BOEM require Chevron to post additional security in accordance with NTL No. 2016-N01 "Requiring Additional Security" or under 30 CFR part 556 subpart I, Chevron will either provide the required additional security or a third party guarantee as soon as possible after receipt of such request from BOEM.

(g) OIL SPILL FINANCIAL RESPONSIBILITY (OSFR)

Chevron U.S.A. Inc., BOEM company number 00078, has demonstrated oil spill financial responsibility for the facilities proposed in this EP according to 30 CFR part 553, and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities."

(h) DEEPWATER WELL CONTROL STATEMENT

Chevron U.S.A. Inc., BOEM company number 00078, has the financial capability to drill a relief well and conduct other emergency well control operations.

(j) BLOWOUT SCENARIO

Assumptions and calculations used in the determination of the Worst Case Discharge Information were included in the confidential copy of Plan S-7778 and approved in that plan. Green Canyon Block 596 is part of the GC 640 Unit, Unit Control Number 754306008.

Estimated flow rate

Systems analysis indicates that an uncontrolled blowout in the 12-1/4" x 13-1/2" open hole section will lead to a maximum Worst Case Discharge Scenario initial flow rate of 338,500 bopd. This rate is based on transient analysis for black oils and gas condensates.

Total volume and maximum duration of the potential blowout

For the purpose of the Worst Case Discharge Scenario, hole collapse and sand bridging are ignored. Due to the complex nature of the retrograde gas condensate fluid, a compositional model was used to calculate the flow rates. Using that rate profile from the model, the Total Potential Spill Volume is estimated at 25,638,936 bbls of oil. The maximum duration of the blowout is estimated at 108 days, the time it would take to kill the blowout well.

Potential for well to bridge over

Although it is highly likely that some sand would be produced under a blowout scenario, Chevron expects that the amount of sand is small enough to be lifted to the seafloor without bridging.

Likelihood for surface intervention to stop the blowout

The likelihood of surface intervention to stop a blowout is based on the equipment specific to the MODU(s) or drillships that will drill the well(s). Chevron's contracted drillships and personnel have the following methods and equipment available to minimize the risk of an incident occurring:

- Maintaining well control
- Deadman / Autoshear functions on the BOP
- Permanently fixed ROV panels on the BOP to allow an ROV to function the BOP via standard hot stab interfaces
- Acoustic Pods on the BOP to function the BOP in the event the primary BOP control system is compromised

In the event of a well blowout, Chevron will act as soon as practical to reduce the overall risk of injury to personnel and damage to the environment and may consider potential actions that may have short term increases in effluent flow in the interest of reducing overall environmental impact or incident escalation. One such action that Chevron would consider is removal of any compromised or damaged equipment that may be restricting our ability to control the effluent flow (a BOP, LMRP, and / or riser) and to allow for installation of the appropriate response equipment (an alternate BOP or capping stack) to assist in controlling the well.

Initial response actions could include, but are not limited to:

- Actions necessary for personnel safety, including evacuation.
- ROV mobilization and tactics, including:
  - Identify the source(s) of hydrocarbon release
  - Assess the post incident geometry of equipment
- Identify existing BOP / LMRP options and / or take action:
  - Status
  - Functionality
  - Actuate rams
  - Disconnection of existing BOP / LMRP / Riser to affect an appropriate connection point for capping / intervention options

There are multiple capping stack alternatives that Chevron will consider to cap and contain a well during a loss of well control event. As a member of the Marine Well Containment Company (MWCC), Chevron has access to MWCC's Interim Containment System. This system can handle pressure up to 15k psi. The Single Ram Capping Stack can ***cap a well*** in deepwater depths up to 10,000 feet. It is engineered to "***cap and flow***" a well in deepwater depths up to 8,000 feet. The system has the capacity to contain 60,000 barrels per day (and 120 million standard cubic feet of gas per day) with potential for expansion and has dispersant injection capability. Through mutual aid agreement by members of MWCC, the interim containment system includes capture vessels under contract to member companies that would be deployed to assist in surface processing and storage of hydrocarbons captured during the event.

In addition to MWCC's capping stacks, Chevron has access to additional capping options through the immediate availability of two complete 18 ¾" 15k BOP stacks, which are held as permanent secondary stacks located on two of Chevron's contracted drillships operating in the Gulf of Mexico. Access to both the MWCC and Chevron specific equipment provides Chevron with increased flexibility in capping and containing a well blowing out. The selection of the appropriate capping method will be dependent upon the incident circumstances.

Time to contract rig, move it onsite and drill relief well

Chevron estimates that it would take ten (10) days to acquire and demobilize a rig, four (4) days to move the rig onsite, and 94 days to drill the relief well, intersect the blowout well, and conduct a kill operation for a total of 108 days.

Availability of a rig to drill a relief well and rig package constraints

Chevron plans to drill the proposed wells in this plan with one of the drillships currently under contract. Chevron has the capability to cease current operations and move one of our contracted drill ships to drill the relief well or contract a rig of opportunity. Our contracted drillships do not have any equipment constraints with respect to drilling a relief well for the project. The relief well would be designed to intercept the blowout well above the 16" casing shoe.

There are no platforms or other infrastructure nearby that would hamper relief well operations. High resolution geophysical AUV data and 3-D seismic data were evaluated to identify surface hazards that might impact the selection of a relief well location. Selection of the actual location would be constrained by typical parameters such as planned inclination, benign water-bottom and salt entry/exit points, wind and current direction and subsurface hazard avoidance. Directional plans for a relief well would be a simple build and hold with a target of less than 40 degrees hole angle. Casing design for the relief well will be similar to that proposed for the wells in this plan.

Measures to enhance the ability to prevent a blowout, reduce the likelihood of a blowout, and conduct effective and early intervention in the event of a blowout

In order for Chevron to address its ability to prevent blowouts, reduce the likelihood of blowouts, and conduct effective/early intervention in the event of a blowout, Chevron has developed standards for well control, personnel safety, and emergency response plans. Chevron has also entered into agreements with industry Subject Matter Experts (SME).

At all times from planning through execution, Chevron takes the necessary steps to maintain primary well control to prevent the occurrence of blowouts as outlined in the Chevron Well Control Guide.

The drilling team works in conjunction with the geological and geophysical operations team and the exploration project team to use their knowledge and good judgment to create the lowest risk well plans and program for any particular prospect. All relevant geological information is used to understand the risks and uncertainties that are unique to the location. Appropriate plans are then generated to eliminate or mitigate the identified risks. Special equipment for contingency plans is sourced and qualified personnel are identified for conducting the various tasks.

Prior to the execution phase, all the well control equipment on the rig undergoes a rigorous inspection and acceptance process/procedure by the Chevron Global Well Intervention group.

To reduce the likelihood of a blowout, appropriate offset information is used to generate pore pressure models that predict localized area pore pressure. Maximum Anticipated Surface Pressure (MASP) is calculated to prevent the BOP equipment from exceeding its working pressure at any time during well construction. Pressure While Drilling (PWD) and Log While Drilling (LWD) data, such as gamma ray, resistivity, sonic, are used during the drilling operation to monitor real time pore pressure variances.

Adjustments can then be made to the mud system to maintain the appropriate overbalance on the pore pressure. Mud tank volumes and trip tank volumes are monitored while drilling for early detection of changes in anticipated trends. Routine maintenance and testing of blowout prevention equipment helps to ensure the equipment is in good working condition during operations. Data sheets and critical wellbore information which are needed in well control situations are maintained at the well site.

There shall be two (2) barriers available during all normal well activities, operations, suspensions, and abandonments to prevent uncontrolled flow from the wellbore to the environment. Prior to removing the Blowout Preventer (BOP) from a well which has hydrocarbons, there will be two mechanical barriers in place.

Preliminary plans are developed for potential relief well locations(s) during the planning phase for the primary well(s). These preliminary plans can be used to develop detailed relief well drilling plans as needed in a timely manner. Two relief well locations have been identified for the primary well location.

In addition to Chevron's contracted resources to assist in the event of a blowout, Chevron is a founding member of the Marine Well Containment Company ("MWCC"), currently has access to

MWCC's Interim Containment Response System ("ICRS"), and will have full access to MWCC's Expanded Containment Response System when it is available. These resources, along with Chevron's own well containment and emergency response planning, give Chevron a high probability of regaining control of a blown out well.

Chevron maintains the "Chevron Interim Well Containment Plan (0128-OFGN-RGL-PLN-DGM-0000-00001)" which guides Chevron's procedures and plans for well containment until the expanded Marine Well Containment System is in place. Additional details for each component of well containment planning can be found in the Chevron Interim Well Containment Plan ("IWCP"), which is available upon request.

Assumptions and calculations used in the determination of the Worst Case Discharge Information were included in the confidential copy of Plan S-7778 and approved with that plan.

SECTION C GEOLOGICAL AND GEOPHYSICAL INFORMATION

(a) GEOLOGICAL DESCRIPTION

Proprietary Information

(b) STRUCTURE CONTOUR MAPS

Proprietary Information

(c) INTERPRETED 2-D AND/OR 3-D SEISMIC LINES

Proprietary Information

(d) GEOLOGICAL STRUCTURE CROSS-SECTION

Proprietary Information

(e) SHALLOW HAZARDS REPORT

Geoscience Earth & Marine Services, Inc. ®, (GEMS) has provided Chevron with the following reports for the Tahiti area:

- "Geologic and Geohazards Site Assessment, Tahiti Development Project, Blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico" Project No. 0103-609
- "Geologic and Stratigraphic Assessment, Blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico" Project No. 1203-751.
- “Integrated Summary Report, Geologic Constraints and Engineering Design Properties, Tahiti development, Green Canyon Area Blocks 596, 640, and 641” Project No. 0504-832c
- “Tahiti Development Area Archaeological Assessment Blocks 595-597, 639-641, & 683-685 Green Canyon Area, Gulf of Mexico” Project No. 0311-1901

Chevron provided a 3-D seismic time volume and high-resolution geophysical data for the geohazard analysis, covering Federal lease blocks 596, 640, and 641 and portions of the adjacent Blocks 551-553, 595, 597-598, 639, 642, and 683-686. The high-resolution data were collected by C & C Technologies, Inc., (C&C) in 2003 using an Autonomous Underwater Vehicle (AUV). The AUV data included 100 kHz side-scan sonar, 2-10 kHz subbottom profiler, 3 m (10 ft) bin multibeam bathymetry, and 1 m (3 ft) bin multibeam backscatter data. The surveyed area encompassed all or portions of Blocks 595-597, 639-641, and 683-685 in Green Canyon Area.

Copies of the GEMS reports were submitted with previously filed EPs and DOCDs.

(f) SHALLOW HAZARDS ASSESSMENT

The site specific clearance letters are based primarily on findings from the reports listed above. The text, maps, and figures included in the site clearance reports provide detail on the regional geology, soil properties, and archaeological assessment of the Study Area.

The site clearance letters comply with the BOEM Notice to Lessees (NTL’s): 2008-G04, 2009-G40, and 2022-G01 with respect to benthic community and shallow hazard assessments.

Digital copies of the proprietary Site Clearance Letters are being submitted with this plan.

(g) HIGH RESOLUTION SEISMIC LINES
The high resolution seismic lines are being replaced by 3-D seismic survey data.

(h) STRATIGRAPHIC COLUMN
A generalized biostratigraphic/lithostratigraphic column from the seafloor to the total depth of the proposed wells in this plan is included as an attachment at the end of this section.

(i) TIME vs. DEPTH TABLE
Due to adequate well control in the area, Chevron feels that a time vs. depth table is not required.

ATTACHMENTS TO SECTION C

- **C- 1, 2, 3, 4:** Depth Structure Contour Maps
- **C-5, 6, 7:** Interpreted 3- D Seismic Sections
- **C-8:** Stratigraphic Column

PROPRIETARY SUBMIISSION TO PLAN:

- Site Clearance Letter, Proposed Wellsite IN, Block 596 (OCS-G-16759), Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc. ®, Project No. GHZ3246, June 7, 2024.
- Site Clearance Letter, Proposed Wellsite RW-B, Block 596 (OCS-G-16759), Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc. ®, Project No. GHZ3246, June 7, 2024.
- Site Clearance Letter, Proposed Wellsite RW-A, Block 641 (OCS-G-16770), Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc. ®, Project No. GHZ3246, June 7, 2024.

A non-proprietary copy of the GEMS site clearance letters for the proposed well surface locations is included below:

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

June 7, 2024 Project No.: GHZ3246

Chevron U.S.A. Inc.
1500 Louisiana
Houston, Texas 77002

Attention: Mr. Phillip Von Dullen III

**Site Clearance Letter,
Proposed Wellsite IN
Block 596 (OCS-G-16759),
Green Canyon Area,
Gulf of Mexico**

Chevron U.S.A. Inc. (Chevron) contracted Geoscience Earth & Marine Services (GEMS) to provide an assessment of the seafloor and shallow geologic conditions to determine the favorability of drilling operations for the proposed location IN, whose surface location is in Block 596 (OCS-G-16759), Green Canyon (GC) Area, Gulf of Mexico. This letter addresses specific seafloor and subsurface conditions around the proposed location to the Top of Salt at a depth of about 1,357 ft below the mudline (bml).

Proposed Wellsite GC 596 IN is located along a relatively benign area of seafloor; however, extensive seafloor and shallow fault offsets exist within about 1,250 ft northeast of the location. Minor seafloor faults also exist as near as 117 ft to the southwest. The faults are a product of diapiric uplift deformation. There are no potential sites for deepwater benthic communities within 2,000 ft of the proposed wellsite. The closest sonar targets are ~143 ft northeast of the wellsite but are not recommended for archaeological avoidance. There is a negligible potential for encountering overpressured sands and negligible to low potential for shallow gas within the limit of investigation based on seismic attributes and amplitude analysis.

This letter provides details specific to the well location, including available data, Notice to Lessees (NTL) requirements, man-made features, and wellsite conditions.

Proposed Well Location

The surface location for the Proposed Wellsite GC 596 IN is in the southeast corner of Block 596 (Figure GC 596 IN-1). Chevron provided the following coordinates:

Table 1. GC 596 IN-1. Proposed Location Coordinates

Proposed Wellsite GC 596 IN			
Spheroid & Datum: Clarke 1866 NAD27 Projection: UTM Zone 15 North		Line Reference	Block Calls (GC 596)
X: 2,372,709 ft	Latitude: 27° 21' 29.3096" N	Inline 1847	3,291 ft FEL
Y: 9,934,217 ft	Longitude: 90° 44' 36.6025" W	Crossline 5092	2,537 ft FSL

Chevron plans to drill this well using a dynamically positioned drilling vessel. GEMS' assessment addresses the seafloor and subsurface conditions within a 2,000 ft radius around the proposed well location.

Available Data

The following discussion is based on findings from the reports listed below:

- Geologic and Geohazards Site Assessment, Tahiti Development Project, Blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico (GEMS, 2003)
- Geologic and Stratigraphic Assessment, Blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico (GEMS, 2004)

- Integrated Summary Report, Geologic Constraints and Engineering Design Properties, Tahiti development, Green Canyon Area Blocks 596, 640, and 641 (GEMS, 2006)
- Tahiti Development Area Archaeological Assessment Blocks 595-597, 639-641, & 683-685 Green Canyon Area, Gulf of Mexico (GEMS, 2011)

The text, maps, and figures included in the reports provide detail on the regional geology, soil properties, and archaeological assessment of the Study Area. For this assessment, GEMS used two sets of geophysical data provided by Chevron: a 3-D exploration seismic time volume and high-resolution (HR) geophysical data. The 3-D seismic data were provided to GEMS in 2003 and cover Blocks GC 596, 640, and 641 (Figure GC596 IN-1).

Proprietary AUV Data. The high-resolution (HR) data were collected by C & C Technologies, Inc., (C&C) in 2003 using an Autonomous Underwater Vehicle (AUV). The AUV data included 100 kHz side-scan sonar, 2-10 kHz subbottom profiler, 3 m (10 ft) bin multibeam bathymetry, and 1 m (3 ft) bin multibeam backscatter data. The surveyed area encompassed all or portions of Blocks 595-597, 639-641, and 683-685 in Green Canyon Area (Figure GC596 IN-1).

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, shallow water flow, shipwrecks, obstructions, and infrastructure (BOEM, 2024a). Regional bathymetry data is from BOEM's deepwater bathymetry grid created from 3-D seismic surveys (BOEM, 2024b).

Subsurface depths at the proposed wellsite were calculated using the following equation, where x is two-way travel time in seconds below the mudline:

$$\text{Depth (feet)} = 425.35 * x^2 + 2459 * x$$

This polynomial was generated from a Chevron velocity gradient and was first used for the Geologic and Stratigraphic Assessment in Blocks 596, 640, and 641 (GEMS, 2003).

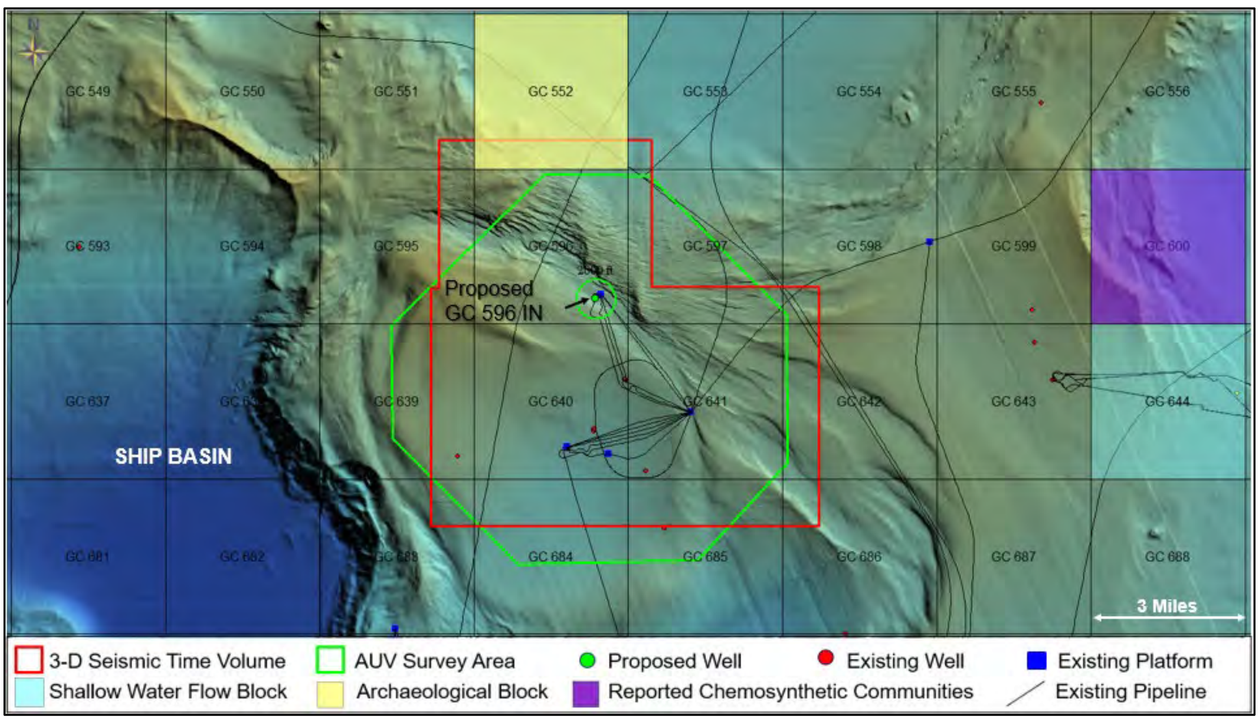


Figure GC 596 IN-1. Seafloor Rendering Showing the Proposed Wellsite Location

Attachments

Wellsite maps are centered on the Proposed Wellsite B and are displayed at a 1 inch = 1,000 ft scale (1:12,000). The maps included in this letter are as follows:

Map No. GC 596 IN-1: Bathymetry Map
Map No. GC 596 IN-2: Seafloor Features Map
Map No. GC 596 IN-3: Side-Scan Sonar Mosaic
Map No. GC 596 IN-4: Seafloor Amplitude Rendering
Map No. GC 596 IN-5: Geologic Features Map

The accompanying illustrations were extracted from the available datasets and are listed below:

Illustration GC 596 IN-1: Portion of Subbottom Profiler Line 318 Showing Near-Surface Conditions Beneath Proposed Wellsite GC 596 IN

Illustration GC 596 IN-2: Portions of Inline 1847 and Crossline 5092 Showing Conditions Beneath Proposed Wellsite GC 596 IN

Illustration GC 596 IN-3: Tophole Prognosis Chart, Proposed Wellsite IN. Surface Location in Green Canyon Area, Block 596

NTL Requirements

The following letter complies with the Bureau of Ocean Energy Management (BOEM) Notices to Lessees (NTL's) 2008-G04, 2009-G40, and 2022-G01, (MMS, 2008, 2010, and BOEM 2022) with respect to benthic community and shallow hazard assessments.

BOEM may require an assessment for potential archaeological resources prior to conducting drilling operations. To satisfy NTL requirements, GEMS completed an archaeological assessment using high-resolution geophysical Autonomous Underwater Vehicle (AUV) survey data. The requirements of NTL 2005-G07 (MMS, 2020), which are applicable for exploration or production activity, have been satisfied and the results were provided in the GEMS archaeological report (GEMS, 2011).

As specified in NTL 2022-G01 (BOEM, 2022), GEMS generated a power spectrum diagram from the 3-D seismic data cube provided by Chevron at the proposed wellsite (Figure GC 596 IN-2). The extraction is generated from the data within a 2,000 ft radius of the proposed well and from the seafloor to Top of Salt. GEMS converted the amplitude vs. frequency spectrum, generated by the IHS software, to power vs. frequency by squaring the amplitude values as described by J. A. Coffeen, 1978. The frequency bandwidth at 50% power ranges between 4 Hz and 63 Hz.

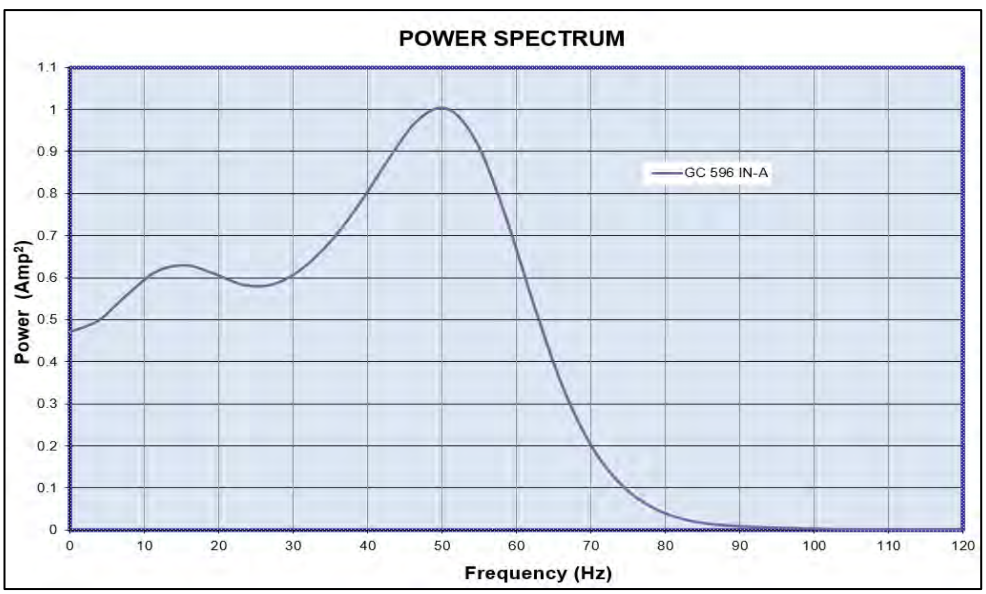


Figure GC 596 IN-2. Power Spectrum Curve (Frequency vs Power)

Man-Made Features

The proposed well GC596 IN is within the Tahiti development area and is about 15,100 ft northwest of the Tahiti truss spar in GC 641. The Tahiti field in GC 596 contains a subsea drill center that is ~580 ft northeast of the proposed location. The drill center is tied back to the floating production facility in GC 641. Oil is exported to the Tahiti truss by two Chevron U.S.A. 9-inch pipelines from 6 existing wells (PN001-PN006) connected to a manifold via 6-inch flying leads. A third 9-inch oil pipeline also exists, but it is listed as abandoned. In addition to the pipelines, there are two 6-inch umbilicals, one to the west and another to the east of the proposed location. The closest existing infrastructure are two umbilicals which lie ~287 west and ~468 ft east of the proposed wellsite, respectively. The closest pipeline lies ~602 ft to the east, and the closest existing well (PN002) is about ~475 ft to the northeast. The other 5 wells at this drill center lie between 485 ft to 615 ft of the proposed location. Maps GC 596 IN-1 through IN-5 illustrate the location of the wells, pipelines, manifold, and drill center nearby the proposed wellsite.

Archaeological Assessment

GEMS archaeologists delineated 68 unidentified contacts in the side-scan scan sonar data within the AUV survey Area (GEMS, 2011). Four of these contacts, Nos. 8, 11, 13, and 14, are located within 2,000 ft of the proposed wellsite location (Table IN-2 and Maps GC596 IN-2, A-3, and A-5). Side-Scan Sonar Contacts #13 and #14 are the closest to the proposed wellsite and lie ~143 ft to the northeast. Side-Scan Sonar Contact #11 lies ~667 ft to the northwest and Contact #8 is ~1,450 ft to the north. The sonar contacts do not have an acoustic signature indicative of archaeological resources. Based on the archaeological review of available AUV data, the Area of Potential Effect around the proposed IN wellsite location appears clear of archaeological resources. The unidentified sonar contacts likely represent modern debris associated with shipping, exploratory drilling, pipelay operation and construction, or storm events (GEMS, 2011).

Table IN-2. Side-Scan Sonar Contacts within 2,000 ft of Proposed Wellsite F

CONTACT	AREA/BLOCK	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	DESCRIPTION	X NAD 27 (FT)	Y NAD 27 (FT)	DISTANCE / DIRECTION FROM SITE
8	GC 596	8.13	3.04	0	Irregular	2,372,834.13	9,935,662.31	143 ft NE
11	GC 596	13.19	2.03	0	Linear	2,372,288.76	9,934,735.44	143 ft NE
13	GC 596	19.78	3.04	0	Linear	2,372,818.48	9,934,309.46	667 ft NW
14	GC 596	5.58	4.06	0	Irregular	2,372,813.99	9,934,315.17	1,450 ft N

The unidentified contacts have the standard 100 ft geohazard avoidance as prescribed in the BOEM guidelines (BOEM, 2022). If any wood, ceramics, textiles or ferrous objects become exposed during any bottom disturbing operations, all activities must be halted and BOEM notified within 48 hours.

Wellsite Conditions

The surface location occurs within a structural low bounded by salt-cored high to the northeast and a relatively flat-topped plateau to the southwest. A large fault system trend northwest to southeast between the highs. Several seafloor and shallow buried faults are within 2,000 ft of the proposed wellsite. The seafloor expressions of the faults nearest the wellsite are relatively minor but become more significant to the northeast. The seafloor is relatively smooth and featureless in the immediate vicinity of the proposed wellsite. The shallow stratigraphy will consist of interbedded hemipelagic clays, turbidites, and mass-transport deposits composed of generally clays and silts with some interspersed thin sands (Illustrations GC596 IN-1 to IN-3).

Water Depth and Seafloor Conditions. The water depth at the location is -4,012 ft below sea level (Map GC 596 IN-1). The seafloor slopes about 1.5˚ to the northeast. The seafloor morphology appears smooth at the proposed surface location. There are no indications of hard bottom areas, seep, or expulsion features within 2,000 ft of the location. Deepwater benthic communities are not expected at the proposed wellsite. The seafloor and surficial sediments consist of very soft to soft clay and silty clay.

Several seafloor faults lie to the southwest, south, east, and northeast of the proposed location. The faults trend northwest to southeast and have variable offset. The nearest seafloor fault to the proposed location lies ~117 ft to the southwest (Maps GC 596 IN-2 and A-5). The seafloor fault is downthrown to the northeast towards the proposed wellsite. Seafloor slopes along this fault scarp are only about 5° and the seafloor offset is approximately 2 ft to 3 ft Illustration GC 596 IN-1). The wellbore at this location will intersect two seafloor faults, one at about 196 ft and another at 741 ft below mud line (bml).

The side-scan sonar reflectivity and low seafloor amplitude response within a 2,000 ft radius of the proposed wellsite suggest the seabed is covered by very soft to soft clays (Maps GC 596 IN-3 and IN-4). A weakly stratified, low-amplitude drape-like layer, about 10 ft thick, occurs at the seafloor around proposed wellsite. The drape represents hemipelagic silty clays that are soft and have high water contents (Illustration GC 596 IN-1).

Deepwater Benthic Communities. No features or areas were interpreted within 2,000 ft of the proposed location that can support high-density chemosynthetic or other deepwater benthic communities. There are no apparent geophysical indicators and/or geologic features at the seafloor or within the subbottom profiler record that would suggest conditions capable of supporting high-density deepwater benthic communities at the proposed wellsite or within the 2,000 ft radius (Maps GC 596 IN-2 through F-4). The side-scan sonar mosaic and multibeam backscatter indicate a uniformly textured seabed near the proposed location. The generally low reflectivity suggests normal Gulf of Mexico surficial sediments. No water bottom anomalies, as defined by BOEM, occur within 2,000 ft of the proposed location (BOEM, 2024c). In addition, the amplitude-enhanced seafloor rendering extracted from the 3-D dataset does not show any high amplitudes near Proposed Wellsite IN (Map GC 596 IN-4). BOEM and BSEE have not reported the existence of high-density deepwater benthic communities within Federal lease Block GC 596 (MMS, 2010).

Stratigraphy. Stratigraphic conditions from the subbottom profiler and 3-D seismic data are shown on Illustrations GC 596 IN-1 through IN-3. The seafloor, 4 horizons (Horizons 120 250, 500 and 900), and the Top of Salt (ToS) were mapped within the suprasalt stratigraphy to define five sediment units (Units 1-5) within the Study Area (GEMS, 2003 and 2004). Inferences from the seismic facies analysis suggest the stratigraphic section beneath the wellsite is characterized by hemipelagic clays, turbidites, and mass-transport deposits containing a mixture of clays, silts, and sands.

The subbottom profiler data define the upper 236 ft of sediments beneath the mudline around the proposed wellsite (Illustration GC596 IN-1). The uppermost 10 ft of sediment at the well is a drape consisting of very soft, high water content clays. The sediments beneath the drape to the limit of the subbottom penetration will consist primarily of hemipelagic clays and silty clays. Standard piston and box cores collected in the area penetrated normally consolidated clays. Soil Boring BH-3 collected at anchor cluster #1 in the southwestern portion of GC 641, encountered normally consolidated clays with shear strengths increasing from very soft at the seafloor to very stiff at 300 ft bml (GEMS, 2006). The BH-3 soil boring lies approximately three miles to the south-southeast of the proposed location.

Units 1 and 2 (Seafloor to Horizon 2). The seismic sequence between the seafloor and Horizon 250 (0 ft to 275 ft bml) consist of low-amplitude, mostly layered reflections. These reflections represent hemipelagic clays and silty clays interbedded with muddy turbidites and thin, mud and clay rich MTDs.

Unit 3 (Horizon 250 to Horizon 500). The seismic sequence between Horizon 250 and Horizon 500 (275 ft to 698 ft bml) consists of low- to moderate- amplitude, continuous to discontinuous reflections (Illustrations GC596 IN-2 and IN-3). These reflections probably represent alternating clay-rich turbidities, interbedded with clay-rich mass-transport deposits.

Unit 4 (Horizon 500 to Horizon 900). The seismic stratigraphy between Horizon 500 and Horizon 900 (698 ft to 1,178 ft bml) consists of moderate-amplitude, continuous reflectors alternating with low- to moderate-amplitude, discontinuous to chaotic intervals (Illustrations GC596 IN-2 and IN-3). These reflections represent predominately turbidites consisting of clays, silts, and thin sands layers. Interval is disrupted and deformed by the underlying salt.

Unit 5 (Horizon 900 to Top of Salt). The seismic sequence below Horizon 900 (Unit 5) is relatively thin at the proposed location, measuring about 179 ft in thickness. The unit consists of mostly low-amplitude, discontinuous to chaotic reflections representing interlayered turbidities and mass-transport deposits (Illustrations GC596 IN-2 and IN-3). The sediments consist of clays and silts; however, sand content may increase compared to overlying units.

The Top of Salt at the base of Unit 5 is approximately 1,357 ft bml (Illustration GC596 IN-3). The salt surface dips to the southwest at about 25°.

Faults. Subbottom profiler and 3-D data indicate a vertical wellbore at the proposed surface location is expected to penetrate three faults, two seafloor and one buried, above the salt interface (Illustrations GC 596 IN-1, IN-2, and IN-3). The shallowest seafloor fault intersection occurs at about 196 ft bml (Illustration GC 596 IN-1). The surface location lies about 117 ft to the southwest. Another seafloor fault will be penetration at about 741 ft bml. The surface location of this seafloor fault lies about 685 ft to the southwest. Both faults trend northwest to southeast and are offset to the northeast (Maps GC 596 IN-2 and IN 3). The buried fault also trends northwest to southeast and is offset to the southwest. The fault plane will be intersected at about 438 ft bml.

There is no geophysical evidence to suggest the faults are an active pathway for fluid/gas migration (Illustrations GC 596 IN-1, IN-2, and IN-3). Loss of circulation may occur across these fault planes.

Many small undifferentiated faults (below the resolution of the 3-D seismic data) probably exist within the suprasalt stratigraphy at this location. Such highly faulted intervals represent potential zones of borehole instability or drilling fluid loss.

Shallow Gas and Shallow Water Flow. Significant shallow gas is not expected within the shallow sediments from the seafloor to the Top of Salt (1,357 ft bml), Illustration GC 596 -IN-3. The potential for shallow water flow is considered negligible to low.

<u>Shallow Gas</u>. There are no apparent subsurface amplitude anomalies or other direct hydrocarbon indicators directly beneath the proposed location (Map GC 596 IN-5). No high-amplitude events are mapped within 2,000 ft of the proposed wellsite. The potential for encountering shallow gas is considered negligible in the clay-prone stratigraphic units from the seafloor to 698 ft bml. A "low" potential for shallow gas is attributed to the bedded turbidite and mass-transport intervals from about 698 ft to the top of salt 1,357 ft bml.

<u>Shallow Water Flow</u>. The potential for shallow water flow at this well location from the Seafloor to Top of Salt, 1,357 ft bml is considered negligible based on the lack of regionally extensive sand-prone complexes in the shallow section and the lack of reported water flow incidents from the nearby existing wells (BOEM, 2024d). The nearest reported occurrence of shallow waterflow is ~12.5 miles to the east in GC 644. Minor flow was encountered in the Anadarko #1 well ~638 ft bml (4,930 ft bsl). The well was drilled to completion. The current status of the well is listed as plugged and abandoned (BOEM, 2024a).

Results

The Proposed Wellsite IN in block 596, Green Canyon Area, appears geologically suitable for exploration drilling operations; however, we advise using caution while drilling through the seafloor and buried fault intervals at 196 ft bml, 438 ft, and 741 ft bml. Faults are potential zones for the loss in drilling fluids. Drillers should be aware that the intersection with the shallowest seafloor fault occurs within the foundation zone of the conductor at ~196 ft bml, and the intersection of the underlying salt is at a relatively steep (~25°).

There is a negligible to low potential for encountering shallow gas within the limit of investigation. There is a negligible potential for encountering shallow waterflow within the same interval.

Engineers should be aware of the location of several pipelines, umbilicals, and wells within 2,000 ft of the proposed well. In addition, four sonar contacts are located within 2,000 ft of the proposed location. We recommend a 100-ft hazards avoidance around any mapped contacts. Should any potentially historic materials such as textiles, wood, ceramics, or other items be discovered during exploration activities, all operations must cease, and BOEM/BESS be notified within 48 hours.

Closing

We appreciate the opportunity to be of service to Chevron U.S.A. and look forward to working together on future projects.

Sincerely,

GEOSCIENCE EARTH & MARINE SERVICES

John Hoffman.
Snr. Consulting Geoscientist

Daniel Lanier
Sr. Principal, GEMS

Erin Janes
Principal/Snr. Geoscientist

Kimberly L. Faulk, MA
Principal/Sr. Marine Archaeologist

Attachments (5 Maps and 3 Illustrations)

Distribution: Mr. Phillip Von Dullen III, Chevron U.S.A. Inc., Houston, TX (Digital Final)

REFERENCES

Bureau of Ocean Energy Management (BOEM), 2020, 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. NTL re-issued by BOEM in 2020.

Bureau of Ocean Energy Management (BOEM) 2022, Notice to lessees and operators of federal oil, gas, and sulphur leases in the outer continental shelf, Gulf of Mexico region, Shallow Hazards Program, NTL 2022-G01. Effective Date October 1, 2022.

Bureau of Ocean Energy Management (BOEM), 2024a, ASCII Data Files, published on the BOEM Gulf of Mexico Region Homepage, https://www.data.boem.gov/Main/Default.aspx, assessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024b, BOEM northern Gulf of Mexico deepwater bathymetry grid from 3D seismic, https://boem.gov/Gulf-of-Mexico-Deepwater-Bathymetry/, assessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024c, Seismic water bottom anomalies map gallery, published on the BOEM Gulf of Mexico Region web page, http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Map-Gallery/Seismic-Water-Bottom-Anomalies-Map-Gallery.aspx, assessed April, 2024..

Bureau of Ocean Energy Management (BOEM), 2024d, Safety performance review – shallow waterflows can pose significant hazards to deepwater drilling, published on the BOEM Gulf of Mexico Region Homepage, http://www.boem.gov/Oil-and-Gas-Energy-Program/Resource-Evaluation/Geological-and-Geophysical-Reviews/Reviews-Gulf-of-Mexico.aspx, assessed April, 2024.

Coffeen, J. A., 1978, Seismic Exploration Fundamentals: Tulsa, the Petroleum Publishing Co., p. 125.

GEMS, 2003, Geologic and geohazards site assessment, Tahiti development project, blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc., Project No. 0103-609.

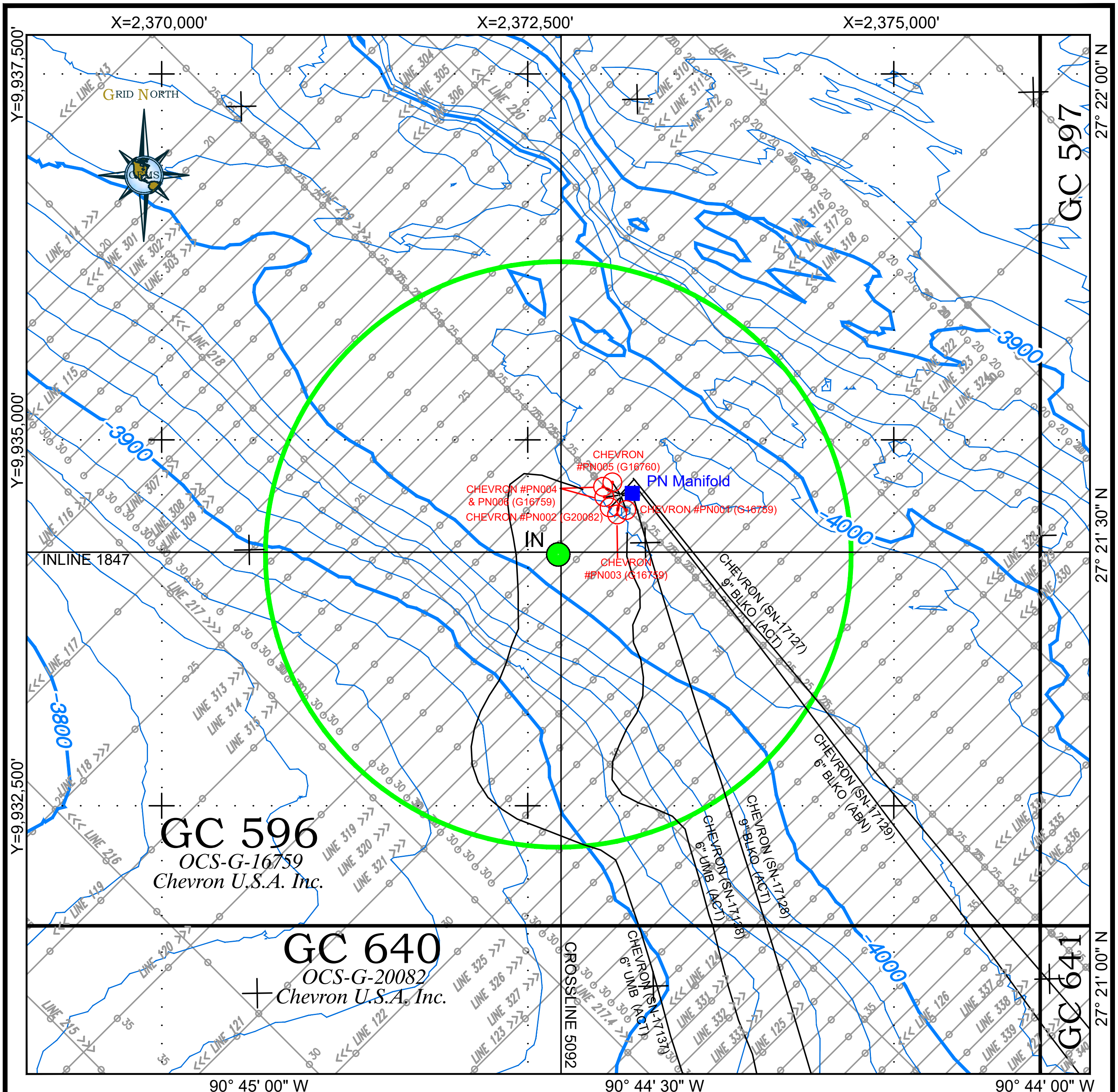
GEMS, 2004, Geologic and stratigraphic assessment, blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth and Marine Services, Inc., Project No. 1203-751.

GEMS, 2006, Integrated summary report, geologic constraints and engineering design properties, Tahiti development, Green Canyon Area, blocks 596, 640, and 641, Geoscience Earth and Marine Services, Inc., Project No. 0504-832c.

GEMS, 2011, Tahiti development area, archaeological assessment, blocks 595-597, 639-641, and 683-685, Green Canyon Area, Gulf of Mexico, May 2011, Geoscience Earth and Marine Services, Inc., Project No. 0311-1901.

Minerals Management Service (MMS), 2008, 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, 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.

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.



3-D SURVEY LINE.

AUV SURVEY LINE.

EXISTING STRUCTURE LOCATION, AS REPORTED BY BOEM.

EXISTING WELL LOCATION, AS REPORTED BY BOEM.

EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.

PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.

WATER DEPTH CONTOUR IN FEET, CONTOUR INTERVAL 20 FT.

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

NOTE: BATHYMETRY DERIVED FROM THE MULTIBEAM BATHYMETRY DATASET COLLECTED IN 2003.

Chevron

CHEVRON U.S.A. INC.

BATHYMETRY MAP

BLOCK 596
GREEN CANYON AREA
GULF OF MEXICO

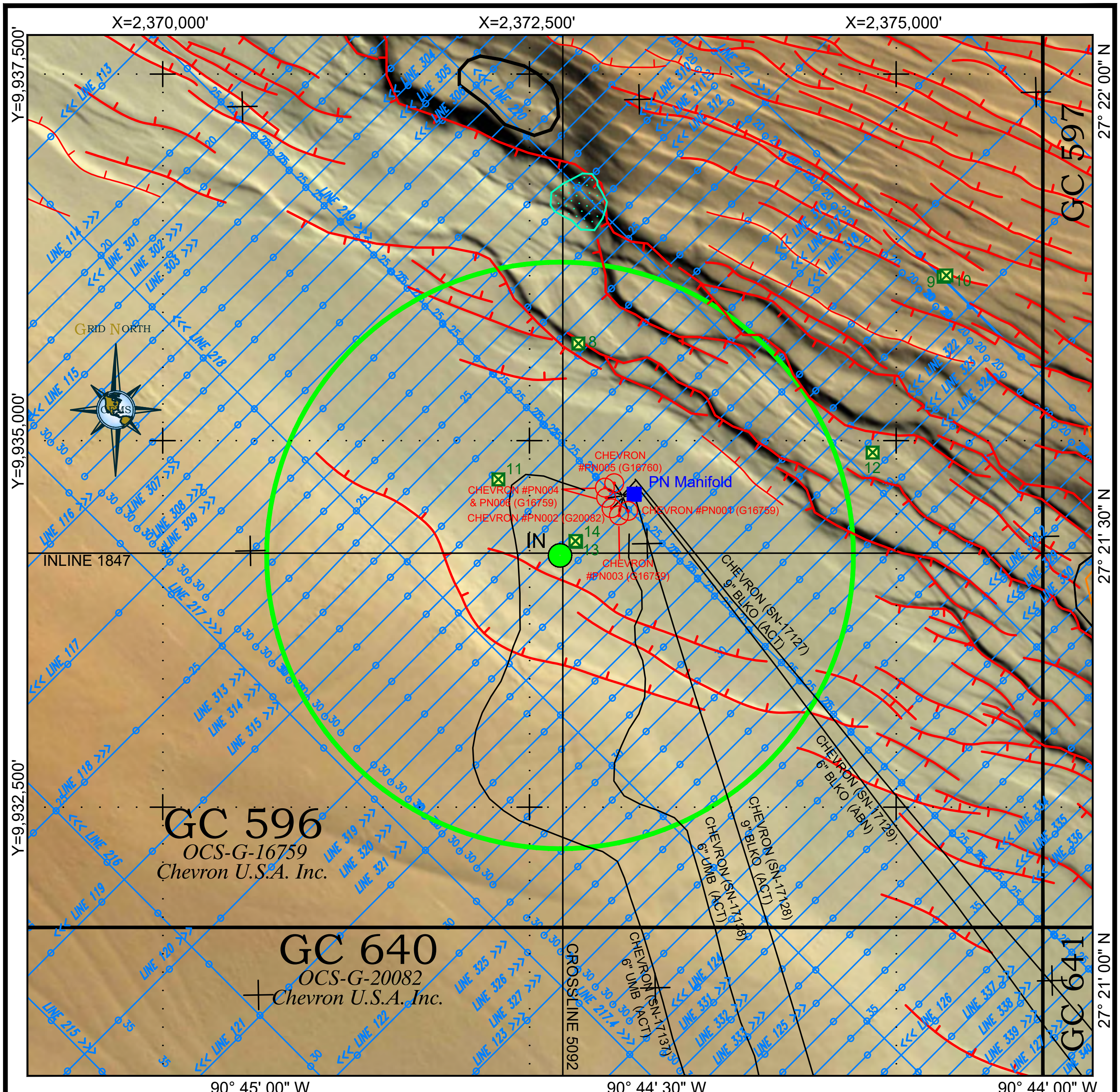
0 500 1000 1500 2000

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

GEOSCIENCE EARTH & MARINE SERVICES, INC.
GEMS
A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 596 IN-1



	3-D SURVEY LINE.
	AUV SURVEY LINE.
	EXISTING STRUCTURE LOCATION, AS REPORTED BY BOEM.
	EXISTING WELL LOCATION, AS REPORTED BY BOEM.
	EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
	PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.
	SIDE-SCAN SONAR TARGET (GEMS, 2011).
	SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.
	AREAS OF POSITIVE ANOMALIES AS REPORTED BY BOEM (2024c).
	EVIDENCE OF POSSIBLE CARBONATE OR HYDRATE MOUNDS -CHEMOSYNTHETICS COULD BE ASSOCIATED.
	FLUID EXPULSION AREAS.

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

NOTE: RENDERING DERIVED FROM THE MULTIBEAM BATHYMETRY DATASET COLLECTED IN 2003.

AZIMUTH =60°
ELEVATION = 55°
V.E. = 4x

-3425 -5050
RELATIVE WATER DEPTH

CHEVRON U.S.A. INC.

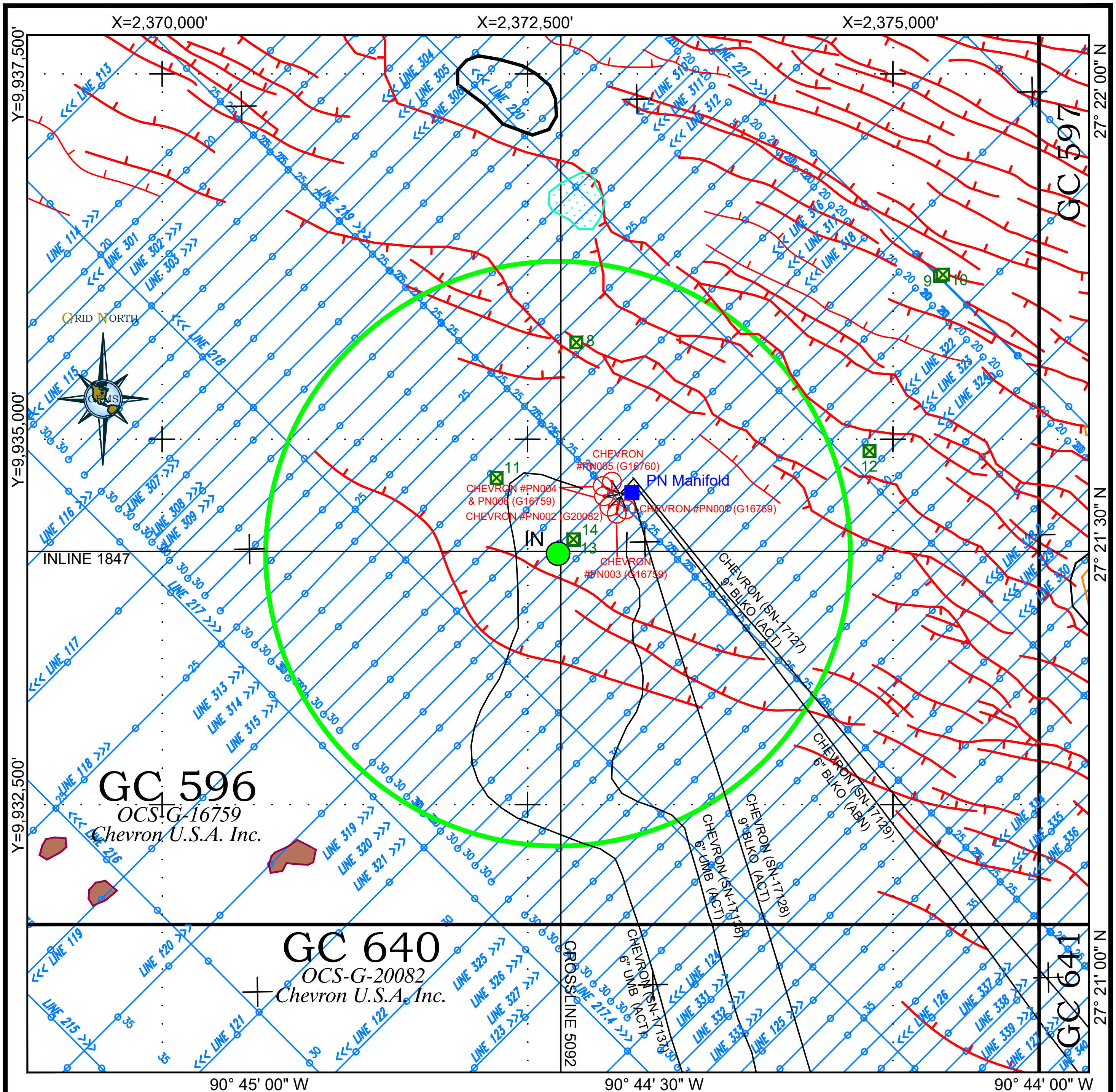
SEAFLOOR FEATURES MAP
BLOCK 596
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000
SCALE 1 : 12,000 or 1" = 1,000'

GEOSCIENCE EARTH & MARINE SERVICES, INC.
A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 596 IN-2



	3-D SURVEY LINE.
	AUV SURVEY LINE.
	EXISTING STRUCTURE LOCATION, AS REPORTED BY BOEM.
	EXISTING WELL LOCATION, AS REPORTED BY BOEM.
	EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
	PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.
	SIDE-SCAN SONAR TARGET (GEMS, 2011).
	SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.
	AREAS OF POSITIVE ANOMALIES AS REPORTED BY BOEM (2024c).
	EVIDENCE OF POSSIBLE CARBONATE OR HYDRATE MOUNDS -CHEMOSYNTHETICS COULD BE ASSOCIATED.
	FLUID EXPULSION AREAS.
	AMPLITUDE ANOMALIES BETWEEN THE HORIZON 900 AND TOP OF SALT.

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

CHEVRON
U.S.A. INC.

GEOLOGIC FEATURES MAP

BLOCK 596
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000
SCALE 1 : 12,000 or 1" = 1,000'

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 596 IN-5

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

June 7, 2024 Project No.: GHZ3246

Chevron U.S.A. Inc.
1500 Louisiana
Houston, Texas 77002

Attention: Mr. Phillip Von Dullen III

Site Clearance Letter,
Proposed Wellsite RW-A
Block 641 (OCS-G-16770),
Green Canyon Area,
Gulf of Mexico

Chevron U.S.A. Inc. (Chevron) contracted Geoscience Earth & Marine Services (GEMS) to provide an assessment of the seafloor and shallow geologic conditions to determine the favorability of drilling operations for the proposed location RW-A, whose surface location is in Block 641 (OCS-G-16770), Green Canyon (GC) Area, Gulf of Mexico. This letter addresses specific seafloor and subsurface conditions around the proposed location to the Top of Salt at a depth of about 1,798 ft below the mudline (bml).

Proposed Wellsite GC 641 RW-A is located along a relatively benign area of seafloor; however, extensive seafloor and shallow fault offsets exist within about 2,000 ft northeast of the location. Minor seafloor faults exist as near as 902 ft to the northeast. The faults are the product of diapiric uplift deformation. There are no potential sites for deepwater benthic communities within 2,000 ft of the proposed wellsite. The closest sonar target is over 2,750 ft northwest of the proposed wellsite. It is not recommended for archaeological avoidance. There is a negligible to low potential for encountering overpressured sands and shallow gas within the limit of investigation based on seismic attributes and amplitude analysis.

This letter provides details specific to the well location, including available data, Notice to Lessees (NTL) requirements, man-made features, and wellsite conditions.

Proposed Well Location

The surface location for the Proposed Wellsite GC 641 RW-A is in the northwest corner of Block 641 (Figure GC 641 RW-A-1). Chevron provided the following coordinates:

Table 1. GC 641 RW-A-1. Proposed Location Coordinates

Proposed Wellsite GC 641 RW-A			
Spheroid & Datum: Clarke 1866 NAD27 Projection: UTM Zone 15 North		Line Reference	Block Calls (GC 641)
X: 2,377,405 ft	Latitude: 27° 20' 29.9422" N	Inline 1937	1,405 ft FWL
Y: 9,928,305 ft	Longitude: 90° 43' 45.7362" W	Crossline 5206	3,375 ft FNL

Chevron plans to drill this well using a dynamically positioned drilling vessel. GEMS' assessment addresses the seafloor and subsurface conditions within a 2,000 ft radius around the proposed well location.

Available Data

The following discussion is based on findings from the reports listed below:

- Geologic and Geohazards Site Assessment, Tahiti Development Project, Blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico (GEMS, 2003)
- Geologic and Stratigraphic Assessment, Blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico (GEMS, 2004)

- Integrated Summary Report, Geologic Constraints and Engineering Design Properties, Tahiti development, Green Canyon Area Blocks 596, 640, and 641 (GEMS, 2006)
- Tahiti Development Area Archaeological Assessment Blocks 595-597, 639-641, & 683-685 Green Canyon Area, Gulf of Mexico (GEMS, 2011)

The text, maps, and figures included in the reports provide detail on the regional geology, soil properties, and archaeological assessment of the Study Area. For this assessment, GEMS used two sets of geophysical data provided by Chevron: a 3-D exploration seismic time volume and high-resolution (HR) geophysical data. The 3-D seismic data were provided to GEMS in 2003 and cover Blocks GC 596, 640, and 641 (Figure GC 641 RW-A-1).

Proprietary AUV Data. The high-resolution (HR) data were collected by C & C Technologies, Inc., (C&C) in 2003 using an Autonomous Underwater Vehicle (AUV). The AUV data included 100 kHz side-scan sonar, 2-10 kHz subbottom profiler, 3 m (10 ft) bin multibeam bathymetry, and 1 m (3 ft) bin multibeam backscatter data. The surveyed area encompassed all or portions of Blocks 595-597, 639-641, and 683-685 in Green Canyon Area (Figure GC 641 RW-A-1).

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, shallow water flow, shipwrecks, obstructions, and infrastructure (BOEM, 2024a). Regional bathymetry data is from BOEM's deepwater bathymetry grid created from 3-D seismic surveys (BOEM, 2024b).

Subsurface depths at the proposed wellsite were calculated using the following equation, where x is two-way travel time in seconds below the mudline:

$$\text{Depth (feet)} = 425.35 * x^2 + 2459 * x$$

This polynomial was generated from a Chevron velocity gradient and was first used for the Geologic and Stratigraphic Assessment in Blocks 596, 640, and 641 (GEMS, 2003).

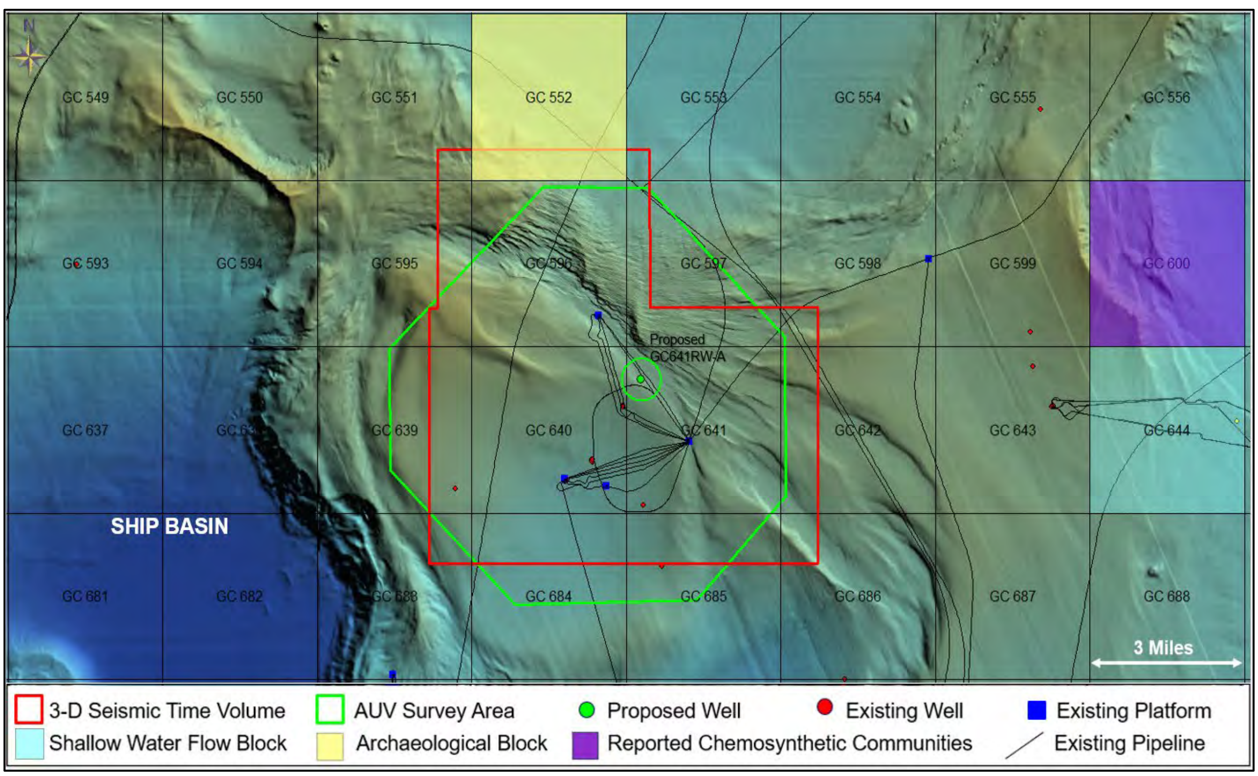


Figure GC 641 RW-A-1. Seafloor Rendering Showing the Proposed Wellsite Location

Attachments

Wellsite maps are centered on the Proposed Wellsite RW-A and are displayed at a 1 inch = 1,000 ft scale (1:12,000). The maps included in this letter are as follows:

Map No. GC 641 RW-A-1: Bathymetry Map
Map No. GC 641 RW-A-2: Seafloor Features Map
Map No. GC 641 RW-A-3: Side-Scan Sonar Mosaic
Map No. GC 641 RW-A-4: Seafloor Amplitude Rendering
Map No. GC 641 RW-A-5: Geologic Features Map

The accompanying illustrations were extracted from the available datasets and are listed below:

Illustration GC 641 RW-A-1: Portion of Subbottom Profiler Line 352 Showing Near-Surface Conditions Beneath Proposed Wellsite GC 641 RW-A

Illustration GC 641 RW-A-2: Portions of Inline 1937 and Crossline 5206 Showing Conditions Beneath Proposed Wellsite GC 641 RW-A

Illustration GC 641 RW-A-3: Tophole Prognosis Chart, Proposed Wellsite RW-A. Surface Location in Green Canyon Area, Block 641

NTL Requirements

The following letter complies with the Bureau of Ocean Energy Management (BOEM) Notices to Lessees (NTL's) 2008-G04, 2009-G40, and 2022-G01, (MMS, 2008, 2010, and BOEM, 2022) with respect to benthic community and shallow hazard assessments.

BOEM may require an assessment for potential archaeological resources prior to conducting drilling operations. To satisfy NTL requirements, GEMS completed an archaeological assessment using high-resolution geophysical Autonomous Underwater Vehicle (AUV) survey data. The requirements of NTL 2005-G07 (BOEM, 2020), which are applicable for exploration or production activity, have been satisfied and the results were provided in the GEMS archaeological report (GEMS, 2011).

As specified in NTL 2022-G01 (BOEM, 2022), GEMS generated a power spectrum diagram from the 3-D seismic data cube provided by Chevron at the proposed wellsite (Figure GC 641 RW-A-2). The extraction is generated from the data within a 2,000 ft radius of the proposed well and from the seafloor to Top of Salt. GEMS converted the amplitude vs. frequency spectrum, generated by the IHS software, to power vs. frequency by squaring the amplitude values as described by J. A. Coffeen, 1978. The frequency bandwidth at 50% power ranges between 10.8 Hz and 62.5 Hz.

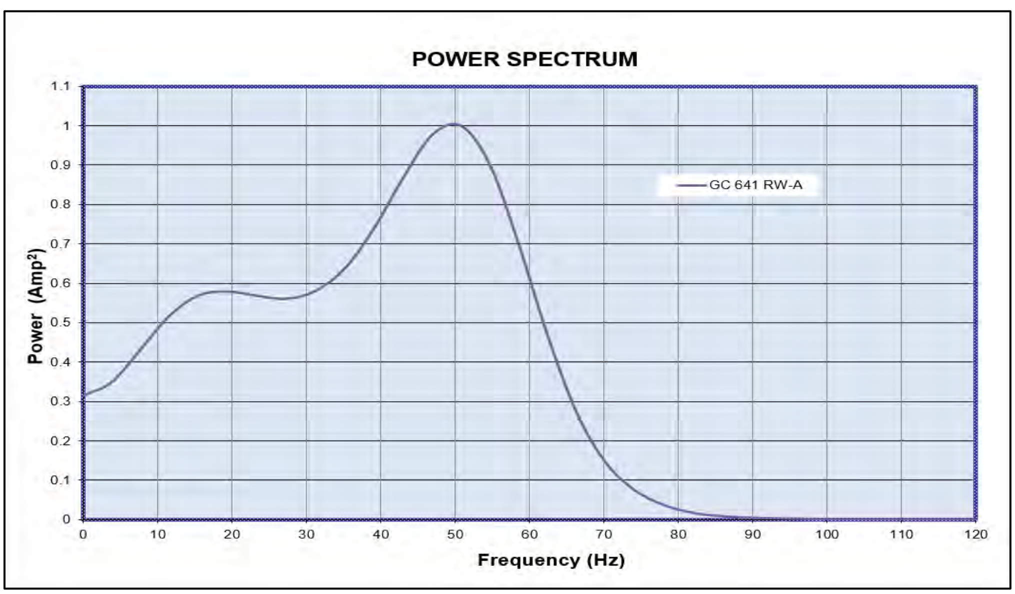


Figure GC 641 RW-A-2. Power Spectrum Curve (Frequency vs Power)

Man-Made Features

The proposed well GC 641 RW-A is within the Tahiti development area and is about 7,470 ft northwest of the Tahiti truss spar in GC 641. The Tahiti field in GC 641 contains the spar and several pipelines, flowlines, and umbilicals extending to and from the structure to drill centers in GC 596 to the northwest and GC 640 to the west (Figure GC 641 RW-A-1). The closest existing infrastructure to the proposed location is a 6-inch bulk oil flowline 330 ft to the southwest (Maps GC 641 RW-A-1 through RW-A-5). The flowline is listed as active and extends from a drill center in the southeast portion of GC 640 to the Tahiti Spar in GC 641. There are two other bulk oil flowlines between 525 ft and 880 ft to the northeast of the proposed location. The pipelines are listed as 6-inch and 9-inch bulk oil flowlines that extend southeast from the drill center in GC 596 to the Tahiti Spar as well. The 6-inch pipeline is listed as abandoned while the 9-inch is listed as active. The closest existing wells are the GC 640 SS1 and SS2 wells that lie 3,122 ft and 3,181 ft, respectively, to the southwest of the proposed location (Maps GC 641 RW-A-1 through RW-A-5).

Archaeological Assessment

GEMS archaeologists delineated 68 unidentified contacts in the side-scan scan sonar data within the AUV Survey Area (GEMS, 2011). None of these contacts are located within 2,000 ft of the proposed wellsite location. The nearest sonar contact to the proposed location, Contact #19, lies ~2,815 ft northwest. The contact measures ~12 ft long by ~2 ft wide and has no vertical relief above the seabed. The sonar contact does not have an acoustic signature indicative of archaeological resources. Based on the archaeological review of available AUV data, the Area of Potential Effect around the proposed RW-A wellsite location appears clear of archaeological resources. The unidentified sonar contact likely represents modern debris associated with shipping, exploratory drilling, pipelay operation and construction, or storm events (GEMS, 2011).

The unidentified contact has the standard 100 ft geohazard avoidance as prescribed in the BOEM guidelines (BOEM, 2022). If any wood, ceramics, textiles or ferrous objects become exposed during any bottom disturbing operations, all activities must be halted and BOEM notified within 48 hours.

Wellsite Conditions

The surface location occurs within a structural low bounded by a salt-cored high to the northeast and a relatively flat-topped plateau to the southwest. A large fault system trends northwest to southeast between the highs. Several seafloor and shallow buried faults are within 2,000 ft of the proposed wellsite. The seafloor expressions of the faults nearest the wellsite are relatively minor but become more significant to the northeast. The seafloor is relatively smooth and featureless in the immediate vicinity of the proposed wellsite. The shallow stratigraphy will consist of interbedded hemipelagic clays, turbidites, and mass-transport deposits (MTD) composed generally of clays and silts with some interspersed thin sands (Illustrations GC 641 RW-A-1 to RW-A-3).

Water Depth and Seafloor Conditions. The water depth at the location is -3,980 ft below sea level (Map GC 641 RW-A-1). The proposed location is on slight incline sloping to the northeast and about 5˚. The seafloor morphology appears smooth to slightly hummocky. There are no indications of hard bottom areas, seep, or expulsion features within 2,000 ft of the location (Maps GC 641 RW-A-2 and RW-A-3). Deepwater benthic communities are not expected at or near the proposed wellsite. The seafloor and surficial sediments consist of very soft to soft clay and silty clay.

Several seafloor faults lie to the north, northeast, and east of the proposed location. The faults trend northwest to southeast and have variable offset. The nearest seafloor fault to the proposed location lies about ~610 ft to the northeast (Maps GC 641 RW-A-2 and A-5). The seafloor fault is downthrown to the northeast away from the proposed wellsite. The seafloor slopes along this fault scarp are minor (<0.5°) and the relief is negligible (<1 ft), Illustration GC 641 RW-A-1. The wellbore at this location will not intersect a seafloor fault within the foundation zone (500 ft bml) at this location. However, a buried fault will be intersected at ~389 ft (Illustrations GC RW-A-2 and A-3).

The side-scan sonar reflectivity and low seafloor amplitude response within a 2,000 ft radius of the proposed wellsite suggest the seabed is covered by very soft to soft clays (Maps GC 641 RW-A-3 and RW-A-4). A weakly stratified, low-amplitude drape-like layer, about 8 ft thick, occurs at the seafloor around proposed wellsite. The drape represents hemipelagic silty clays that are soft and have high water contents (Illustration GC 641 RW-A-1).

Deepwater Benthic Communities. No features or areas were interpreted within 2,000 ft of the proposed location that can support high-density chemosynthetic or other deepwater benthic communities. There are no apparent geophysical indicators and/or geologic features at the seafloor or within the subbottom profiler record that would suggest conditions capable of supporting high-density deepwater benthic communities at the proposed wellsite or within the 2,000 ft radius (Maps GC 641 RW-A-2 through RW-A-4). The side-scan sonar mosaic and multibeam backscatter indicate a uniformly textured seabed near the proposed location. The generally low reflectivity suggests normal Gulf of Mexico surficial sediments. No water bottom anomalies, as defined by BOEM, occur within 2,000 ft of the proposed location (BOEM, 2024c). In addition, the amplitude-enhanced seafloor rendering extracted from the 3-D dataset does not show any high amplitudes near Proposed Wellsite RW-A (Map GC 641 RW-A-4). BOEM has not reported the existence of high-density deepwater benthic communities within Federal lease Block GC 641 (MMS, 2010).

Stratigraphy. Stratigraphic conditions from the subbottom profiler and 3-D seismic data are shown on Illustrations GC 641 RW-A-1 through RW-A-3. The seafloor, four horizons (Horizons 120, 250, 500, and 900), and the Top of Salt (ToS) were mapped within the suprasalt stratigraphy to define five sediment units (Units 1-5) within the Study Area (GEMS, 2003 and 2004). Inferences from the seismic facies analysis suggest the stratigraphic section beneath the wellsite is characterized by hemipelagic clays, turbidites, and mass-transport deposits containing a mixture of clays, silts, and sands.

The subbottom profiler data define the upper 195 ft of sediments beneath the mudline around the proposed wellsite (Illustration GC 641 RW-A-1). The uppermost 8 ft of sediment at the well is a drape consisting of very soft, high water content clays. The sediments beneath the drape to the limit of the subbottom penetration will consist primarily of hemipelagic clays and silty clays interlayed with thin turbidities and mass-transport deposits. A thin, mud-rich, mass-transport deposit (MTD) exists from about 17 ft to 32 ft bml. Standard piston and box cores collected in the area penetrated normally consolidated clays. Soil Boring BH-3 collected at anchor cluster #1 in the southwest portion of GC 641 encountered normally consolidated clays with shear strengths increasing from very soft at the seafloor to very stiff at 300 ft bml (GEMS, 2006). The BH-3 soil boring lies approximately two miles to the south-southeast of the proposed location.

<u>Units 1 and 2 (Seafloor to Horizon 250)</u>. The seismic sequence between the seafloor and Horizon 250 (207 ft bml) consist of low-amplitude, mostly layered reflections. These reflections represent hemipelagic clays and silty clays interlayered with muddy turbidites and clay-rich MTDs.

<u>Unit 3 (Horizon 250 to Horizon 500)</u>. The seismic sequence between Horizon 250 and Horizon 500 (207 ft to 636 ft bml) consists of low- to moderate- amplitude, continuous to discontinuous reflections (Illustrations GC 641 RW-A-2 and RW-A-3). These reflections probably represent alternating clay-rich turbidities, interbedded with clay-rich mass-transport deposits.

<u>Unit 4 (Horizon 500 to Horizon 900)</u>. The seismic stratigraphy between Horizon 500 and Horizon 900 (636 ft to 1,399 ft bml) consists of moderate-amplitude, continuous reflectors alternating with low- to moderate-amplitude, discontinuous to chaotic intervals (Illustrations GC 641 RW-A-2 and RW-A-3). These reflections represent predominately turbidites consisting of clays, silts, and thin sands layers. Interval is disrupted and deformed by the underlying salt.

<u>Unit 5 (Horizon 900 to Top of Salt)</u>. Unit 5 is relatively thin section (<300 ft thick) at the proposed wellsite due to the shallowness of the underlying salt. The unit consists of mostly low-amplitude, discontinuous to chaotic reflections representing interlayered turbidities and mass-transport deposits (Illustrations GC 641 RW-A-2 and RW-A-3). The sediments consist of clays and silts; however, sand content may increase compared to overlying units.

The Top of Salt will be encountered at approximately 1,567 ft bml, or -5,567 ft subsea (Illustration GC 641 RW-A-3). The salt surface dips to the southwest at about 26˚.

Faults. The high-resolution geophysical and 3-D data indicate a vertical wellbore at the proposed surface location is not expected to penetrate any seafloor or buried faults two faults above the salt interface (Illustrations GC 641 RW-A-1, RW-A-2, and RW-A-3).

Many small undifferentiated faults (below the resolution of the 3-D seismic data) probably exist within the suprasalt stratigraphy below Horizon 500 at this location. Such faulted intervals represent potential zones of borehole instability or drilling fluid loss.

Shallow Gas and Shallow Water Flow. Significant shallow gas is not likely to be encountered within the shallow sediments from the seafloor to the Top of Salt (1,798 ft bml). The potential for encountering shallow gas is considered negligible to low, Illustration GC 641-RW-A-3. The potential for shallow water flow is considered negligible.

Shallow Gas. There are no apparent subsurface amplitude anomalies or other direct hydrocarbon indicators directly beneath the proposed location (Map GC 641 RW-A-5). The nearest high-amplitude events are lie about 1,690 ft to the northeast in t ~380 ft bml. The potential for encountering shallow gas is considered negligible in the clay-prone stratigraphic units from the seafloor to 207 ft bml (Unit 2) and in the section above the Top of Salt from ~1,399 ft to 1,798 ft. A "low" potential for shallow gas is attributed to the bedded turbidite and mass-transport intervals from about ~207 ft to the base of Unit 4 (~1,399 ft).

Shallow Water Flow. The potential for shallow water flow at this well location from the Seafloor to Top of Salt, 1,798 ft bml is considered negligible based on the lack of regionally extensive sand-prone complexes in the shallow section, and the lack of reported water flow incidents from the nearby existing wells (BOEM, 2024d). The nearest reported occurrence of shallow waterflow is ~11.6 miles to the east in GC 644 (Figure GC 641 RW-A-1). Minor flow was encountered in the Anadarko #1 well at ~638 ft bml (4,930 ft bsl). The well was drilled to completion. The current status of the well is listed as plugged and abandoned (BOEM, 2024a).

Results

The Proposed Wellsite RW-A in Block 641, Green Canyon Area, appears geologically suitable for exploration drilling operations. Drillers should be aware that the seafloor is on a 5.0˚ and the intersection of the underlying salt is relatively steep (~26˚).

There is a negligible to low potential for encountering shallow gas within the limit of investigation. There is a negligible potential for encountering shallow waterflow within the same interval.

Engineers should be aware of the location of several pipelines within 2,000 ft of the proposed well. Additional pipelines and umbilical also exist to the southwest just beyond 2,000 ft. No sonar contacts are located within 2,000 ft of the proposed location; however, should any potentially historic materials such as textiles, wood, ceramics, or other items be discovered during exploration activities, all operations must cease, and BOEM be notified within 48 hours.

Closing

We appreciate the opportunity to be of service to Chevron U.S.A. and look forward to working together on future projects.

Sincerely,

GEOSCIENCE EARTH & MARINE SERVICES

John Hoffman.
Snr. Consulting Geoscientist

Daniel Lanier
Sr. Principal, GEMS

Erin Janes
Principal/Snr. Geoscientist

Kimberly L. Faulk, MA
Principal/Sr. Marine Archaeologist

Attachments (5 Maps and 3 Illustrations)

Distribution: Mr. Phillip Von Dullen III, Chevron U.S.A. Inc., Houston, TX (Digital Final)

REFERENCES

Bureau of Ocean Energy Management (BOEM), 2020, 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. NTL re-issued by BOEM in 2020.

Bureau of Ocean Energy Management (BOEM) 2022, Notice to lessees and operators of federal oil, gas, and sulphur leases in the outer continental shelf, Gulf of Mexico region, Shallow Hazards Program, NTL 2022-G01. Effective Date October 1, 2022.

Bureau of Ocean Energy Management (BOEM), 2024a, ASCII Data Files, published on the BOEM Gulf of Mexico Region Homepage, https://www.data.boem.gov/Main/Default.aspx, assessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024b, BOEM northern Gulf of Mexico deepwater bathymetry grid from 3D seismic, https://boem.gov/Gulf-of-Mexico-Deepwater-Bathymetry/, accessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024c, Seismic water bottom anomalies map gallery, published on the BOEM Gulf of Mexico Region web page, http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Map-Gallery/Seismic-Water-Bottom-Anomalies-Map-Gallery.aspx, accessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024d, Safety performance review – shallow waterflows can pose significant hazards to deepwater drilling, published on the BOEM Gulf of Mexico Region Homepage, http://www.boem.gov/Oil-and-Gas-Energy-Program/Resource-Evaluation/Geological-and-Geophysical-Reviews/Reviews-Gulf-of-Mexico.aspx, accessed April, 2024.

Coffeen, J. A., 1978, Seismic Exploration Fundamentals: Tulsa, the Petroleum Publishing Co., p. 125.

GEMS, 2003, Geologic and geohazards site assessment, Tahiti development project, blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc., Project No. 0103-609.

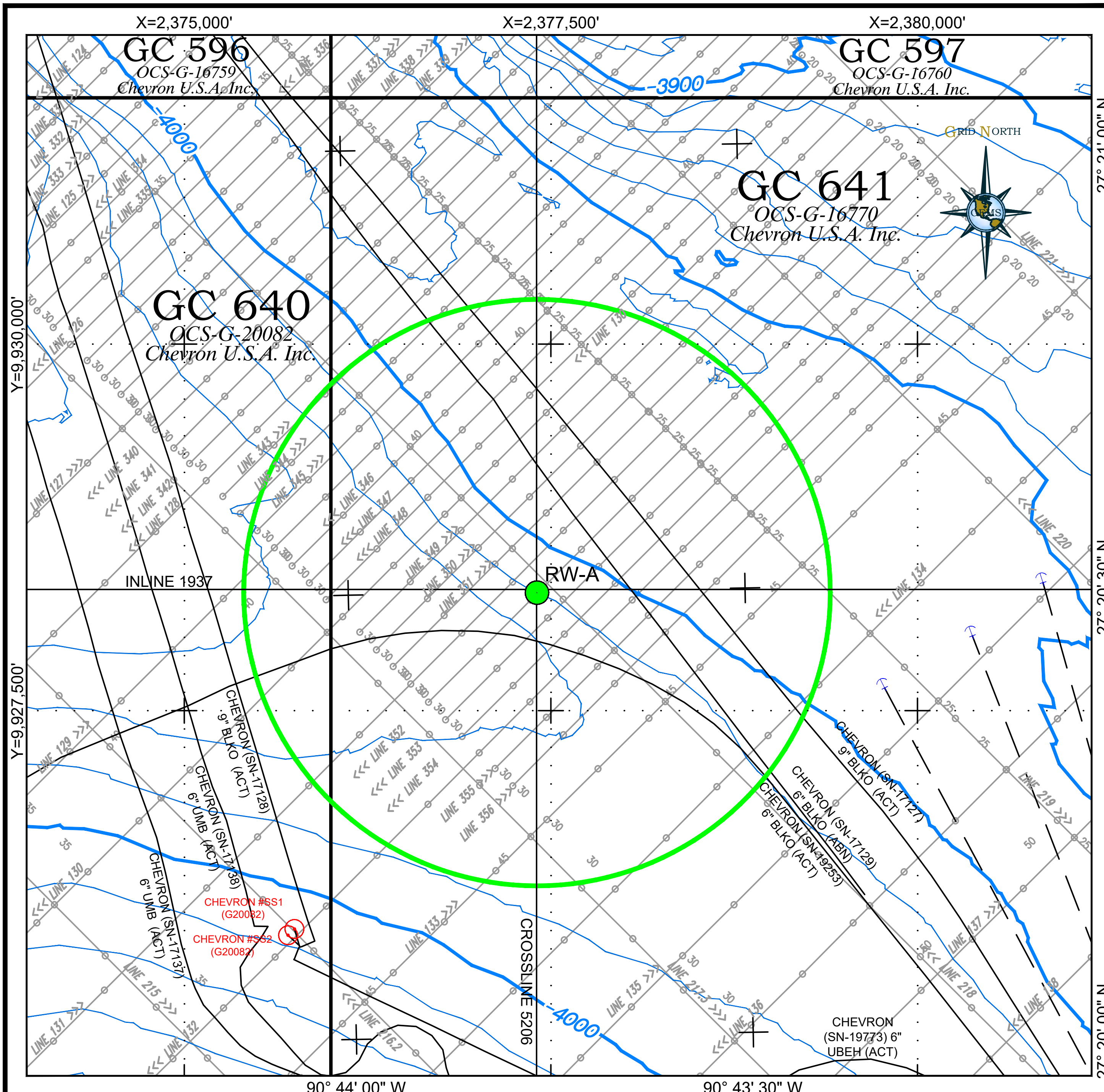
GEMS, 2004, Geologic and stratigraphic assessment, blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth and Marine Services, Inc., Project No. 1203-751.

GEMS, 2006, Integrated summary report, geologic constraints and engineering design properties, Tahiti development, Green Canyon Area, blocks 596, 640, and 641, Geoscience Earth and Marine Services, Inc., Project No. 0504-832c.

GEMS, 2011, Tahiti development area, archaeological assessment, blocks 595-597, 639-641, and 683-685, Green Canyon Area, Gulf of Mexico, May 2011, Geoscience Earth and Marine Services, Inc., Project No. 0311-1901.

Minerals Management Service (MMS), 2008, 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, 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.

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.



3-D SURVEY LINE.

EXISTING WELL LOCATION, AS REPORTED BY BOEM.

AUV SURVEY LINE.

EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.

EXISTING ANCHOR AND MOORING LINE.

PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.

WATER DEPTH CONTOUR IN FEET, CONTOUR INTERVAL 20 FT.

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

NOTE: BATHYMETRY DERIVED FROM THE MULTIBEAM BATHYMETRY DATASET COLLECTED IN 2003.

CHEVRON U.S.A. INC.

BATHYMETRY MAP

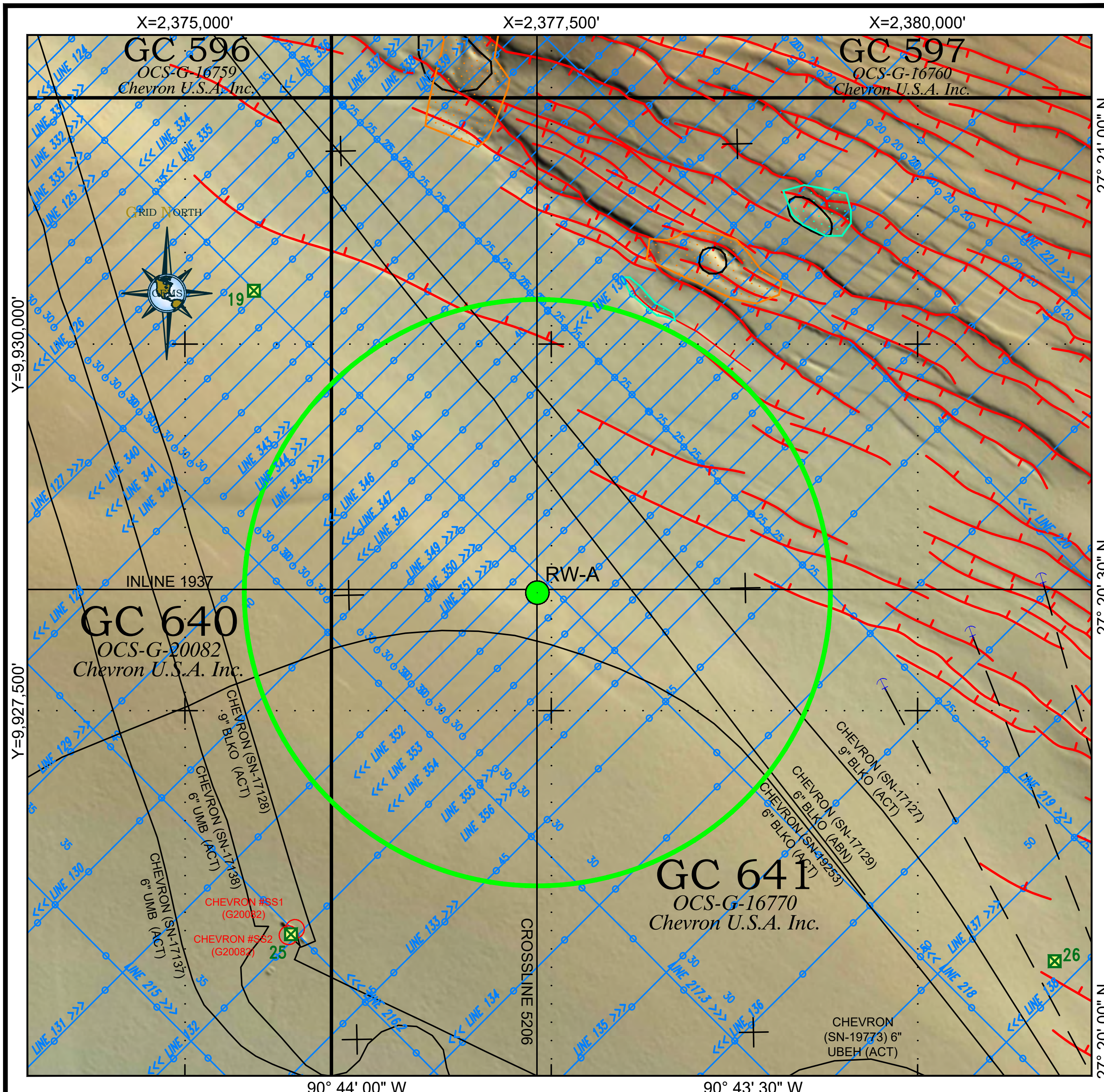
BLOCK 641
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000
SCALE 1 : 12,000 or 1" = 1,000'

GEOSCIENCE EARTH & MARINE SERVICES, INC. — A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 641 RW-A-1



3-D SURVEY LINE.

EXISTING WELL LOCATION, AS REPORTED BY BOEM.

AUV SURVEY LINE.

EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.

EXISTING ANCHOR AND MOORING LINE.

PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.

SIDE-SCAN SONAR TARGET (GEMS, 2011).

SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.

AREAS OF POSITIVE ANOMALIES AS REPORTED BY BOEM (2024c).

EVIDENCE OF POSSIBLE CARBONATE OR HYDRATE MOUNDS -CHEMOSYNTHETICS COULD BE ASSOCIATED.

FLUID EXPULSION AREAS.

NOTE: RENDERING DERIVED FROM THE MULTIBEAM BATHYMETRY DATASET COLLECTED IN 2003.

AZIMUTH =60°
ELEVATION = 55°
V.E. = 4x

-3425 *-5050*
RELATIVE WATER DEPTH

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

CHEVRON U.S.A. INC.

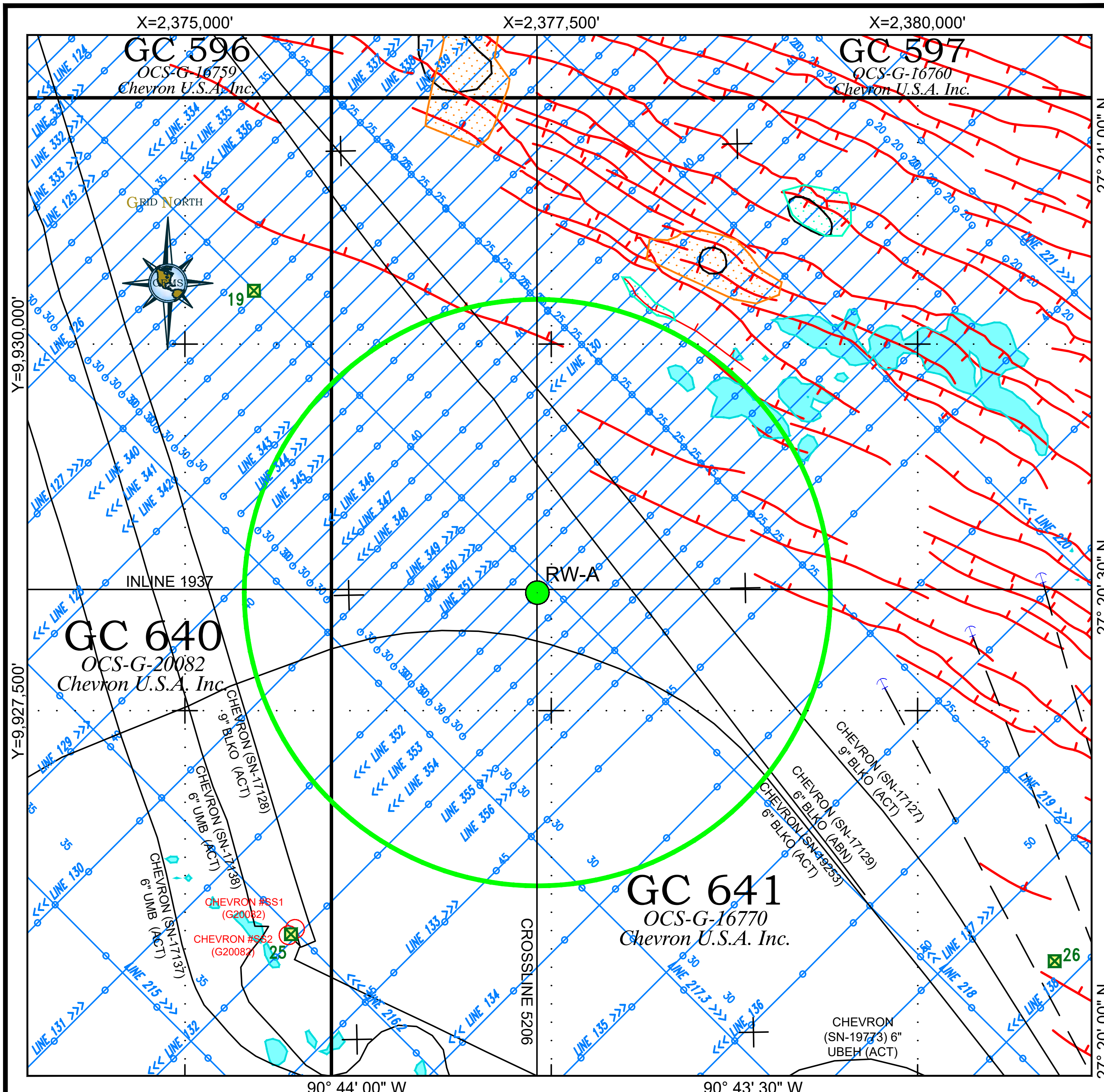
SEAFLOOR FEATURES MAP
BLOCK 641
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000
SCALE 1 : 12,000 or 1" = 1,000'

GEOSCIENCE EARTH & MARINE SERVICES, INC. — A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 641 RW-A-2



3-D SURVEY LINE.

EXISTING WELL LOCATION, AS REPORTED BY BOEM.

AUV SURVEY LINE.

EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.

EXISTING ANCHOR AND MOORING LINE.

PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.

SIDE-SCAN SONAR TARGET (GEMS, 2011).

SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.

AREAS OF POSITIVE ANOMALIES AS REPORTED BY BOEM (2024c).

EVIDENCE OF POSSIBLE CARBONATE OR HYDRATE MOUNDS -CHEMOSYNTHETICS COULD BE ASSOCIATED.

FLUID EXPULSION AREAS.

AMPLITUDE ANOMALIES BETWEEN THE SEAFLOOR AND TOP OF SALT.

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

Chevron

CHEVRON
U.S.A. INC.

GEOLOGIC FEATURES MAP

BLOCK 641
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000

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

GEOSCIENCE EARTH & MARINE SERVICES, INC.
GEMS
A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 641 RW-A-5

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

June 7, 2024 Project No.: GHZ3246

Chevron U.S.A. Inc.
1500 Louisiana
Houston, Texas 77002

Attention: Mr. Phillip Von Dullen III

Site Clearance Letter,
Proposed Wellsite RW-B
Block 596 (OCS-G-16759),
Green Canyon Area,
Gulf of Mexico

Chevron U.S.A. Inc. (Chevron) contracted Geoscience Earth & Marine Services (GEMS) to provide an assessment of the seafloor and shallow geologic conditions to determine the favorability of drilling operations for the proposed location RW-B, whose surface location is in Block 596 (OCS-G-16759), Green Canyon (GC) Area, Gulf of Mexico. This letter addresses specific seafloor and subsurface conditions around the proposed location to the Top of Salt at a depth of about 3,771 ft below the mudline (bml).

Proposed Wellsite GC 596 RW-B is located along a relatively benign area of seafloor; however, some seafloor and shallow fault offsets exist within 2,000 ft northeast of the location. Minor seafloor faults exist starting at about 1,472 ft to the northeast. The faults are the product of diapiric uplift deformation. There are no potential sites for deepwater benthic communities within 2,000 ft of the proposed wellsite. The closest sonar targets are ~2,288 ft to 2,292 ft northeast of the proposed wellsite. They are not recommended for archaeological avoidance. There is a negligible to low potential for encountering overpressured sands and shallow gas within the limit of investigation based on seismic attributes and amplitude analysis.

This letter provides details specific to the well location, including available data, Notice to Lessees (NTL) requirements, man-made features, and wellsite conditions.

Proposed Well Location

The surface location for the Proposed Wellsite GC 596 RW-B is in the southeast corner of Block 596 (Figure GC 596 RW-B-1). Chevron provided the following coordinates:

Table 1. GC 596 RW-B-1. Proposed Location Coordinates

Proposed Wellsite GC 596 RW-B			
Spheroid & Datum: Clarke 1866 NAD27 Projection: UTM Zone 15 North		Line Reference	Block Calls (GC 596)
X: 2,371,931 ft	Latitude: 27° 21' 29.4825" N	Inline 1878	4,069 ft FEL
Y: 9,932,200 ft	Longitude: 90° 44' 45.6319" W	Crossline 5073	520 ft FSL

Chevron plans to drill this well using a dynamically positioned drilling vessel. GEMS' assessment addresses the seafloor and subsurface conditions within a 2,000 ft radius around the proposed well location.

Available Data

The following discussion is based on findings from the reports listed below:

- Geologic and Geohazards Site Assessment, Tahiti Development Project, Blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico (GEMS, 2003)
- Geologic and Stratigraphic Assessment, Blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico (GEMS, 2004)

- Integrated Summary Report, Geologic Constraints and Engineering Design Properties, Tahiti development, Green Canyon Area Blocks 596, 640, and 641 (GEMS, 2006)
- Tahiti Development Area Archaeological Assessment Blocks 595-597, 639-641, & 683-685 Green Canyon Area, Gulf of Mexico (GEMS, 2011)

The text, maps, and figures included in the reports provide detail on the regional geology, soil properties, and archaeological assessment of the Study Area. For this assessment, GEMS used two sets of geophysical data provided by Chevron: a 3-D exploration seismic time volume and high-resolution (HR) geophysical data. The 3-D seismic data were provided to GEMS in 2003 and cover Blocks GC 596, 640, and 641 (Figure GC 596 RW-B-1).

Proprietary AUV Data. The high-resolution (HR) data were collected by C & C Technologies, Inc., (C&C) in 2003 using an Autonomous Underwater Vehicle (AUV). The AUV data included 100 kHz side-scan sonar, 2-10 kHz subbottom profiler, 3 m (10 ft) bin multibeam bathymetry, and 1 m (3 ft) bin multibeam backscatter data. The surveyed area encompassed all or portions of Blocks 595-597, 639-641, and 683-685 in Green Canyon Area (Figure GC 596 RW-B-1).

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, shallow water flow, shipwrecks, obstructions, and infrastructure (BOEM, 2024a). Regional bathymetry data is from BOEM's deepwater bathymetry grid created from 3-D seismic surveys (BOEM, 2024b).

Subsurface depths at the proposed wellsite were calculated using the following equation, where x is two-way travel time in seconds below the mudline:

$$\text{Depth (feet)} = 425.35*x^2 + 2459*x$$

This polynomial was generated from a Chevron velocity gradient and was first used for the Geologic and Stratigraphic Assessment in Blocks 596, 640, and 641 (GEMS, 2003).

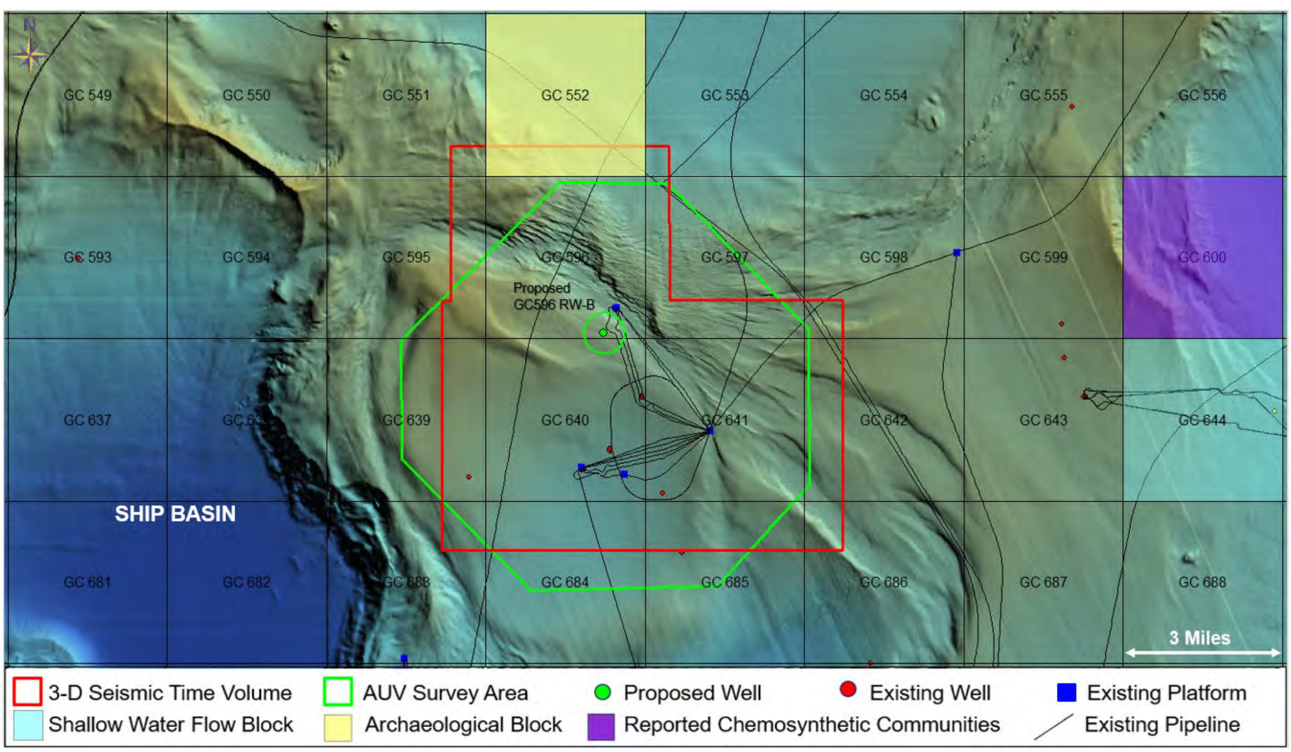


Figure GC 596 RW-B-1. Seafloor Rendering Showing the Proposed Wellsite Location

Attachments

Wellsite maps are centered on the Proposed Wellsite RW-B and are displayed at a 1 inch = 1,000 ft scale (1:12,000). The maps included in this letter are as follows:

Map No. GC 596 RW-B-1: Bathymetry Map
Map No. GC 596 RW-B-2: Seafloor Features Map
Map No. GC 596 RW-B-3: Side-Scan Sonar Mosaic
Map No. GC 596 RW-B-4: Seafloor Amplitude Rendering
Map No. GC 596 RW-B-5: Geologic Features Map

The accompanying illustrations were extracted from the available datasets and are listed below:

Illustration GC 596 RW-B-1: Portion of Subbottom Profiler Line 217 Showing Near-Surface Conditions Beneath Proposed Wellsite GC 596 RW-B

Illustration GC 596 RW-B-2: Portions of Inline 1878 and Crossline 5073 Showing Conditions Beneath Proposed Wellsite GC 596 RW-B

Illustration GC 596 RW-B-3: Tophole Prognosis Chart, Proposed Wellsite RW-B. Surface Location in Green Canyon Area, Block 596

NTL Requirements

The following letter complies with the Bureau of Ocean Energy Management (BOEM) Notices to Lessees (NTL's) 2008-G04, 2009-G40, and 2022-G01, (MMS, 2008, 2010, and BOEM, 2022) with respect to benthic community and shallow hazard assessments.

BOEM may require an assessment for potential archaeological resources prior to conducting drilling operations. To satisfy NTL requirements, GEMS completed an archaeological assessment using high-resolution geophysical Autonomous Underwater Vehicle (AUV) survey data. The requirements of NTL 2005-G07 (BOEM, 2020), which are applicable for exploration or production activity, have been satisfied and the results were provided in the GEMS archaeological report (GEMS, 2011).

As specified in NTL 2022-G01 (BOEM, 2022), GEMS generated a power spectrum diagram from the 3-D seismic data cube provided by Chevron at the proposed wellsite (Figure GC 596 RW-B-2). The extraction is generated from the data within a 2,000 ft radius of the proposed well and from the seafloor to Top of Salt. GEMS converted the amplitude vs. frequency spectrum, generated by the IHS software, to power vs. frequency by squaring the amplitude values as described by J. A. Coffeen, 1978. The frequency bandwidth at 50% power ranges between 10.0 Hz and 61.0 Hz.

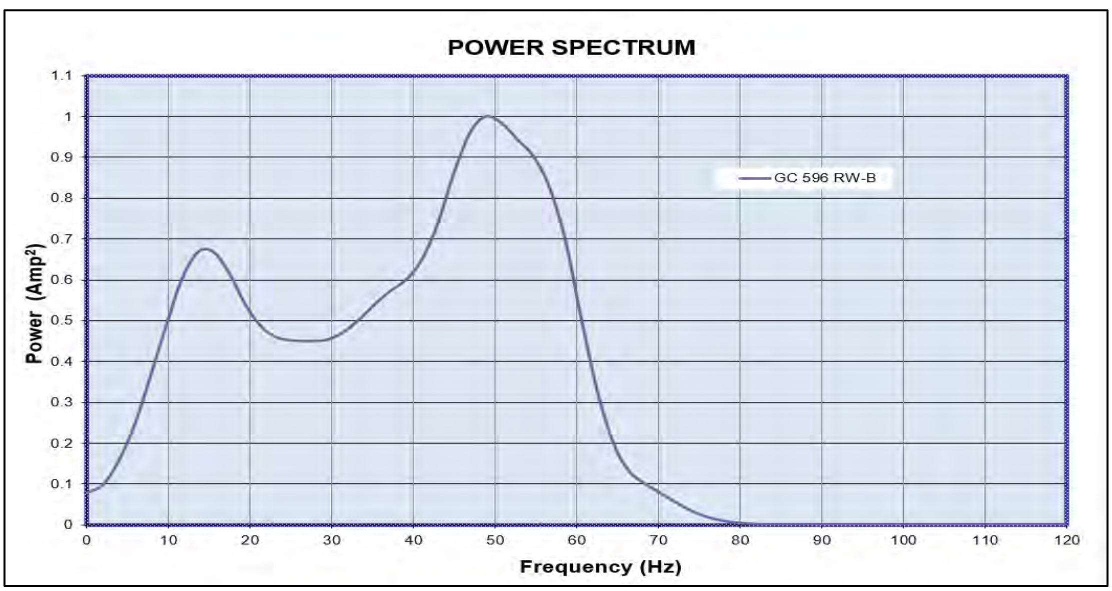


Figure GC 596 RW-B-2. Power Spectrum Curve (Frequency vs Power)

Man-Made Features

The proposed well GC 596 RW-B is within the Tahiti development area and is about 14,190 ft northwest of the Tahiti truss spar in GC 641. The components of the Tahiti field in GC 596 include a subsea drill center and manifold, three pipelines, two umbilicals, and six wells. The drill center manifold and wells are ~2,582 ft to the northeast of the proposed location (Maps GC 596 RW-B-1 through RW-B-5). The drill center is tied back to the floating production facility in GC 641. Oil is exported to the Tahiti truss by two Chevron U.S.A. 9-in. pipelines from 6 existing wells (PN001-PN006) connected to the manifold via 6-inch flying leads. A 6-in. oil pipeline that semi-parallels the northeastern 9-in. pipeline also exists, but it is listed as abandoned. In addition to the pipelines, there are two 6-inch umbilicals, both lie to the east of the proposed wellsite between ~465 ft to 1,240 ft, respectively (Figure GC 596 RW-B-1). The closest existing infrastructure are the two umbilicals. The closest pipeline lies ~1,940 ft to the northeast, and the closest existing well (PN003) is about ~2,582 ft to the northeast. Maps GC 596 RW-B-1 through RW-B-5 illustrate the location of the wells, pipelines, manifold, and drill center nearby the proposed wellsite.

Archaeological Assessment

GEMS archaeologists delineated 68 unidentified contacts in the side-scan scan sonar data within the AUV Survey Area (GEMS, 2011). None of these contacts are located within 2,000 ft of the proposed wellsite location. The nearest sonar contacts to the proposed location, Contacts #13 and #14, lie ~2,292 ft northeast. Contact #13 is listed as linear shaped and measures ~19.8 ft long and ~3.0 ft wide. Contact #14 is irregular in shape and measures ~5.6 ft long and ~4.0 ft wide. Neither contact shows vertical relief above the seabed.

The sonar contacts do not have an acoustic signature indicative of archaeological resources. Based on the archaeological review of available AUV data, the Area of Potential Effect around the proposed RW-B wellsite location appears clear of archaeological resources. The unidentified sonar contacts likely represent modern debris associated with shipping, exploratory drilling, pipelay operation and construction, or storm events (GEMS, 2011).

The unidentified contacts have the standard 100 ft geohazard avoidance as prescribed in the BOEM guidelines (BOEM, 2022). If any wood, ceramics, textiles or ferrous objects become exposed during any bottom disturbing operations, all activities must be halted and BOEM notified within 48 hours.

Wellsite Conditions

The surface location occurs along the northeastern portion of a relatively flat-topped plateau and adjacent to structural low bounded by a salt-cored high to the northeast (Figure GC 596 RW-B-1). A large fault system trends northwest to southeast between the highs and across the high to the northeast (Maps GC 596 RW-B-2 and RW-B-5). Some seafloor and shallow buried faults are within 2,000 ft of the proposed wellsite. The seafloor expressions of the faults nearest the wellsite are relatively minor but become more significant to the northeast. The seafloor is relatively smooth and featureless in the immediate vicinity of the proposed wellsite. The shallow stratigraphy will consist of interbedded hemipelagic clays, turbidites, and mass-transport deposits (MTD) composed generally of clays and silts with some interspersed thin sands (Illustrations GC 596 RW-B-1 to RW-B-3).

Water Depth and Seafloor Conditions. The water depth at the location is -3,864 ft below sea level (Map GC 596 RW-B-1). The seafloor slopes about 1.6˚ to the northeast. The seafloor morphology appears smooth at the proposed surface location. There are no indications of hard bottom areas, seep, or expulsion features within 2,000 ft of the location. Deepwater benthic communities are not expected at the proposed wellsite. The seafloor and surficial sediments consist of very soft to soft clay and silty clay.

Several seafloor faults lie to the northeast and east of the proposed location. The faults trend northwest to southeast and are offset to the northeast. The nearest seafloor fault to the proposed location lies about 1,472 ft to the northeast (Maps GC 596 RW-B-2 and B-5). The seafloor fault is downthrown to the northeast away from the proposed wellsite. Seafloor slopes along this fault scarp is up to 22° locally, but the seafloor offset is relatively minor at 2 ft to 4 ft. The wellbore at this location will not intersect any seafloor faults but will intersect three buried faults.

A shallow seabed trough trending west-northwest to east-southeast exists about 150 ft to the south of the proposed location (Illustration GC 596 RW-B-W-1). The trough is about 3 ft to 4 ft deep and about 200 ft to 250 ft wide. There is no indications of fluid or gas along the trough, and it does not appear to be the surface expression of a buried feature such as a fault. It is likely related to turbidity flows or seabed currents.

The side-scan sonar reflectivity and low seafloor amplitude response within a 2,000 ft radius of the proposed wellsite suggest the seabed is covered by very soft to soft clays (Maps GC 596 RW-B-3 and RW-B-4). A weakly stratified, low-amplitude drape-like layer, about 8 ft thick, occurs at the seafloor around proposed wellsite. The drape represents hemipelagic silty clays that are soft and have high water contents (Illustration GC 596 RW-B-1).

Deepwater Benthic Communities. No features or areas were interpreted within 2,000 ft of the proposed location that can support high-density chemosynthetic or other deepwater benthic communities. There are no apparent geophysical indicators and/or geologic features at the seafloor or within the subbottom profiler record that would suggest conditions capable of supporting high-density deepwater benthic communities at the proposed wellsite or within the 2,000 ft radius (Maps GC 596 RW-B-2 through RW-B-4). The side-scan sonar mosaic and multibeam backscatter indicate a uniformly textured seabed near the proposed location. The generally low reflectivity suggests normal Gulf of Mexico surficial sediments. No water bottom anomalies, as defined by BOEM, occur within 2,000 ft of the proposed location (BOEM, 2024c). In addition, the amplitude-enhanced seafloor rendering extracted from the 3-D dataset does not show any high amplitudes near Proposed Wellsite RW-B (Map GC 596 RW-B-4). BOEM has not reported the existence of high-density deepwater benthic communities within Federal lease Block GC 596 (MMS, 2010).

Stratigraphy. Stratigraphic conditions from the subbottom profiler and 3-D seismic data are shown on Illustrations GC 596 RW-B-1 through RW-B-3. The seafloor, four horizons (Horizons 120, 250, 500, and 900), and the Top of Salt (ToS) were mapped within the suprasalt stratigraphy to define five sediment units (Units 1-5) within the Study Area (GEMS, 2003 and 2004). Inferences from the seismic facies analysis suggest the stratigraphic section beneath the wellsite is characterized by hemipelagic clays, turbidites, and mass-transport deposits containing a mixture of clays, silts, and sands.

The subbottom profiler data define the upper 235 ft of sediments beneath the mudline around the proposed wellsite (Illustration GC 596 RW-B-1). The uppermost 8 ft of sediment at the well is a drape consisting of very soft, high water content clays. The sediments beneath the drape to the limit of the subbottom penetration will consist primarily of hemipelagic clays and silty clays. Standard piston and box cores collected in the area penetrated normally consolidated clays. Soil Boring BH-3 collected at anchor cluster #1 in the southwestern portion of GC 641, encountered normally consolidated clays with shear strengths increasing from very soft at the seafloor to very stiff at 300 ft bml (GEMS, 2006). The BH-3 soil boring lies approximately three miles to the south-southeast of the proposed location.

<u>Units 1 and 2 (Seafloor to Horizon 250)</u>. The seismic sequence between the seafloor and Horizon 250 (0 ft to 243 ft bml) consist of low-amplitude, mostly layered reflections. These reflections represent hemipelagic clays and silty clays interbedded with muddy turbidites and thin, mud and clay rich MTDs.

<u>Unit 3 (Horizon 250 to Horizon 500)</u>. The seismic sequence between Horizon 250 and Horizon 500 (243 ft to 657 ft bml) consists of low- to moderate- amplitude, continuous to discontinuous reflections (Illustrations GC 596 RW-B-2 and RW-B-3). These reflections probably represent alternating clay-rich turbidities, interbedded with clay-rich mass-transport deposits.

<u>Unit 4 (Horizon 500 to Horizon 900)</u>. The seismic stratigraphy between Horizon 500 and Horizon 900 (657 ft to 1,347 ft bml) consists of moderate-amplitude, continuous reflectors alternating with low- to moderate-amplitude, discontinuous to chaotic intervals (Illustrations GC 596 RW-B-2 and RW-B-3). These reflections represent predominately turbidites consisting of clays, silts, and thin sands layers. The interval is disrupted and deformed by the underlying salt.

<u>Unit 5 (Horizon 900 to Top of Salt)</u>. The seismic sequence below Horizon 900 (1,347 ft bml) consists of moderate-amplitude, continuous reflectors alternating with low- to moderate-amplitude, discontinuous to chaotic intervals (Illustrations GC 596 RW-B-2 and RW-B-3). These reflections represent turbidites alternating with muddy mass-transport complexes, although the sand content may increase in this interval compared to the overlying units. There is a noticeable increase in amplitude character at approximately 2,190 ft and below supporting the likelihood of an increase in coarse-grained sediments from this interface to the Top of Salt. The

Top of Salt will be encountered at approximately 3,771 ft bml (-7,635 ft bsl). The salt surface dips to the southwest at about 24˚.

Faults. The Subbottom Profiler and 3-D data indicate that no seafloor faults will be penetrated by a vertical wellbore; however, the well is expected to penetrate three buried faults above the salt interface (Illustrations GC 596 RW-B-1, RW-B-2, and RW-B-3). The shallowest fault intersection occurs at ~697 ft bml. The next buried fault will be penetrated at ~2,868 ft bml. The deepest buried fault plane will be intersected at ~3,357 ft bml, just above the Top of Salt interface (Illustration GC 596 RW-B-3). Loss of circulation may occur across these fault planes. Although there are no indications of gas or fluids at the intersection with the deepest fault, there are high-amplitude events updip and relatively near the fault plane.

Many small undifferentiated faults (below the resolution of the 3-D seismic data) probably exist within the suprasalt stratigraphy at this location. Such highly faulted intervals represent potential zones of borehole instability or drilling fluid loss.

Shallow Gas and Shallow Water Flow. There is negligible to low potential for encountering significant shallow gas and shallow water flow in the sediments from the seafloor to the Top of Salt (3,771 ft bml), Illustration GC 596 RW-B-3.

<u>Shallow Gas</u>. There are no apparent subsurface amplitude anomalies or other direct hydrocarbon indicators directly beneath the proposed location (Map GC 596 RW-B-5). The nearest high-amplitude event lies 875 ft to the west within Unit 5 (Horizon 900 to Top of Salt). Other similar events occur in Unit 5 farther to the west and to the south, but these events are beyond 2,000 ft of the proposed wellsite (Map GC 596 RW-B-5). A nearby buried fault suggests that these events might be from fluid migration along the fluid plane. A vertical wellbore at this location will penetrate this fault, but there are no indications of fluids or gas at the intersection (Illustrations GC 596 RW-B-2 and RW-B-3).

The potential for encountering shallow gas is considered negligible in the clay-prone stratigraphic Units 1-3 from the seafloor to 657 ft bml. A "low" potential for shallow gas is attributed to the high-amplitude events in Unit 4, and the bedded turbidite and mass-transport intervals from about 657 ft to the top of salt 3,771 ft bml.

<u>Shallow Water Flow</u>. The potential for encountering shallow water flow is considered negligible in the clay-prone stratigraphic Units 1-3 from the Seafloor to 657 ft bml. The potential increases to low in Units 4 and 5 from 657 ft bml to the Top of Salt, 3,771 ft bml due to the likely increase of coarse-grained sediments and high-amplitude events in these units. The nearest reported occurrence of shallow waterflow is ~12.5 miles to the east in GC 644 (Figure GC 596 RW-B-1). Minor flow was encountered in the Anadarko #1 well at ~638 ft bml (4,930 ft bsl); BOEM, 2024d. The well was drilled to completion. The current status of the well is listed as plugged and abandoned (BOEM, 2024a).

Results

The Proposed Wellsite RW-B in Block 596, Green Canyon Area, appears geologically suitable for exploration drilling operations; however, we advise using caution while drilling through the buried fault intervals at 697 ft, 2,868 ft, and 3,357 ft bml. Faults are possible zones for potential loss in drilling fluids and potential gas kicks. The intersection of the underlying salt at this location is relatively steep (~24˚).

There is a negligible to low potential for encountering shallow gas within the limit of investigation. There is a negligible to low potential for encountering shallow waterflow within the same interval.

Engineers should be aware of the location of the umbilicals and pipeline within 2,000 ft of the proposed well. There are no sonar contacts within 2,000 ft of the proposed location; however, should any potentially historic materials such as textiles, wood, ceramics, or other items be discovered during exploration activities, all operations must cease, and BOEM be notified within 48 hours.

Closing

We appreciate the opportunity to be of service to Chevron U.S.A. and look forward to working together on future projects.

Sincerely,

GEOSCIENCE EARTH & MARINE SERVICES

John Hoffman.
Sr. Consulting Geoscientist

Daniel Lanier
Sr. Principal, GEMS

Erin Janes
Principal/Sr. Geoscientist

Kimberly L. Faulk, MA
Principal/Sr. Marine Archaeologist

Attachments (5 Maps and 3 Illustrations)

Distribution: Mr. Phillip Von Dullen III, Chevron U.S.A. Inc., Houston, TX (Digital Final)

REFERENCES

Bureau of Ocean Energy Management (BOEM), 2020, 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. NTL re-issued by BOEM in 2020.

Bureau of Ocean Energy Management (BOEM) 2022, Notice to lessees and operators of federal oil, gas, and sulphur leases in the outer continental shelf, Gulf of Mexico region, Shallow Hazards Program, NTL 2022-G01. Effective Date October 1, 2022.

Bureau of Ocean Energy Management (BOEM), 2024a, ASCII Data Files, published on the BOEM Gulf of Mexico Region Homepage, https://www.data.boem.gov/Main/Default.aspx, accessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024b, BOEM northern Gulf of Mexico deepwater bathymetry grid from 3D seismic, https://boem.gov/Gulf-of-Mexico-Deepwater-Bathymetry/, accessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024c, Seismic water bottom anomalies map gallery, published on the BOEM Gulf of Mexico Region web page, http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Map-Gallery/Seismic-Water-Bottom-Anomalies-Map-Gallery.aspx, accessed April, 2024.

Bureau of Ocean Energy Management (BOEM), 2024d, Safety performance review – shallow waterflows can pose significant hazards to deepwater drilling, published on the BOEM Gulf of Mexico Region Homepage, http://www.boem.gov/Oil-and-Gas-Energy-Program/Resource-Evaluation/Geological-and-Geophysical-Reviews/Reviews-Gulf-of-Mexico.aspx, accessed April, 2024.

Coffeen, J. A., 1978, Seismic Exploration Fundamentals: Tulsa, the Petroleum Publishing Co., p. 125.

GEMS, 2003, Geologic and geohazards site assessment, Tahiti development project, blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc., Project No. 0103-609.

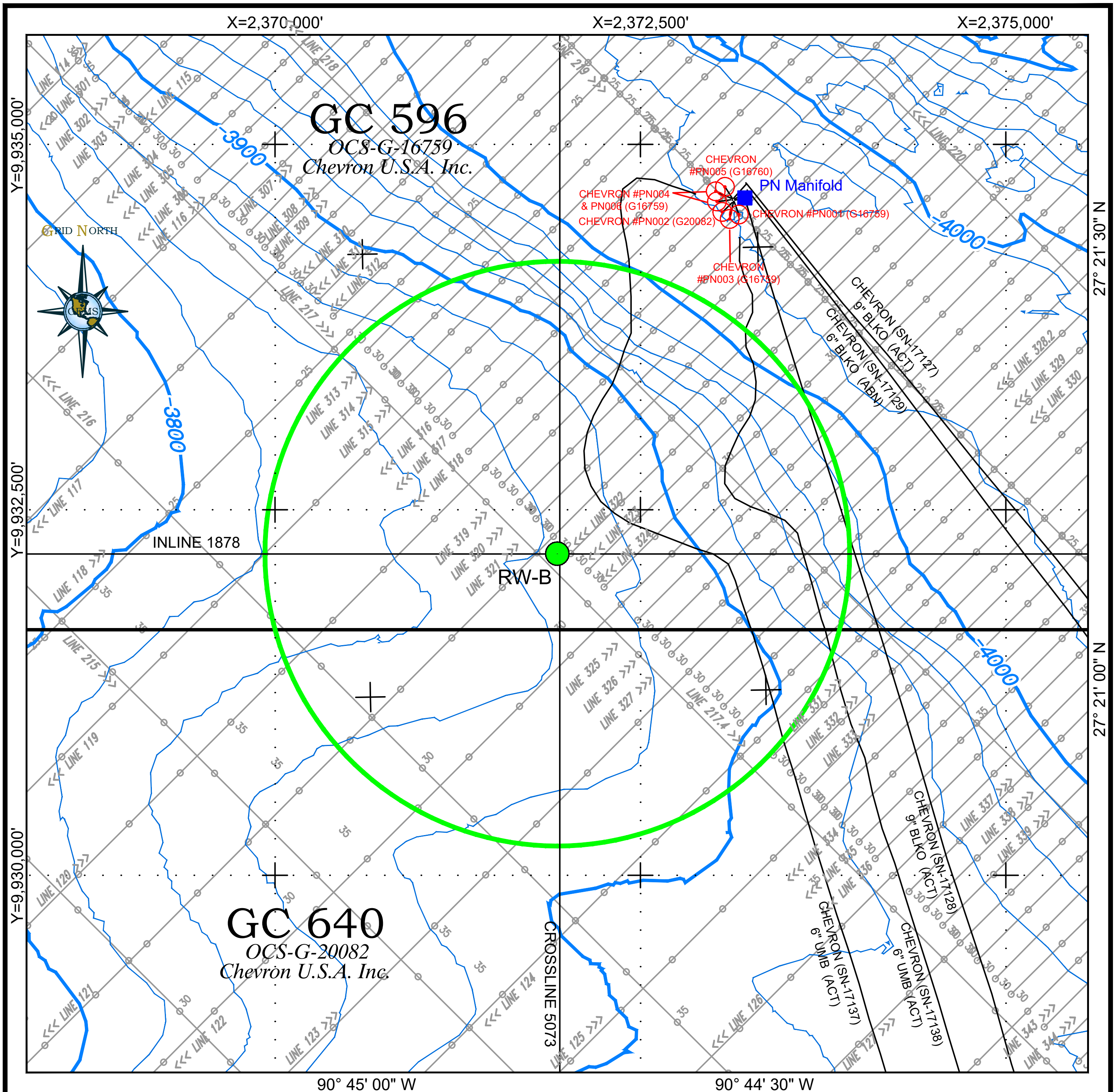
GEMS, 2004, Geologic and stratigraphic assessment, blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth and Marine Services, Inc., Project No. 1203-751.

GEMS, 2006, Integrated summary report, geologic constraints and engineering design properties, Tahiti development, Green Canyon Area, blocks 596, 640, and 641, Geoscience Earth and Marine Services, Inc., Project No. 0504-832c.

GEMS, 2011, Tahiti development area, archaeological assessment, blocks 595-597, 639-641, and 683-685, Green Canyon Area, Gulf of Mexico, May 2011, Geoscience Earth and Marine Services, Inc., Project No. 0311-1901.

Minerals Management Service (MMS), 2008, 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, 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.

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.



3-D SURVEY LINE.

AUV SURVEY LINE.

EXISTING STRUCTURE LOCATION, AS REPORTED BY BOEM.

EXISTING WELL LOCATION, AS REPORTED BY BOEM.

EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.

PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.

WATER DEPTH CONTOUR IN FEET, CONTOUR INTERVAL 20 FT.

Chevron

CHEVRON U.S.A. INC.

BATHYMETRY MAP

BLOCK 596
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000

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

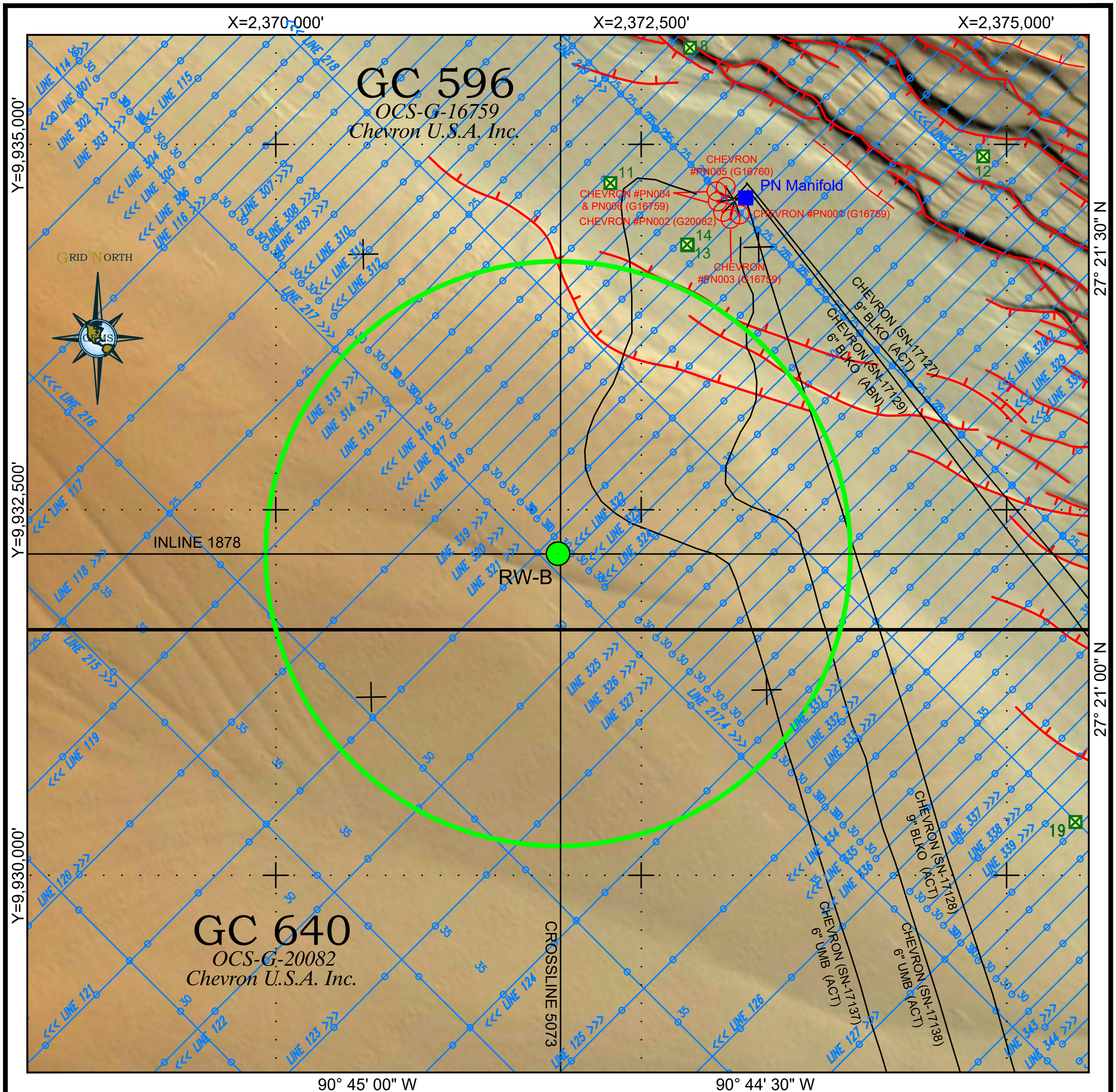
GEOSCIENCE EARTH & MARINE SERVICES, INC.
A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 596 RW-B-1

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

NOTE: BATHYMETRY DERIVED FROM THE MULTIBEAM BATHYMETRY DATASET COLLECTED IN 2003.



- 3-D SURVEY LINE.
- AUV SURVEY LINE.
- EXISTING STRUCTURE LOCATION, AS REPORTED BY BOEM.
- EXISTING WELL LOCATION, AS REPORTED BY BOEM.
- EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.
- PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.
- SIDE-SCAN SONAR TARGET (GEMS, 2011).
- SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.

NOTE: RENDERING DERIVED FROM THE MULTIBEAM BATHYMETRY DATASET COLLECTED IN 2003.

AZIMUTH =60°
ELEVATION = 55°
V.E. = 4x

-3425 -5050
RELATIVE WATER DEPTH

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

CHEVRON U.S.A. INC.

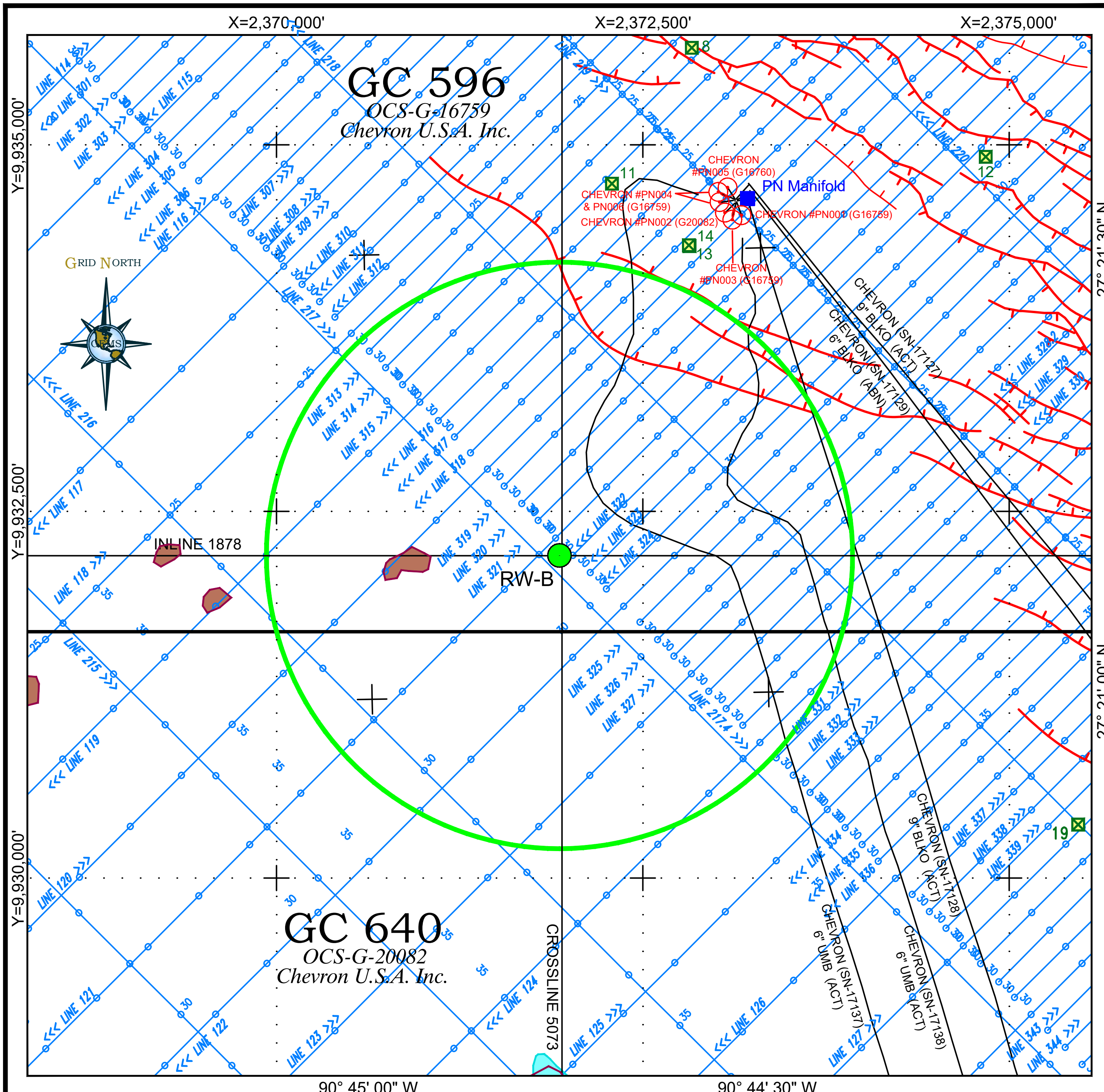
SEAFLOOR FEATURES MAP
BLOCK 596
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000
SCALE 1 : 12,000 or 1" = 1,000'

GEOSCIENCE EARTH & MARINE SERVICES, INC.
A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 596 RW-B-2



3-D SURVEY LINE.	
AUV SURVEY LINE.	
EXISTING STRUCTURE LOCATION, AS REPORTED BY BOEM.	
EXISTING WELL LOCATION, AS REPORTED BY BOEM.	
EXISTING PIPELINE/UMBILICAL/CABLE LOCATION, AS REPORTED BY BOEM.	
PROPOSED WELL LOCATION. CIRCLE REPRESENTS 2000 FT RADIUS AROUND PROPOSED WELLSITE.	
SIDE-SCAN SONAR TARGET (GEMS, 2011).	
SEAFLOOR FAULTS. TICKS INDICATE DOWNTHROWN SIDE OF FAULT.	
AMPLITUDE ANOMALIES BETWEEN THE SEAFLOOR AND TOP OF SALT.	
AMPLITUDE ANOMALIES BETWEEN THE HORIZON 900 AND TOP OF SALT.	

GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15
GRID UNITS: US FEET

CHEVRON U.S.A. INC.

GEOLOGIC FEATURES MAP

BLOCK 596
GREEN CANYON AREA
GULF OF MEXICO

0 500 1000 1500 2000
SCALE 1 : 12,000 or 1" = 1,000'

GEOSCIENCE EARTH & MARINE SERVICES, INC.
A Geosyntec Company

DATE: 7 JUNE 2024
FILE NAME: 3246_WELLS.DWG
PROJECT NO.: GHZ3246

MAP NO. GC 596 RW-B-5

SECTION D HYDROGEN SULFIDE (H_2S) INFORMATION

(a) CONCENTRATION
It is not expected that H_2S will be encountered or handled while conducting the activities proposed in this plan.

(b) CLASSIFICATION
Chevron requests the Regional Supervisor to make a determination of the area's classification of the probability of encountering H_2S during operations. H_2S was not detected in samples of the wells drilled to date in the Tahiti Field and is not anticipated in the wells in this plan. In the previously approved EPs and DOCDs, the BOEM has classified the area as "H_2S absent". Based on this evidence, Chevron requests that the area be classified as a zone where the absence of H_2S has been confirmed.

(c) H_2S CONTINGENCY PLAN
Should the Regional Supervisor not classify the activities proposed in this plan as being situated in an area designated as "H_2S absent" - an H_2S contingency plan will be proposed and submitted for approval. This proposed contingency plan would accompany the Application for Permit to Drill (APD) for the respective proposed well(s).

(d) MODELING REPORT
H_2S concentrations greater than 500 parts per million (ppm) have not been determined or estimated to be encountered or handled while conducting the activities proposed in this plan, therefore a modeling report is not required for this plan based on the guidelines provided in NTL No. 2008-G04.

SECTION E BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION

(a) HIGH-DENSITY DEEPWATER BENTHIC COMMUNITIES INFORMATION

Chevron contracted GEMS to prepare Site Clearance Letters for the surface locations proposed in this plan. The site clearance letter addresses specific seafloor and subsurface geologic conditions near the proposed location to the Top of Salt along with containing Deepwater benthic community reviews.
The report complies with the BOEM Notice to Lessees (NTL's): 2008-G04, 2009-G40, and 2022-G01 with respect to benthic community and shallow hazard assessments.

The proposed wells in this plan will be drilled with a dynamically positioned drillship, so there are no associated anchors, anchor chain or wire ropes.

High-Density Deepwater Benthic Communities Summary Statement from the Site Clearance Letters for the proposed locations:

GC 596 "IN" Surface Location (IN-A, IN-B, IN-C, and IN-D):
No features or areas were interpreted within 2,000 ft of the proposed location that can support high-density chemosynthetic or other deepwater benthic communities. There are no apparent geophysical indicators and/or geologic features at the seafloor or within the subbottom profiler record that would suggest conditions capable of supporting high-density deepwater benthic communities at the proposed wellsite or within the 2,000 ft radius. The side-scan sonar mosaic and multibeam backscatter indicate a uniformly textured seabed near the proposed location. The generally low reflectivity suggests normal Gulf of Mexico surficial sediments. No water bottom anomalies, as defined by BOEM, occur within 2,000 ft of the proposed location. In addition, the amplitude-enhanced seafloor rendering extracted from the 3-D dataset does not show any high amplitudes near Proposed Wellsite IN. BOEM and BSEE have not reported the existence of high-density deepwater benthic communities within Federal lease Block GC 596.

GC 641 "RW-A":
No features or areas were interpreted within 2,000 ft of the proposed location that can support high-density chemosynthetic or other deepwater benthic communities. There are no apparent geophysical indicators and/or geologic features at the seafloor or within the subbottom profiler record that would suggest conditions capable of supporting high-density deepwater benthic communities at the proposed wellsite or within the 2,000 ft radius. The side-scan sonar mosaic and multibeam backscatter indicate a uniformly textured seabed near the proposed location. The generally low reflectivity suggests normal Gulf of Mexico surficial sediments. No water bottom anomalies, as defined by BOEM, occur within 2,000 ft of the proposed location. In addition, the amplitude-enhanced seafloor rendering extracted from the 3-D dataset does not show any high amplitudes near Proposed Wellsite RW-A. BOEM has not reported the existence of high-density deepwater benthic communities within Federal lease Block GC 641.

GC 596 "RW-B"
No features or areas were interpreted within 2,000 ft of the proposed location that can support high-density chemosynthetic or other deepwater benthic communities. There are no apparent geophysical indicators and/or geologic features at the seafloor or within the subbottom profiler record that would suggest conditions capable of supporting high-density deepwater benthic communities at the proposed wellsite or within the 2,000 ft radius. The side-scan sonar mosaic and multibeam backscatter indicate a uniformly textured seabed near the proposed location. The

generally low reflectivity suggests normal Gulf of Mexico surficial sediments. No water bottom anomalies, as defined by BOEM, occur within 2,000 ft of the proposed location. In addition, the amplitude-enhanced seafloor rendering extracted from the 3-D dataset does not show any high amplitudes near Proposed Wellsite RW-B. BOEM has not reported the existence of high-density deepwater benthic communities within Federal lease Block GC 596.

(b) TOPOGRAPHIC FEATURES MAP

The proposed bottom disturbing activity is greater than 305 meters (1,000 feet) from the "No Activity Zone" of an identified topographic feature; therefore, the map described in Attachment 2, Section A, Item No. 1 of NTL No. 2004-G05 is not required for this plan based on the guidelines provided in NTL No. 2008-G04.

(c) TOPOGRAPHIC FEATURES STATEMENT (SHUNTING)

Chevron does not propose to drill two wells from the same surface location outside the 1-mile Zone but within the Protective Zone of an identified topographic feature. The statement described in Attachment 2, Section A, Item No.2 of NTL No. 2004-G05 is not required for this plan based on the guidelines provided in NTL No. 2008-G04.

(d) LIVE BOTTOMS (PINNACLE TREND) MAP

The leases in this proposed plan do not have the Live Bottoms (Pinnacle Trend) stipulation.

(e) LIVE BOTTOMS (LOW RELIEF) MAP

The leases in this proposed plan do not have the Live Bottoms (Low Relief) stipulation.

(f) POTENTIALLY SENSITIVE BIOLOGICAL FEATURES

No bottom disturbing activities will be within 30 meters (100 feet) of potentially sensitive biological features. Therefore the map described in Attachment 8, Section A of NTL No. 2004-G05 is not required for this plan based on the guidelines provided in NTL No. 2008-G04.

(g) REMOTELY OPERATED VEHICLE (ROV) MONITORING SURVEY PLAN

This plan is no longer required.

(h) THREATENED OR ENDANGERED SPECIES, CRITICAL HABITAT, AND MARINE MAMMAL INFORMATION

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

Five species of sea turtles, the Rice's whale, sperm whale, oceanic whitetip shark, giant manta ray and the Black-capped Petrel are the only endangered or threatened species likely to occur at or near the lease area. Critical habitat has been designated for the loggerhead turtle. No critical habitat has been designated in the Gulf of Mexico for the sperm whale or the other four sea turtle species.

Coastal endangered or threatened species that may occur along the U.S. Gulf Coast include the West Indian manatee, Piping Plover, Ruda Red Knot, Florida salt marsh vole, Panama City crayfish, Whooping Crane, Gulf sturgeon, smalltooth sawfish, Queen conch, and four subspecies of beach mouse. Critical habitat has been designated for all of these species except the Florida salt marsh vole.

Federally listed endangered, threatened, and candidate species potentially present in the lease area and along the northern Gulf Coast:

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Marine Mammals					
Rice's whale[1]	*Balaenoptera ricei*	E	X	--	None
Sperm whale	*Physeter macrocephalus*	E	X	--	None
West Indian manatee	*Trichechus manatus*[2]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T,E[3]	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); *Sargassum* habitat including most of the central & western Gulf of Mexico.
Green turtle	*Chelonia mydas*	T	X	X	None
Leatherback turtle	*Dermochelys coriacea*	E	X	X	None
Hawksbill turtle	*Eretmochelys imbricata*	E	X	X	None
Kemp's ridley turtle	*Lepidochelys kempii*	E	X	X	None
Birds					
Piping Plover	*Charadrius melodus*	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	*Grus americana*	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Rufa Red Knot	*Calidris canutus rufa*	T	--	X	None
Black-capped Petrel	*Pterodroma hasitata*	E	X	--	None
Fishes					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	X	--	None
Giant manta ray	*Mobula birostris*	T	X	X	None
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Nassau grouper	*Epinephelus striatus*	T	--	X	20 different geographic units, located in waters off the coasts of southeastern Florida and the Florida Keys, Puerto Rico, Navassa, and the U.S. Virgin Islands
Smalltooth sawfish	*Pristis pectinata*	E	--	X	Southwest Florida
Invertebrates					
Elkhorn coral	*Acropora palmata*	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	*Acropora cervicornis*	T	--	X	Florida Keys and the Dry Tortugas
Pillar coral	*Dendrogyra cylindrus*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Rough cactus coral	*Mycetophyllia ferox*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Lobed star coral	*Orbicella annularis*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Mountainous star coral	*Orbicella faveolata*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Boulder star coral	*Orbicella franksi*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Panama City crayfish	*Procambarus econfinae*	T	--	X	South-central Bay County, Florida
Queen conch	*Aliger gigas*	T	--	X	None

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus subsp. Ammobates, allophrys, trissyllepsis, and peninsularis, respectively*	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	E	--	X	None

E = Endangered; T = Threatened; X = potentially present; -- = not present.

1 In 2021, National Marine Fisheries Service recognized that what had previously been accepted as a subspecies of the Bryde's whale is actually a separate species. The reclassification is formerly recognized under 86 *Federal Register* [FR] 47022 effective date 22 October 2021 as the Rice's whale (*Balaenoptera ricei*).

2 There are two subspecies of West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern Gulf of Mexico to Virginia, and the Antillean manatee (*T. m. manatus*), which ranges from northern Mexico to eastern Brazil. Only the Florida manatee subspecies is likely to be found in the northern Gulf of Mexico.

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

(i) ARCHAEOLOGICAL REPORT

Chevron contracted C & C Technologies Inc., (C & C) to conduct a high-resolution geophysical AUV survey in 2003 in the Tahiti Development Area, Green Canyon Blocks 595-597, 639-641, and 683-685. The AUV collected 100 kHz side-scan sonar, 2-10 kHz subbottom profiler, 3 m (10 ft) bin multibeam bathymetry, and 1 m (3 ft) bin multibeam backscatter data. GEMS was contracted by Chevron to examine the data collected and to locate any potential submerged cultural resources.

GEMS completed an archaeological assessment using the high-resolution geophysical AUV survey data. The requirements of NTL 2005-G07, which are applicable for exploration or production activity, have been satisfied and the results were provided in the GEMS archaeological report, “Tahiti Development Area Archaeological Assessment Blocks 595-597, 639-641, & 683-685 Green Canyon Area, Gulf of Mexico”.

Blocks 595-597, 639-641, and 683-685, Green Canyon Area Results

- Water depths across the surveyed area range from approximately 3,425 feet below Mean Sea Level (MSL) in the southeast corner of GC 595, to approximately 4,383 feet below MSL in the north-central portion of GC 684.
- Sixty-eight (68) unidentified sonar contacts are located within the surveyed area.
- No sonar contacts are recommended for archaeological avoidance or investigation based on the reviewed data.
- The unidentified side-scan sonar contacts likely represent modern debris associated with shipping, exploratory, or storm activities.
- The unidentified contacts have the standard 100 ft geohazard avoidance as prescribed in the BOEM guidelines.

No areas in the Tahiti Development Area were designated as archaeologically sensitive. No sonar contacts are recommended for archaeological avoidance, but care should be exercised when working on the seabed near the side-scan sonar contacts. 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.

The archaeological report, “Tahiti Development Area, Archaeological Assessment, Blocks 595-597,639-641, and 683-685, Green Canyon Area, Gulf of Mexico, May 2011”, Project No. 0311-1901, was previously submitted in the Revised EP, Control No. R-05825.

Results and Recommendations from the Site Clearance Letters:

GC 596 IN Location:

Four sonar contacts, Nos. 8, 11, 13, and 14, are located within 2,000 ft of the proposed wellsite location. Side-Scan Sonar Contacts #13 and #14 are the closest to the proposed wellsite and lie ~143 ft to the northeast. Side-Scan Sonar Contact #11 lies ~667 ft to the northwest and Contact #8 is ~1,450 ft to the north. The sonar contacts do not have an acoustic signature indicative of archaeological resources. Based on the archaeological review of available AUV data, the Area of Potential Effect around the proposed IN wellsite location appears clear of archaeological resources. The unidentified sonar contacts likely represent modern debris associated with shipping, exploratory drilling, pipelay operation and construction, or storm events.

GC 641 RW-A Location:

None of the sonar contacts are located within 2,000 ft of the proposed wellsite location. The nearest sonar contact to the proposed location, Contact #19, lies ~2,815 ft northwest. The contact measures ~12 ft long by ~2 ft wide and has no vertical relief above the seabed. The sonar contact does not have an acoustic signature indicative of archaeological resources. Based on the archaeological review of available AUV data, the Area of Potential Effect around the proposed RW-A wellsite location appears clear of archaeological resources. The unidentified sonar contact likely represents modern debris associated with shipping, exploratory drilling, pipelay operation and construction, or storm events.

GC 596 RW-B Location:
None of the sonar contacts are located within 2,000 ft of the proposed wellsite location. The nearest sonar contacts to the proposed location, Contacts #13 and #14, lie ~2,292 ft northeast. Contact #13 is listed as linear shaped and measures ~19.8 ft long and ~3.0 ft wide. Contact #14 is irregular in shape and measures ~5.6 ft long and ~4.0 ft wide. Neither contact shows vertical relief above the seabed. The sonar contacts do not have an acoustic signature indicative of archaeological resources. Based on the archaeological review of available AUV data, the Area of Potential Effect around the proposed RW-B wellsite location appears clear of archaeological resources. The unidentified sonar contacts likely represent modern debris associated with shipping, exploratory drilling, pipelay operation and construction, or storm events.

SECTION F WASTE AND DISCHARGE INFORMATION

(a) PROJECTED GENERATED WASTES
(b) PROJECTED OCEAN DISCHARGES

Water Quality Spreadsheets, included below, replace the Projected Generated Wastes and the Projected Generated Ocean Discharges Tables.

TABLE 1. WASTES YOU WILL GENERATE, TREAT AND DOWNHOLE DISPOSE OR DISCHARGE TO THE GOM ~ Tahiti - 200 drilling days

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	Water-based drilling muds	44,875 bbls/well	4,488 bbls/day	Discharge at mudline prior to riser installation.	No
	Cuttings wetted with water-based fluid	Cuttings coated with water-based drilling muds	2,955 bbls/well	296 bbls/day	Discharge at mudline prior to riser installation.	No
	Cuttings wetted with synthetic-based fluid	Cuttings coated with Synthetic drilling muds, including drilled out cement	5,359 bbls/well	28 bbls/day	Treated cuttings will be discharged overboard during drilling of SBM interval. Cuttings will pass through curttings dryer substantially reducing ROC percentage from worst case quoted below. Or stored in cutting boxes and transported to shore.	No
Will humans be there? If yes, expect conventional waste						
	Domestic waste	Gray water from living quarters,control	75,400 bbls/well	377 bbls/day	Food grinder. Starboard Caisson.	No
	Sanitary waste	Sanitary waste from living quarters,control rooms, and common	37,400 bbls/well	187 bbls/day	USCG-approved MSD with chlorination. Starboard Caisson.	No
Is there a deck? If yes, there will be Deck Drainage						
	Deck Drainage	Deck drainage from drilling floor,	227,400 bbls/well	1,137 bbls/day	Hull discharge overboard.	No
Will you conduct well treatment, completion, or workover?						
	Well completion fluids	N/A	N/A	N/A	N/A	No
Miscellaneous discharges. If yes, only fill in those associated with your activity.						
	Desalinization unit discharge	Rejected water from watermaker unit	365,400 bbls/well	1,827 bbls/day	Hull discharge overboard.	No
	Blowout prevent fluid	Stackmagic 200/0/5% glycol based on 2% mixture with potable water	416 bbls/well	2.08 bbls/day	discharge at sea floor, or w/ deck drainage when tested on the surface	No
	Ballast water	Uncontaminated seawater used to maintain proper draft	1,013,600 bbls/well	5,068 bbls/day	Hull discharge overboard.	No
	Excess cement	Cement,Fluid Loss Additive,Cement Retarder,Free Water Control Additive,Defoamer,Surfacant	800 bbls/well	800 bbls/well	Discharged at seafloor during riserless drilling	No
	Fire water	Seawater with no addition of chemicals	51,428 bbls/day when flaring	51,428 bbls/day when flaring	Hull discharge overboard.	No
	Cooling water	Seawater with no addition of chemicals	100,000,000 bbls/well	500,000 bbls/day	Hull discharge overboard.	No
	Hydrate control fluid	Glycol	25 gals/well	25 gals/well	Discharge at seafloor	No
	Sub sea wellhead preservation fluid	Sub sea wellhead preservation fluid	2 bbls/well	2 bbls/well	Discharge at seafloor	No
	Leak tracer dye	Lignite	21,000 lbs/well	21,000 lbs/well	Discharge at seafloor	No
Will you produce hydrocarbons? If yes fill in for produced water.						
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	Synthetic-based drilling muds	Internal mud tanks on motor vessel	Ecoserv, Port Fourchon, LA	20,000 bbls/well	Transport by boat in cutting bins to shorebase; truck to disposal facility. Recycled where possible, or injected.
Cuttings wetted with Water-based fluid	N/A	N/A	N/A	N/A	N/A
Cuttings wetted with Synthetic-based fluid	Cuttings coated with Synthetic drilling muds, including drilled out cement	Cuttings box on workboat/crewboat	Ecoserv, Port Fourchon, LA	1,000 bbs/well	Transport by boat in cutting bins to shorebase; truck to disposal facility. Treated and landfilled.
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	N/A	N/A	N/A	N/A	N/A
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.					
EXAMPLE: trash and debris (recylables)	*Plastic, paper, aluminum*	*barged in a storage bin*	*ARC, New Iberia, LA*	*X lb/well*	*Recycled*
Trash and debris	Plastic, paper, aluminum, glass, and other refuse	Storage bins on crew boat	Total Waste Solutions, Port Fourchon, LA	1,800 lbs/day	Transport by boat in storage bins to shorebase. Landfilled.
Wash water		Transport by boat in tanks to shorebase	Ecoserv, Port Fourchon, LA	2-5 bbls/day	Transport by boat in cutting bins to shorebase; truck to disposal facility. Injected.
Chemical product wastes	Used oil, hazardous waste, and nonhazardous waste	Drums on crew boat	Chemical Waste Management, Sulfur, La; WMI Woodside, Walker, LA; Aaron Oil, Berwick,LA	3 bbls/day	Transport in portable tanks or drums on crew boat to shorebase; truck to disposal facility. Recycled where possible, otherwise landfilled or incinerated.
Completion Fluids	Calcium Bromide	Transport by boat in tanks back to vendor	Halliburton-Baroid, Golden Meadow, LA	10,000 bbls/well	Recycled

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

SECTION G AIR EMISSIONS INFORMATION

(a)EMISSIONS WORKSHEETS AND SCREENING QUESTIONS

The emissions for the drillship are based on the 2023 historical actual fuel usage for the Valaris DS-18 (formerly, Rowan Relentless) with a 250% contingency factor added. The historical actual fuel usage is based on the fuel usage recorded each day on the drilling reports. Attachment G-2 shows the actual fuel usage data for 2023 for the DS-18. An average fuel usage of 1,391 gals/hr (historical daily fuel average plus 250%) was utilized in the air emissions spreadsheets. While the current plan is to use the DS-18 for this activity, this may change. The DS-18's actual fuel usage was used to calculate emissions in the AQR because this drillship had the highest fuel usage across the 2023 Chevron GOM drillship fleet. Therefore, any other drillship in the Chevron GOM fleet would be able to comply with the annual fuel usage limit. The actual daily fuel usage will be recorded on the daily drilling report and be kept on the drilling rig.

The activity proposed in this plan will occur in Green Canyon 596 and 641. An AQR sheet was prepared to show drilling, completing, and abandoning operations in each surface block during each calendar year. Please note, 365 days of activity has been included in the AQR for all the years calculated. This is for contingency purposes to accommodate likely schedule changes within the overall drilling schedule. The Complex Total Emissions are the same as the Plan Emissions, and therefore only one set of emissions calculations is included for each surface block.

GC 596 and GC 641

SCREENING QUESTIONS FOR EP'S	YES	NO
Is any calculated Complex Total (CT) Emission amount (in tons) associated with your proposed exploration activities more than 90% of the amounts calculated using the following formulas: CT = 3400D2/3 for CO, and CT = 33.3D for the other pollutants (where D = distances to shore in miles)?	☐	☒
Do your emissions calculations include any emission reduction measures or modified emissions factors?	☒	☐
Are your proposed exploration activities located east of 87.5° W longitude?	☐	☒
Do you expect to encounter H2S at concentrations greater than 20 parts per million (ppm)?	☐	☒
Do you propose to flare or vent natural gas for more than 48 continuous hours from any proposed well?	☐	☒
Do you propose to burn produced hydrocarbon liquids?	☐	☒

Emission Source	Reduction Control Method	Amount of Reduction	Annual Fuel Usage Limit for Drillship (gal/yr)	Monitoring System
DS-18	Actual fuel consumption	630.97 lb/hr NOx	12,187,384	Fuel log

CONTACT INFORMATION

Heather Spindel-Colwell
Chevron U.S.A. Inc.
100 Northpark Blvd.
Covington, LA 70433
985-273-9599
heather.spindelcolwell@chevron.com

MODELING REPORT

A Modeling Report is not required for activities proposed in this plan.

ATTACHMENTS TO SECTION G

- **G-1** – Form BOEM-0138 “Gulf of Mexico Air Emissions Calculations for EP's”
- **G-2** – Valaris DS-18 Historical Actual Fuel Usage

COMPANY	Chevron U.S.A. Inc.
AREA	Green Canyon
BLOCK	596
LEASE	OCS-G 16759
FACILITY	NA - DP Drillship
WELL	IN-A, IN-B, IN-C, IN-D, and RW-B
COMPANY CONTACT	Heather Spindel-Colwell
TELEPHONE NO.	985-273-9599
REMARKS	DP Drillship emissions based on DS-18 fuel usage.

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.api.org/
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	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	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

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

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

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

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

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron U.S.A. Inc.	Green Canyon		596	OCS-G 16759	NA - DP Drillship	IN-A, IN-B, IN-C, IN-D, and RW-B					Heather Spindel-Colwell		985-273-9599		DP Drillship emissions based on DS-18 fuel usage.										
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	DS-18*	27,038	1,391.00	33,388	24	365	19.07	11.51	11.16	0.28	457.02	13.14	0.00	71.68	0.13	83.56	50.41	48.90	1.22	2001.97	57.56	0.01	314.00	0.58
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0.00	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	0.00	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	0.00	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	0.00	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	0.00	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
			BPD																						
DRILLING	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
WELL TEST	COMBUSTION FLARE - no smoke			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	--
	COMBUSTION FLARE - light smoke			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	--
	COMBUSTION FLARE - medium smoke			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	--
	COMBUSTION FLARE - heavy smoke			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	--
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
2024-2029	**Facility Total Emissions**							**19.07**	**11.51**	**11.16**	**0.28**	**457.02**	**13.14**	**0.00**	**71.68**	**0.13**	**83.56**	**50.41**	**48.90**	**1.22**	**2,001.97**	**57.56**	**0.01**	**314.00**	**0.58**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**3,929.40**			**3,929.40**	**3,929.40**	**3,929.40**		**81,796.29**	
	118.0																								
DRILLING	VESSELS- Crew Diesel	Crew Vessel	10,800	555.62	13,334.80	7	122	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05	3.24	1.96	1.90	0.05	77.74	2.24	0.00	12.19	0.02
	VESSELS - Supply Diesel	Supply Vessel	6,600	339.54	8,149.05	19	183	4.66	2.81	2.72	0.07	111.56	3.21	0.00	17.50	0.03	8.07	4.87	4.72	0.12	193.41	5.56	0.00	30.34	0.06
	VESSELS - Tugs Diesel		0	0.00	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	VESSELS - Material Tug Diesel		0	0.00	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
INSTALLATION	VESSELS - Crew Diesel		0	0.00	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	0.00	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	0.00	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			0.00	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
	On-Ice – Other Construction Equipment			0.00	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
	On-Ice – Other Survey Equipment			0.00	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
	On-Ice – Tractor			0.00	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
	On-Ice – Truck (for gravel island)			0.00	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
	On-Ice – Truck (for surveys)			0.00	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
	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
2024-2029	**Non-Facility Total Emissions**							**12.28**	**7.41**	**7.18**	**0.18**	**294.11**	**8.46**	**0.00**	**46.13**	**0.09**	**11.32**	**6.83**	**6.62**	**0.16**	**271.15**	**7.80**	**0.00**	**42.53**	**0.08**

* Based on 2023 actual fuel usage plus contingency.

** This AQR includes additional drilling days each year for contingency purposes. Number of days included in AQR will not match Form 137.

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL
Chevron U.S.A. Inc.	Green Canyon	596	OCS-G 16759	NA - DP Drillship	IN-A, IN-B, IN-C, IN-D, and RW-B

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2024-2029	83.56	50.41	48.90	1.22	2,001.97	57.56	0.01	314.00	0.58
Allowable	3,929.40			3,929.40	3,929.40	3,929.40		81,796.29	

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

COMPANY	Chevron U.S.A. Inc.
AREA	Green Canyon
BLOCK	641
LEASE	OCS-G 16770
FACILITY	NA - DP Drillship
WELL	RW-A
COMPANY CONTACT	Heather Spindel-Colwell
TELEPHONE NO.	985-273-9599
REMARKS	DP Drillship emissions based on DS-18 fuel usage.

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	
Vessels – Drilling Prime Engine, Auxiliary	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels – Diesel Boiler	g/hp-hr	0.0466	0.1491	0.1417	0.4400	1.4914	0.0820	3.73E-05	0.1491	0.0003	USEPA 2017 NEI;TSP (units converted) refer to Diesel Boiler Reference	3/19	
Vessels – Well Stimulation	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Natural Gas Heater/Boiler/Burner	lbs/MMscf	7.60	1.90	1.90	0.60	190.00	5.50	5.00E-04	84.00	3.2	AP42 1.4-1 & 1.4-2; Pb and NH3: WebFIRE (08/2018)	7/98 and 8/18	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf https://cfpub.epa.gov/webfire/
Combustion Flare (no smoke)	lbs/MMscf	0.00	0.00	0.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	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.api.org/
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	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	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

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

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

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

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

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron U.S.A. Inc.	Green Canyon		641	OCS-G 16770	NA - DP Drillship	RW-A					Heather Spindel-Colwell		985-273-9599		DP Drillship emissions based on DS-18 fuel usage.										
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	DS-18*	27,038	1,391.00	33,388	24	365	19.07	11.51	11.16	0.28	457.02	13.14	0.00	71.68	0.13	83.56	50.41	48.90	1.22	2001.97	57.56	0.01	314.00	0.58
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0.00	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	0.00	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	0.00	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	0.00	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	0.00	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
			BPD																						
DRILLING	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
WELL TEST	COMBUSTION FLARE - no smoke			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	--
	COMBUSTION FLARE - light smoke			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	--
	COMBUSTION FLARE - medium smoke			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	--
	COMBUSTION FLARE - heavy smoke			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	--
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
2024-2029	**Facility Total Emissions**							**19.07**	**11.51**	**11.16**	**0.28**	**457.02**	**13.14**	**0.00**	**71.68**	**0.13**	**83.56**	**50.41**	**48.90**	**1.22**	**2,001.97**	**57.56**	**0.01**	**314.00**	**0.58**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**3,929.40**			**3,929.40**	**3,929.40**	**3,929.40**		**81,796.29**	
	118.0																								
DRILLING	VESSELS- Crew Diesel	Crew Vessel	10,800	555.62	13,334.80	7	122	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05	3.24	1.96	1.90	0.05	77.74	2.24	0.00	12.19	0.02
	VESSELS - Supply Diesel	Supply Vessel	6,600	339.54	8,149.05	19	183	4.66	2.81	2.72	0.07	111.56	3.21	0.00	17.50	0.03	8.07	4.87	4.72	0.12	193.41	5.56	0.00	30.34	0.06
	VESSELS - Tugs Diesel		0	0.00	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	VESSELS - Material Tug Diesel		0	0.00	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
INSTALLATION	VESSELS - Crew Diesel		0	0.00	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	0.00	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	0.00	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			0.00	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
	On-Ice – Other Construction Equipment			0.00	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
	On-Ice – Other Survey Equipment			0.00	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
	On-Ice – Tractor			0.00	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
	On-Ice – Truck (for gravel island)			0.00	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
	On-Ice – Truck (for surveys)			0.00	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
	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
2024-2029	**Non-Facility Total Emissions**							**12.28**	**7.41**	**7.18**	**0.18**	**294.11**	**8.46**	**0.00**	**46.13**	**0.09**	**11.32**	**6.83**	**6.62**	**0.16**	**271.15**	**7.80**	**0.00**	**42.53**	**0.08**

* Based on 2023 actual fuel usage plus contingency.

** This AQR includes additional drilling days each year for contingency purposes. Number of days included in AQR will not match Form 137.

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL			
Chevron U.S.A. Inc.	Green Canyon	641	OCS-G 16770	NA - DP Drillship	RW-A			

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2024-2029	83.56	50.41	48.90	1.22	2,001.97	57.56	0.01	314.00	0.58
Allowable	3,929.40			3,929.40	3,929.40	3,929.40		81,796.29	

Fuel Usage: DS-18

Month	gal/month	avg gal/day	
Jan 2023	407,244	13,137	
Feb 2023	373,853	13,352	
Mar 2023	404,576	13,051	
Apr 2023	398,351	13,278	
May 2023	447,108	14,423	
Jun 2023	425,393	14,180	
Jul 2023	404,999	13,064	
Aug 2023	414,747	13,379	
Sep 2023	395,938	13,198	
Oct 2023	400,667	12,925	
Nov 2023	373,563	12,452	
Dec 2023	428,514	13,823	
	Average	13,355	gal/day
	Total	4,874,954	gal/year
	Total w/ contigency	12,187,384	gal/year

Date	Gal/Day
01/01/23	16,352
01/02/23	13,816
01/03/23	9,722
01/04/23	10,276
01/05/23	9,669
01/06/23	10,303
01/07/23	13,737
01/08/23	11,412
01/09/23	13,076
01/10/23	13,816
01/11/23	13,024
01/12/23	14,397
01/13/23	15,243
01/14/23	12,707
01/15/23	14,794
01/16/23	7,423
01/17/23	19,390
01/18/23	13,605
01/19/23	12,786
01/20/23	12,786
01/21/23	15,692
01/22/23	9,695
01/23/23	17,065
01/24/23	14,450
01/25/23	9,933
01/26/23	11,624
01/27/23	13,975
01/28/23	13,314
01/29/23	12,812
01/30/23	14,952
01/31/23	15,401
02/01/23	15,665
02/02/23	15,348
02/03/23	14,688
02/04/23	15,058
02/05/23	12,548
02/06/23	11,703
02/07/23	13,156
02/08/23	14,397
02/09/23	10,461
02/10/23	12,575
02/11/23	15,163
02/12/23	12,601
02/13/23	14,133
02/14/23	14,398
02/15/23	13,446
02/16/23	15,401
02/17/23	14,450
02/18/23	11,254
02/19/23	12,865
02/20/23	13,024
02/21/23	12,786
02/22/23	15,190
02/23/23	13,948
02/24/23	13,341
02/25/23	12,812
02/26/23	10,171
02/27/23	15,137
02/28/23	8,136

Date	Gal/Day
03/01/23	12,469
03/02/23	11,729
03/03/23	15,533
03/04/23	8,453
03/05/23	12,099
03/06/23	10,223
03/07/23	13,763
03/08/23	13,763
03/09/23	10,593
03/10/23	15,428
03/11/23	12,337
03/12/23	13,737
03/13/23	10,620
03/14/23	15,930
03/15/23	16,326
03/16/23	13,737
03/17/23	9,140
03/18/23	12,865
03/19/23	12,997
03/20/23	12,363
03/21/23	10,223
03/22/23	12,812
03/23/23	13,895
03/24/23	14,133
03/25/23	16,933
03/26/23	13,658
03/27/23	16,775
03/28/23	14,292
03/29/23	11,756
03/30/23	12,178
03/31/23	13,816
04/01/23	12,073
04/02/23	14,846
04/03/23	11,782
04/04/23	16,589
04/05/23	16,854
04/06/23	11,491
04/07/23	11,650
04/08/23	12,205
04/09/23	10,646
04/10/23	13,314
04/11/23	14,820
04/12/23	11,201
04/13/23	15,903
04/14/23	11,597
04/15/23	13,826
04/16/23	9,220
04/17/23	10,805
04/18/23	12,812
04/19/23	15,665
04/20/23	15,665
04/21/23	13,261
04/22/23	14,899
04/23/23	14,054
04/24/23	12,997
04/25/23	12,548
04/26/23	10,435
04/27/23	14,635
04/28/23	13,763
04/29/23	13,895
04/30/23	14,899

Date	Gal/Day
05/01/23	10,778
05/02/23	12,073
05/03/23	13,367
05/04/23	12,971
05/05/23	13,024
05/06/23	12,125
05/07/23	16,088
05/08/23	16,722
05/09/23	18,096
05/10/23	14,477
05/11/23	15,877
05/12/23	18,175
05/13/23	16,405
05/14/23	18,967
05/15/23	14,952
05/16/23	19,311
05/17/23	15,956
05/18/23	14,714
05/19/23	16,035
05/20/23	13,050
05/21/23	17,488
05/22/23	15,560
05/23/23	11,122
05/24/23	13,314
05/25/23	12,865
05/26/23	9,325
05/27/23	13,235
05/28/23	12,997
05/29/23	11,333
05/30/23	13,710
05/31/23	12,997
06/01/23	16,669
06/02/23	19,047
06/03/23	14,160
06/04/23	13,314
06/05/23	12,865
06/06/23	14,001
06/07/23	12,944
06/08/23	12,522
06/09/23	13,050
06/10/23	12,786
06/11/23	13,895
06/12/23	15,322
06/13/23	16,194
06/14/23	15,243
06/15/23	17,013
06/16/23	15,322
06/17/23	15,058
06/18/23	13,050
06/19/23	13,895
06/20/23	13,288
06/21/23	13,446
06/22/23	13,790
06/23/23	11,491
06/24/23	14,344
06/25/23	16,590
06/26/23	11,624
06/27/23	11,544
06/28/23	16,009
06/29/23	13,103
06/30/23	13,816

Date	Gal/Day
07/01/23	17,224
07/02/23	14,899
07/03/23	12,733
07/04/23	11,307
07/05/23	14,292
07/06/23	14,212
07/07/23	11,016
07/08/23	13,737
07/09/23	11,782
07/10/23	11,174
07/11/23	12,495
07/12/23	13,473
07/13/23	11,914
07/14/23	11,835
07/15/23	14,239
07/16/23	12,231
07/17/23	12,786
07/18/23	12,337
07/19/23	12,258
07/20/23	11,808
07/21/23	15,692
07/22/23	9,061
07/23/23	11,624
07/24/23	15,243
07/25/23	14,344
07/26/23	13,895
07/27/23	12,046
07/28/23	13,948
07/29/23	15,137
07/30/23	12,759
07/31/23	13,499
08/01/23	14,556
08/02/23	15,745
08/03/23	17,435
08/04/23	14,661
08/05/23	14,556
08/06/23	14,107
08/07/23	13,024
08/08/23	12,707
08/09/23	13,341
08/10/23	13,526
08/11/23	12,971
08/12/23	12,310
08/13/23	12,125
08/14/23	12,258
08/15/23	11,703
08/16/23	12,258
08/17/23	12,258
08/18/23	12,363
08/19/23	14,662
08/20/23	13,393
08/21/23	14,978
08/22/23	16,669
08/23/23	11,808
08/24/23	14,926
08/25/23	12,073
08/26/23	10,408
08/27/23	12,205
08/28/23	12,099
08/29/23	11,174
08/30/23	12,337
08/31/23	16,114

Date	Gal/Day
09/01/23	11,412
09/02/23	10,620
09/03/23	15,507
09/04/23	14,952
09/05/23	14,661
09/06/23	13,420
09/07/23	13,684
09/08/23	14,080
09/09/23	13,129
09/10/23	12,812
09/11/23	9,959
09/12/23	11,571
09/13/23	15,718
09/14/23	10,937
09/15/23	9,801
09/16/23	15,692
09/17/23	13,076
09/18/23	14,212
09/19/23	12,707
09/20/23	13,816
09/21/23	17,224
09/22/23	14,001
09/23/23	10,382
09/24/23	12,099
09/25/23	14,582
09/26/23	12,918
09/27/23	11,861
09/28/23	11,941
09/29/23	12,759
09/30/23	16,405
10/01/23	11,914
10/02/23	13,261
10/03/23	12,073
10/04/23	13,235
10/05/23	11,835
10/06/23	10,884
10/07/23	12,707
10/08/23	18,228
10/09/23	9,986
10/10/23	14,477
10/11/23	13,605
10/12/23	12,707
10/13/23	10,593
10/14/23	11,095
10/15/23	13,684
10/16/23	12,020
10/17/23	12,205
10/18/23	15,665
10/19/23	12,812
10/20/23	10,276
10/21/23	13,288
10/22/23	12,495
10/23/23	12,839
10/24/23	13,446
10/25/23	12,865
10/26/23	12,310
10/27/23	11,676
10/28/23	13,578
10/29/23	14,186
10/30/23	17,832
10/31/23	12,892

Date	Gal/Day
11/01/23	12,733
11/02/23	11,544
11/03/23	12,469
11/04/23	11,650
11/05/23	12,363
11/06/23	12,337
11/07/23	11,914
11/08/23	12,654
11/09/23	12,205
11/10/23	13,684
11/11/23	11,941
11/12/23	11,782
11/13/23	19,311
11/14/23	11,597
11/15/23	13,129
11/16/23	11,254
11/17/23	11,254
11/18/23	11,808
11/19/23	11,835
11/20/23	12,258
11/21/23	11,465
11/22/23	14,450
11/23/23	11,359
11/24/23	11,888
11/25/23	12,865
11/26/23	14,688
11/27/23	10,725
11/28/23	10,963
11/29/23	11,861
11/30/23	13,578
12/01/23	12,601
12/02/23	11,993
12/03/23	15,639
12/04/23	9,061
12/05/23	16,114
12/06/23	7,978
12/07/23	13,024
12/08/23	21,688
12/09/23	13,895
12/10/23	11,307
12/11/23	13,209
12/12/23	13,186
12/13/23	16,194
12/14/23	10,276
12/15/23	18,413
12/16/23	15,216
12/17/23	12,522
12/18/23	13,103
12/19/23	13,420
12/20/23	14,318
12/21/23	11,782
12/22/23	10,699
12/23/23	15,586
12/24/23	16,035
12/25/23	15,031
12/26/23	13,103
12/27/23	14,820
12/28/23	14,160
12/29/23	13,869
12/30/23	12,627
12/31/23	17,647

SECTION H OIL SPILLS INFORMATION

(a) OIL SPILL RESPONSE PLANNING

REGIONAL OSRP INFORMATION

All the proposed activities in this plan will be covered by Chevron's Gulf of Mexico Regional Oil Spill Response Plan (OSRP), approved by BSEE on March 22, 2016; biennial review was deemed in compliance with 30 CFR 254 by BSEE on March 23, 2021. A biennial review of the OSRP was submitted in June 2023. Revisions to the approved OSRP was received by BSEE on August 28, 2023 and approved on November 6, 2023. Companies covered under this OSRP: Chevron Corporation (02335), Chevron U.S.A. Inc. (00078), Chevron Pipe Line Company (00400), Union Oil Company of California (00003), Chevron Midcontinent L.P. (23200), and Noble Energy Inc. (02237).

SPILL RESPONSE SITES

In the table below, information is provided concerning the location of the primary spill response equipment and the location of the planned staging area(s) that would be used should an oil spill occur resulting from activities proposed in this plan.

Primary Response Equipment Locations	Preplanned Staging Location(s)
Ingleside, Galveston, and Port Arthur, TX; Lake Charles, Morgan City, Houma, Port Fourchon, Leeville, Venice, Fort Jackson, Harvey, Belle Chasse, and Baton Rouge, LA; Pascagoula, MS; Theodore, AL; Tampa, Miami, and Jacksonville, FL.	Ingleside, TX; Port Fourchon and Galliano, LA; Theodore, AL.

OIL SPILL REMOVAL ORGANIZATION (OSRO) INFORMATION

Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) cooperatives are the primary surface response equipment providers for Chevron in the Gulf of Mexico Region. CGA & MSRC each maintain a dedicated fleet of vessels and other equipment strategically positioned along the Gulf Coast. CGA & MSRC each maintain a network trained Oil Spill Removal Organizations (OSROs) deploy and operate their equipment. CGA & MSRC have the capability to plan the mobilization and rapid deployment of spill response resources on a 24-hour, 7 days a week basis, year round.

Marine Well Containment Company (MWCC) is the primary subsea containment service provider for Chevron. MWCC equipment is available on a 24-hour, 7 days a week basis, year round.

Chevron's primary staging areas, marine transportation facilities and helicopter bases are located in Port Fourchon and Galliano, Louisiana. Chevron also can contract for additional staging areas throughout Gulf of Mexico coastal ports.

Chevron's primary command post for an oil spill is located in Covington, LA; however, Chevron has the ability to set up and effectively manage spills at Chevron facilities located in Houma and Lafayette, LA and Houston, TX. Chevron can also contract additional command posts facilities as necessary throughout Gulf Coast region.

WORST CASE DISCHARGE COMPARISON TABLE

The table below provides a comparison of the worst-case scenario from Chevron's Regional OSRP with the worst-case scenario from the proposed activities in this plan.

The Regional OSRP calculations and assumptions used to calculate the WCD volume from a blowout in accordance with NTL No. 2015-N01 was submitted and accepted by the BOEM with Exploration Plan, N-9930, Mississippi Canyon Blocks 122 and 166, OCS-G 34424 and 35318.

The EP calculations and assumptions used to calculate the WCD volume from a blowout in accordance with NTL No. 2015-N01 were submitted and accepted by the BOEM with Exploration Plan S-7778, Green Canon Block 640.

Category	Regional OSRP "Drilling > 10 miles" Worst-Case Discharge Scenario	EP
Type of Activity *(Types of activities include pipeline, platform, caisson, subsea completion or manifold, and mobile drilling rig)*	Exploratory Drilling	Exploratory Drilling
Facility Location (area/block)	Mississippi Canyon Block 122	Green Canyon Block 640
Facility Designation *(e.g., Well No. 2, Platform JA, Pipeline Segment No. 6373)*	MC 122 "AA"	GC 640 PC004
Distance to Nearest Shoreline	46 miles	118 miles
Volume Uncontrolled blowout (volume per day)	465,709 barrels	338,500 barrels
Type of Oil(s) - *(crude oil, condensate, diesel)*	Crude Oil	Crude Oil
Gravity(s) API - *(Provide API gravity of all oils given under "Type of Oil(s)" above. Estimate for EP's)*	38.2 °	31.8 °

Chevron has the capability to respond to the appropriate worst-case spill scenario included in its Regional OSRP. The worst-case scenario determined for this EP does not replace the appropriate worst-case scenario in our Regional OSRP. Therefore, Chevron hereby certifies that Chevron has the capability to respond, to the maximum extent practicable, to a worst case discharge, or a substantial threat of such a discharge, resulting from the activities proposed in our Plan.[1]

[1] This certification is provided as required by NTL No. 2008-G04 at page 19.

(b) OIL SPILL RESPONSE DISCUSSION

Given below is a discussion of the response to an oil spill resulting from the activities proposed in this plan. All the applicable information described in 30 CFR 254.26(b), (c), (d), and (e) is included.

Oil spill response-related activities for facilities included in this document are governed by the Chevron regional Gulf of Mexico Oil Spill Response Plan (OSRP). This OSRP meets all requirements contained in 30 CFR 250. The Chevron regional Gulf of Mexico OSRP encompasses all facilities operated by Chevron U.S.A. Inc. and, herein, the jurisdiction of the BOEM and BSEE.

Upon notification of a major oil release from a Chevron facility or operation in the Gulf of Mexico, Chevron response personnel will make the initial notifications to all involved government agencies, Oil Spill Response Organizations (OSROs), and associated support services.

Chevron has a contract in effect with MWCC, MSRC and CGA, as well as other OSROs, to ensure availability of personnel, services, and equipment on a 24-hour-per-day basis. The OSROs can provide personnel, equipment, and materials in sufficient quantities and recovery capacity to respond effectively to oil spills from the facilities and leases covered by this plan, including the Worst Case Discharge scenarios. OSROs under contract with Chevron have oil spill response equipment located throughout the Gulf Coast area. Much of the equipment is in road-ready condition and is available to be transported on short notice to the nearest predetermined staging areas(s). The “road-ready condition” provides the shortest reasonable response times for transporting equipment to the staging areas.

These assets are listed in the Chevron Oil Spill Response Plan.

Trajectory Analysis

Land areas that could be potentially impacted by an oil spill were determined using the BOEM Oil Spill Risk Analysis Model (OSRAM) trajectory results. The OSRAM estimates the probability that oil spills from designated locations would contact shoreline and offshore natural resources. These probabilities indicate, in terms of percentage, the chance that an oil spill occurring in a particular launch area will contact a certain county or parish within 3, 10, and 30 days. OCS Launch Area 46 was used as the point of origin for the blocks in this plan. Land segments identified by the model are listed below:

Shoreline Segment, County or Parish, State	chance of contacting within 3 days	chance of contacting within 10 days	chance of contacting within 30 days
C08, Matagorda County, TX	0	0	1 %
C09, Brazoria County, TX	0	0	1 %
C10, Galveston County, TX	0	0	2 %
C12, Jefferson County, TX	0	0	1 %
C13, Cameron Parish, LA	0	0	3 %
C14, Vermilion Parish, LA	0	0	1 %
C17,Terrebonne Parish, LA	0	0	1 %
C18, Lafourche Parish, LA	0	0	1 %
C20, Plaquemines Parish, LA	0	0	3 %

Resource Identification

Resources of special economic or environmental importance found in land segments identified in the above paragraph can be found in the NOAA ESI Coastal Sensitivity Atlas (Maps). These maps can be accessed through NOAA and will be used during any spill occurring from the locations listed in this document.

Additionally, information on environmental sensitivities is contained in the Coast Guard Area Contingency Plans listed below. These plans will be accessed and followed during an oil spill that threatens the Gulf of Mexico shoreline.

- South Texas Coastal Zone Area Contingency Plan
- South East Texas & South West Louisiana Area Contingency Plan
- Central Texas Coastal Area Contingency Plan
- Southeast Louisiana Area Contingency Plan
- South Central Louisiana Area Contingency Plan
- Alabama, Mississippi & North West Florida Area Contingency Plan
- West Central Florida Area Contingency Plan
- Florida Keys Area Contingency Plan

Response Discussion

Chevron maintains numerous resources, equipment and expertise to respond to an oil spill in the Gulf of Mexico. Chevron has oil spill response service contracts with both local and international companies and cooperatives and has a large corps of dedicated Chevron emergency responders that can work in the Gulf of Mexico. Chevron has contracts with the following oil spill response service providers.

<u>Oil Spill Removal Organizations (OSRO)</u>. These companies have on-hand shoreline protection and cleanup equipment to respond to a spill in the Gulf of Mexico.

- OMI LLC
- Clean Gulf Associates Services
- U.S. Environmental Services
- ES&H Consulting
- American Pollution Control
- T&T Marine
- Oil Spill Response (OSRL)

<u>Oil Spill Cooperatives (OSC)</u>. OSCs have equipment pre-staged in the Gulf of Mexico, including Lake Charles, Intracoastal City, Houma, Fort Jackson and Venice, Louisiana; Galveston, Texas; and Pascagoula, Mississippi. OSCs provide resources to respond to offshore incidents including areas identified in this plan.

- Clean Gulf Associates (CGA) – This major cooperative is strictly dedicated to Gulf of Mexico oil and gas developers and producers.
- Marine Spill Response Corporation (MSRC) – This national cooperative has extensive dedicated offshore resources located in the Gulf of Mexico

<u>Well Control Emergency Response Companies</u>

- Wild Well Control Inc.
- Boots & Coots
- IWC Services, Inc.

<u>Oil Spill Management and Response Consultants</u>

- The Response Group (TRG)

<u>Chemical Dispersant Companies</u> (capable of delivering air and vessel dispersants)

- Airborne Support, Inc
- MSRC
- CCA
- OSRL

Chevron will use a layered approach to respond to a worst case discharge from the area by conducting simultaneous response operations at the **well site**, in the **offshore environment** and in **nearshore and shoreline areas**. Plans will be implemented, resources deployed and response operations established within these environmental areas to accomplish the following objectives:

- Provide for the safety of responders and the general public
- Intervene at the well site to stop the flow of oil
- Minimize the spread of oil at the surface
- Minimize encroachment to the coastline environment
- Protect coastal and natural resources

Upon notification of a worst case discharge oil spill at the locations listed in this plan, Chevron will mobilize resources listed in the attached enclosures. This information comes directly from the Chevron regional Gulf of Mexico Oil Spill Response Plan and applies to a worst case discharge volume of 465,709 barrels per day that could occur at a Chevron facility located in Mississippi Canyon Block 122. These same assets would be mobilized to all sites contained in this plan.

- Aerial Surveillance Equipment
- Offshore Recovery Equipment
- Nearshore Recovery Equipment
- In-Situ Burn Equipment
- Aerial Dispersant Equipment
- Shoreline Protection Equipment
- Offshore Storage Equipment

Chevron will also take the following general actions to mobilize and coordinate response operations:

- Set up and staff its command center in Covington, LA
- Set up a source control group in Houston, TX or Covington, LA
- Mobilize well site resources to cap, contain and disperse oil at the well head
- Mobilize assets to drill relief wells
- Mobilize assets to contain and collect surface oil at the well site and in the offshore environment
- Mobilize assets to disperse and burn surface oil at the well site and in the offshore environment
- Establish a deepwater staging area from a LA port or location
- Deploy assets to track the movement of oil on the surface

Follow up actions will include the following:

- Locate, monitor, track and project the movement of the oil spill

- Mobilize nearshore skimming and booming vessels, barges and systems to shorebase locations for rapid deployment in the nearshore environment
- Mobilize oil spill removal organization (OSRO) resources and assets to staging areas for rapid deployment of shoreline protection resources
- Mobilize wildlife protection and rehabilitation resources to staging areas for rapid deployment of resources
- Determine Incident Command Post (ICP) locations based on intervention operations and results and surface oil spill trajectories
- Determine ICP Operations Branch locations based on intervention operations and results and surface oil spill trajectories
- Determine additional staging areas based on the spill trajectory

Spill Response Resources and Deployment Time

Offshore Response: Offshore response operations will integrate simultaneous containment booming, mechanical recovery, aerial dispersants and in-situ burning. Response objectives within the offshore layer are to:

- Provide for the safety of responders and the general public
- Minimize wide-scale spread of oil
- Minimize encroachment to coastline environment

The strategy for offshore response will be to:

- Station mechanical recovery vessels and barges that are outfitted with ocean boom systems closest to the source to contain and collect as much oil as possible.
- Station mechanical recovery vessels and barges that deploy skimming systems on vessels of opportunity close to the source to rapidly contain and collect oil that strays from the main oil slick.
- Station in-situ burn assets close to the source to burn as much oil as possible.
- Aerially disperse oil that cannot be mechanically recovered.

Simultaneous implementation of these strategies is designed to effectively contain and recover an oil spill significantly offshore in order to minimize the potential impacts to public health, wildlife and the environment. Separate and distinct resources will be assigned for each operation. Based on the anticipated worst case discharge scenario, Chevron 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 24 hours.

The following sections provide more information on each operation needed to contain a worst case discharge to the maximum extent possible.

(1) Mechanical Recovery and Slick Containment. Offshore skimming and booming vessels, barges and systems will be deployed to the source of the spill and stationed in the thickest parts of the spill to enhance the encounter rate, collect and contain the oil. VHF radio communications will be established between skimming vessels and barges and spotter aircraft and surveillance systems to direct vessels to coordinates of thickest oil to maximize the effectiveness and efficiency of on-water recovery resources. Vessels operating in oil will relay spill characteristics (thickness, trajectory) to the Forward Operating Branch and Incident Command Post in order to station additional vessels and barges that are equipped with night-sensing systems in areas of

recoverable oil prior to nightfall. This will again maximize the oil recovery encounter rate. MSRC Responder Class vessels, the CGA Hoss barge, Production Support Vessels, Dual Purpose Vessels and vessels of opportunity outfitted with KOSEQ skimming systems will deploy J-boom or U-boom configurations that will maximize containment of oil to collect using skimmers. These vessels will work in tandem to cover as large of a geographic area as possible at the location of the surface spill where oil is thickest.

Vessels deployed with MSRC and CGA Fast Response Units and CGA Fast Response Vessels will be stationed to collect oil that moves past the front line mechanical assets. These units will deploy a J-boom configuration because it only requires one support vessel. Oil that escapes the above assets and moves shoreward will be collected by vessels of opportunity that deploy sorbent boom, collection nets or other types of equipment that absorbs surface oil. These assets will be deployed as task forces that can rapidly respond to light oil.

(2) In-Situ Burning. Offshore in-situ burn assets will be deployed as primary response resources for all locations within federal waters. Vessels of opportunity that can operate near the spill site will be used to deploy fire boom and trained in-situ burn responders. Fire boom will be configured in a “U” shape or similar to the NOFI Ocean Buster design.

(3) Aerial Dispersants. Aerial dispersants will be deployed as primary response resources for all locations that fall within the FOSC pre-approval process. Dispersant aircraft that arrive on-scene before mechanical recovery or in-situ burn resources will apply dispersants to areas until relieved by a different asset.

Vessel radar systems and infrared cameras will be used to detect and mechanically collect oil at night. This will allow surveillance operations to continue both day and night and through inclement weather. These systems also will be used to track the movement of oil which will assist with shoreline response planning.

Louisiana, Texas, and Florida resources potentially at risk may include but are not limited to the following: marine sensitivities, beaches, waterfowl, shoreline resources, marshes, marinas/piers, populated areas, and environmental sensitivities.

The BOEM oil spill trajectory model indicates that Louisiana parishes and Texas and Florida counties could be impacted by an oil spill from areas listed in this plan. These areas are dominated by fine sand beaches, coarse sand beaches, swamps and salt water marshes. The four subsections below summarize potential concerns with each environment. This information is taken from various Coast Guard Area Contingency Plans.

Fine Sand Beach Environment

- Sensitivity: Fine sand beaches have a low sensitivity to oil spill impacts and cleanup methods.
- Oil Behavior: Oil typically stains and covers the beach sands with low permeability.
- Cleanup: The penetration is low to moderate depending on the water table and the position of the oiling on the shoreline. A potential environmental issue during beach cleanup is the protection of the dune habitat from the cleanup operations. Fine sand beaches typically have poor access, but good transportation ability. Fine sand beaches are relatively easier to clean in contrast to marshes. Large volumes of stained sand and debris can be generated by beach cleanup.

Coarse Sand Beach Environment

- Sensitivity: The environmental sensitivity of coarse sand beaches is low due to the limited animal and vegetation population.
- Oil Behavior: Spilled oil typically stains and coats coarse grain beach sands with moderate to high permeability.
- Cleanup: Sediment penetration on coarse grain beaches is moderate/high depending on the water table and the location of oil deposition. A potential environmental issue is the protection of the dune habitat from cleanup operations. The transit ability of this shoreline type is less than fine sand beaches because the bearing strength is lower, and this type of sand builds steep beach faces. Access is typically poor.

Swamp Environment
- Sensitivity: The environmental sensitivity is high for swamps because of the presence of wetland habitat.
- Oil Behavior: Oil usually coats and covers the sediment and vegetation with low sediment penetration.
- Cleanup: The sediment penetration potential is low due to the high water table and the water content of the sediments. A potential environmental issue is that the cleanup may be more damaging than the oil itself. The access to swamps is poor due to the soft sediment and the presence of dense tree growth.

Salt Marsh Environment
- Sensitivity: The environmental sensitivity is high for salt marsh because of the presence of wetland habitat.
- Oil Behavior: Oil usually coats and covers the sediment and vegetation with low sediment penetration.
- Cleanup: The sediment penetration potential is low/moderate due to the high water table and water content of the sediment. A potential environmental issue is that the cleanup may be more damaging than the oil itself. Access is typically poor in Louisiana.

The protection of waterfowl and wildlife during the course of an oil release is an essential element in every spill response operation. Federal and state natural resource trustees will be notified in the event that a wildlife habitat may be affected by a spill event. Information concerning methods to protect waterfowl and wildlife are contained in the Chevron OSRP. For fish and wildlife resources, the emphasis is on habitats where:
- Large numbers of animals are concentrated in small areas, such as bays where waterfowl concentrate during migration or for overwintering
- Early life stages are present in somewhat restricted areas or in shallow water, such as anadromous fish streams and turtle nesting beaches
- Habitats are extremely important to specific life stages or migration patterns such as foraging or overwintering
- Specific areas are vital sources for seed or propagation
- The species are on Federal or state threatened or endangered lists
- A significant percentage of the population is likely to be exposed to oil

Human-use resources of concern are listed in the Chevron OSRP. Areas of economic importance, like waterfront hotels, should also be considered when establishing resource protection priorities. Human-use resources are most sensitive when:
- Archaeological and cultural sites are located in the intertidal zones
- Oiling can result in potential significant commercial losses through fouling, tainting, or avoidance because of public perception of a problem

- The resource is unique, such as a historical site
- Oiling can result in potential human health concerns, such as tainting of water intakes and/or subsistence fisheries

Response Capability

Chevron is a member of both Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) cooperatives. CGA & MSRC are the primary surface response equipment providers for Chevron in the Gulf of Mexico Region. CGA & MSRC each maintain a dedicated fleet of vessels and other equipment strategically positioned along the Gulf Coast. CGA & MSRC each maintain a network of trained Oil Spill Removal Organizations (OSROs) deploy and operate their equipment. CGA & MSRC have the capability to plan the mobilization and rapid deployment of spill response resources on a 24-hour, 7 days a week basis, year-round.

Chevron maintains service contracts with several private OSROs including American Pollution Control Corporation (AmPol), U.S. Environmental Services (USES), OMIES, ES&H Environmental Services and Airborne Support Inc.

Chevron's Aviation Group operates and maintains a private fleet of helicopters servicing our operation in the Gulf of Mexico. Chevron helicopters provide aerial surveillance.

Marine Well Containment Company (MWCC) is the designated subsea containment service provider for Chevron. MWCC equipment is available on a 24-hour, 7 days a week basis, year-round. MWCC equipment locations are Ingleside, TX and Theodore, AL.

Chevron's primary staging areas are located in Fourchon and Galliano, Louisiana. Chevron has the capability to contract for additional staging areas throughout Gulf of Mexico coastal ports.

Chevron's primary command post for an oil spill is located in Covington, LA; however, Chevron has the ability to set up and effectively manage spills at Chevron facilities located in Houma and Lafayette, LA and Houston, TX. Chevron has the capability to contract for additional command posts facilities as necessary throughout Gulf Coast region.

Estimated Initial Equipment Response Times

Capability	Equipment	ETA	Source
Aerial Surveillance	Manned Aircraft (Helicopters and Fixed-wing)	~1 to 2 hours	Chevron Aviation (Galliano, LA & Picayune, MS)
On-water Containment, Skimming, & Storage	Response Vessels (w/ boom, skimmer and storage and surveillance technology)	~10 to 14 hours	CGA & MSRC: Venice, Fort Jackson, Harvey, Belle Chasse, Fourchon
Aerial Dispersant	Spotter and Spray aircraft	~4 to 6 hours	MSRC (Stennis) and/or CGA Airborne Support (Houma)
In-Situ Burn	Vessels, Boom and support equipment	~12 to 24 hours	CGA (Harvey) & MSRC (Fort Jackson)
Sub-sea Surveillance	Remote Operated Vehicles (ROVs)	~18 to 24 hours	Chouest Offshore (Fourchon)
Additional resources will continue to be deployed over subsequent days, weeks, and/or months as necessary			

Response Technology

Chevron, through our cooperative response organizations (Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC)), we have developed high-tech surveillance capabilities with the primary objective of positioning on-water assets in the thickest parts of the spill by detection and classification of potential oil targets as recoverable, tracking moving oil, and expanding the operating window of skimming operations to low-light conditions.

This technology includes high-definition (HD) cameras, optical and thermal infrared imaging systems, and X-band radar oil detection. These systems are integrated into an electronic chart system that provides an exact geographic position and can project the image onto the electronic map for oil spill recovery.

This capability can be leveraged across the response zones and enables the on-water recovery task force strategy where multiple skimming vessels may be directed by a command and control vessel.

The above information is taken from the Chevron GOM Regional Oil Spill Response Plan (OSRP), submitted to BSEE in accordance with 30 CFR 254.

Suitability of Resources

All response equipment, materials, support vessels and strategies listed in this document and in the Chevron regional Gulf of Mexico Oil Spill Response Plan have proven suitable for the many environmental conditions existing at the locations listed in this plan. Chevron additionally conducts annual oil spill response training, drills and exercises and validates the content of the Oil Spill Response Plan. The Chevron regional Gulf of Mexico Oil Spill Response Plan is maintained by the Chevron Greater Gulf of Mexico Emergency Management Coordinator.

SECTION I ENVIRONMENTAL MONITORING INFORMATION

Moon Pool Monitoring and Reporting Operations
Chevron will document visual observation of the moon pool to confirm whether sea turtles or marine mammals are present. A log of observations will be maintained, including Vessel Identification, Vessel Location (Area, Block), Date of Observation, Time of Observation, Sea Turtle/Marine Mammal Observed, Type of Activity Occurring in Moonpool, Initials of Observer.

If sea turtle or marine mammals are observed in the moon pool, BSEE and NMFS will be contacted for additional guidance.

Moon Pool Requirements Before Transit
Document that the observation was made prior to closure of the hull door and no animals were present.

(b) INCIDENTAL TAKES

Chevron does not expect any “takes” of protected species as a result of the operations proposed under this Plan.

Chevron 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. 2016-BOEM-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting”
- NTL No. 2016-BOEM-G02, “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program” (Note: there are no seismic surveys proposed in this Plan)
- NTL No. 2015-BSEE-G03, “Marine Trash and Debris Awareness and Elimination”
- “Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, Appendices to the Programmatic Biological Opinion on the Gulf of Mexico Oil and Gas Program”, Appendices A, B, C, and J

(c) FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY

No activities proposed in this plan will be conducted within the Protective Zones of the Flower Garden Banks and Stetson Bank.

SECTION J LEASE STIPULATIONS INFORMATION

Although the Protected Species Stipulation is not assigned to these leases, Chevron will follow all guidelines to implement the mitigation measures to reduce the potential taking of Federally protected species.

The Endangered Species Act (16 U.S.C. 1531-1544) and the Marine Mammal Protection Act (MMPA) (16 U.S.C. 1361-1423h) are designed to protect threatened and endangered species and marine mammals and apply to activities on the Outer Continental Shelf (OCS). The OCS Lands Act (43 U.S.C. 1331-1356a) provides that the OCS should be made available for expeditious and orderly development subject to environmental safeguards, in a manner which is consistent with the maintenance of competition and other national needs (see 43 U.S.C. 1332).

Chevron will follow all guidelines:

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

2) 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;

3) 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;

4) 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;

5) 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

6) 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 and Operators (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. Chevron and its operators, personnel, and subcontractors, while undertaking activities authorized under these leases, will implement and comply with the specific mitigation measures outlined in BOEM NTL No. 2016-G01 (Vessel Strike Avoidance and Injured/Dead Protected Species Reporting), BOEM NTL No. 2016-G02 (Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program) and BSEE NTL No. 2015-G03 (Marine Trash and Debris Awareness and Elimination). At Chevron's option, Chevron, 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 these leases, including, but not limited to, new or updated versions of the NTLs identified in this paragraph. Chevron 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 plans or permits.

SECTION K ENVIRONMENTAL MITIGATION MEASURES INFORMATION

(a) Measures Taken to Avoid, Minimize, and Mitigate Impacts

This plan does not propose activities for which the state of Florida is an affected state; however, Chevron 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. 2016-BOEM-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
- NTL No. 2016-BOEM-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program" (Note: there are no seismic surveys proposed in this Plan)
- NTL No. 2015-BSEE-G03, "Marine Trash and Debris Awareness and Elimination"
- "Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, Appendices to the Programmatic Biological Opinion on the Gulf of Mexico Oil and Gas Program", Appendices A, B, C, and J

Entanglement/Entrainment Reduction Measures

Chevron will ensure that all underwater lines will be stiff, taut, and non-looping, and no excess underwater line will be used.

Sea Turtle Resuscitation Guidelines

Chevron will follow the procedures provided under Appendix J. Sea Turtle Handling and Resuscitation Guidelines found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020.

If a turtle becomes trapped in the moon pool, no attempt to remove the turtle will be made without explicit direction to do so from BOEM/BSEE or NMFS.

Appendix J. Sea Turtle Handling and Resuscitation Guidelines

Any sea turtles taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

I. Sea turtles that are actively moving or determined to be dead (as described in paragraph (B)(4) below) must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

II. Resuscitation must be attempted on sea turtles that are comatose or inactive by:

   i. Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 to 24 hours. The amount of elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

   ii. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

iii. Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

iv. A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise, the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

Any sea turtle so taken must not be consumed, sold, landed, offloaded, transshipped, or kept below deck.

These requirements are excerpted from 50 CFR 223.206(d)(1). Failure to follow these procedures is therefore a punishable offense under the Endangered Species Act.

(b) Incidental Takes

Chevron does not expect any “takes” of protected species as a result of the operations proposed under this Plan.

Chevron 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. 2016-BOEM-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting”
- NTL No. 2016-BOEM-G02, “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program” (Note: there are no seismic surveys proposed in this Plan)
- NTL No. 2015-BSEE-G03, “Marine Trash and Debris Awareness and Elimination”
- “Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, Appendices to the Programmatic Biological Opinion on the Gulf of Mexico Oil and Gas Program”, Appendices A, B, C, and J

See **SECTION E BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION** for a list of Threatened and Endangered Species, Critical Habitat and Marine Mammal Information.

SECTION L SUPPORT VESSELS AND AIRCRAFT INFORMATION

(a) GENERAL
In the table below, information is provided regarding the vessels (e.g., tug boats, anchor-handling vessels, construction barges, lay barges, supply boats, crew boats) and aircraft you will use to support your proposed activities. If specific vessels have not yet been determined, use the maximum capacities, numbers, and trip frequencies for the types of vessels you will use.

Type	Maximum Fuel Tank Storage Capacity	Maximum No. in Area at Any Time	Trip Frequency or Duration
Crew Boat	47,382 gals.	One	Once per week
Supply Boat	303,093 gals.	Two	Every 2 to 3 days
Helicopter	2,800 lbs. / 430 gals.	One	7 trips per week

(b) DIESEL OIL SUPPLY VESSELS
Information on the vessels used to supply diesel oil. Any vessels that will transfer diesel oil you will use for purposes other than fuel.

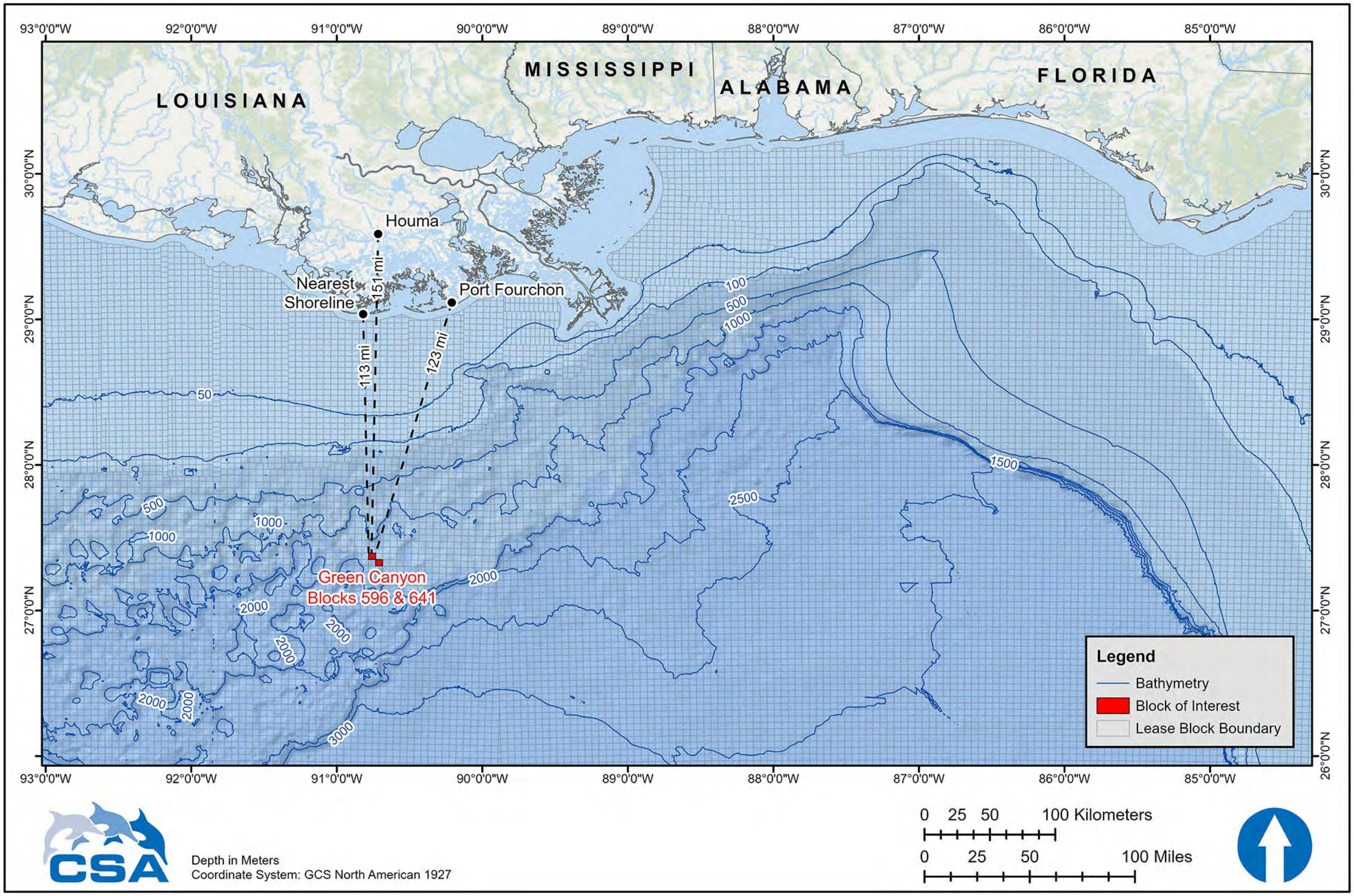
Size of Fuel Supply Vessel	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
280 foot	860,000 gals	quarterly	From shore base to block
280 foot	275,000 gals	4-6 weeks	From shore base to block

(d) SOLID AND LIQUID WASTES TRANSPORTATION
Water Quality Spreadsheets replace the Solid and Liquid Wastes Transportation Table.

(e) VICINITY MAP
A map showing the location of the proposed activities relative to the shoreline, the distance of the proposed activities from the shoreline, and the primary route(s) of the support vessels and aircraft you will use when traveling between the onshore support facilities and the drilling unit is provided as attachment L-1 at the end of this section.

ATTACHMENTS TO SECTION L

- **L-1** – Vicinity Map



Attachment L-1: Vicinity Map

SECTION M ONSHORE SUPPORT FACILITIES INFORMATION

(a) GENERAL

The table below provides a listing of the onshore facilities that will be used to provide supply and service support for the proposed activities.

Name	Location	Existing/New/Modified
C-Port Shorebase- Port Fourchon	Fourchon, Louisiana	Existing
Chevron Galliano Airbase	Galliano, Louisiana	Existing

(b) SUPPORT BASE CONSTRUCTION OR EXPANSION

Chevron will use its existing onshore base facilities located in Leeville, Fourchon, and Galliano Louisiana. The base has adequate facilities for marine and air transportation to accommodate the activities proposed in this plan. The proposed operations do not require expansion or modifications to the base.

(d) WASTE DISPOSAL

Water Quality Spreadsheets replace the Waste Disposal Table.

SECTION N COASTAL ZONE MANAGEMENT ACT (CZMA) INFORMATION

(a) CONSISTENCY CERTIFICATION

A Coastal Zone Management Act consistency certification for the State of Louisiana was previously obtained for these lease blocks. Chevron believes that additional consistency certification is not required for this supplemental plan.

(b)OTHER INFORMATION

To the best of our knowledge, the set of findings included in the Environmental Impact Analysis and this Exploration Plan indicate that the proposed activity and its associated facilities and effects are all consistent with, and comply with, the provisions and guidelines of the Louisiana Coastal Resources Program (LCRP). The proposed activity will be conducted in a manner consistent with such program.

SECTION O ENVIRONMENTAL IMPACT ANALYSIS (EIA)

The project-specific EIA is included at the end of this plan as Appendix A.

SECTION P ADMINISTRATIVE INFORMATION

(a) EXEMPTED INFORMATION

Proprietary information included in the confidential copy of this EP:

- BHL, TVD, and MD on Form BOEM-0137 (OCS Plan Information Form)
- Correlative well names and information in H_2S Classification
- All items and enclosures under Geological and Geophysical Information
- Seafloor Rendering Figure, Illustration of Portion of Subbottom Profiler Line, Illustration of 3D Seismic Inline/Crossline, Tophole Prognosis Chart, Illustration of Seismic Correlation, Seafloor Rendering Map, Side Scan Sonar Mosaic Map, Seafloor Amplitude Rendering Map in the Wellsite Clearance Letters submitted with the Confidential Copy of the Plan

(b) BIBLIOGRAPHY

Any previously submitted EP, DPP, or DOCD; study report; survey report; or other material referenced in this EP or its accompanying information, is listed below:

- Chevron's Regional Oil Spill Response Plan (Regional OSRP)
- Initial EP, N-7157, Approved July 30, 2001
- Initial EP, N-7408, Approved March 22, 2002
- Supplemental EP, S-5973, Approved July 12, 2002
- Initial EP, N-7479, Approved August 6, 2002
- Revised EP, R-3837, Approved September 10, 2002
- Supplemental EP, S-6016, Approved October 16, 2002
- Initial DOCD, N-8406, Approved November 17, 2005
- Supplemental EP, S-7399, Approved April 16, 2010
- Revised EP, R-5087, Approved December 22, 2010
- Supplemental DOCD, S-7447, Approved June 21, 2011
- Revised DOCD, R-5101, Approved October, 28,2011
- Revised EP, R-5825, Approved April 18, 2013
- Supplemental EP, S-7778, Approved January 14, 2016
- Supplemental EP, S-7839, Approved June 16, 2017
- Supplemental EP, S-7956, Approved June 14, 2019
- Geologic and Geohazards Site Assessment, Blocks 596, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc., Project No. 0103-609
- Geologic and Stratigraphic Assessment, Blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth and Marine Services, Inc., Project No. 1203-751
- Geologic and Stratigraphic Assessment, Tahiti Development Project, Blocks 596, 597, 640, and 641, Green Canyon Area, Gulf of Mexico, Geoscience Earth and Marine Services, Inc., Project No. 0504-832c
- Site Clearance Letter, Proposed Location SWIDC, Block 640 (OCS-G 20082), Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc., Project No. 1109-1724
- Tahiti Development Area, Archaeological Assessment, Blocks 595-597, 639-641, & 683-685, Green Canyon Area, Gulf of Mexico, Geoscience Earth & Marine Services, Inc., Project No.0311-1901

Environmental Impact Analysis

for a

Supplemental Exploration Plan (EP)
for
Green Canyon Block 596 (OCS-G 16759) and Green Canyon Block 641 (OCS-G 16770)
Offshore Louisiana

June 2024

Prepared for:

Chevron U.S.A. Inc.
1500 Louisiana Street
Houston, Texas 77002

Prepared by:

CSA Ocean Sciences Inc.
8502 SW Kansas Avenue
Stuart, Florida 34997
Telephone: (772) 219-3000

Environmental Impact Analysis
for a
SUPPLEMENTAL EXPLORATION PLAN for
Green Canyon Block 596 (OCS-G 16759) and Block 641 (OCS-G 16770)

DOCUMENT NO. CSA-Chevron-FL-24-4081-01-REP-01-002

Suggested citation: CSA Ocean Sciences Inc. (CSA). 2024. Environmental Impact Analysis for a Supplemental Exploration Plan for Green Canyon Block 596 (OCS-G 16759) and Block 641 (OCS-G 16770). Prepared for Chevron. 119 pp.

Contact information: info@csaocean.com

Internal review process					
Version	Date	Description	Prepared by:	Reviewed by:	Approved by:
INT-01	06/14/2024	Initial draft for science and TE review	S. Greaves	J. Tiggelaar	J. Tiggelaar

Client deliverable			
Version	Date	Description	Project Manager Approval
001	06/17/2024	Client deliverable	J. Tiggelaar
002	06/20/2024	Revised client deliverable	J. Tiggelaar

Table of Contents

List of Tables v

List of Figures vi

Acronyms and Abbreviations vii

Introduction 1

A. Impact-Producing Factors 6

A.1 Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights 6
A.2 Physical Disturbance to the Seafloor 11
A.3 Air Pollutant Emissions 11
A.4 Effluent Discharges 11
A.5 Water Intake 12
A.6 Onshore Waste Disposal 13
A.7 Marine Debris 13
A.8 Support Vessel and Helicopter Traffic 14
A.8.1 Physical Presence 14
A.8.2 Operational Sound 14
A.9 Accidents 15
A.9.1 Small Fuel Spill 17
A.9.2 Large Oil Spill (Worst Case Discharge) 18

B. Affected Environment 22

C. Impact Analysis 24

C.1 Physical/Chemical Environment 24
C.1.1 Air Quality 24
C.1.2 Water Quality 26
C.2 Seafloor Habitats and Biota 30
C.2.1 Soft Bottom Benthic Communities 30
C.2.2 High-Density Deepwater Benthic Communities 32
C.2.3 Designated Topographic Features 34
C.2.4 Pinnacle Trend Area Live Bottoms 34
C.2.5 Eastern Gulf Live Bottoms 34
C.3 Threatened, Endangered, and Protected Species and Critical Habitat 35
C.3.1 Sperm Whale (Endangered) 38
C.3.2 Rice's Whale (Endangered) 43
C.3.3 West Indian Manatee (Threatened) 49
C.3.4 Non-Endangered Marine Mammals (Protected) 51
C.3.5 Sea Turtles (Endangered/Threatened) 55
C.3.6 Piping Plover (Threatened) 62
C.3.7 Whooping Crane (Endangered) 63
C.3.8 Black-capped Petrel 64
C.3.9 Oceanic Whitetip Shark (Threatened) 66
C.3.10 Giant Manta Ray (Threatened) 67
C.3.11 Gulf Sturgeon (Threatened) 68

Table of Contents
(Continued)

Page

C.3.12 Nassau Grouper (Threatened) 69
C.3.13 Smalltooth Sawfish (Endangered) 70
C.3.14 Beach Mice (Endangered) 71
C.3.15 Florida Salt Marsh Vole (Endangered) 72
C.3.16 Panama City Crayfish (Threatened) 73
C.3.17 Threatened Coral Species 73
C.3.18 Queen Conch (Threatened) 75
C.4 Coastal and Marine Birds 75
C.4.1 Marine Birds 75
C.4.2 Coastal Birds 78
C.5 Fisheries Resources 80
C.5.1 Pelagic Communities and Ichthyoplankton 80
C.5.2 Essential Fish Habitat 84
C.6 Archaeological Resources 87
C.6.1 Shipwreck Sites 87
C.6.2 Prehistoric Archaeological Sites 88
C.7 Coastal Habitats and Protected Areas 89
C.8 Socioeconomic and Other Resources 91
C.8.1 Recreational and Commercial Fishing 91
C.8.2 Public Health and Safety 93
C.8.3 Employment and Infrastructure 94
C.8.4 Recreation and Tourism 95
C.8.5 Land Use 95
C.8.6 Other Marine Uses 96
C.9 Cumulative Impacts 96

D. Environmental Hazards 97
D.1 Geologic Hazards 97
D.2 Severe Weather 97
D.3 Currents and Waves 98

E. Alternatives 98

F. Mitigation Measures 98

G. Consultation 99

H. Preparers 100

I. References 101

List of Tables

Table		Page
1	Notices to Lessees and Operators (NTLs) applicable to the Environmental Impact Analysis (EIA)	3
2	Matrix of impact-producing factors (IPF) and affected environmental resources	7
3	Conditional probabilities of a spill in Green Canyon Block 596 (GC 596) and 641 (GC 641) contacting shoreline segments based on the 30-day Oil Spill Risk Analysis (OSRA) (From: Ji et al., 2004)	19
4	Shoreline segments with a 1% or greater conditional probability of contact from a spill starting at Launch Point 3 based on the 60-day Oil Spill Risk Analysis (OSRA)	20
5	Baseline benthic community data from stations near the project area in similar depths sampled during the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (Adapted from: Wei, 2006; Rowe and Kennicutt, 2009)	30
6	Federally listed Endangered and Threatened species potentially occurring in the project area and along the northern Gulf Coast	35
7	Migratory fish species with designated Essential Fish Habitat (EFH) at or near Green Canyon Block 596 and 641, including life stage(s) potentially present within the project area	85
8	Wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts after 30 days of a hypothetical spill from Launch Area 46 based on the 30-day OSRA model	90

List of Figures

Figure		Page
1	Location of Green Canyon Block 596 and 641 relative to the Louisiana shoreline and offshore bathymetric contours	2
2	Bathymetric map of the project area showing the proposed surface hole locations	23
3	Location of selected environmental features in relation to the project area	44
4	Location of loggerhead turtle designated *Sargassum* critical habitat and nearshore reproductive critical habitat in relation to the project area	57

Acronyms and Abbreviations

§	section
µPa	micropascal
ac	acre
ADIOS2	Automated Data Inquiry for Oil Spills 2
bbl	barrel
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOP	blowout preventer
BOPD	barrels of oil per day
BSEE	Bureau of Safety and Environmental Enforcement
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CFR	Code of Federal Regulations
Chevron	Chevron U.S.A. Inc.
dB	decibel
DP	dynamically positioned
DPS	distinct population segment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIA	Environmental Impact Analysis
EIS	Environmental Impact Statement
EP	Exploration Plan
ESA	Endangered Species Act
FAD	fish aggregating device
FR	*Federal Register*
GC	Green Canyon
GPS	global positioning system
GMFMC	Gulf of Mexico Fishery Management Council
H_2S	hydrogen sulfide
ha	hectare
HAPC	Habitat Area of Particular Concern
Hz	hertz
IPF	impact-producing factor
IMT	Incident Management Team
MARPOL	International Convention for the Prevention of Pollution from Ships
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NAAQS	National Ambient Air Quality Standards
NH_3	ammonia
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Assessment
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OSRA	Oil Spill Risk Analysis
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PK	zero-to-peak sound pressure level
PM	particulate matter
PSD	Prevention of Significant Deterioration
re	referenced to
OSRP	Oil Spill Response Plan
SBM	synthetic-based drilling muds
SEL_{24h}	sound exposure level over 24 hours
SEMS	Safety and Environmental Management system
SO_x	sulfur oxides
SPL	root-mean-square sound pressure level
SWSS	Sperm Whale Seismic Study
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WCD	worst case discharge

Introduction

Chevron U.S.A. Inc. (Chevron) is submitting a Supplemental Exploration Plan for Green Canyon (GC) Block 596 (GC 596) and Block 641 (GC 641), Gulf of Mexico, Outer Continental Shelf (OCS)-G 16759. Under this EP, Chevron proposes to drill six production wells (IN-A, IN-B, IN-C, IN-D, RW-A, RW-B) The Environmental Impact Analysis (EIA) provides information on potential impacts to environmental, archaeological, and socioeconomic resources that could be affected by Chevron's proposed activities in the project area under this EP.

GC 596 and 641 are located within the Central Gulf of Mexico OCS Planning Area, approximately 113 statute miles (182 kilometers [km]) from the nearest shoreline (Plaquemines Parish, Louisiana), 123 statute miles (198 km) from the regional onshore support base (Port Fourchon, Louisiana), and 151 statute miles (243 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The water depth at the proposed project location is approximately 1,213 to 1,223 m (3,980 to 4,012 ft). A dynamically positioned (DP) drillship is anticipated to be on site for no more than 200 days per well for well drilling and completion activities

The EIA for this EP was prepared for submittal to the Bureau of Ocean Energy Management (BOEM) in accordance with applicable regulations, including Title 30 Code of Federal Regulations (CFR) § 550.242 and § 550.261. The EIA is a project- and site-specific analysis of the potential environmental impacts of Chevron's planned activities. The EIA complies with guidance provided in existing Notices to Lessees and Operators (NTLs) issued by BOEM and its predecessors, Minerals Management Service (MMS) and Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), including NTLs 2008-G04 (extended by 2015-N02) and 2015-N01. Potential impacts have been analyzed at a broader level in the 2024-2029 Programmatic Environmental Impact Statement (EIS) for the OCS Oil and Gas Leasing Program (BOEM, 2023a) and in multisale EISs for the Western and Central Gulf of Mexico Planning Areas (BOEM, 2012a,b; 2013; 2014a; 2015; 2016b; 2017; 2023b). The most recent multisale EIS contains updated environmental baseline information in light of the Macondo (*Deepwater Horizon*) incident and addresses potential impacts of a catastrophic spill (BOEM, 2012a,b; 2013; 2014a; 2015; 2016b; 2017). The National Marine Fisheries Service (NMFS) Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico assesses impacts and requires additional mitigation measures for protected species (NMFS, 2020a). The analyses and relevant information from those documents are incorporated in this EIA by reference.

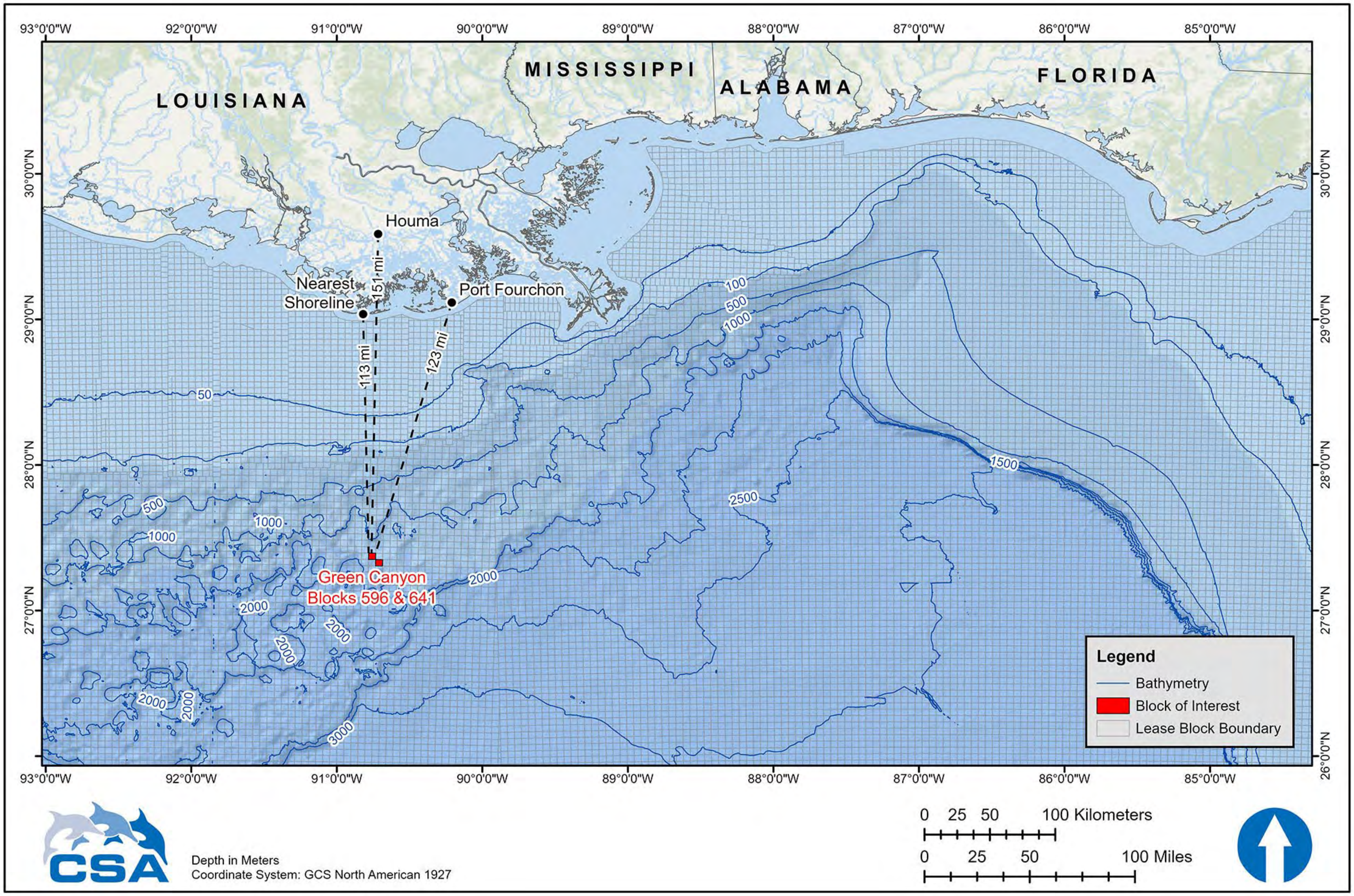


Figure 1. Location of Green Canyon Block 596 and 641 relative to the Louisiana shoreline and offshore bathymetric contours.

Chevron's spill response program meets the response planning requirements of the relevant coastal states and applicable federal oil spill planning regulations. The OSRP also includes information regarding Chevron's regional oil spill organization and dedicated response assets, potential spill risks, local environmental team organization, and an overview of actions and notifications that will be taken in the event of a spill.

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

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

NTL	Title	Summary
BOEM-2023-G01	Expanded Rice's Whale Protection Efforts During Reinitiated Consultation with NMFS	Provides recommendations and guidance for operators for suggested measures to expand protections for the Rice's whale while BOEM and BSEE are involved in consultation with NMFS on the amended 2020 Biological Opinion. The NTL guidance applies to the Expanded Rice's Whale Area, comprising the entire northern Gulf of Mexico between the 100 and 400 m isobaths.
BOEM-2020-G01	Air Quality Information Requirements for Exploration Plans, Development Operations Coordination Documents, and Development and Production Plans in the Gulf of Mexico Region	Cancels and supersedes the air emission information portion of NTL 2008-G04, Information Requirement for Exploration Plans and Development Operations Coordination Documents, effective date May 5, 2008.
BOEM-2016-G01 or Appendix C (NMFS, 2020a, 2021)	Vessel Strike Avoidance and Injured/Dead Protected Species Reporting	Recommends protected species identification training; recommends that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel movement to avoid colliding with protected species; and requires operators to report sightings of any injured or dead protected species. Reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with this NTL.
BOEM-2016-G02 or Appendix A (NMFS, 2020a)	Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program	Summarizes seismic survey mitigation measures, updates regulatory citations, and provides clarification on how the measures identified in the NTL will be used by BOEM, BSEE, and operators in order to comply with the Endangered Species Act and the Marine Mammals Protection Act. Reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with this NTL.

Table 1. (Continued).

NTL	Title	Summary
2015-G03 or Appendix B (NMFS 2020a)	Marine Trash and Debris Awareness and Elimination	Instructs operators to exercise caution in the handling and disposal of small items and packaging materials; requires the posting of instructional placards at prominent locations on offshore vessels and structures; and mandates a yearly marine trash and debris awareness training and certification process.
BOEM 2015-N02	Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance	Eliminates expiration dates (past or upcoming) of all NTLs currently posted on the BOEM website.
BOEM 2015-N01	Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge (WCD) and Blowout Scenarios	Provides guidance regarding information required in WCD descriptions and blowout scenarios.
BOEM 2014-G04	Military Warning and Water Test Areas	Provides contact links to individual command headquarters for the military warning and water test areas in the Gulf of Mexico.
BSEE 2014-N01	Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance	Eliminates expiration dates (past or upcoming) of all NTLs currently posted on the BSEE website.
BSEE-2012-N06	Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans	Provides clarification, guidance, and information for preparation of regional Oil Spill Response Plans. Recommends description of response strategy for worst-case discharge scenarios to ensure capability to respond to oil spills is both efficient and effective.
2010-N10	Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources	Informs operators using subsea blowout preventers (BOPs) or surface BOPs on floating facilities that applications for well permits must include a statement signed by an authorized company official stating that the operator will conduct all activities in compliance with all applicable regulations, including the increased safety measures regulations (75 *Federal Register* [FR] 63346). Informs operators that BOEM will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy containment resources to respond promptly to a blowout or other loss of well control.

Table 1. (Continued).

NTL	Title	Summary
2009-G40	Deepwater Benthic Communities	Provides guidance for avoiding and protecting high-density deepwater benthic communities (including chemosynthetic and deepwater coral communities) from damage caused by OCS oil and gas activities in water depths greater than 300 m (984 ft). Prescribes separation distances of 610 m (2,000 ft) from each mud and cuttings discharge location and 76 m (250 ft) from all other seafloor disturbances.
2009-G39	Biologically Sensitive Underwater Features and Areas	Provides guidance for avoiding and protecting biologically sensitive features and areas (i.e., topographic features, pinnacles, low relief live bottom areas, and other potentially sensitive biological features) when conducting OCS operations in water depths less than 300 m (984 ft) in the Gulf of Mexico.
2008-G04	Information Requirements for Exploration Plans and Development Operations Coordination Documents	Provides guidance on information requirements for OCS plans, including EIA requirements and information regarding compliance with the provisions of the Endangered Species Act and Marine Mammal Protection Act.
2008-N05	Guidelines for Oil Spill Financial Responsibility (OSFR) for Covered Facilities	Provides clarification and guidance to operators/lessees on policies for submitting required OSFR documents to the Gulf of Mexico OCS Region as required under 30 CFR Part 253.
2005-G07	Archaeological Resource Surveys and Reports	Provides guidance on regulations regarding archaeological discoveries, specifies requirements for archaeological resource surveys and reports, and outlines options for protecting archaeological resources. Reissued in June 2020 to comply with Executive Order 13891 of 9 October 2019 and to rescind NTL 2011-JOINT-G01.

BOEM = Bureau of Ocean Energy Management; BSEE = Bureau of Safety and Environmental Enforcement; NMFS = National Marine Fisheries Service; OCS = Outer Continental Shelf.

A. Impact-Producing Factors

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

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

A.1 Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

The 6 wells proposed in this EP will be drilled using DP vessels. DP vessels use a global positioning system (GPS), specific computer software, and sensors in conjunction with a series of thrusters to maintain position. Through satellite navigation and position reference sensors, the location of the drilling rig is precisely monitored while thrusters, positioned at various locations about the rig pontoons, are activated to maintain position. This allows operations at sea in areas where mooring or anchoring may not best suited or feasible. Consequently, there will be no anchoring during this project. The selected drilling rig is expected to be on site for up to 179 days and the installation vessel is expected to be on site for approximately 51 days. The drilling rig and installation vessel will maintain exterior lighting in accordance with applicable federal navigation and aviation safety regulations (International Regulations for Preventing Collisions at Sea, 1972 [72 COLREGS], Part C).

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

During the physical presence of the drilling rig and associated subsea infrastructure installation activities there may be occasion where equipment may be suspended in the water column. Entanglement and entrapment of protected species can occur from equipment with slack or looping lines and cables in the water. Marine mammals and sea turtles can become entangled in vessel lines in the water with loops or sufficient looping to trap the animals if they come into contact with them. Entanglement and entrapment can be minimized with proper maintenance of equipment lines in the water by encasing flexible lines, removing excess lines, and keeping lines taught to remove slack and line loops.

Table 2. Matrix of impact-producing factors (IPF) and affected environmental resources.

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

Table 2. (Continued).

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

*Numbers refer to table footnotes.

X = potential impact; dash (--) = no impact or negligible impact.

Table 2 Footnotes and Applicability to this Program:

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

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

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

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

(4) Activities on blocks designated by the BOEM as being in water depths 400 m or greater.
   - No impacts on high-density deepwater benthic communities are anticipated. There are no features indicative of seafloor hard bottom that could support high-density chemosynthetic communities or coral communities within 610 m (2,000 ft) of the proposed wellsite locations [GEMS], 2024a,b).

(5) Exploration or production activities where Hydrogen Sulfide (H_2S) concentrations greater than 500 ppm might be encountered.
   - GC 596 and 641 are classified as H_2S Absent. See EP Section 4 for H_2S management information.

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

(7) All activities that involve seafloor disturbances, including anchor emplacements, in any OCS block designated by the BOEM as having high-probability for the occurrence of shipwrecks or prehistoric sites, including such blocks that will be affected that are adjacent to the lease block in which your planned activity will occur. If the proposed activities are located a sufficient distance from a shipwreck or prehistoric site that no impact would occur, the EIA can note that in a sentence or two.
   - No impacts to archaeological resources are expected. A previously submitted archaeologically report determined that none of the sonar contacts in the project area were identified as being archaeologically significant.

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

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

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

Drilling and subsea installation operations can be expected to produce sound associated with propulsion machinery that transmits directly to the water during station keeping, drilling, and maintenance operations. Additional sound and vibration are transmitted through the hull to the water from auxiliary machinery, such as generators, pumps, and compressors onboard the drilling rig (Richardson et al., 1995). The sound levels produced by DP vessels for station-keeping are largely dependent on the level of thruster activity required to keep position and, therefore, vary based on local ocean currents, vessel thruster specifications, and operational requirements. Representative source levels for vessels in DP mode range from 184 to 190 decibels (dB) referenced to (re) 1 micropascal (µPa) m with a primary frequency below 600 Hz (Blackwell and Greene Jr., 2003; McKenna et al., 2012; Kyhn et al., 2014). Zykov (2016) characterized a noisier drillship thruster with a source level, expressed as root-mean-square sound pressure level (SPL), of 190 to 195 dB re 1 µPa m. The source level for the thrusters used by Zykov (2016) were estimated for power output close to the nominal value (the maximum sustainable) for all thrusters; it is highly unlikely that all the thrusters of all vessels will be operated at such conditions for a prolonged period of time.

Drilling operations produce sound that includes strong tonal components at low frequencies. When drilling, the drill string represents a long vertical sound source (McCauley, 1998). Source levels associated with drilling activities have a maximum broadband (10 Hz to 10 kHz) energy of approximately 190 dB re 1 µPa m (Hildebrand, 2005). Based on available data, source levels generated from drillships during drilling and in the absence of thrusters can be expected to range between 154 and 176 dB re 1 µPa m (Nedwell et al., 2001). The use of thrusters, whether drilling or not, can elevate sound source levels from a drillship or semisubmersible to approximately 188 dB re 1 µPa m (Nedwell and Howell, 2004).

Positioning of the drilling rig requires the use of a vessel-mounted transducer and a series of transceivers placed on the seafloor. The transducer employs a high frequency acoustic signal (i.e., main energy between 21 and 31 kHz) throughout the operation. While the acoustic signal emitted by the transducer is similar to that emitted by a commercial echosounder, its source level will vary depending upon water depth (i.e., higher source levels required in deeper water). Source levels for the vessel-mounted transceiver, expressed as SPL, are estimated to be >200 dB re 1 µPa m, with the energy focused towards the seafloor (Equinor, 2019). The directionality and frequency of the source results in minimal propagation outside the main beam of the pulse.

The response of marine mammals, sea turtles, and fishes to a perceived marine sound depends on a range of factors, including 1) SPL, frequency, duration, and novelty of the sound; 2) the physical and behavioral state of the animal at the time of perception; and 3) the ambient acoustic features of the environment (Hildebrand, 2009). Additionally, the sound detection capabilities of a particular species or group of species can make them more or less susceptible to potential impacts from sound sources (BOEM, 2014b).

A.2 Physical Disturbance to the Seafloor

In water depths of 600 m (1,969 ft) or greater, DP drilling rigs disturb only a very small area of the seafloor around the wellbore where the bottom template and blowout preventer (BOP) are located. Depending on the specific well configuration, the total disturbed area is estimated to be 0.25 hectares (ha) (0.62 acres [ac]) per well (BOEM, 2012a). Additional areas on the seafloor will be disturbed during seafloor infrastructure installation activities. These disturbances will be limited to the immediate vicinity of where equipment will be installed.

A.3 Air Pollutant Emissions

The air pollutant emissions are calculated in accordance with BOEM requirements for screening air impacts and summarized in the Air Quality Emissions Report in EP Section G. The primary air pollutants typically associated with OCS activities are suspended particulate matter ($PM_{2.5}$ and PM_{10}), sulfur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds (VOCs), and carbon monoxide (CO) (Reşitoğlu et al., 2015), as well as ammonia (NH_3) and lead (Pb) per NTL BOEM-2020-G01. These emissions occur mainly from combustion diesel and aviation fuel, also known as Jet-A.

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

A.4 Effluent Discharges

The discharges will include treated sanitary and domestic wastes, deck drainage, desalination unit brine, BOP fluid, uncontaminated ballast and bilge water, noncontact cooling water, fire water, water-based drilling muds (WBM) and cuttings, cuttings wetted with synthetic-based drilling muds (SBM), hydrate control fluid, subsea wellhead preservation fluid, leak tracer dye, and excess cement. All offshore discharges are expected to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit issued by the U.S. Environmental Protection Agency (USEPA) and any applicable U.S. Coast Guard (USCG) regulations such as International Sewage Pollution Prevention Certificates and maintenance logs/records for marine sanitation devices.

Water-based drilling muds and cuttings are expected to be released at the seafloor during the initial well-drilling intervals before the marine riser that enables the return of drilling muds and cuttings to the surface is installed and set. Excess cement slurry will also be released at the seafloor during casing installation for the riserless portion of the drilling operations. Blowout prevention fluids also are expected to be discharged during the setting of the BOP, diverter systems testing after drilling fluids displacement, and at regular testing intervals at NPDES allowable de minimis levels. Drill cuttings generated during synthetic-based drilling mud (SBM) operations will be collected on the rig in dry cuttings boxes. SBM will either be reused by the vendor on the rig or transported via bulk tank containers to Port Fourchon, Louisiana, for recycling and/or disposal at an approved facility. Drill cuttings wetted with some residual SBMs will be discharged at the surface in accordance with the Base Fluids Retained on Cuttings (RoC %) percentage as listed in NPDES permit conditions averaged over all well sections. Dry cuttings are sent ashore in cutting boxes for disposal at approved facilities. Well treatment fluids, well completion fluids, well workover fluids, residual drilling fluids adhered to marine risers and minor drips/splatters around mud and solids control equipment also are expected to be contained, handled or discharged in accordance with the specified conditions, terms, or limitations in the NPDES permit.

Drilling fluids or cuttings will not be discharged when they fail the static sheen test defined in Appendix 1 of 40 CFR 435, Subpart A.

Other marine vessel effluent discharges are expected from drilling or subsea installation activities and are expected to be discharged in accordance with the conditions in the NPDES permit or USCG regulations (33 CFR 151.51-151.79 and 33 CFR 159) that pertain to MARPOL 73/78 Annex IV & V. These marine operations effluents include miscellaneous discharges that are untreated, effluents that are treated before discharge, and substances removed during wastewater control. Miscellaneous discharges will consist of uncontaminated seawater/ freshwater, such as uncontaminated ballast/bilge water, fire water, cooling water, potable water, graywater from dishwater, shower, laundry, bath, and washbasin drains, off-specification potable water and desalination unit discharge. Chemically treated effluents include seawater/freshwater to which treatment chemicals such as biocides or corrosion inhibitors have been added, sewage processed through a marine sanitation device, and deck drainage effluents passed through the drillship oil-water separator. Removed substances and include, but are not limited to, solids, sewage sludges, filter backwash, and other pollutants removed from wastewater removed in the course of treatment or wastewater control shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

Waste streams will not be discharged that contain free oil as evidenced by the monitoring method specified for that particular stream, e.g., deck drainage or miscellaneous discharges will not be discharged when they would cause a film or sheen upon or discoloration of the surface of the receiving water.

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

A.5 Water Intake

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

A.6 Onshore Waste Disposal

A list of the solid and liquid wastes generated during this project to be disposed of onshore are tabulated in EP Section F. A total of approximately 1,800 lbs per day of trash and debris will be generated over the life of the project. Wastes generated during the proposed project are expected to be properly stored and segregated on the drilling rig. Wastes are to be packaged in appropriate non-hazardous or hazardous waste containers for transportation to shore for disposal in an appropriately permitted facility. All wastes will be transported to shore in containers approved by the U.S. Department of Transportation for re-use, recycling, or disposal in accordance with applicable regulations. Compliance with these requirements is expected to result in either no or negligible impacts from this factor.

A.7 Marine Debris

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

A.8 Support Vessel and Helicopter Traffic

A.8.1 Physical Presence

IPFs associated with support vessel and helicopter traffic include their physical presence and operational sound. The existing shorebase facilities at Port Fourchon, Louisiana, will be used by Chevron for support vessel activities. Support helicopters are expected to be based at heliport facilities in Houma, Louisiana. No terminal expansion or construction is planned at either location.

NMFS (2020a) has found that support vessel traffic has the potential to disturb protected species (e.g., marine mammals, sea turtles, fishes) and creates a risk of vessel collisions. The probability of a vessel collision depends on the number, size, and speed of vessels as well as the distribution, abundance, and behavior of the species (Conn and Silber, 2013; Hazel et al., 2007; Jensen and Silber, 2004; Laist et al., 2001; Vanderlaan and Taggart, 2007; NMFS, 2020a). To reduce the potential for vessel collisions, BOEM issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species and requires operators to report sightings of any injured or dead protected species. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with the NTL. In April 2021 (NMFS, 2021), the 2020 NMFS Biological Opinion Appendix C Vessel Strike Avoidance and Dead/Injured Protected Species Reporting Protocols (NMFS, 2020a) was amended. The project will be supported by onshore crew boats and supply vessels making trips every two to three days, as well as a diesel oil supply vessel making weekly trips as needed. The boats typically move to the project area via the most direct route from the shorebase.

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

A.8.2 Operational Sound

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

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

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

A.9 Accidents

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

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

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

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

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

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

Vessel Collisions. BSEE data show that there were 197 OCS-related collisions between 2007 and 2022 (BSEE, 2022). Most collision mishaps are the result of service vessels colliding with platforms or vessel collisions with pipeline risers. Approximately 10% of vessel collisions with platforms in the OCS resulted in diesel spills, and during several collision incidents, fires resulted from hydrocarbon releases. To date, the largest diesel spill associated with a collision occurred in 1979 when an anchor-handling boat collided with a drilling platform in the Main Pass Lease Area, spilling 1,500 barrels (bbl). Diesel fuel is the product most frequently spilled, but oil, natural gas, corrosion inhibitor, hydraulic fluid, and lube oil have also been released as the result of vessel collisions. Human error accounted for approximately half of all reported vessel collisions from 2006 to 2009. As summarized by BOEM (2017), vessel collisions occasionally occur during routine operations. Some of these collisions have caused spills of diesel fuel or chemicals. Chevron and its contractors intend to comply with all applicable USCG and BOEM safety requirements to minimize the potential for vessel collisions.

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

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

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

H_2S Release. GC 596 and 641 are classified as H_2S Absent.

A.9.1 Small Fuel Spill

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

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

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

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

For purposes of the EIA, the fate of a small diesel fuel spill of 3 bbl was estimated using WebGNOME, a publicly available oil spill trajectory and fate model developed by NOAA (NOAA, 2022). This model uses the physical properties of oils in its database to predict the rate of evaporation and dispersion over time as well as changes in the density, viscosity, and water content of the product spilled. It is estimated that over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it during this 24-hour period would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

The WebGNOME results, coupled with spill trajectory information discussed below for a large spill, indicate that a small fuel spill would not impact coastal or shoreline resources. The project area is 113 statute miles (182 km) from the nearest shoreline (Plaquemines Parish, Louisiana). Slicks from small fuel spills are expected to persist for relatively short periods of time ranging from minutes (<1 bbl) to hours (<10 bbl) to a few days (10 to 1,000 bbl) and rapidly spread out, evaporate, and disperse into the water column (BOEM, 2012a). Because of the distance from shore of these potential spills on the OCS and their lack of persistence, it is unlikely that a spill would make landfall prior to dissipation (BOEM, 2012a).

Spill Response. In the unlikely event the shipboard procedures fail to prevent a fuel spill, response equipment and trained personnel would be activated so that any spill effects would be localized and would result only in short-term environmental consequences. A discussion of Chevron's response efforts if a spill were to occur during operational activities is provided in EP Section H.

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

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

A.9.2 Large Oil Spill (Worst Case Discharge)

Under this EP, Chevron proposes to drill six production wells in GC 596 and 641. The uncontrolled blowout scenario is for a potential blowout of the well which Chevron calculates has the highest liquid hydrocarbons rate potential in the area.

Spill Size. The WCD scenario for this project is defined as an uncontrollable oil discharge from the subsea wellbore resulting from a blowout incident during drilling operations. The initial Open Flow Potential Rate was calculated with systems analysis using the Prosper nodal software package from Petroleum Experts, Ltd. The WCD is calculated at 338,500 bopd by nodal analysis using Prosper. At this rate, severe pressure depletion is expected to occur in the case of an uncontrolled blow-out during the time it would take to drill the relief well. Chevron estimates 108 days to mobilize a rig, drill a relief well to intersect the blowout well and conduct a kill operation. During this time, the total potential spill volume is estimated at 25,638,936 bbl.

Spill Probability. Statistics from offshore drilling in the U.S. Gulf of Mexico provide a reasonable basis for evaluating oil spill risk during exploratory drilling. Historically, blowouts are rare events, and most do not result in oil spills. A 2010 analysis using the SINTEF[1] database estimates a blowout frequency of 0.0017 per exploratory well for non-North Sea locations (International Association of Oil & Gas Producers, 2010). BOEM has updated spill frequencies to include the *Deepwater Horizon* incident and found that spill rates (bbl spilled per bbl produced) for OCS platform spills were unchanged for spills >1,000 bbl when compared with previously

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

published data (Anderson et al., 2012). According to the BSEE analysis conducted for the Final Drilling Safety Rule issued in 2010, the baseline risk of a catastrophic blowout is estimated to be once every 26 years (75 *Federal Register* [FR] 63365).

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

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

The results for Launch Area 46 (where GC 596 and 641 are located) are presented in **Table 3**. The model predicts a <0.5% chance of contact with any shoreline within 10 days of a spill. Shoreline contact is predicted within 30 days for shorelines ranging from Matagorda County, Texas to Plaquemines Parish, Louisiana. The conditional probability of shoreline contact is low (1% to 3%) for all shorelines with predicted contact within 30 days.

Table 3. Conditional probabilities of a spill in Green Canyon Block 596 (GC 596) and 641 (GC 641) contacting shoreline segments based on the 30-day Oil Spill Risk Analysis (OSRA) (From: Ji et al., 2004). Values are conditional probabilities that a hypothetical spill in GC 596 and 641 (represented by OSRA Launch Area 46) could contact shoreline segments (as referenced from Ji et al., 2004) within 3, 10, or 30 days.

Shoreline Segment	County or Parish and State	Conditional Probability of Contact[a] (%)		
		3 Days	10 Days	30 Days
C08	Matagorda County, Texas	--	--	1
C09	Brazoria County, Texas	--	--	1
C10	Galveston County, Texas	--	--	2
C12	Jefferson County, Texas	--	--	1
C13	Cameron Parish, Louisiana	--	--	3
C14	Vermilion Parish, Louisiana	--	--	1
C17	Terrebonne Parish, Louisiana	--	--	1
C18	Lafourche Parish, Louisiana	--	--	1
C20	Plaquemines Parish, Louisiana	--	--	3

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

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

BOEM presented additional OSRA modeling to simulate a spill that continues for 90 consecutive days, with each trajectory tracked for 60 days during four seasons. In this updated OSRA model (herein referred to as the 60-day OSRA model), 60 days was chosen as a conservative estimate of the maximum duration that spilled oil would persist on the sea surface following a spill (BOEM, 2017b). The spatial resolution is limited, with five launch points in the entire Western and Central Planning Areas of the Gulf of Mexico. These launch points were deliberately located in areas identified as having a high possibility of containing large oil reserves. The 60-day OSRA model launch point most appropriate for modeling a spill in the project area is Launch Point 3 (located in the Central Planning Area shelf area). The 60-day OSRA results for Launch Point 3 are presented in **Table 4**.

Table 4. Shoreline segments with a 1% or greater conditional probability of contact from a spill starting at Launch Point 3 based on the 60-day Oil Spill Risk Analysis (OSRA). Values are conditional probabilities that a hypothetical spill in the project area could contact shoreline segments within 60 days. Modified from: BOEM (2017a).

Season	Spring				Summer				Fall				Winter			
Day	3	10	30	60	3	10	30	60	3	10	30	60	3	10	30	60
County or Parish	Conditional Probability of Contact[1] (%)															
Cameron, Texas	--	--	--	--	--	--	--	2	--	--	--	1	--	--	--	1
Willacy, Texas	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	2
Kenedy, Texas	--	--	--	--	--	--	1	5	--	--	--	2	--	--	--	3
Kleberg, Texas	--	--	--	--	--	--	1	3	--	--	1	2	--	--	--	2
Nueces, Texas	--	--	--	--	--	--	--	2	--	--	1	2	--	--	--	3
Aransas, Texas	--	--	--	--	--	--	--	2	--	--	1	2	--	--	--	3
Calhoun, Texas	--	--	--	--	--	--	--	3	--	--	1	2	--	--	1	4
Matagorda, Texas	--	--	3	5	--	--	1	4	--	--	2	5	--	--	3	10
Brazoria, Texas	--	--	3	3	--	--	2	5	--	--	1	2	--	--	3	8
Galveston, Texas	--	--	3	5	--	--	2	3	--	--	1	2	--	--	2	5
Jefferson, Texas	--	--	4	5	--	--	1	1	--	--	--	--	--	--	1	2
Cameron, Louisiana	--	--	9	11	--	--	1	3	--	--	--	2	--	--	1	3
Vermilion, Louisiana	--	1	5	6	--	--	1	1	--	--	--	--	--	--	1	2
Iberia, Louisiana	--	1	3	3	--	--	--	--	--	--	--	--	--	--	--	1
St. Mary, Louisiana		--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Terrebonne, Louisiana	--	5	12	13	--	--	1	2	--	--	1	1	--	1	2	2
Lafourche, Louisiana	--	2	5	6	--	--	1	2	--	--	--	--	--	--	1	2
Jefferson, Louisiana	--	--	1	1	--	--	--	1	--	--	--	--	--	--	--	--
Plaquemines, Louisiana	--	3	10	10	--	--	2	3	--	--	--	--	--	--	2	2
St. Bernard, Louisiana	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Baldwin, Alabama	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Escambia, Florida	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Okaloosa, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Bay, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Miami-Dade, Florida	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--
State Coastline	Conditional Probability of Contact (%)															
Texas	--	--	13	19	--	--	7	30	--	--	7	21	--	--	11	44
Louisiana	--	12	46	52	--	2	6	12	--	1	2	4	--	2	8	12
Mississippi	--	--	1	1	--	--	--	1	--	--	--	--	--	--	--	--

Table 4. (Continued).

Season	Spring				Summer				Fall				Winter			
Day	3	10	30	60	3	10	30	60	3	10	30	60	3	10	30	60
County or Parish	Conditional Probability of Contact[1] (%)															
Alabama	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Florida	--	--	2	5	--	--	--	2	--	--	--	--	--	--	--	1

From Launch Point 3, potential shoreline contacts within 60 days range from Cameron County, Texas, to Miami-Dade County, Florida. Based on statewide contact probabilities within 60 days, Texas has the highest likelihood of contact during summer, fall, and winter (ranging from 21% to 44% within 60 days), while Louisiana has the highest contact probability in spring (52% within 60 days). The model predicts potential contact with Mississippi shorelines during spring or summer with contact probabilities of 1% (within 60 days of a spill). Alabama shorelines are predicted to be potentially contacted only during spring with a contact probability of 1% within 60 days. Florida shorelines are predicted to be potentially contacted during all seasons except fall, with contact probabilities of up to 5% (during spring). Based on the 60-day trajectories, counties or parishes with a 10% or greater contact probability during any season include Matagorda County, Texas; and Cameron, Terrebonne, and Plaquemines parishes in Louisiana (**Table 4**).

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

Weathering. In the event of a diesel fuel spill, it is expected that weathering and evaporation will occur quickly. The constituents of diesel fuel are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. NOAA has reported that diesel fuel is readily and completely degraded by naturally occurring microbes (NOAA, 2006).

Weathering decreases the concentration of oil and produces changes in its chemical composition, physical properties, and toxicity. The more toxic, light aromatic and aliphatic hydrocarbons are lost rapidly by evaporation and dissolution from a slick on the water surface. For example, the light, paraffinic crude oil spilled during the *Deepwater Horizon* incident lost approximately 55 wt. % to evaporation during the first 3 to 5 days while floating on the sea surface (Daling et al., 2014). Evaporated hydrocarbons are degraded rapidly by sunlight. Biodegradation of oil on the water surface and in the water column by marine bacteria removes first the n-alkanes and then the light aromatics from the oil. Other petroleum components are biodegraded more slowly (National Research Council, 2003a). Photo-oxidation attacks mainly the medium and high molecular weight PAHs in the oil on the water surface (Prince, 2014).

Spill Response. See EP Section H for a detailed description of Chevron's site-specific response to the WCD for this EP. These sections, along with Chevron's OSRP, also include a description of surface and subsea containment capabilities that could be implemented in the event of the WCD for this EP.

All the proposed activities in this plan will be covered by Chevron's Gulf of Mexico Regional Oil Spill Response Plan (OSRP), approved by BSEE on 22 March 2016; biennial review was deemed in compliance with 30 CFR 254 by BSEE on 23 March 2021. A biennial review of the OSRP was submitted in June 2023. Companies covered under this OSRP include: Chevron Corporation (02335), Chevron U.S.A. Inc. (00078), Chevron Pipe Line Company (00400), Union Oil Company of California (00003), Chevron Midcontinent L.P., and Noble Energy Inc. (02237). Chevron has certified that it has the capability to respond to the maximum extent practical to a WCD from all Chevron facilities in the Gulf of Mexico.

B. Affected Environment

The project area is in the central Gulf of Mexico, approximately 113 statute miles (182 km) from the nearest shoreline (Plaquemines Parish, Louisiana), 123 statute miles (198 km) from the onshore support base at Port Fourchon, Louisiana, and 151 statute miles (243 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The water depth at the location of the proposed activities ranges from approximately 1,213 to 1,223 m (3,980 to 4,012 ft) (**Figure 2**).

The proposed wellsites are located southwest of the Mississippi Canyon along the flank of Henderson Ridge. The ridge flank is irregular with a dendritic-like topography. The shallow stratigraphy at the proposed wellsites consists of layered hemipelagic clays and silty-clays overlying chaotic mass-transport deposits (GEMS, 2024a,b).

A detailed description of the regional affected environment, including meteorology, oceanography, geology, air and water quality, benthic communities, threatened and endangered species, biologically sensitive resources, archaeological resources, socioeconomic conditions, and other marine uses is provided in recent EISs (BOEM, 2012a; 2013; 2014a; 2015; 2016b; 2017, 2023a,b). These regional descriptions, applicable to GC 596 and 641, remain valid and are incorporated by reference. General background information is presented in the following sections, and brief descriptions of each potentially affected resource, including site-specific and new information if available, are presented in **Section C**.

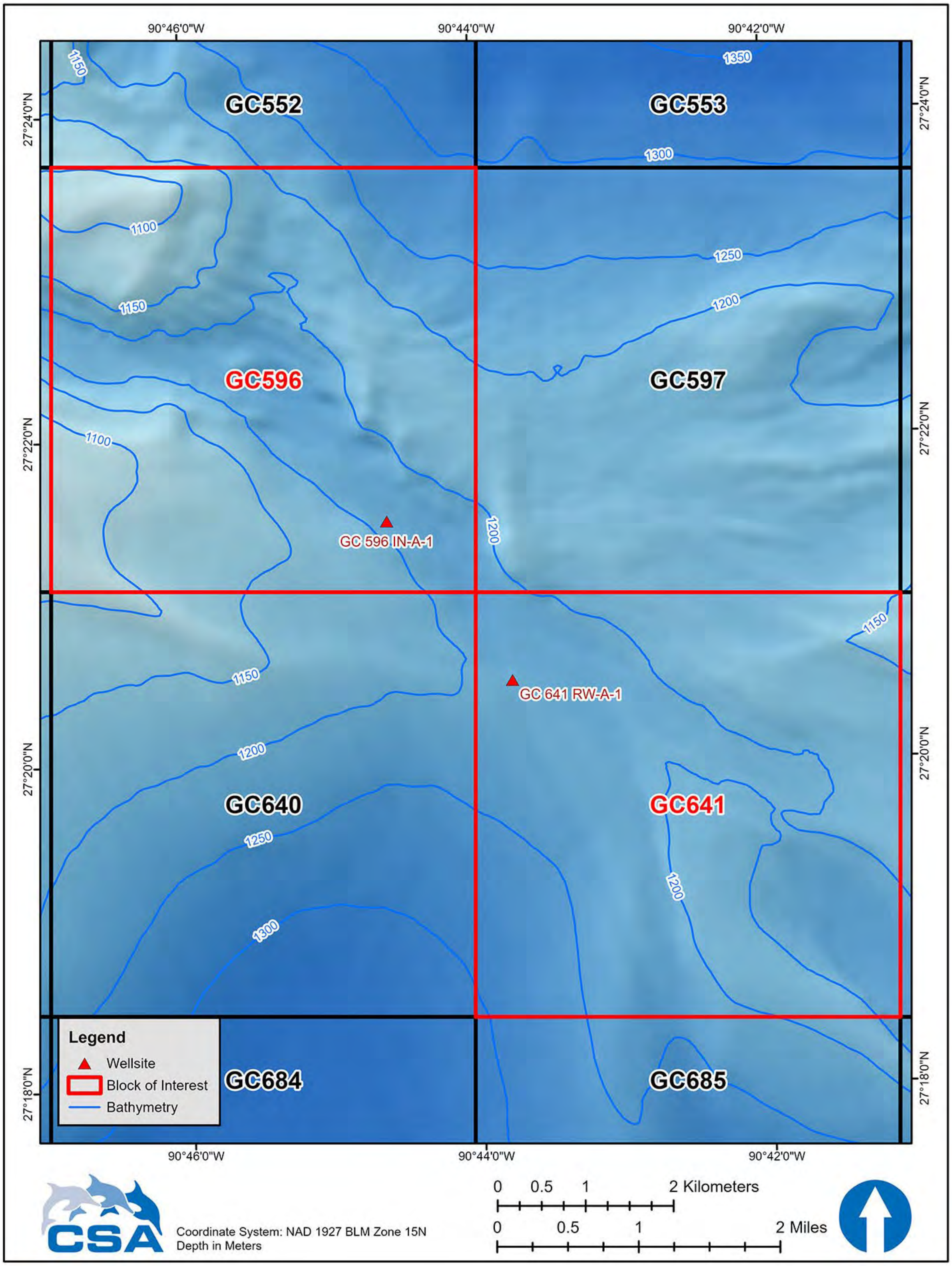


Figure 2. Bathymetric map of the project area showing the proposed surface hole locations.

C. Impact Analysis

This section analyzes the potential direct and indirect impacts of routine activities and accidents. Impacts have been analyzed extensively in lease sale EISs for the Central and Western Gulf of Mexico Planning Areas (BOEM, 2013; 2014a; 2015; 2016a,b; 2017; 2023b) and this information in these documents is incorporated by reference. This section is organized by the environmental resources identified in **Table 2** and addresses each IPF potentially affecting the resource.

C.1 Physical/Chemical Environment

C.1.1 Air Quality

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

In general, ambient air quality of coastal counties along the Gulf of Mexico is relatively good (BOEM, 2012a). As of April 2024, Mississippi, Alabama, and Florida Panhandle coastal counties, in proximity to the project area, are in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants (USEPA, 2024). St. Bernard Parish in Louisiana is a nonattainment area for sulfur dioxide based on the 2010 standard. One coastal metropolitan area in Texas (Houston-Galveston-Brazoria) is a nonattainment area for 8-hour ozone (2015 Standard).

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

As noted earlier, based on calculations made pursuant to applicable regulations and guidance in NTL BOEM-2020-G01, emissions from drilling activities are not expected to be significant. Therefore, the only potential effects to air quality would be from air pollutant emissions associated with routine operations and accidental spills (a small fuel spill or a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Air Pollutant Emissions

Air pollutant emissions are the only routine IPF likely to affect air quality. Offshore air pollutant emissions will result primarily from the drilling and subsea installation operations and service vessels. These emissions occur mainly from combustion or burning of diesel and Jet-A aircraft fuel. The combustion of fuels occurs primarily in generators, pumps, or motors and from lighter fuel motors. Primary air pollutants typically associated with OCS activities are suspended PM, SOx, NOx, VOCs, CO, NH_3, and Pb. As noted by BOEM (2017b), emissions from routine activities are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, anticipated emission rates, anticipated heights of emission sources, and the distance to shore of the proposed activities. However, support vessel and helicopter traffic entering or departing coastal facilities will release air pollutants in these areas during the project period. The incremental contribution to cumulative impacts from activities described in Chevron's EP is minimal and is not expected to cause or contribute to a violation of NAAQS.

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

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

The Breton Wilderness Area, which is part of the Breton National Wildlife Refuge (NWR), is designated under the Clean Air Act as a Prevention of Significant Deterioration (PSD) Class I air quality area. BOEM is required to notify the National Park Service and U.S. Fish and Wildlife Service (USFWS) if emissions from proposed projects may affect the Breton Class I area. The project area is approximately 185 statute miles [2] (298 km) from the Breton Wilderness Area. Chevron and its contractors intend to comply with all BOEM requirements regarding air emissions.

There are three Class I air quality areas on the west coast of Florida: St. Marks National Wildlife Refuge in Wakulla County, Chassahowitzka National Wildlife Refuge in Hernando County, and Everglades National Park in Monroe, Miami-Dade, and Collier counties. The project area is approximately 417 statute miles (671 km) from the closest Florida Class I air quality area (St. Marks National Wildlife Refuge Class I Air Quality Area). Chevron expects to comply with emissions requirements as directed by BOEM.

Impacts of a Small Fuel Spill

Potential impacts of a small spill on air quality are expected to be consistent with those analyzed and discussed by (BOEM, 2012a; 2015; 2016b; 2017, 2023a,b). The probability of a small spill

[2] Distance calculated based on the nearest point of Green Canyon Block 743.

would be minimized by Chevron's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to reduce the potential impacts.

The EIA small spill scenario is proposed to occur in offshore waters at or near the drilling rig/installation vessel. A small fuel spill would affect air quality near the spill site by introducing VOCs into the atmosphere through evaporation. The WebGNOME model (see **Section A.9.1**) indicates that over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

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

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on air quality are expected to be consistent with those analyzed and discussed by BOEM (2012a; 2015; 2016b; 2017; 2023a,b). A large oil spill could potentially affect air quality by introducing VOCs into the atmosphere through evaporation. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill and the effectiveness of spill response measures. Real-time wind and current data from the project area would be available at the time of a spill and would be used to assess the fate and effects of VOCs released. Additional air quality impacts could occur if response measures included in situ burning of floating oil. Burning would generate a plume of black smoke and result in emissions of NO_x, SO_x, CO, and PM as well as greenhouse gases. However, in situ burning would occur only after authorization from the USCG Federal On-Scene Coordinator. This approval would also be based upon consultation with the regional response team, including the USEPA.

Because of the project area's location (113 statute miles [182 km]) from the nearest shoreline, most air quality impacts would occur in offshore waters with minimal chance to affect onshore air quality. However, depending on the spill trajectory and the effectiveness of spill response measures, coastal air quality could be affected if oil on the sea surface approaches or contacts the coast.

C.1.2 Water Quality

There are no site-specific baseline water quality data for the project area. Deepwater areas in the northern Gulf of Mexico are relatively similar with respect to patterns of water column temperature, salinity, and oxygen (BOEM, 2017). Kennicutt (2000) noted that the deepwater region has little evidence of contaminants in the dissolved or particulate phases of the water column. Within the northern Gulf of Mexico, there are localized areas (termed natural seeps) that release oil, gas, and brines from sub-surface deposits into near surface sediments and up through the water column. No natural seeps were noted within 610 m (2,000 ft) of the proposed wellsites (GEMS, 2024a,b).

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

Impacts of Effluent Discharges

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

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

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

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

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

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

Impacts of a Small Fuel Spill

Potential impacts of a small spill on water quality are expected to be consistent with those analyzed and discussed by BOEM (2012a; 2015; 2016b; 2017, 2023a,b). The EIA small spill scenario is proposed to occur in offshore waters at or near the drilling rig/installation vessel. The probability of a small spill would be minimized by Chevron's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to potentially help mitigate and reduce the impacts. EP Section H provides details on spill response measures in addition to the summary information provided in the EIA.

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

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

Some vessels may contain Heavy Fuel Oil (i.e., No. 6 Fuel Oil, Bunker C) that may sink or be suspended in the water column. This fuel can stick to surfaces and does not readily disperse or breakdown from weathering. However, encounters with these vessels are considered rare and not further discussed.

The extent and persistence of water quality impacts from a small diesel fuel spill would depend on the meteorological and oceanographic conditions at the time of the spill and the effectiveness of spill response measures. It is estimated that more than 90% of a small diesel spill would evaporate or disperse within 24 hours (NOAA, 2022) (see **Section A.9.1**). The sea surface area covered with a very thin layer of diesel fuel would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions. In addition to removal by evaporation, constituents of diesel fuel are readily and completely degraded by naturally occurring microbes (NOAA, 2006; 2017a). Given the open ocean location of the project area, the extent and duration of water quality impacts from a small spill would not be significant.

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on water quality are expected to be consistent with those analyzed and discussed by BOEM (2012a; 2015; 2016b; 2017, 2023a,b). Most of the spilled oil would be expected to form a slick at the surface, although information from the *Deepwater Horizon* incident indicates that submerged oil droplets can be produced when subsea dispersants are applied at the wellhead (Camilli et al., 2010; Hazen et al., 2010; NOAA, 2011a,b,c). Dispersants would be applied only after approval from the Federal On-Scene Coordinator with collaboration from the USEPA and Regional Response Team Region 6.

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

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

Due to the project area being located approximately 113 statute miles (182 km) from the nearest shoreline (Plaquemines Parish, Louisiana), it is expected that most water quality impacts would occur in offshore waters before low molecular weight alkanes and volatiles are weathered (Operational Science Advisory Team, 2011), especially in the event of a spill lasting less than 30 days. The 30-day OSRA modeling (**Table 3**) indicates nearshore waters and embayments of from Matagorda County, Texas to Plaquemines Parish, Louisiana, could be affected within 30 days of a spill (1% to 3% conditional probability within 30 days). The 60-day OSRA model predicts contact of shorelines between Cameron County, Texas, and Miami-Dade County, Florida, with a maximum conditional probability of contact of 13% in Terrebonne Parish, Louisiana (**Table 4**).

C.2 Seafloor Habitats and Biota

The water depth at the location of the proposed wellsite is approximately 1,213 to 1,223 m (3,980 to 4,012 ft). According to BOEM (2016a), existing information for the deepwater Gulf of Mexico indicates that the seafloor is composed primarily of soft sediments; exposed hard substrate habitats and associated biological communities are rare. The site clearance letter did not note the presence of hard bottom communities or potential seepage locations within 610 m (2,000 ft) of the proposed wellsite locations (GEMS, 2024a,b). The IPFs with potential impacts listed in **Table 2** are discussed below.

C.2.1 Soft Bottom Benthic Communities

There are no site-specific benthic community data from the project area. However, data from the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (Wei, 2006; Rowe and Kennicutt, 2009; Wei et al., 2010; Carvalho et al., 2013; Spies et al., 2016) can be used to describe typical baseline benthic communities in the area. **Table 5** summarizes data collected at two stations in water depths similar to those in the proposed project area.

Table 5. Baseline benthic community data from stations near the project area in similar depths sampled during the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (Adapted from: Wei, 2006; Rowe and Kennicutt, 2009).

Station	Water Depth (m)	Abundance		
		Meiofauna (>63 µm; individuals m^{-2})	Macroinfauna (>300 mm; individuals m^{-2})	Megafauna (>1 cm; individuals ha^{-1})
GKF	2,465	84,348	737	ND
B1	2,255	157,417	1,446	252

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

Densities of meiofauna (animals passing through a 0.5-mm sieve but retained on a 0.062-mm sieve) at stations in the vicinity of the project area ranged from approximately 84,348 to 157,417 individuals m^{-2} (**Table 5**) (Rowe and Kennicutt, 2009). Nematodes, nauplii, and harpacticoid copepods were the three dominant meiofaunal groups, accounting for about 90% of total abundance.

The benthic macroinfauna is characterized by small mean individual sizes and low densities, both of which reflect the meager primary production in surface waters of the Gulf of Mexico continental slope (Wei, 2006). Densities decrease exponentially with water depth. Based on the Wei (2006) equation, the macroinfauna density in the project area in GC 596 and 641 are expected to be approximately 737 to 1,446 individuals m^{-2}.

Polychaetes are typically the most abundant macroinfaunal group on the northern Gulf of Mexico continental slope, followed by amphipods, tanaids, bivalves, and isopods. Carvalho et al. (2013) found polychaete abundance to be higher in the central region of the northern Gulf of Mexico when compared to the eastern and western regions. Wei (2006) recognized four depth-dependent faunal zones (1 through 4), two of which are divided horizontally. The lease area is in Zone 3W, which consists of stations on the mid Texas-Louisiana Slope ranging in depth from 1,875 to 3,008 m (6,152 to 9,869 ft). The most abundant species in this zone were the polychaetes *Levinsenia uncinata, Paraonella monilaris*, and *Tachytrypane* sp. A; the bivalve

Heterodonta sp. B; and the isopod *Macrostylis* sp. The megafaunal density at one nearby station in the vicinity of the project area was ranged was 252 individuals ha^{-1}. Common megafauna included motile taxa such as echinoderms, cnidarians (sessile sea anemones, pens and whips), decapod crustaceans, and demersal fish (Rowe and Kennicutt, 2009).

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

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

Impacts of Physical Disturbance to the Seafloor

In water depths such as those in the project area, DP drilling rigs disturb the seafloor only around the wellbore (surface hole location) where the bottom template and BOP are located. Depending upon the specific well configuration, this area of disturbance is generally about 0.25 ha (0.62 ac) per well (BOEM, 2012a). Additional areas on the seafloor will be disturbed during seafloor infrastructure installation activities. These disturbances will be limited to the immediate vicinity of where equipment will be installed.

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

Impacts of Effluent Discharges

Drilling mud and cuttings are the only effluents that could be present in vicinity of the wellsite that are likely to affect local soft bottom benthic communities. During initial well drilling interval(s) before the marine riser is set, cuttings and water-based mud will be released at the seafloor. Excess cement slurry will also be released at the seafloor during casing installation for the riserless portion of the drilling operations. Cement slurry components typically include cement mix and some of the same chemicals used in water-based drilling muds (Boehm et al., 2001; Fink, 2016). The main impacts will be burial and smothering of benthic organisms within several meters to tens of meters around the wellbore where cuttings and water-based muds physically contact the seafloor. Soft bottom sediments disturbed by cuttings, drilling muds, and cement slurry will eventually be recolonized through larval settlement and migration from adjacent areas. Because some deep-sea biota grow and reproduce slowly, recovery may require several years for the affected area within meters to tens of meters of the wellbore.

Discharges of treated SBM cuttings from the rig may affect benthic communities, primarily within several hundred meters of the wellsite. The fate and effects of SBM cuttings have been reviewed by Neff et al. (2000), and monitoring studies have been conducted in the Gulf of

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

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

Impacts of a Large Oil Spill

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

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

C.2.2 High-Density Deepwater Benthic Communities

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

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

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

Impacts of a Large Oil Spill

A large oil spill caused by a seafloor blowout could cause direct impacts (i.e., caused by the physical impacts of a blowout) on benthic communities within approximately 300 m (984 ft) of the wellhead (BOEM, 2012a; 2013). However, based on the site clearance letter for the proposed wellsites (GEMS, 2024a,b), there are no seafloor features that could support high-density deepwater benthic communities within 610 m (2,000 ft). Therefore, this type of impact is not expected.

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

The biological effects and fate of the oil remaining in the Gulf of Mexico from the *Deepwater Horizon* incident are still being studied, but numerous papers have been published discussing the nature of subsea oil plumes (e.g., Ramseur, 2011; Reddy et al., 2012; Valentine et al., 2014). Hazen et al. (2010) reported changes in plume hydrocarbon composition with distance from the source. Incubation experiments with environmental isolates demonstrated faster than expected hydrocarbon biodegradation rates at 5°C (41°F). Based on these results, Hazen et al. (2010) suggested the potential exists for intrinsic bioremediation of the oil plume in the deepwater column without substantial oxygen drawdown.

Potential impacts of oil on high-density deepwater benthic communities are discussed in recent EISs (BOEM, 2012a; 2015; 2016b; 2017, 2023a,b). Oil droplets or oiled sediment particles could come into contact with chemosynthetic organisms or deepwater corals in the vicinity of the spill site. Impacts could include loss of habitat, biodiversity, and live coral coverage; destruction of hard substrate; reduction or loss of one or more commercial and recreational fishery habitats; or changes in sediment characteristics (BOEM, 2023a).

C.2.3 Designated Topographic Features

GC 596 641 are not within or near a designated topographic feature or a no-activity zone as identified in NTL 2009-G39. The nearest designated Topographic Feature Stipulation Block is located approximately 42 statute miles (68 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to designated topographic features.

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

C.2.4 Pinnacle Trend Area Live Bottoms

The project area is not covered by the Live Bottom (Pinnacle Trend) Stipulation. As defined by NTL 2009-G39, the nearest Pinnacle Stipulation Block is located approximately 186 statute miles (299 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to pinnacle trend area live bottoms due to the distance from the project area.

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

C.2.5 Eastern Gulf Live Bottoms

The project area is not covered by the Live Bottom (Low-Relief) Stipulation, which applies to seagrass communities and low-relief hard bottom reef within the Eastern Gulf of Mexico Planning Area leases in water depths of 100 m (328 ft) or less and portions of Pensacola and Destin Dome Area blocks in the Central Gulf of Mexico Planning Area. The nearest block covered by the Live Bottom Stipulation, as defined by NTL 2009-G39, is located approximately 225 statute miles (362 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to eastern Gulf live bottom areas due to the distance from the project area.

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

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

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

Endangered or Threatened species that may occur in the project area and/or along the northern Gulf Coast are listed in **Table 6**. The table also indicates the location of critical habitat (if designated in the Gulf of Mexico). Critical habitat is defined as (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. The NMFS has jurisdiction for ESA-listed marine mammals (cetaceans), sea turtles, and fishes in the Gulf of Mexico. The USFWS has jurisdiction for ESA-listed birds, the West Indian manatee (*Trichechus manatus*), and sea turtles while on their nesting beaches.

Table 6. Federally listed Endangered and Threatened species potentially occurring in the project area and along the northern Gulf Coast. Adapted from: U.S. Fish and Wildlife Service (2020) and National and Oceanic Atmospheric Administration Fisheries (2020).

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Marine Mammals					
Rice's whale[1]	*Balaenoptera ricei*	E	X	--	None
Sperm whale	*Physeter macrocephalus*	E	X	--	None
West Indian manatee	*Trichechus manatus*[2]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T,E[3]	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); *Sargassum* habitat including most of the central & western Gulf of Mexico.
Green turtle	*Chelonia mydas*	T	X	X	None
Leatherback turtle	*Dermochelys coriacea*	E	X	X	None
Hawksbill turtle	*Eretmochelys imbricata*	E	X	X	None
Kemp's ridley turtle	*Lepidochelys kempii*	E	X	X	None
Birds					
Piping Plover	*Charadrius melodus*	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	*Grus americana*	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Rufa Red Knot	*Calidris canutus rufa*	T	--	X	None
Black-capped Petrel	*Pterodroma hasitata*	E	X	--	None
Fishes					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	X	--	None
Giant manta ray	*Mobula birostris*	T	X	X	None
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)

Table 6. (Continued).

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Nassau grouper	*Epinephelus striatus*	T	--	X	20 different geographic units, located in waters off the coasts of southeastern Florida and the Florida Keys, Puerto Rico, Navassa, and the U.S. Virgin Islands
Smalltooth sawfish	*Pristis pectinata*	E	--	X	Southwest Florida
Invertebrates					
Elkhorn coral	*Acropora palmata*	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	*Acropora cervicornis*	T	--	X	Florida Keys and the Dry Tortugas
Pillar coral	*Dendrogyra cylindrus*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Rough cactus coral	*Mycetophyllia ferox*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Lobed star coral	*Orbicella annularis*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Mountainous star coral	*Orbicella faveolata*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Boulder star coral	*Orbicella franksi*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Panama City crayfish	*Procambarus econfinae*	T	--	X	South-central Bay County, Florida
Queen conch	*Aliger gigas*	T	--	X	None
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus subsp. Ammobates, allophrys, trissyllepsis, and peninsularis, respectively*	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	E	--	X	None

E = Endangered; T = Threatened; X = potentially present; -- = not present.

1 In 2021, the National Marine Fisheries Service recognized that what had previously been accepted as a subspecies of the Bryde's whale is actually a separate species. The reclassification is formerly recognized under 86 FR 47022 effective date 22 October 2021 as the Rice's whale (*Balaenoptera ricei*).

2 There are two subspecies of West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern Gulf of Mexico to Virginia, and the Antillean manatee (T. m. manatus), which ranges from northern Mexico to eastern Brazil. Only the Florida manatee subspecies is likely to be found in the northern Gulf of Mexico.

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

Coastal Endangered or Threatened species that may occur along the U.S. Gulf Coast include the West Indian manatee, Piping Plover (*Charadrius melodus*), Ruda Red Knot (*Calidris canutus rufa) Florida* salt marsh vole (*Microtus pennsylvanicus dukecampbelli*), Panama City crayfish (*Procambarus econfinae*), Whooping Crane (*Grus americana*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), smalltooth sawfish (*Pristis pectinata*), Queen conch (*Aliger gigas*) and four subspecies of beach mouse. Critical habitat has been designated for all of these species (except the Florida salt marsh vole) as indicated in **Table 6** and discussed in individual sections. Two other coastal bird species (Bald Eagle [*Haliaeetus leucocephalus*] and Brown Pelican [*Pelecanus occidentalis*]) are no longer federally listed as Endangered or Threatened; these are discussed in **Section C.4.2**.

Five sea turtle species, the Rice's whale (*Balaenoptera ricei*), sperm whale (*Physeter macrocephalus*), oceanic whitetip shark (*Carcharhinus longimanus*), and giant manta ray (*Mobula birostris*), and the Black-capped Petrel (*Pteredroma hasitata*) are the only Endangered or Threatened species that could potentially occur within the project area. The listed sea turtles include the leatherback turtle (*Dermochelys coriacea*), Kemp's ridley turtle (*Lepidochelys kempii*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), and green turtle (*Chelonia mydas*) (Pritchard, 1997). Effective 11 August 2014, NMFS has designated certain marine areas as critical habitat for the Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle (see **Section C.3.5**). No critical habitat has been designated in the Gulf of Mexico for the leatherback turtle, Kemp's ridley turtle, hawksbill turtle, green turtle, or the sperm whale.

Four Endangered mysticetes (blue whale [*Balaenoptera musculus*], fin whale [*Balaenoptera physalus*], North Atlantic right whale [*Eubalaena glacialis*], and sei whale [*Balaenoptera borealis*]) have been reported in the Gulf of Mexico, and are considered rare or extralimital (Würsig et al., 2017). These species are not included in the most recent NMFS stock assessment report (Hayes et al., 2022) nor in the most recent BOEM multisale EIS (BOEM, 2017); therefore, they are not considered further in the EIA.

The Rice's whale exists in the Gulf of Mexico as a small, resident population. This species was formally known as a subspecies to the Bryde's whale (*Balaenoptera edeni brydei*) until a DNA study identified it as a separate species (Rosel et al., 2021). It is the only baleen whale known to be resident to the Gulf of Mexico. The species is severely restricted in range, being found only in the northeastern Gulf in the waters of the DeSoto Canyon (Waring et al., 2016, Rosel et al., 2021). However, recent work by Soldevilla et al. (2022a) suggests the range may be broader than previously thought (see **Section C.3.2**).

In several recent acoustic studies in the Gulf of Mexico (Soldevilla et al., 2022a,b; 2024), all Bryde's whale complex individuals are assumed to be Rice's whales. However, Bryde's whales have a global tropical and sub-tropical range that can include the Gulf of Mexico. Moreover, in the latest NMFS Rice's whale Marine Mammal Stock Assessment Report (Hayes et al., 2023), all previous data of Gulf of Mexico Bryde's whales from studies that pre-dated the Rosel et al. (2021) study that determined that Rice's whales are a distinct species were now assumed to all be Rice's whales. However, it is unclear on what percentage of Bryde's whale complex individuals that live or previously lived in Gulf of Mexico are Rice's whales vs Bryde's whales due to having no DNA studies that analyzed a representative population of Gulf of Mexico Bryde's whale complex individuals.

The giant manta ray could occur in the project area but is most commonly observed in the Gulf of Mexico at the Flower Garden Banks. The Nassau grouper (*Epinephelus striatus*) has been observed in the Gulf of Mexico at the Flower Garden Banks but is most commonly observed in shallow tropical reefs of the Caribbean and is not expected to occur in the project area. The smalltooth sawfish is a coastal species limited to shallow areas off the west coast of Florida and is not expected to occur in the project area. The Panama City crayfish (*Procambarus econfinae*) is a coastal species in south-central Bay County, Florida and is not expected to occur in the project area.

Seven Threatened coral species are known from the northern Gulf of Mexico: elkhorn coral (*Acropora palmata*), staghorn coral (*Acropora cervicronis*), lobed star coral (*Orbicella annularis*), mountainous star coral (*Orbicella faveolata*), boulder star coral (*Orbicella franksi*), pillar coral (*Dendrogyra cylindrus*), and rough cactus coral (*Mycetophyllia ferox*). These corals are shallow water, zooxanthellate species (containing symbiotic photosynthetic zooxanthellae which contribute to their nutritional needs) and so are not present in the deepwater project area (see **Section C.3.16**).

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

C.3.1 Sperm Whale (Endangered)

The Endangered marine mammal likely to be present at or near the project area is the sperm whale. Resident populations of sperm whales occur within the Gulf of Mexico; a species description is presented in the recovery plan for this species (NMFS, 2010b). Gulf of Mexico sperm whales are classified as an Endangered species and a "strategic stock" (defined as a stock that may have unsustainable human-caused impacts) by NOAA Fisheries (Waring et al., 2016). A "strategic stock" is defined by the MMPA as a marine mammal stock that meets the following criteria:

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

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

The distribution of sperm whales in the Gulf of Mexico is correlated with mesoscale physical features such as eddies associated with the Loop Current (Jochens et al., 2008). Sperm whale populations in the north-central Gulf of Mexico are present throughout the year (Davis et al., 2000). Results of a multi-year tracking study show female sperm whales are typically concentrated along the upper continental slope between the 200- and 1,000-meter (656 and

3,280 ft) depth contours (Jochens et al., 2008). Male sperm whales were more variable in their movements and were documented in water depths greater than 3,000 m (9,843 ft). Generally, groups of sperm whales observed in the Gulf of Mexico during the MMS-funded Sperm Whale Seismic Study (SWSS) consisted of mixed-sex groups comprising adult females with juveniles, and groups of bachelor males. Typical group size for mixed groups was 10 individuals (Jochens et al., 2008).

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

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

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

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

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

NMFS (2018a) lists sperm whales in the same functional hearing group (i.e., mid frequency cetaceans) as most dolphins and other toothed whales (i.e., odontocetes), with an estimated hearing sensitivity from 150 Hz to 160 kHz. Therefore, DP vessel-related sound is likely to be audible to sperm whales. Frequencies <150 Hz produced by the drilling operations may be audible but are not likely to be perceived with any significance by mid-frequency cetaceans. The sperm whale may possess better low frequency hearing than some of the other odontocetes, although not as low as many baleen whale species whose vocalizations between 12 Hz and 28 kHz (Wartzok and Ketten, 1999). Generally, most of the vocalizations produced by sperm whales occur at frequencies below 10 kHz, although diffuse energy up to and past 20 kHz is common, with source levels up to 236 dB re1 µPa m (Møhl et al., 2003).

It is expected that, due to the relatively stationary nature of the proposed activities, sperm whales would move away from the proposed operations area, and sound levels that could cause auditory injury would be avoided. Sound associated with proposed vessel operations may cause behavioral disturbances to sperm whales. Observations of behavioral responses of marine mammals to anthropogenic sound, in general, have been limited to short term behavioral responses, which included the temporary cessation of feeding, resting, or social interactions (NMFS, 2015a). Animals can determine the direction from which a sound arrives based on cues, such as differences in arrival times, sound levels, and phases at the two ears. Thus, an animal's directional hearing capabilities have a bearing on its ability to avoid sound sources.

NMFS (2018a) presents criteria that are used to determine physiological (i.e., injury) thresholds for marine mammals. Behavioral disturbance thresholds have not been updated in the most recent acoustic guidance (NMFS, 2018a) and therefore, revert to thresholds established and published by NMFS in FR 70(7): 1871-1875 (NMFS and NOAA, 2005). Behavioral disturbance thresholds for marine mammals are applied equally across all functional hearing groups. Received SPL of 120 dB re 1 µPa from a non-impulsive source is considered high enough to elicit the onset of a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, in the case of behavioral responses, exposure to above-threshold sound levels alone do not indicate a behavioral response and, more importantly, do not equate to biologically important responses (Southall et al., 2016; Ellison et al., 2012).

For mid-frequency cetaceans exposed to non-impulsive sources, acoustic injury such as permanent threshold shifts are estimated to occur when the mammal has received a sound exposure level over 24 hours (SEL_{24h}) of 198 dB re 1 μPa^2 s. Similarly, temporary threshold shifts are estimated to occur when the mammal has received an SEL_{24h} of 178 dB re 1 μPa^2 s. Due to transient nature of sperm whales and the stationary nature of installation activities, it is not expected that any sperm whales will remain in proximity to the source for a full 24-hour period to receive an SEL_{24h} necessary for the onset of auditory threshold shifts.

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

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sperm whales, and there is also a risk of vessel collisions, which are identified as a threat in the recovery plan for this species (NMFS, 2010b). To reduce the potential for vessel collisions, BOEM issued BOEM-2016-G01. This NTL recommends that vessel operators and crews receive protected species identification training. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with the NTL as well as the amendment in April 2021 (NMFS, 2021a). Vessel operators are required to maintain a vigilant watch for and report sightings of any injured or dead protected species. In addition, when sperm whales are sighted, vessel operators and crews are required to maintain a distance of 100 m (328 ft) or greater whenever possible (NTL BOEM 2016-G01 and NMFS, 2020a, 2021a).

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

NMFS (2020a) analyzed the potential for vessel collisions and harassment of sperm whales in its Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. NMFS concluded that the observed avoidance of passing vessels by sperm whales is an advantageous response to avoid a potential threat and is not expected to result in any significant effect on migration, breathing, nursing, breeding, feeding, or sheltering to individuals, or have any consequences at the level of the population. With the implementation of the NMFS vessel collision protocols listed in Appendix C of NMFS (2021a) in addition to the NTL BOEM-2016-G01, NMFS concluded that the likelihood of collisions between vessels and sperm whales would be reduced during daylight hours. During nighttime and during periods of poor visibility, it is assumed that vessel sound and sperm whale avoidance of moving vessels would reduce the chance of vessel collisions with this species. It is, however, likely that a collision between a sperm whale and a moving support vessel would result in severe injury or mortality of the stricken animal. The current Potential Biological Removal (PBR) level for the Gulf of Mexico stock of sperm whales is 2.0 (Hayes et al., 2022). The PBR level is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. Mortality of a single sperm whale would constitute a significant impact to the local (Gulf of Mexico) stock of sperm whales but would not likely be significant at the species level.

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

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

Impacts of a Small Fuel Spill

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

A small fuel spill in offshore waters would produce a thin sheen on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

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

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

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals, including sperm whales, are discussed by NMFS (2020a) and BOEM (2017, 2023a,b). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011). For this EP, there are no unique site-specific issues with respect to spill impacts on sperm whales.

Impacts of oil spills on sperm whales can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and marine sound of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Hayes et al., 2020). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals, including displacement from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb sperm whales and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for colliding with or disturbing these animals. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) and the amendment in April 2021 (NMFS, 2021a) replaces compliance with the NTL. Based on the current PBR level for the Gulf of Mexico stock of sperm whales (2.0), mortality of a single sperm whale would constitute a significant impact to the local (Gulf of Mexico) stock of sperm whales but would not likely be significant at the species level.

C.3.2 Rice's Whale (Endangered)

A study by Rosel et al. (2021), identified the genetically distinct northern Gulf of Mexico Bryde's whale stock as a new species of baleen whale named the Rice's whale through DNA analysis. The reclassification was approved by NMFS under 86 *FR* 47022 and was effective 22 October 2021. The Rice's whale is the only year-round resident baleen whale in the northern Gulf of Mexico. The Rice's whale is sighted most frequently in the waters over DeSoto Canyon between the 100 m (328 ft) and 1,000 m (3,280 ft) isobaths (**Figure 3**; Rosel et al., 2016; Hayes et al., 2021). **Figure 3** also shows the Rice's whale Biologically Important Area defined in 2015 after ESA Section 7 consultations between NMFS and other agencies, as well as the Rice's Whale Core Distribution Area defined in 2019 by NMFS.

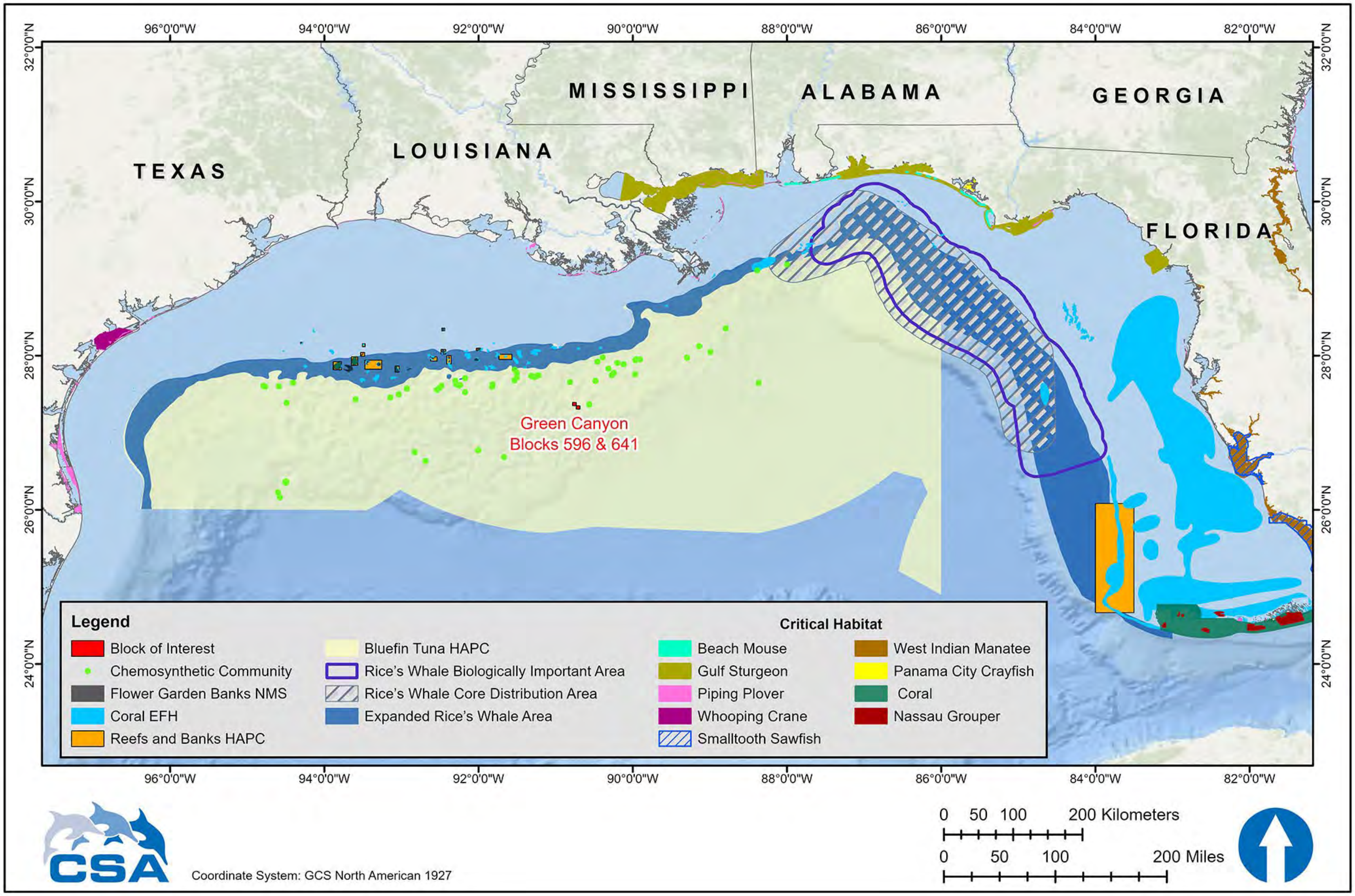


Figure 3. Location of selected environmental features in relation to the project area. EFH = Essential Fish Habitat; HAPC = Habitat Area of Particular Concern; NMS = National Marine Sanctuary.

Most sightings have been made in the DeSoto Canyon region and off western Florida, although there have been some in the west-central portion of the northeastern Gulf of Mexico. Soldevilla et al. (2022) identified new variants of long-moan calls along the northwestern Gulf of Mexico shelf break that were determined to share distinctive features with typical eastern Gulf of Mexico long-moan calls. A genetically confirmed sighting of a Rice's whale individual offshore Corpus Christi, Texas in 2017, along with the newly identified long-moan calls in the northwestern Gulf of Mexico indicate that Rice's whales may occur in a broader range in the Gulf of Mexico than previously known and this broader range should be considered when designating critical habitat. The sighting of this individual in 2017 partially resulted in the issuance of BOEM NTL-2023-G01, which established an Expanded Rice's Whale Area that encompasses all areas in the northern Gulf of Mexico between the 100 and 400 m isobaths (**Figure 3**).

Kiska et al. (2023) studied the drivers of resource selection by Rice's whale in relation to prey availability and energy density. The study indicated that Rice's whales are selective predators consuming schooling prey with the highest energy content (i.e., silver rag [*Ariomma bondi*]). The silver rag is found at a depth range of 25 to 640 m (82 to 2,100 ft) primarily over muddy bottoms on the OCS though juveniles can be within the surficial waters (Smithsonian Tropical Research Institute, 2015). Therefore, it is unlikely that Rice's whales would occur in the project area. However, support vessels transiting through the 25 to 640 m (82 to 2,100 ft) water depths could encounter a Rice's whale, although unlikely given the rate of sightings of the whales.

In 2014, a petition was submitted to designate the northern Gulf of Mexico population as a DPS and list it as Endangered under the ESA (Natural Resources Defense Council, 2014). This petition received a 90-day positive finding by NMFS in 2015 and a proposed rule to list was published in 2016 (Hayes et al., 2019). On 15 April 2019, NMFS issued a final rule to list the Gulf of Mexico DPS of Bryde's whale as Endangered under the ESA. NMFS final rule on the reclassification (86 *FR* 47022) does not affect the ESA standing; thus, the Rice's whale is listed as an Endangered species.

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

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

NTL BOEM 2023-G01 provides recommendations and guidance for operators regarding suggested measures to expand protections for the Rice's whale while BOEM and BSEE are involved in consultation with NMFS on the amended 2020 Biological Opinion. The NTL guidance applies to the Expanded Rice's Whale Area (**Figure 3**), comprising the entire northern Gulf of Mexico between the 100 and 400 m isobaths.

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

NMFS (2018a) lists Rice's whales in the functional hearing group of low frequency cetaceans (baleen whales), with an estimated hearing sensitivity from 7 Hz to 35 kHz. Noise produced by the drilling rig and drilling-associated vessels may be emitted at levels that could potentially disturb individual whales or mask the sounds animals would normally produce or hear. Sound associated with drilling and installation activities is relatively low in intensity relative to impulsive sources such as airgun sound, and an individual animal's sound exposure would be transient. As discussed in **Section A.1**, an actively drilling rig may produce broadband (10 Hz to 10 kHz) source levels ranging from approximately 180 to 190 dB re 1 µPa m (Hildebrand, 2005). Frequencies <1,000 Hz produced by the drilling operations are more likely to be perceived by low-frequency cetaceans, such as the Rice's whale.

It is expected that, due to the relatively stationary nature of the drilling and subsea installation operations, Rice's whales would move away from the proposed operations area, and sound levels that could cause auditory injury would be avoided. Sound associated with proposed vessel operations may cause behavioral disturbance effects to individual Rice's whales. NMFS (2018a) presents criteria that are used to determine physiological (i.e., acoustic injury) thresholds for marine mammals. Behavioral disturbance thresholds have not been updated in the most recent acoustic guidance (NMFS, 2018a) and therefore, revert to thresholds established and published by NMFS in 70 FR 1871. Received SPL of 120 dB re 1 µPa from non-impulsive sources are considered high enough to elicit the onset of a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, exposure to SPL of 120 dB re 1 µPa does not alone equate to a behavioral response or a biological consequence; rather it represents the level at which onset of a behavioral response may occur that, more importantly, may not result in biologically significant responses (Southall et al., 2016; Ellison et al., 2012).

For low-frequency cetaceans, specifically the Rice's whale, permanent and temporary threshold shift onset is estimated to occur at SEL_{24h} of 199 dB re 1 μPa^2 s and 179 re 1 μPa^2 s, repectively. Sounds generated by drilling operations, located within a deep-water, open ocean environment, will be generally non-impulsive, with some variability in sound level and frequency, and are not expected to reach permanent or temporary threshold shift values. This analysis assumes that the continuous nature of sounds produced by the drilling rig will provide individual whales with cues relative to the direction and relative distance of the sound source, and the fixed position of the drilling rig will allow for active avoidance of potential physical impacts. Drilling-related sound associated with this project may contribute to increases in the ambient sound environment of the region but are not expected to cause sound -related impacts to Rice's whales. Drilling rig/installation vessel lighting and presence are not expected to impact Rice's whales (BOEM, 2017).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb Rice's whales and create the potential for vessel collisions. Kiska et al. (2023) indicated through Bayesian stable isotope mixing models that Rice's whales primarily feed on silver rag found between 25 and 640 m water depths. Although it is unlikely support vessels will encounter Rice's whale given that they are primarily found over DeSoto Canyon between the 100 m (328 ft) and 1,000 m (3,280 ft) isobaths (**Figure 3**; Rosel et al., 2016; Hayes et al., 2021).

To reduce the potential for vessel collisions, BOEM has issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid colliding with protected species and requires operators to report sightings of any injured or dead protected species. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) and the amendment in April 2021 (NMFS, 2021) replaces compliance with the NTL. When whales are sighted, vessel operators and crews are required to maintain a distance of 500 m (1,640 ft) or greater whenever possible (NTL BOEM-2016-G01; NMFS, 2020a, 2021). Vessel operators are required to reduce vessel speed to 10 knots or less, as safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel (NTL BOEM-2016-G01). When a Rice's whale is sighted while a vessel is underway, the vessel should take action (e.g., attempt to remain parallel to the whale's course, avoid excessive speed or abrupt changes in direction until the whale has left the area) as necessary to avoid violating the relevant separation distance. However, if the whale is sighted within this distance, the vessel should reduce speed and shift the engine to neutral and not re-engage until the whale is outside of the separation area. This does not apply to any vessel towing gear (NMFS, 2021).

NTL BOEM 2023-G01 provides additional guidance on Rice's whale protection efforts within the expanded Rice's whale area, inclusive of all areas between the 100 and 400 m isobaths in the northern Gulf of Mexico. These include retaining vessel transit details if transiting within the expanded Rice's whale area, maintaining separation distances, and utilizing Automatic Identification System on vessels 65 ft or greater, among others. When baleen whales are sighted, vessel operators and crews are required to attempt to maintain a distance of 1,640 ft (500 m) or greater whenever possible (NMFS, 2020a, 2021). Vessel operators are required to reduce vessel speed to 10 knots or less, when safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel. Compliance with these NTLs will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing Rice's whales.

The current PBR level for the Gulf of Mexico stock of Rice's whale is 0.1 (Hayes et al., 2022). Mortality of a single Rice's whale would constitute a significant impact to the local (Gulf of Mexico) stock of Rice's whales. However, it is very unlikely that Rice's whale occurs within the project area, including the transit corridor for support vessels; consequently, the probability of a vessel collision with this species is extremely low.

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

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by NMFS (2020a) and BOEM (2012a; 2015; 2016b; 2017; 2023a,b). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011). In the unlikely event of a spill, implementation of Chevron's OSRP will mitigate and reduce the potential for impacts on Rice's whales. Given the open ocean location of the project area and the brief duration of a small spill, any impacts are expected to be minimal.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill as well as the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours (NOAA, 2022). The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions at the time of a spill.

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

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012a; 2015; 2016b; 2017; 2023a,b), NMFS (2020a), Geraci and St. Aubin (1990), and the MMC (2011). Potential impacts of a large oil spill on Rice's whales could include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, sound, and dispersants) (MMC, 2011). Direct physical and physiological effects could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and sound of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Hayes et al., 2019). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb Rice's whales and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTLs BOEM-2016-G01, BOEM-2023-G01, and NMFS (2020a, 2021a) (see **Table 1**) to reduce the potential for colliding with or disturbing these animals. In the event of oil from a large spill contacting Rice's whales, it is expected that impacts resulting in the injury or death of individual

Rice's whales would be significant based on the current PBR level for the Gulf of Mexico subspecies and stock (0.1). Mortality of a single Rice's whale would constitute a significant impact to the local (Gulf of Mexico) stock of Rice's whales. The core distribution area for Rice's whales is within the eastern Gulf of Mexico OCS Planning Area; therefore, it unlikely that Rice's whales would occur within the project area. Consequently, the probability of spilled oil from a project-related well blowout reaching Rice's whales is extremely low.

C.3.3 West Indian Manatee (Threatened)

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

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

IPFs that potentially may affect manatees include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the project area would be unlikely to affect manatees, as the project area is approximately 113 statute miles (182 km) from the nearest shoreline (Louisiana).

As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with BSEE-NTL 2015-G03 is intended to minimize the potential for marine debris-related impacts on manatees.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb manatees, and there is also a risk of vessel collisions, which are identified as a threat in the recovery plan for this species (USFWS, 2001a). Manatees are expected to be limited to shelf and coastal waters, and impacts are expected to be limited to transits of these vessels and helicopters through these waters. To reduce the potential for vessel collisions, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessel operators and that vessels slow down or stop their vessel to avoid colliding with protected species. NTL 2016-G01 was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with the NTL and in an amendment published in April 2021 (NMFS, 2021a). Vessel collision avoidance measures described in NMFS (2020a, 2021) for the marine mammal species managed by that agency may also provide some additional indirect protections to manatees. If a manatee is sighted, vessels associated with the operation should operate at no wake/idle speed within that area, follow routes in deep water whenever possible, and attempt to maintain a distance of 50 m (164 ft) if practical. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling).

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

Helicopter traffic has the potential to disturb manatees and Rathbun (1988) reported that manatees were disturbed more by low-flying 20 to 160 m (66 to 525 ft) helicopters than by fixed-wing aircraft. Helicopters used in support operations maintain a minimum altitude of 213 m (700 ft) while in transit offshore, 305 m (1,000 ft) over unpopulated areas or across coastlines, and 610 m (2,000 ft) overpopulated areas and sensitive habitats such as wildlife refuges and park properties. In addition, guidelines and regulations specify that helicopters maintain an altitude of 305 m (1,000 ft) within 100 m (328 ft) of marine mammals (BOEM, 2017; NMFS, 2020a, 2021a). This helicopter traffic mitigation measure will minimize the potential for disturbing manatees and results in no expected impacts.

Impacts of a Large Oil Spill

The potential for significant impacts to manatees from a large oil spill would be most likely associated with coastal oiling in areas of manatee habitats. The 30-day OSRA modeling (**Table 3**) indicates nearshore waters and embayments from Matagorda County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days of spill (1% to 3% conditional probability). The 60-day OSRA model predicts contact of shorelines between Cameron County, Texas, and Miami-Dade County, Florida, with a maximum conditional probability of contact of 13% in Terrebonne Parish, Louisiana (**Table 4**). This range includes manatee critical habitat on the west coast of Florida but is predicted by the 60-day OSRA model to have <0.5% chance of shoreline contact within 60 days of a spill.

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

In the event that a large spill reached coastal waters where manatees were present, the level of vessel and aircraft activity associated with spill response could disturb manatees and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels would be expected to operate in accordance with NTL BOEM-2016-G01 and NMFS (2020a, 2021a) (see **Table 1**) to reduce the potential for colliding with or disturbing these animals. The current PBR level for the Florida subspecies of West Indian manatee is 14 (USFWS, 2014). It is not anticipated that groups of manatees would occur in coastal waters of the north central Gulf of Mexico; therefore, in the event of mortality of individual manatees from a large oil spill would constitute an adverse but insignificant impact to the subspecies.

C.3.4 Non-Endangered Marine Mammals (Protected)

Excluding the three Endangered or Threatened species that have been discussed previously, there are 20 additional species of whales and dolphins (cetaceans) that may be found in the Gulf of Mexico, including dwarf and pygmy sperm whales (*Kogia sima* and *K. breviceps*), four species of beaked whales, and 14 species of delphinid whales (dolphins). All marine mammals are protected species under the MMPA. The most common non-endangered cetaceans in the deepwater environment are small odontocetes such as the pantropical spotted dolphin (*Stenella attenuata*), spinner dolphin (*S. longirostris*), and bottlenose dolphin (*Tursiops truncatus*). A brief summary is presented below, and additional information on these groups is presented by BOEM (2017).

Dwarf and pygmy sperm whales. At sea, it is difficult to differentiate dwarf sperm whales from pygmy sperm whales, and sightings are often grouped together as *Kogia* spp. Both species have a worldwide distribution in temperate to tropical waters. In the Gulf of Mexico, both species occur primarily along the continental shelf edge and in deeper waters off the continental shelf (Mullin et al., 1991; Mullin, 2007; Waring et al., 2016). Either species could occur in the project area.

Beaked whales. Four species of beaked whales are known to occur in the Gulf of Mexico: Blainville's beaked whale (*Mesoplodon densirostris*), Sowerby's beaked whale (*M. bidens*), Gervais' beaked whale (*M. europaeus*), and Cuvier's beaked whale (*Ziphius cavirostris*). Stranding records as well as passive acoustic monitoring in the Gulf of Mexico (Hildebrand et al., 2015) suggest that Gervais' beaked whale and Cuvier's beaked whale are the most common species in the region. The Sowerby's beaked whale is considered extralimital, with one documented stranding reported in the Gulf of Mexico by Bonde and O'Shea (1989). There are a number of extralimital strandings and sightings reported beyond the recognized range of Sowerby's beaked whale (e.g., Canary Islands, Mediterranean Sea), including from the eastern Gulf of Mexico (Pitman and Brownell, 2020). Blainville's beaked whales are rare, with only four documented strandings in the northern Gulf of Mexico (Würsig et al., 2000) and three sightings in the Gulf of Mexico (Hayes et al., 2021).

Due to the difficulties of at-sea identification, beaked whales in the Gulf of Mexico are identified either as Cuvier's beaked whales or are grouped into an undifferentiated species complex (*Mesoplodon* spp.). In the northern Gulf of Mexico, they are broadly distributed in water depths greater than 1,000 m (3,281 ft) over lower slope and abyssal landscapes (Davis et al., 2000; HIdebrand et al., 2015). Any of these species could occur in the project area (Hayes et al., 2022).

Delphinids. Fourteen species of delphinids are known from the Gulf of Mexico, including Atlantic spotted dolphin (*Stenella frontalis*), bottlenose dolphin (*Tursiops truncatus*), Clymene dolphin (*Stenella clymene*), false killer whale (*Pseudorca crassidens*), Fraser's dolphin (*Lagenodelphis hosei*), killer whale (*Orcinus orca*), melon-headed whale (*Peponocephala electra*), pantropical spotted dolphin, pygmy killer whale (*Feresa attenuata*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), spinner dolphin, and striped dolphin (*Stenella coeruleoalba*). Any of these species could occur in the project area (Hayes et al., 2022).

The bottlenose dolphin is a common inhabitant of the northern Gulf of Mexico, particularly within continental shelf waters. There are two ecotypes of bottlenose dolphins, a coastal form and an offshore form, which are genetically isolated from each other (Waring et al., 2016). The offshore form of the bottlenose dolphin may occur within the project area. Inshore populations of coastal bottlenose dolphins in the northern Gulf of Mexico are separated into 31 geographically distinct population units, or stocks, for management purposes by NMFS (Hayes et al., 2022).

IPFs that potentially may affect non-endangered marine mammals include drilling rig/installation vessel presence, marine sound, and lights; support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges are likely to have negligible impacts on marine mammals due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of marine mammals. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on marine mammals.

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

The presence of the drilling rig and the installation vessel presents an attraction to pelagic food sources that may attract cetaceans. Some odontocetes have shown increased feeding activity around lighted platforms at night (Todd et al., 2009). Therefore, prey congregation could pose an attraction to protected species that exposes them to higher levels or longer durations of sound that might otherwise be avoided. Drilling and support vessel presence and lighting are not considered as IPFs for marine mammals (BOEM, 2017).

If the vessel(s) are equipped with a moon pool, a trained crew member or company representative must monitor the moon pool area for marine mammals during operations. If a marine mammal is detected in the moon pool, immediate reporting to NMFS, BOEM, and BSEE is required (NMFS, 2020a).

Sound from routine drilling and subsea installation operations has the potential to disturb marine mammals. As discussed in **Section A.1**, sound impacts would be expected at greater distances when DP thrusters are in use than with vessel and drilling sound alone and are dependent on variables relating to sea state conditions, thruster type and usage. Three functional hearing groups are represented in the 20 non-endangered cetaceans found in the Gulf of Mexico. Eighteen of the 20 odontocete species are considered to be in the mid-frequency functional hearing group and two species (*Kogia* spp.) are in the high frequency functional hearing group, (NMFS, 2018a). Thruster and drilling sound will affect each group differently depending on the frequency bandwidths produced by operations. Generally, sound produced by drilling rigs on DP is dominated by frequencies below 10 kHz. Thus, drilling rig DP sound sources are out of the audible range for the high frequency group.

For mid frequency cetaceans exposed to a non-impulsive source (like drilling operations), permanent threshold shifts are estimated to occur when the mammal has received an SEL of 198 dB re 1 μPa^2 s over a 24-hour period. Simlarly, temporary threshold shifts are estimated to occur when the mammal has received an SEL of 178 dB re 1 μPa^2 s over a 24-hour period. Due to the transient nature of marine mammals and the stationary nature of the proposed activites, it is not expected that any marine mammals will remain within the ensonified area for a full 24-hour period to receive SEL necessary for the onset of auditory threshold shifts.

NMFS (2018a) presents criteria used to determine physiological (i.e., injury) thresholds for marine mammals but the behavioral disturbance thresholds were not updated in this most recent acoustic guidance; these behavioral disturbance thresholds are established and published by NMFS in 70 *FR* 1871. Received SPL of 120 dB re 1 μPa from a non-impulsive, continuous source is considered high enough to elicit a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, in the case of behavioral responses, received levels alone do not indicate a behavioral response and, more importantly, do not equate to biologically important responses (Southall et al., 2016; Ellison et al., 2012).

There are other OCS facilities and activities near the project area, and the region as a whole has a large number of similar sources. Marine mammal species in the northern Gulf of Mexico have been exposed to sound from anthropogenic sources for a long period of time and over large geographic areas and likely do not represent a naïve population with regard to sound (National Research Council, 2003b). Due to the limited scope, timing, and geographic extent of installation activities, this project would represent a small, temporary contribution to the overall soundscape, and any short-term behavioral impacts are not expected to be biologically significant to marine mammal populations. Drilling rig/installation and support vessel lighting and presence are not identified as IPFs for marine mammals by BOEM (2017).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb marine mammals, and there is also a risk of vessel collisions. Data concerning the frequency of vessel collisions are presented by BOEM (2012a). To reduce the potential for vessel collisions, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessels operators and that vessels slow down or stop to avoid colliding with protected species. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with the NTL. The NTL also requires that operators and crews maintain a vigilant watch for marine mammals and report sightings of any injured or dead protected species. Vessel operators and crews are required to attempt to maintain a distance of 100 m (328 ft) or greater when toothed whales are sighted and 50 m (164 ft) when small cetaceans are sighted (NMFS, 2020a). When cetaceans are sighted while a vessel is underway, vessels must attempt to remain parallel to the animal's course and avoid excessive speed or abrupt changes in direction until the cetacean has left the area. Vessel operators are required to reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel, when safety permits. These mitigation measures are only effective during daylight hours, or in sea and weather conditions where cetaceans are sighted. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all "other aquatic protected species" including sea turtles, with an exception made for those animals that approach the vessel. Vessel speeds must also be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages (greater than three) of any marine mammal are observed near a vessel. Although vessel strike avoidance measures described in NMFS (2020a) are only applicable to ESA-listed species, complying with them may provide additional indirect protections to non-listed species as well.

When aquatic protected species are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array, site clearance trawling). Use of these measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing marine mammals, and therefore no significant impacts are expected.

The current PBR level for several non-endangered cetacean species in the Gulf of Mexico are less than 3 individuals (e.g., rough-toothed dolphin = undetermined, Clymene dolphin = 2.5, Fraser's dolphin = 1.0, killer whale = 1.5, pygmy and false killer whales = 2.8, dwarf and pygmy sperm whales = 2.5) (Hayes et al., 2022). Mortality of individuals equal to or in excess of their PBR level would constitute a significant impact at a population level to the local (Gulf of Mexico) stocks of these species.

Helicopter traffic has the potential to disturb marine mammals (Würsig et al., 1998) but relatively high-altitude flying is conducted to minimize the potential for disturbances. While flying offshore, helicopters maintain altitudes above 213 m (700 ft) during transit to and from the working area. In addition, guidelines and regulations specify that helicopters maintain an altitude of 305 m (1,000 ft) within 100 m (328 ft) of marine mammals (BOEM, 2012a; 2016a). Maintaining these altitudes during helicopter operations will minimize the potential for disturbing marine mammals, and no significant impacts are expected (BOEM, 2017; NMFS, 2020a).

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by BOEM (2017; 2023a,b). Oil impacts on marine mammals in general are discussed by Geraci and St. Aubin (1990). For this EP, there are no unique site-specific issues with respect to spill impacts on these animals.

The probability of a fuel spill is expected to be minimized by Chevron's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to lessen the potential for impacts on marine mammals. EP Appendix G provides detail on spill response measures, and those measures are summarized in the EIA. Given the open ocean location of the project area, the limited duration of a small spill, and response efforts, it is expected that any impacts would be brief and minimal.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce the concentrations of petroleum hydrocarbons and their degradation products. Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and sound of response vessels and aircraft (MMC, 2011). The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. A small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (**Section A.9.1**). Therefore, due to the limited areal extent and short duration of water quality impacts from a small fuel spill as well as the mobility of marine mammals, no significant impacts would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2017; 2023a,b). For this EP, there are no unique site-specific issues. Impacts of oil spills on marine mammals can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey. Complications of the above may lead to dysfunction of immune and reproductive systems (De Guise et al., 2017), physiological stress, declining physical condition, and death. Indirect impacts could include stress from the activities and sound of response vessels and aircraft. Behavioral responses can include displacement of animals from prime habitat (McDonald et al., 2017), disruption of social structure, change in prey availability and foraging distribution or patterns, change in reproductive behavior/productivity, and change in movement patterns or migration (MMC, 2011).

In the event of a large spill, response activities that may impact marine mammals include increased vessel traffic and remediation activities (e.g., use of dispersants, controlled burns, skimmers, boom, etc.) (BOEM, 2017). The increased level of vessel and aircraft activity associated with spill response could disturb marine mammals, potentially resulting in behavioral changes. The large number of response vessels could result in vessel collisions, entanglement or other injury, or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for colliding with or disturbing these animals, and therefore no significant impacts are expected.

This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) and amendment in April 2021 (NMFS, 2021a) replaces compliance with the NTL. The application of dispersants greatly reduces exposure risks to marine mammals as the dispersants would remove oil from the surface thereby reducing the risk of contact and rendering it less likely to adhere to skin, baleen plates, or other body surfaces (BOEM, 2017). Based on the current PBR level for several non-endangered cetacean species in the Gulf of Mexico that are less than 3 individuals (e.g., rough-toothed dolphin = undetermined, Clymene dolphin = 2.5, Fraser’s dolphin = 1.0, killer whale = 1.5, pygmy and false killer whales = 2.8, dwarf and pygmy sperm whales = 2.5) (Hayes et al., 2022), mortality of individuals equal to or in excess of their PBR level would constitute a significant impact at the population level to the local (Gulf of Mexico) stocks of these species.

C.3.5 Sea Turtles (Endangered/Threatened)

Five species of Endangered or Threatened sea turtles may be found near the project area. Endangered species include the leatherback, Kemp’s ridley, and hawksbill turtles. As of 6 May 2016, the entire North Atlantic DPS of the green turtle is listed as Threatened (81 FR 20057). The DPS of loggerhead turtles that occurs in the Gulf of Mexico is listed as Threatened.

Critical habitat has been designated for the loggerhead turtle in the Gulf of Mexico as shown in **Figure 4**. Loggerhead turtles in the Gulf of Mexico are part of the Northwest Atlantic Ocean DPS (76 FR 58868). In July 2014, NMFS and the USFWS designated critical habitat for this DPS (NMFS, 2021b). The USFWS designation (79 FR 39756) includes nesting beaches in Jackson County, Mississippi; Baldwin County, Alabama; and Bay, Gulf, and Franklin Counties in the Florida Panhandle as well as several counties in southwest Florida and the Florida Keys (and other areas along the Atlantic coast). The NMFS designation (79 FR 39856) includes nearshore reproductive habitat within 0.99 miles (1.6 km) seaward of the mean high-water line along these same nesting beaches. NMFS also designated a large area of shelf and oceanic waters, termed *Sargassum* habitat, in the Gulf of Mexico (and Atlantic Ocean) as critical habitat. *Sargassum* is a brown algae (Class Phaeophyceae) that takes on a planktonic, often epipelagic existence after being removed from reefs during rough weather. Rafts of *Sargassum* serve as important foraging and developmental habitat for numerous fishes, and young sea turtles, including loggerhead, green, hawksbill, and Kemp's ridley turtles (Witherington et al., 2012). NMFS designated three other categories of critical habitat; of these, two (migratory habitat and overwintering habitat) are along the Atlantic coast and the third (breeding habitat) is found in the Florida Keys and along the Florida east coast (NMFS, 2021b).

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 228 statute miles (367 km) from the project area. The project area is located within the designated *Sargassum* critical habitat for loggerhead sea turtles (**Figure 4**).

Leatherbacks are the species most likely to be present near the project area, as they are the most pelagic of the sea turtles and feed on populations of gelatinous plankton, such as jellyfish and salps in all water depths. Loggerhead, green, hawksbill, and Kemp's ridley turtles are typically inner-shelf and nearshore species but may be found transiting in oceanic waters during seasonal migrations. Loggerheads and green turtles are more likely to occur or be attracted to offshore structures than the other species. Hatchlings or juveniles of any of the sea turtle species with the exception of leatherbacks may be present in deepwater areas, including the project area, where they may be associated with *Sargassum* rafts and other flotsam. Leatherbacks, while not specifically associated with Sargassum, do utilize similar pelagic habitats for foraging where Sargassum is routinely found. All five sea turtle species in the Gulf of Mexico are migratory and use different marine habitats according to their life stage. These habitats include high-energy beaches for nesting females and emerging hatchlings and pelagic convergence zones for hatchling and juvenile turtles. As adults, green, hawksbill, and loggerhead turtles forage primarily in shallow, benthic habitats.

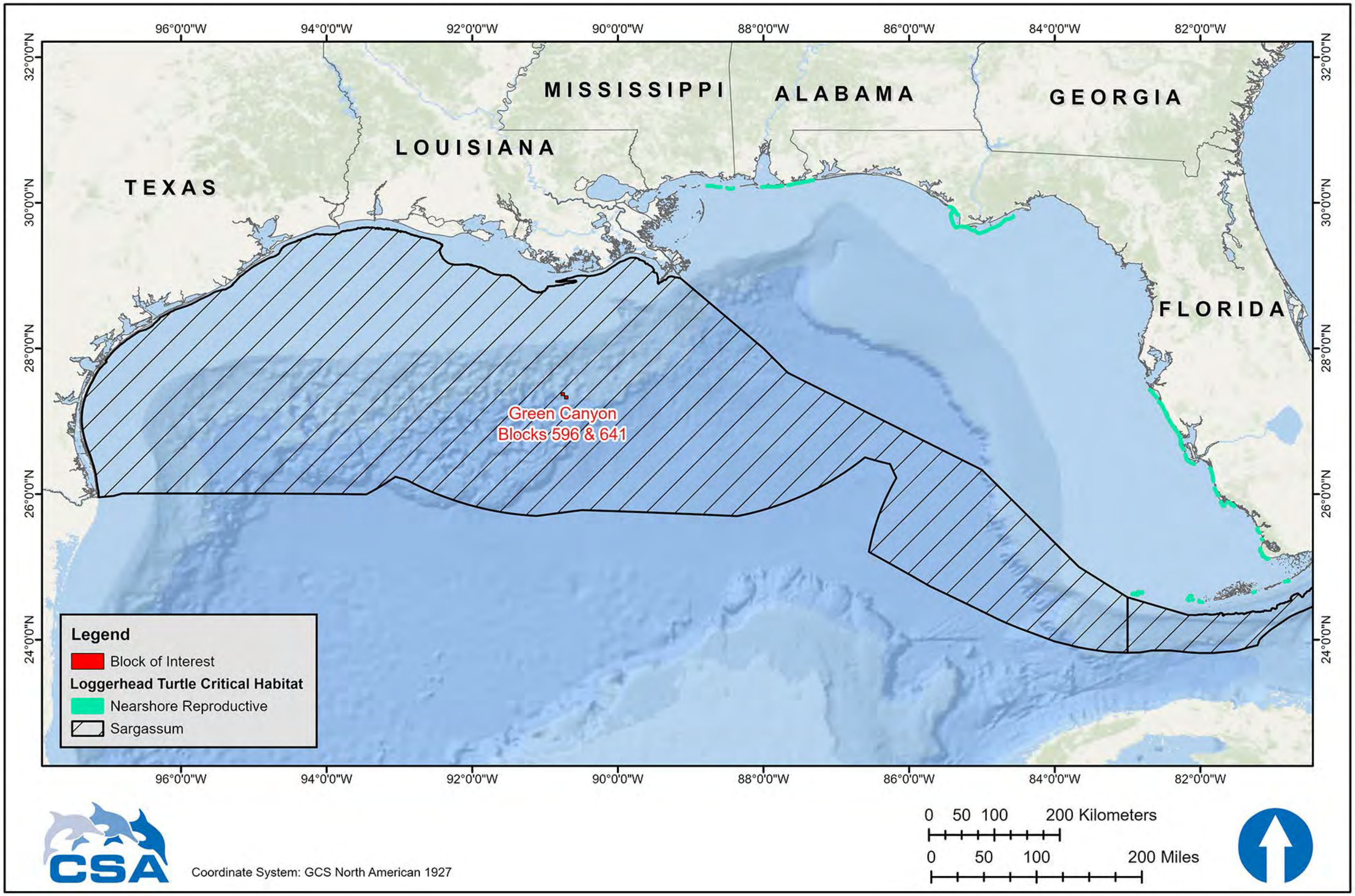


Figure 4. Location of loggerhead turtle designated *Sargassum* critical habitat and nearshore reproductive critical habitat in relation to the project area.

Sea turtle nesting in the northern Gulf of Mexico can be summarized by species as follows:

- Loggerhead turtles – Loggerhead turtles nest in significant numbers along the Florida Panhandle (Florida Fish and Wildlife Conservation Commission, nd-a) and, to a lesser extent, from Texas through Alabama (NMFS and USFWS, 2008);
- Green turtles – Green turtles are known to nest along the Florida Panhandle and in southwest Florida, from Tampa Bay south to Ten Thousand Island, and in the Florida Keys and Dry Tortugas (Florida Fish and Wildlife Conservation Commission, nd-b);
- Leatherback turtles – Leatherback turtles infrequently nest on Florida Panhandle beaches (Florida Fish and Wildlife Conservation Commission, nd-c);
- Kemp's ridley turtles – The critically endangered Kemp's ridley turtle nests almost exclusively on a 16-mile (26-km) stretch of coastline near Rancho Nuevo in the Mexican state of Tamaulipas (NMFS et al., 2011). A much smaller population nests in Padre Island National Seashore, Texas, mostly as a result of reintroduction efforts (NMFS et al., 2011). A total of 256 Kemp's ridley turtle nests were counted in Texas in 2023. A total of 284 Kemp's ridley turtle nests were counted on Texas beaches for the 2022 nesting season and total of 262 Kemp's ridley turtle nests were counted on Texas beaches during the 2020 nesting season. This was an increase from 2019 (190 nests), but similar to 2018 (250 nests) (Turtle Island Restoration Network, 2023). Padre Island National Seashore along the coast of Willacy, Kenedy, and Kleberg Counties in southern Texas, is the most important nesting location for this species in the United States; and
- Hawksbill turtles – Hawksbill turtles typically do not nest anywhere near the project area, with most nesting in the region located in the Caribbean Sea and on the beaches of the Yucatán Peninsula (USFWS, 2016a).

IPFs that could potentially affect sea turtles include drilling rig/installation vessel presence, marine sound, and lights; support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges are likely to have negligible impacts on sea turtles due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges.

Though NMFS (2020a) stated marine debris as an IPF, compliance with NTL BSEE 2015-G013 (See Table 1) and NMFS (2020a) Appendix B will minimize the potential for marine debris-related impacts on sea turtles. NMFS (2020a) estimated a small proportion of individual sea turtles would be adversely affected from exposure to marine debris. Therefore, marine debris is likely to have negligible impacts on sea turtles and is not further discussed in this EIA (See **Table 2**).

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

Drilling and subsea installation activities produce a broad array of sounds at frequencies and intensities that may be detected by sea turtles (Samuel et al., 2005, Popper et al., 2014). Potential impacts may include behavioral disruption and temporary or permanent displacement from the area near the sound source. Sea turtles can hear low to mid-frequency sounds and they appear to hear best between 200 and 750 Hz; they do not respond well to sounds above 2,000 Hz, although primary hearing frequency ranges vary per species and life stage (Ketten and Bartol, 2005; Dow Piniak et al., 2012a,b; Martin et al., 2012; Piniak et al., 2016).

The currently accepted hearing and response estimates for sea turtles are based on work conducted by the U.S. Navy (Finneran et al., 2017). These are applied in the NMFS Biological Opinion (NMFS, 2020a) which uses a zero-to-peak sound pressure level (PK) permanent threshold shift (i.e., acoustic injury) threshold of 232 dB re 1 µPa, and an SEL_{24h} threshold of 204 dB re 1 $µPa^2$ s. Behavioral thresholds for sea turtles are also based on work by the U.S. Navy (Blackstock et al., 2018) which recommends an SPL threshold of 175 dB re 1 µPa. Based on transmission loss calculations (see Urick, 1983), open water propagation of sound produced by typical sources with DP thrusters in use during drilling, are not expected to produce SPL greater than 175 dB re 1 µPa beyond a few meters from the source. Certain sea turtles, especially loggerheads, may be attracted to offshore structures (Lohoefener et al., 1990; Gitschlag et al., 1997; Colman et al., 2020) and thus may be more susceptible to impacts from sounds produced during routine drilling activities. Any impacts would likely be short-term behavioral changes such as diving and evasive swimming, disruption of activities, or departure from the area. Because of the limited scope and short duration of drilling activities, these short-term impacts are not expected to be biologically significant to sea turtle populations.

Artificial lighting can disrupt the nocturnal orientation of sea turtle hatchlings (Tuxbury and Salmon, 2005; Berry et al., 2013; Simões et al., 2017). However, hatchlings may rely less on light cues when they are offshore than when they are emerging on the beach (Salmon and Wyneken, 1990). NMFS (2007) concluded that the effects of lighting from offshore structures on sea turtles are insignificant.

NMFS (2020a) stated sea turtles have the potential to be entangled or entrapped in moon pools, and though many sea turtles could exit the moon pool under their own volition, sublethal effects could occur. If the vessel(s) are equipped with a moon pool, a trained crew member or company representative will monitor the moon pool area for sea turtles during operations. If a sea turtle is detected in the moon pool, it will be immediately reported to agencies including NMFS, BOEM, and BSEE per NMFS (2020a); compliance with ensuing agency guidance is expected. Resuscitation of any trapped sea turtles is expected to occur in compliance with NMFS (2020a) Appendix J. Based on the moon pool entrapment cases of sea turtles reported and successful rescues and releases that have occurred, NMFS (2020a) estimated approximately about one sea turtle will be sub lethally entrapped in moon pools every year. Therefore, no significant impacts are expected.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sea turtles, and there is also a risk of vessel collisions. Data show that vessel traffic is one cause of sea turtle mortality in the Gulf of Mexico (Lutcavage et al., 1997). While adult sea turtles are visible at the surface during the day and in clear weather, they can be difficult to spot from a moving vessel when resting below the water surface, during nighttime, or during periods of inclement weather. To reduce the potential for vessel collisions, BOEM issued NTL BOEM-2016-G01, which addresses 1) protected species identification training; 2) vessel operators and crews' observational vigilance and protected species collision avoidance; and 3) reporting of sightings of any injured or dead protected species. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) and amendment in April 2021 replaces compliance with the NTL. When sea turtles are sighted, vessel operators and crews must, to the maximum extent possible, attempt to maintain a distance of 50 m (164 ft) or greater whenever possible (NMFS, 2021). When sea turtles are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling). Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing sea turtles. Therefore, no significant impacts are expected.

Sound generated from support helicopter traffic has the potential to disturb sea turtles but relatively high-altitude flying is conducted to minimize the potential for disturbances. While flying offshore, helicopters maintain altitudes above 213 m (700 ft) during transit to and from the working area. This altitude is intended to minimize the potential for disturbing sea turtles, and no significant impacts are expected (NMFS, 2007; BOEM, 2012a).

Impacts of a Small Fuel Spill

Potential spill impacts on sea turtles are discussed by NMFS (2020a) and BOEM (2017; 2023a,b). For this EP, there are no unique site-specific issues with respect to spill impacts on sea turtles.

The probability of a fuel spill is expected to be minimized by Chevron's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to minimize potential impacts on sea turtles. EP Appendix G provides details on spill response measures. Given the open ocean location of the project area, the duration of a small spill would be brief and the potential for impacts to occur would be minimal.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and sound of response vessels and aircrafts (NMFS, 2020b). The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions. Therefore, due to the limited areal extent and short duration of water quality impacts from a small fuel spill, no significant impacts to sea turtles from direct or indirect exposure would be expected.

Loggerhead Critical Habitat – Nesting Beaches. A small fuel spill in the project area would be unlikely to affect sea turtle nesting beaches due to the distance from the nearest shoreline. Loggerhead turtle nesting beaches and nearshore reproductive habitat designated as critical habitat are located in Mississippi, Alabama, and the Florida Panhandle, at least 228 statute miles (367 km) from the project area. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to natural dispersion and degradation.

Loggerhead Critical Habitat – *Sargassum*. The project area is located within the designated *Sargassum* critical habitat for the loggerhead turtles (**Figure 4**). A small diesel fuel spill would likely affect *Sargassum* and juvenile turtles in this habitat. If juvenile sea turtles come into contact with or ingest diesel fuel, impacts could include death, injury, or other sublethal effects. However, effects of a small spill on *Sargassum* critical habitat for loggerhead turtles would be limited to the small area (0.5 to 5 ha [1.2 to 12 ac]) likely to be impacted by a small spill. An impact area of 5 ha (12 ac) would represent a negligible portion of the approximately 40,662,810 ha (100,480,000 ac) designated *Sargassum* critical habitat for loggerhead turtles in the northern Gulf of Mexico. However, if juvenile sea turtles are present in the area impacted, significant impacts to the regional population could occur.

Impacts of a Large Oil Spill

Impacts of oil spills on sea turtles can include direct impacts from oil exposure as well as indirect impacts due to response activities (e.g., vessel traffic, marine sound, and dispersant use). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes and smoke (e.g., from in situ burning of oil); ingestion of oil (and dispersants) directly or via contaminated food; and stress from the activities and marine sound of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing food availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (NOAA, 2010; NMFS, 2020b). In the unlikely event of a spill, implementation of Chevron's OSRP is expected to minimize the potential for these types of impacts on sea turtles. EP Appendix G provides further details on spill response measures.

Studies of oil effects on loggerhead turtles in a controlled setting (NOAA, 2010, Lutcavage et al., 1995) suggest that sea turtles show no avoidance behavior when they encounter an oil slick, and any sea turtle in an affected area would be expected to be exposed. Sea turtles' diving behaviors also put them at risk. Sea turtles rapidly inhale a large volume of air before diving and continually resurface over time, which may result in repeated exposure to volatile vapors and oiling (NMFS, 2007).

Loggerhead Critical Habitat – Nesting Beaches. If spilled oil reaches sea turtle nesting beaches, nesting sea turtles and egg development could be affected (NMFS, 2020a). An oiled beach could affect nest site selection or result in no nesting at all (e.g., false crawls). Upon hatching and successfully reaching the water, hatchlings are subject to the same types of oil spill exposure hazards as adults. Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects, from acute toxicity to impaired movement and normal bodily functions (NMFS, 2007).

The 30-day OSRA modeling (**Table 3**) indicates nearshore waters and embayments from Matagorda County Texas to Plaquemines Parish, Louisiana could be affected within 30 days of a spill (1% to 3% conditional probability). The 60-day OSRA model predicts contact of shorelines between Cameron County, Texas, and Miami-Dade County, Florida, with a maximum conditional probability of contact of 13% in Terrebonne Parish, Louisiana (**Table 4**). The nearest nearshore reproductive critical habitat for the loggerhead turtle in Baldwin County, Alabama is 188 miles (303 km) from the project area and is predicted by the 60-day OSRA model to have an 1% or less conditional probability of contact within 60 days of a spill.

Loggerhead Critical Habitat – *Sargassum*. The project area is located within the designated *Sargassum* critical habitat for the loggerhead turtles which includes most of the Western and Central Planning Areas in the Gulf of Mexico and parts of the southern portion of the Eastern Planning Area (**Figure 4**) (NMFS, 2021b). Because of the large area covered by the designated *Sargassum* critical habitat for loggerhead turtles, a large spill could result in a substantial part of the *Sargassum* critical habitat in the northern Gulf of Mexico being oiled. The 2010 *Deepwater Horizon* spill affected approximately one-third of the *Sargassum* habitat in the northern Gulf of Mexico (BOEM, 2014a). It is extremely unlikely that the entire *Sargassum* critical habitat would be affected by a large spill. Because *Sargassum* is a floating, pelagic species, it would only be affected by impacts that occur near the surface.

The effects of oiling on *Sargassum* vary with spill severity, but moderate to heavy oiling that could occur during a large spill could cause complete mortality to floating *Sargassum* and its associated communities (BOEM, 2017). *Sargassum* also has the potential to sink during a large spill, thus temporarily removing the habitat and possibly being an additional pathway of exposure to the benthic environment (Powers et al., 2013). Lower levels of oiling may cause sub-lethal affects, including a reduction in growth, productivity, and recruitment of organisms associated with the *Sargassum.* The *Sargassum* algae itself could be less impacted by light to moderate oiling than associated organisms because of a waxy outer layer that might help protect it from oiling (BOEM, 2016b). *Sargassum* has a yearly seasonal cycle of growth and a yearly cycle of migration from the Gulf of Mexico to the western Atlantic. A large spill could affect a large portion of the annual crop of the algae; however, because of its ubiquitous distribution and seasonal cycle, recovery of the *Sargassum* community would be expected to occur within one to two years (BOEM, 2017).

Impacts to sea turtles from a large oil spill and associated cleanup activities would depend on spill extent, duration, and season (relative to turtle nesting season); the amount of oil reaching the shore; the importance of specific beaches to sea turtle nesting; and the level of cleanup vessel and beach crew activity required. In the event of oil from a large spill, it is expected that impacts resulting in the injury or death of individual sea turtles would be adverse but not likely significant at the population level. In the event that spilled oil reached nesting beaches during nesting period(s), the level of mortality (and impact) would increase.

C.3.6 Piping Plover (Threatened)

The Piping Plover is a migratory shorebird that overwinters along the southeastern U.S. and Gulf of Mexico coasts. This Threatened species experienced declines in population as a result of hunting, habitat loss and modification, predation, and disease (USFWS, 2003). However, as a result of intensive conservation and management, populations of Piping Plover appear to have been increasing since 1991 throughout its range (Bird Life International, 2020). Critical overwintering habitat has been designated, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida (**Figure 3**). Piping Plovers inhabit coastal sandy beaches and mudflats, feeding by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening.

A large oil spill is the only IPF that potentially may affect Piping Plovers. There are no IPFs associated with routine project activities that could affect these birds. A small fuel spill in the project area would be unlikely to affect Piping Plovers because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Sound from helicopters would be unlikely to significantly affect piping plover populations, because it is assumed that helicopters will maintain an altitude of 305 m (1,000 ft) over unpopulated areas or across coastlines.

Impacts of a Large Oil Spill

The project area is approximately 113 statute miles (182 km) from the nearest shorelines designated as critical habitat for the Piping Plover (**Figure 3**). The 30-day OSRA modeling (**Table 3**) predicts that Piping Plover critical habitat in Texas and Louisiana could be contacted within 30 days of a spill (1% to 3% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts that during the spring, there is up to 13% conditional probability that an oil spill from the project area would reach a shoreline designated as critical habitat for the Piping Plover within 60 days of a spill.

Plovers could physically oil themselves while foraging on oiled shores or secondarily contaminate themselves through ingestion of oiled intertidal sediments and prey (BOEM, 2017). Piping Plovers congregate and feed along tidally-exposed banks and shorelines, following the tidal boundary and foraging at the water's edge. It is possible that some deaths of Piping Plovers could occur, especially if spills occur during winter months when plovers are most common along the coastal Gulf or if spills contacted critical habitat. Impacts could also occur from vehicular traffic on beaches and other activities associated with spill cleanup. Extensive Chevron resources will be available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

However, a large spill that contacts shorelines would not necessarily substantially impact Piping Plovers. In the aftermath of the *Deepwater Horizon* incident, Gibson et al. (2017) completed thorough surveys of coastal Piping Plover habitat in coastal Louisiana, Mississippi, and Alabama and found that only 0.89% of all observed Piping Plovers were visibly oiled, leaving the authors to conclude that the *Deepwater Horizon* incident did not substantially affect Piping Plover populations.

C.3.7 Whooping Crane (Endangered)

The Whooping Crane is a large omnivorous wading bird listed as an Endangered species. Three wild populations live in North America (National Wildlife Federation, 2016). One population overwinters along the Texas coast at Aransas NWR and summers at Wood Buffalo National Park in Canada. This population represents the majority of the world's population of free-ranging Whooping Cranes, reaching an estimated population of 536 at Aransas NWR during the 2022 to 2023 winter (USFWS, 2023a), a slight decrease from an estimated 543 individuals counted in the 2021 to 2022 winter survey. Whooping Cranes breed, migrate, winter, and forage in a variety of habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields (USFWS, 2007). About 9,000 ha (22,240 ac) of salt flats on Aransas NWR and adjacent islands comprise the principal wintering grounds of the Whooping Crane. Aransas NWR is designated as critical habitat for the species.

A large oil spill is the only IPF that potentially may affect Whooping Cranes. A small fuel spill in the project area would also be unlikely to affect Whooping Cranes, due to the distance of the project area from Aransas NWR. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior natural dispersion and degradation.

Impacts of a Large Oil Spill

A large oil spill is unlikely to affect Whooping Cranes as the project area is approximately 353 statute miles (568 km) from the Aransas NWR, which is the nearest designated critical habitat. The 30-day OSRA modeling (**Table 3**) predicts a <0.5% or less chance of oil contacting Whooping Crane critical habitat within 30 days of a spill. The 60-day OSRA model (**Table 4**) predicts that there is a 4% or less chance oil contacting Whooping Crane critical habitat within 60 days of a spill.

In the event of oil exposure, Whooping Cranes could physically oil themselves while foraging in oiled areas or secondarily contaminate themselves through ingestion of contaminated shellfish, frogs, and fishes. It is possible that some Whooping Crane deaths could occur, especially if a spill occurred during winter months when Whooping Cranes are most common along the Texas coast and if the spill contacts their critical habitat in Aransas NWR. Impacts could also occur from vehicular traffic on beaches and other activities associated with spill cleanup. In the event of a spill, Chevron would work with the applicable state and federal agencies to prevent impacts on Whooping Cranes. Extensive Chevron resources will be available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

C.3.8 Black-capped Petrel

The Black-capped Petrel is a pelagic seabird that solely nests on Hispaniola that was listed as Endangered under the ESA in 2024. The species travels long distances to forage on fish, squid, crustaceans, and *Sargassum* (Simons et al., 2013) and have occasionally been sighted in the northern Gulf of Mexico. While the Gulf of Mexico is not their primary foraging grounds, the most recent species status review (USFWS, 2023b) reported 11 sightings in the Gulf of Mexico in 2017-2018 during surveys as part of the Gulf of Mexico Marine Assessment Program for Protected Species. Overall, the population of Black-capped Petrels is declining, largely due to deforestation and urbanization on Hispaniola. Exact population numbers are unknown due to the difficulty in obtaining accurate counts and their nocturnal nature, but BirdLife International (2018) estimated a total of 1,000 to 2,000 mature individuals and an overall population of 2,000 to 4,000 individuals.

IPFs that potentially may affect the Black-capped Petrel include drilling rig and installation vessel presence, marine sound, lighting, support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges permitted under the NPDES are likely to have negligible impacts on the birds due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these animals. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts. The IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig and Installation Vessel Presence, Marine Sound, and Lights

Marine birds that frequent offshore oil and gas operations may be exposed to contaminants including air pollutants and routine discharges, but significant impacts are unlikely due to rapid dispersion. Birds migrating over water have been known to collide with offshore structures, resulting in injury and/or death (Wiese et al., 2001; Russell, 2005). Black-capped Petrels may be attracted to lights on the drilling rig or installation vessel which could increase the risk of a collision.

Mortality of migrant birds at tall towers and other land-based structures has been reviewed extensively, and the mechanisms involved in offshore vessel collisions appear to be similar. In some cases, birds simply do not see a part of the structure until it is too late to avoid it. In other cases, navigation may be disrupted by marine sound (Russell, 2005). On the other hand, offshore structures are suitable stopover perches for most species (Russell, 2005). Due to the limited scope and short duration of drilling and installation activities described in this EP and the low density of Black-capped Petrels in the Gulf of Mexico, no significant impacts are expected.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters are unlikely to significantly disturb Black-capped Petrels in open, offshore waters. Schwemmer et al. (2011) showed that several marine bird species showed behavioral responses and altered distribution patterns in response to ship traffic, which could potentially cause loss of foraging time and resting habitat. However, it is likely that individuals would experience, at most, only short-term behavioral disruption, and the impact would not be significant on Black-capped Petrels.

Impacts of a Small Fuel Spill

Potential spill impacts on marine birds in general are discussed by BOEM (2017). For this EP, there are no unique site-specific issues with respect to spill impacts on Black-capped Petrels.

The probability of a fuel spill is expected to be minimized by Chevron’s preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of Chevron’s OSRP is expected to reduce the potential for impacts on Black-capped Petrels. EP Appendix G provides details on spill response measures. Given the open ocean location of the project area and the expected short duration of a small fuel spill, the potential exposure period for Black-capped Petrels would be brief.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

Black-capped Petrels exposed to fuel on the sea surface could experience direct physical and physiological effects including skin irritation; chemical burns of skin, eyes, and mucous membranes; and inhalation of VOCs. Due to the limited areal extent and short duration of water quality impacts from a small fuel spill, secondary impacts due to ingestion of oil via contaminated prey or reductions in prey abundance are unlikely. Due to the low densities of Black-capped Petrels, the small area affected, and the brief duration of the surface slick, minimal if any impacts would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine and pelagic birds in general are discussed by BOEM (2017). For this EP, there are no unique site-specific issues with respect to spill impacts on Black-capped Petrels.

Black-capped Petrels could be exposed to oil from a spill at the project area; the number of individuals that could be affected in open, offshore waters would depend on the extent and persistence of the oil slick and the number of Black-capped Petrels in the area.

Following the *Deepwater Horizon* incident in 2010, no Black-capped Petrels were reported as oiled or recovered dead (USFWS, 2023b), but decomposition would likely have made positive identification difficult (Haney et al., 2014). Exposure of marine birds to oil can result in adverse health with severity, depending on the level of oiling. Effects can range from plumage damage and loss of buoyancy from external oiling to more severe effects, such as organ damage, immune suppression, endocrine imbalance, reduced aerobic capacity, and death as a result of oil inhalation or ingestion (NOAA, 2018a). Other indirect impacts would also likely occur after a large oil spill, such as a reduction in suitable foraging habitat and the decline in population of prey species (USFWS, 2023b).

Overall, a large oil spill could cause significant impacts on Black-capped Petrel populations if there were numerous individuals in the area of the spill. However, due to the low number of individuals thought to frequent the northern Gulf of Mexico, significant impacts on this species from a large spill is considered unlikely.

C.3.9 Oceanic Whitetip Shark (Threatened)

The oceanic whitetip shark was listed as Threatened under the ESA on 30 January 2018 (effective 30 March 2018) by NMFS (83 FR 4153). Oceanic whitetip sharks are found worldwide in offshore waters between approximately 30° N and 35° S latitude, and historically were one of the most widespread and abundant species of shark (Rigby et al., 2019). However, based on reported oceanic whitetip shark catches in several major long-line fisheries, the global population appears to have suffered substantial declines (Camhi et al., 2008) and the species is now only occasionally reported in the Gulf of Mexico (Rigby et al., 2019).

Oceanic whitetip shark management is complicated due to it being globally distributed, highly migratory, and overlapping in areas of high fishing pressure; thus, leaving assessment of population trends on fishery dependent catch-and-effort data rather than scientific surveys (Young and Carlson, 2020). A comparison of historical shark catch rates in the Gulf of Mexico by Baum and Myers (2004) noted that most recent papers dismissed the oceanic whitetip shark as rare or absent in the Gulf of Mexico. NMFS (2023) noted that there has been an 88% decline in abundance of the species in the Gulf of Mexico since the mid-1990s due to commercial fishing pressure.

IPFs that could affect the oceanic whitetip shark include drilling rig/installation vessel presence, sound, and lights, and a large oil spill. Though NMFS (2020a) lists a small diesel fuel spill as an IPF, in the project area, a small diesel fuel spill would be unlikely to affect oceanic whitetip sharks due to rapid natural dispersion of diesel fuel and the low density of oceanic whitetip sharks potentially present in the project area. Therefore, no significant impacts are expected from small diesel fuel spills and they are not further discussed (**Table 2**).

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

Offshore drilling and subsea installation activities produce a broad array of sound at frequencies and intensities that may be detected by sharks including the Threatened oceanic whitetip shark. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013) which includes sensitivities for individual species to SPLs between approximately 134 to 148 dB re 1 µPa in nurse sharks (*Ginglymostoma cirratum*) at frequencies between 100 and 1,000 Hz (Casper and Mann, 2006). These frequencies overlap with sound associated with drilling activities (source levels of 195 dB re 1 µPa m with peak frequencies at 40 to 100 Hz) (Hildebrand, 2005). Impacts from offshore drilling or installation subsea activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). However, because of the limited propagation distances of high SPLs from the drilling rig, impacts would be limited in geographic scope. It is anticipated that animals would move away from the static sound source and avoid auditory injury or disturbances. Therefore, no population level impacts on oceanic whitetip sharks are expected.

Impacts of a Large Oil Spill

Information regarding the direct effects of oil on elasmobranchs, including the oceanic whitetip shark are largely unknown. However, in the event of a large oil spill, oceanic whitetip sharks could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Because oceanic whitetip sharks may be found in surface waters, they could be more likely to be impacted by floating oil than other species which only reside at depth.

It is possible that a large oil spill could affect individual oceanic whitetip sharks and result in injuries or deaths. However, due to the low density of oceanic whitetip sharks thought to exist in the Gulf of Mexico, it is unlikely that a large spill would result in population level effects.

C.3.10 Giant Manta Ray (Threatened)

The giant manta ray is a Threatened elasmobranch species that is a slow-growing, migratory, planktivorous species than inhabits tropical, subtropical, and temperate bodies of water worldwide (NOAA, 2018). The giant manta ray became listed as Threatened under the ESA in 2018.

Commercial fishing is the primary threat to giant manta rays (NOAA, 2023b). The species is targeted and caught as bycatch in several global fisheries throughout its range. Although protected in U.S. waters, protection of populations is difficult as they are highly migratory with sparsely distributed and fragmented populations throughout the world. Some estimated regional population sizes are small (between 100 to 1,500 individuals) (Marshall et al., 2018; NOAA, 2018). Stewart et al. (2018) recently reported that the Flower Garden Banks serves as nursery habitat for aggregations of juvenile manta rays. Approximately 100 unique individuals have been positively identified at the Flower Garden Banks based on unique underbelly coloration (Belter et al., 2020). Genetic and photographic evidence in the Flower Garden Banks over 25 years of monitoring showed that 95% of identified giant manta ray male individuals were smaller than mature size (Stewart et al., 2018).

IPFs that may impact giant manta rays include drilling rig/installation vessel presence, marine sound, and lights, and a large oil spill. Though NMFS (2020a) lists a small diesel fuel spill as an

IPF, in the project area a small diesel fuel spill would be unlikely to affect giant manta rays due to rapid natural dispersion of diesel fuel and the low density of giant manta rays potentially present in the project area. Therefore, no significant impacts are expected from small diesel fuel spills and they are not further discussed (See **Table 2**).

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

Offshore drilling and subsea installation activities produce a broad array of sound at frequencies and intensities that may be detected by elasmobranchs including the Threatened giant manta ray. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013). Studies indicate sensitivities to SPLs between approximately 139 and 153 dB re 1 µPa in yellow stingray (*Urobatis jamaicensis*) and SPLs between approximately 120 and 145 dB re 1 µPa in little skate (*Erinacea raja*) at frequencies from 100 to 1,000 Hz (Casper et al., 2003; Casper and Mann, 2006). These frequencies overlap with sound associated with drilling activities (source levels of 195 dB re 1 µPa m with peak frequencies at 40 to 100 Hz) (Hildebrand, 2005). Impacts from offshore drilling or subsea installation activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). However, because of the limited propagation distances of high SPLs from the drilling rig, impacts would be limited in geographic scope. It is anticipated that animals would move away from the static sound source and avoid auditory injury or disturbances. Therefore, no population level impacts on giant manta rays are expected.

Impacts of a Large Oil Spill

A large oil spill in the project area could reach coral reefs at the Flower Garden Banks which is the only known location of giant manta ray aggregations in the Gulf of Mexico, although individuals may occur anywhere in the Gulf. In the unlikely event of a large oil spill impacting areas with giant manta rays, individual rays could be affected by direct ingestion of oil which could cover their gill filaments or gill rakers, or by ingestion of oiled plankton. Giant manta rays typically feed in shallow waters of less than 10 m (33 ft) depth (NOAA, 2018). Because of this shallow water feeding behavior, giant manta rays would be more likely to be impacted by floating oil than other species which most typically reside at depth.

In the event of a large oil spill, due to the distance between the project area and the Flower Garden Banks, it is unlikely that oil would impact the threatened giant manta ray nursery habitat. It is possible that a large oil spill could contact individual giant manta rays, but due to the low density of individuals thought to occur in the Gulf of Mexico, population-level impacts are not expected.

C.3.11 Gulf Sturgeon (Threatened)

The Gulf sturgeon is a Threatened fish species that inhabits major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida (Barkuloo, 1988; Wakeford, 2001). Sturgeon are anadromous fish that migrate from the ocean upstream into coastal rivers to spawn in freshwater.

The historic range of the species extended from the Mississippi River to Charlotte Harbor, Florida (Wakeford, 2001). This range has contracted to encompass major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida. Populations have been depleted or even extirpated throughout this range by fishing, shoreline development, dam construction, water quality changes, and other factors (Barkuloo, 1988; Wakeford, 2001). These declines prompted the listing of the Gulf sturgeon as a Threatened species in 1991. The best-known populations occur in the Apalachicola and Suwannee Rivers in Florida (Carr, 1996; Sulak and Clugston, 1998), the Choctawhatchee River in Alabama (Fox et al., 2000), and the Pearl River in Mississippi/Louisiana (Morrow et al., 1998). Rudd et al. (2014) reconfirmed the spatial distribution and movement patterns of Gulf sturgeon by surgically implanting acoustic telemetry tags. Critical habitat in the Gulf extends from Lake Borgne, Louisiana (St. Bernard Parish), to Suwannee Sound, Florida (Levy County) (NMFS, 2022) (**Figure 3**). A species description is presented by BOEM (2012a) and in the recovery plan for this species (USFWS et al., 1995).

A large oil spill is the only IPF that potentially may affect Gulf sturgeon. There are no IPFs associated with routine project activities that could affect these fish. A small fuel spill in the project area would be unlikely to affect Gulf sturgeon because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Vessel collisions to Gulf sturgeon would be unlikely based on the location of the support vessel base and NMFS (2020a) estimated one non-lethal Gulf sturgeon collision in the 50 years of proposed action.

Impacts of a Large Oil Spill

Potential spill impacts on Gulf sturgeon are discussed by NMFS (2007) and BOEM (2012a; 2017). For this EP, there are no unique site-specific issues with respect to this species.

The project area is approximately 216 statute miles (348 km) from the nearest Gulf sturgeon critical habitat. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has a <0.5% or less conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 30 days of a spill. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project areas has a 1% or less conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 60 days of a spill.

In the event of oil reaching Gulf sturgeon habitat, the fish could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Based on the life history of this species, subadult and adult Gulf sturgeon would be most vulnerable to an estuarine or marine oil spill, and would be vulnerable from approximately October through April when this species is foraging in estuarine and shallow marine habitats (NMFS, 2020a).

C.3.12 Nassau Grouper (Threatened)

The Nassau grouper (*Epinephelus striatus)* is a Threatened, long-lived reef fish typically associated with hard bottom structures such as natural and artificial reefs, rocks, and underwater ledges (NOAA, 2024a). Once one of the most common reef fish species in the coastal waters of the United States and Caribbean (Sadovy, 1997), the Nassau grouper been subject to overfishing and is considered extinct in much of its historical range. Observations of current spawning aggregations compared with historical landings data suggest that the Nassau grouper population is substantially smaller than its historical size (NOAA, 2024a). The Nassau grouper was listed as Threatened under the ESA in 2016 (81 FR 42268).

Nassau groupers are found mainly in the shallow tropical and subtropical waters of eastern Florida, the Florida Keys, Bermuda, the Yucatán Peninsula, and the Caribbean, including the U.S. Virgin Islands and Puerto Rico within water depths up to 130 m (426 ft) (NOAA, 2024a). There has been one confirmed sighting of Nassau grouper from the Flower Garden Banks in the Gulf of Mexico at a water depth of 36 m (118 ft) (Foley et al., 2007). Three additional unconfirmed reports (i.e. lacking photographic evidence) of Nassau grouper have also been documented from mooring buoys and the coral cap region of the West Flower Garden flats (Foley et al., 2007).

There are no IPFs associated with routine project activities that could affect Nassau grouper. A small fuel spill would not affect Nassau grouper because the fuel would float and dissipate on the sea surface and would not be expected to reach the Flower Garden Banks or Florida Keys. A large hydrocarbon spill is the only relevant IPF.

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 4**), a large oil spill would be unlikely (<0.5% probability) to reach Nassau grouper habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks (approximately 174 statute miles [280 km]), and the difference in water depth between the project area (1,213 to 1,223 m [3,980 to 4,012 ft]) and the Banks (approximately 17 to 145 m [56 to 476 ft]). While on the surface, hydrocarbons would not be expected to contact subsurface fish.

In the unlikely event that hydrocarbons contact Nassau grouper habitat, hydrocarbon droplets or contaminated sediment particles could come into contact with Nassau grouper present on the reefs. Individual fish could be affected by direct ingestion of hydrocarbons which could cover their gill filaments or gill rakers, result in ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills.

C.3.13 Smalltooth Sawfish (Endangered)

The smalltooth sawfish, named due to their flat, saw-like rostrum, is an elasmobranch ray which lives in shallow coastal tropical seas and estuaries where they feed on fish and invertebrates such as shrimp and crabs (NOAA Fisheries, 2023). Once found along most of the northern Gulf of Mexico coast from Texas to Florida, their current range in Gulf of Mexico is restricted to areas primarily in southwest Florida (Brame et al., 2019) where several areas of critical habitat have been designated (**Figure 3**). A species description is presented in the recovery plan for this species (NMFS, 2009b).

Listed as Endangered under the ESA in 2003, population numbers have drastically declined over the past century primarily due to accidental bycatch (Seitz and Poulakis, 2006). Although there are no reliable estimates for smalltooth sawfish population numbers throughout its range (NMFS, 2018b), data from 1989 to 2004 indicated a slight increasing trend in population numbers in Everglades National Park during that time period (Carlson et al., 2007). More recent data resulted in a similar conclusion, with indications that populations were stable or slightly increasing in southwest Florida (Carlson and Osborne, 2012).

There are no IPFs associated with routine project activities that could affect smalltooth sawfish. A small fuel spill would not affect smalltooth sawfish because the fuel would float and dissipate on the sea surface and would not be expected to reach smalltooth sawfish habitat in coastal areas (see **Section A.9.1**). A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

The project area is approximately 517 miles (832 km) from the nearest smalltooth sawfish critical habitat in Charlotte County, Florida. Based on the 30-day OSRA modeling (**Table 3**), coastal areas containing smalltooth sawfish critical habitat are unlikely to be affected within 30 days of a spill (<0.5% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts a <0.5% probability of shoreline contact to coastal areas containing smalltooth sawfish critical habitat within 60 days of a spill.

Information regarding the direct effects of oil on elasmobranchs, including the smalltooth sawfish are largely unknown. A recent study by Cave and Kajiura (2018) reported that when exposed to crude oil, the Atlantic stingray (*Hypanus sabinus*) experienced impaired olfactory function which could lead to decreased fitness. In the event of oil reaching smalltooth sawfish habitats, the smalltooth sawfish could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills as well as impaired olfactory function. Based on the shallow, coastal habitats preferred by smalltooth sawfish, individuals in areas subject to coastal oiling could be more likely to be impacted than other species that reside at depth.

C.3.14 Beach Mice (Endangered)

Four subspecies of Endangered beach mouse occur on the barrier islands of Alabama and the Florida Panhandle: the Alabama (*Peromyscus polionotus ammobates*), Choctawhatchee (*P. p. allophrys*), Perdido Key (*P. p. trissyllepsis*), and St. Andrew beach mouse (*P. p. peninsularis*). Critical habitat has been designated for all four subspecies and is shown combined in **Figure 3**. One additional subspecies of *Peromyscus* beach mouse inhabiting dunes on the western Florida Panhandle, the Santa Rosa beach mouse (*P. p. leucocephalus*), is not listed under the ESA. A large oil spill is the only IPF that potentially may affect beach mice. There are no IPFs associated with routine project activities that could affect these animals due to the distance from shore and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect beach mice because a small fuel spill would not be expected to reach beach mice habitat prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Potential spill impacts on Endangered beach mice are discussed by BOEM (2017; 2023a,b). For this EP, there are no unique site-specific issues with respect to these species that were not analyzed in these documents.

Beach mouse critical habitat in Baldwin County, Alabama, is approximately 254 statute miles (409 km) from the project area. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has a <0.5% or less conditional probability of contacting any coastal areas containing beach mouse critical habitat within 30 days of a spill. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has a 1% or less conditional probability of contacting any coastal areas containing beach mouse critical habitat within 60 days of a spill.

In the event of oil contacting these beaches, beach mice could experience several types of direct and indirect impacts. Contact with spilled oil could cause skin and eye irritation and subsequent infection; matting of fur; irritation of sweat glands, ear tissues, and throat tissues; disruption of sight and hearing; asphyxiation from inhalation of fumes; and toxicity from ingestion of oil and contaminated food. Indirect impacts could include reduction of food supply, destruction of habitat, and fouling of nests. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. However, any such impacts are unlikely due to the distance from shore and response actions that would occur in the event of a spill.

C.3.15 Florida Salt Marsh Vole (Endangered)

The Florida salt marsh vole is a small, dark brown or black rodent found only in saltgrass (*Distichlis spicata*) meadows in the Big Bend region of Florida that was listed as Endangered under the ESA in 1991. Only two populations of Florida salt marsh vole are known to exist: one near Cedar Key in Levy County, Florida and one in the Lower Suwanee National Wildlife Refuge in Dixie County, Florida (Florida Fish and Wildlife Conservation Commission, nd-e). No critical habitat has been established for the Florida salt marsh vole in part due to concerns over illegal trapping or trespassing if the location of the populations were publicly disclosed (USFWS, 2001b).

A large oil spill is the only IPF that potentially may affect the Florida salt marsh vole. There are no IPFs associated with routine project activities that could affect these animals due to the distance from the project area to their habitat and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect the Florida salt marsh vole because a small fuel spill would not be expected to reach their habitat prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Florida salt marsh vole habitat in Levy and Dixie counties, Florida is approximately 463 miles (745 km) from the project area. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has <0.5% or less conditional probability of contacting any coastal areas containing Florida salt marsh vole habitat within 30 days. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has <0.5% conditional probability of contacting any coastal areas containing Florida salt marsh vole habitat within 60 days of a spill.

In the event of oil contacting beaches containing these animals, Florida salt marsh voles could experience several types of direct and indirect impacts. Contact with spilled oil could cause skin and eye irritation and subsequent infection; matting of fur; irritation of sweat glands, ear tissues, and throat tissues; disruption of sight and hearing; asphyxiation from inhalation of fumes; and toxicity from ingestion of oil and contaminated food. Indirect impacts could include reduction of food supply, destruction of habitat, and fouling of nests. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. Impacts associated with an extensive oiling of coastal habitat containing Florida salt marsh voles from a large oil spill are expected to be significant. Due to the extremely low population numbers, extensive oiling of Florida salt marsh vole habitat could result in the extinction of the species. However, any such impacts are unlikely due to the distance from the project area to Florida salt marsh vole habitat and response actions that would occur in the event of a spill.

C.3.16 Panama City Crayfish (Threatened)

The USFWS issued a Final Rule designating the Panama City crayfish as Threatened under the ESA in 2022. The Panama City crayfish is a semi-terrestrial crayfish that grows up to 2 inches (51 mm) in size and is found in south-central Bay County, Florida. Medium to dark brown in color, the crayfish prefers areas dominated by herbaceous vegetation and shallow or fluctuating water levels (Keppner and Keppner, 2004). Historically prevalent in shallow freshwater bodies in pine and prairie communities, urban development has largely replaced these habitats. The Panama City crayfish is now generally found in wet or semi-wet swales, ditches, slash pine plantations, undeveloped utility rights-of-way, and remnant wetlands (Florida Fish and Wildlife Conservation Commission, 2016).

A large oil spill is the only IPF that potentially may affect the Panama City crayfish. There are no IPFs associated with routine project activities that could affect these animals due to the distance from the project area to their habitat and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect the Panama City crayfish because a small fuel spill would not be expected to reach their habitat prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Panama City crayfish critical habitat in Bay County, Florida is approximately 360 miles (579 km) from the project area. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has a <0.5% or less conditional probability of contacting any coastal areas containing Panama City crayfish critical habitat within 30 days. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has 1% or less conditional probability of contacting any coastal areas containing Panama City crayfish critical habitat within 60 days of a spill.

Effects of oiling on the Panama City crayfish are largely unknown. In general, crayfishes use chemoreception to orient themselves in their environmental, to find food, and to avoid predators (Bergman and Moore, 2005). Exposure to hydrocarbons has been shown to damage receptor cells that crayfish use for chemoreception, thus decreasing their fitness (Tierney et al., 2010).

Indirect impacts of oiling of Panama City crayfish habitat could include reduction of food supply, destruction of habitat, and fouling of burrows. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. Impacts associated with an extensive oiling of coastal habitat containing Panama City crayfish from a large oil spill are expected to be significant. Due to the low population numbers and restricted range, extensive oiling of Panama City crayfish habitat could be significant at the species level. However, any such impacts are unlikely due to the distance from the project area to Panama City crayfish habitat and response actions that would occur in the event of a spill.

C.3.17 Threatened Coral Species

Seven Threatened coral species are known from the northern Gulf of Mexico: elkhorn coral, staghorn coral, lobed star coral, mountainous star coral, boulder star coral, pillar coral, and rough cactus coral. Elkhorn coral, lobed star coral, mountainous star coral, and boulder star coral have been reported from the coral cap region of the Flower Garden Banks (NOAA, 2014), but are unlikely to be present with a widespread distribution in the northern Gulf of Mexico because they typically inhabit coral reefs in shallow, clear tropical, or subtropical waters. Staghorn coral, pillar coral, and rough cactus coral are only known from the Florida Keys and Dry Tortugas (Florida Fish and Wildlife Conservation Commission, nd-d). Other Caribbean coral species evaluated by NMFS in 2014 (79 FR 53852) either do not meet the criteria for ESA listing or are not known from the Flower Garden Banks, Florida Keys, or Dry Tortugas.

NMFS has designated critical habitat for the boulder star coral, lobed star coral, mountainous star coral, pillar coral, and rough cactus coral in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea per 88 FR 54026 and became effective in September 2023. For the areas in the Gulf of Mexico, this includes the Flower Garden Banks and the waters near Miami-Dade and Monroe counties, Florida, and the Dry Tortugas (**Figure 3**).

There are no IPFs associated with routine project activities that could affect threatened corals in the northern Gulf of Mexico. A small fuel spill would not affect threatened coral species because the oil would float and dissipate on the sea surface. A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 4**), a large oil spill would be unlikely (<0.5% probability) to reach elkhorn or staghorn coral critical habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the corals of the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks (approximately 174 statute miles [280 km]), and the difference in water depth between the project area (1,213 to 1,223 m [3,980 to 4,012 ft]) and the Banks (approximately 17 to 145 m [56 to 476 ft]). While on the surface, oil would not be expected to contact corals on the seafloor. Natural or chemical dispersion of oil could cause a subsurface plume which would have the remote possibility of contacting seafloor corals.

If a subsurface plume were to occur, impacts on the Flower Garden Banks would be unlikely due to the distance between the project area and corals within the Flower Garden Banks. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume upward onto the continental shelf. Valentine et al. (2014) observed the spatial distribution of excess hopane, a crude oil tracer from *Deepwater Horizon* spill sediment core samples, to be in the deeper waters and not transported up the shelf, thus confirming that near-bottom currents flow along the isobaths.

In the unlikely event that a subsurface plume reached reefs at the Flower Garden Banks or other Gulf of Mexico reefs, oil droplets or oiled sediment particles could come into contact with reef organisms or corals. As discussed by BOEM (2017), impacts relevant to these corals could include loss of habitat, biodiversity, and live coral coverage. Sub-lethal effects could be long-lasting and affect the resilience of coral colonies to natural disturbances (e.g., elevated water temperature and diseases) (BOEM, 2017).

Due to the distance between the project area and coral habitats, there is a low chance of oil contacting Threatened coral critical habitat in the event of a spill, and no significant impacts on threatened coral species are expected.

C.3.18 Queen Conch (Threatened)

The Queen conch is a large gastropod that occurs throughout the Caribbean Sea, Gulf of Mexico, and Bermuda which was listed as Threatened under the ESA in 2024 (NOAA, 2024b). The species is slow moving and found in a variety of habitats including seagrass beds, sands flats, algal beds, and rubble areas up to 30 meters in water depth. Larval conch feed primarily on phytoplankton, while juvenile and adults feed on a mix of seagrass and macroalgae (Stoner and Appeldoorn, 2022). Overall, the population of Queen conch is declining, largely due to overfishing and illegal fishing practices. Exact population numbers are unknown due to the difficulty in obtaining accurate counts. The majority of available density estimates suggest that conch populations are below minimum thresholds necessary to maintain or increase populations (Horn et al., 2022).

There are no IPFs associated with routine project activities that could affect Queen conch. A small fuel spill would not affect Queen conch because the fuel would float and dissipate on the sea surface. A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

A large oil spill in the project area could potentially reach Queen conch habitat and affect the substrate. These effects would be of particular concern where the species occurs in shallower waters. There is some information available on the effects of oil spills on seagrass meadows and other marine gastropods, but little information available on the direct effects of oil on Queen conch (Horn et al., 2022). In the event of a large oil spill, due to the low density of individual Queen conch thought to occur in the Gulf of Mexico, any population-level impacts are considered unlikely.

C.4 Coastal and Marine Birds

C.4.1 Marine Birds

Marine birds include seabirds and other species that may occur in the pelagic environment of the project area (Clapp et al., 1982a; Clapp et al., 1982b; 1983; Davis and Fargion, 1996; Davis et al., 2000). Seabirds spend much of their lives offshore over the open ocean, except during breeding season when they nest along the coast (on the mainland and on barrier islands). In addition, other birds such as waterfowl, marsh birds, and shorebirds may occasionally be present over open ocean areas. No Endangered or Threatened bird species are likely to occur at the project area due to the distance from shore. For a discussion of shorebirds and coastal nesting birds, see **Section C.4.2**.

Seabirds of the northern Gulf of Mexico were surveyed from ships during the GulfCet II program (Davis et al., 2000) which reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in deepwater areas of the Gulf of Mexico. From these surveys, four ecological categories of seabirds were documented in the deepwater areas of the Gulf: summer migrants (shearwaters, storm petrels, boobies); summer residents that breed in the Gulf (Sooty Tern [*Onychoprion fuscatus*], Least Tern [*Sternula antillarum*], Sandwich Tern [*Thalasseus sandvicensis*], Magnificent Frigatebird [*Fregata magnificens*]); winter residents (gannets, gulls, jaegers); and permanent resident species (Laughing Gulls[*Leucophaeus atricilla*], Royal Terns[*Thalasseus maximus*], Bridled Terns [*Onychoprion anaethetus*]) (Davis et al., 2000).

Common marine bird species include Wilson's Storm-Petrel (*Oceanites oceanicus*), Magnificent Frigatebird, Northern Gannet (*Morus bassanus*), Masked Booby (*Sula dactylatra*), Brown Booby (*Sula leucogaster*), Cory's Shearwater (*Calonectris borealis*), Greater Shearwater (*Puffinus gravis*), and Audubon's Shearwater (*Puffinus lherminieri*). Seabirds are distributed Gulf-wide and are not specifically associated with the project area.

Relationships with hydrographic features were found for several marine bird species, possibly due to effects of hydrography on nutrient levels and productivity of surface waters where birds forage. The GulfCet II study did not estimate bird densities; however, Haney et al. (2014) indicated that marine bird densities over the open ocean were estimated to be 1.6 birds km^{-2}.

IPFs that potentially may affect marine birds include drilling rig/installation vessel presence, marine sound, lighting, support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges permitted under the NPDES are likely to have negligible impacts on the birds due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these animals. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on birds. The IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

Marine birds that frequent offshore oil and gas operations may be exposed to contaminants including air pollutants and routine discharges, but significant impacts are unlikely due to rapid dispersion. Birds migrating over water have been known to collide with offshore structures, resulting in injury and/or death (Wiese et al., 2001; Russell, 2005). Mortality of migrant birds at tall towers and other land-based structures has been reviewed extensively, and the mechanisms involved in rig collisions appear to be similar. In some cases, migrants simply do not see a part of the rig until it is too late to avoid it. In other cases, navigation may be disrupted by marine sound (Russell, 2005). On the other hand, offshore structures are suitable stopover perches for most trans-Gulf migrant species, and most of the migrants that stop over on rigs probably benefit from their stay, particularly in spring (Russell, 2005). Due to the limited scope and short duration of activities described in this EP, any impacts on populations of either seabirds or trans-Gulf migrant birds are not expected to be significant.

Trans-Gulf migrant birds including shorebirds, wading birds, and terrestrial birds may also be present in the project area. Migrant birds may use offshore structures, including platforms and semisubmersibles for resting, feeding, or as temporary shelter from inclement weather (Russell, 2005). Some birds may be attracted to offshore structures because of the lights and the fish populations that aggregate around these structures. A study in the North Sea indicated that rig lighting causes circling behavior in various birds, especially on cloudy nights; apparently the birds' geomagnetic compass is upset by the red part of the spectrum from the lights currently in use (Van de Laar, 2007; Poot et al., 2008). The numbers varied greatly, from none to some tens of thousands of birds per night per rig, with an apparent effect radius of up to 3 miles (5 km) (Poot et al., 2008). A study in the Gulf of Mexico also noted the phenomenon but did not recommend mitigation (Russell, 2005). One factor to consider in evaluating this impact in the Gulf of Mexico would include the lower incidence of cloudy and foggy days in the Gulf of Mexico versus the North Sea. In laboratory experiments, Poot et al. (2008) found the magnetic compass of migratory birds to be wavelength dependent. Migratory birds require light from the blue-green part of the spectrum for magnetic compass orientation, whereas red light (visible long-wavelength) disrupts their magnetic orientation. They designed a field study to test if and how changing light color influenced migrating birds under field conditions. During field studies they found that nocturnally migrating birds were disoriented and attracted by red and white light (containing visible long-wavelength radiation), whereas they were clearly less disoriented by blue and green light (containing less or no visible long-wavelength radiation) (Poot et al., 2008).

Overall, potential negative impacts to birds from drilling rig/installation vessel lighting, sound, collisions, or other adverse effects are highly localized and may affect individual birds during migration periods. Sound generated from the drilling rig/installation vessel is not expected to impact marine birds. Therefore, these potential impacts are not expected to affect marine birds at the population or species level and are not significant.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters are unlikely to significantly disturb marine birds in open, offshore waters. Schwemmer et al. (2011) showed that several marine bird species showed behavioral responses and altered distribution patterns in response to ship traffic, which could potentially cause loss of foraging time and resting habitat. However, it is likely that individual birds would experience, at most, only short-term behavioral disruption, and the impact would not be significant.

Impacts of a Small Fuel Spill

Potential spill impacts on marine birds are discussed by BOEM (2017). For this EP, there are no unique site-specific issues with respect to spill impacts on these animals.

The probability of a fuel spill is expected to be minimized by Chevron's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to reduce the potential for impacts on marine birds. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area and the expected short duration of a small fuel spill, the potential exposure period for marine birds would be brief.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

Marine birds exposed to oil on the sea surface could experience direct physical and physiological effects including skin irritation; chemical burns of skin, eyes, and mucous membranes; and inhalation of VOCs. Due to the limited areal extent and short duration of water quality impacts from a small fuel spill, secondary impacts due to ingestion of oil via contaminated prey or reductions in prey abundance are unlikely. Due to the low densities of birds in open ocean areas, the small area affected, and the brief duration of the surface slick, minimal if any impacts on pelagic birds would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine and pelagic birds are discussed by BOEM (2017). For this EP, there are no unique site-specific issues with respect to spill impacts on these animals.

Pelagic seabirds could be exposed to oil from a spill at the project area. Davis et al. (2000) reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in the deepwater Gulf of Mexico (>200 m). Haney et al. (2014) estimated that seabird densities over the open ocean were approximately 1.6 birds km^{-2}. The number of pelagic birds that could be affected in open, offshore waters would depend on the extent and persistence of the oil slick.

Data following the *Deepwater Horizon* incident provide relevant information about the species of pelagic birds that may be affected in the event of a large oil spill. Birds that were treated for oiling include several pelagic species such as the Northern Gannet, Magnificent Frigatebird, and Masked Booby. The Northern Gannet is among the species with the largest numbers of birds affected by the spill. Exposure of marine birds to oil can result in adverse health with severity, depending on the level of oiling. Effects can range from plumage damage and loss of buoyancy from external oiling to more severe effects, such as organ damage, immune suppression, endocrine imbalance, reduced aerobic capacity, and death as a result of oil inhalation or ingestion (NOAA, 2016).

C.4.2 Coastal Birds

Threatened and Endangered bird species (Piping Plover and Whooping Crane) have been discussed previously in **Sections C.3.6** and **C.3.7**. The western Gulf of Mexico (in the US EEZ from Texas to Mississippi) is a known wintering area for the Threatened Rufa Red Knot (*Calidris canutus rufa*) (USFWS, nd). Various species of non-endangered birds are also found along the northern Gulf Coast, including diving birds, shorebirds, marsh birds, wading birds, and waterfowl. Gulf Coast marshes and beaches also provide important feeding and nesting habitats. Species that nest on beaches, flats, dunes, bars, barrier islands, and similar coastal and nearshore habitats include the Sandwich Tern (*Thalasseus sandvicensis*), Wilson's Plover (*Charadrius wilsonia*), Black Skimmer (*Rynchops niger*), Forster's Tern (*Sterna forsteri*), Gull-Billed Tern (*Gelochelidon nilotica*), Laughing Gull, Least Tern, and Royal Tern. Additional information is presented by BOEM (2017).

The Eastern Brown Pelican was delisted from federal Endangered status in 2009 (USFWS, 2016b) and was delisted from state species of special concern status by the State of Florida in 2017 (Florida Fish and Wildlife Conservation Commission, 2021) and Louisiana (Louisiana Wildlife and Fisheries, 2020). However, this species remains listed as endangered by the state of Mississippi (Mississippi Natural Heritage Program, 2018). Brown Pelicans inhabit coastal habitats and forage within both coastal waters and waters of the inner continental shelf. Aerial and shipboard surveys, including GulfCet and GulfCet II, indicate that Brown Pelicans do not occur in deep offshore waters (Fritts and Reynolds, 1981; Davis and Fargion, 1996; Davis et al., 2000).

The Bald Eagle was delisted from its Threatened status in the lower 48 states on 28 June 2007, but still receives protection under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940. The Bald Eagle is a terrestrial raptor widely distributed across the southern U.S., including coastal habitats along the Gulf of Mexico. The Gulf Coast is inhabited by both wintering migrant and resident Bald Eagles (Johnsgard, 1990; Ehrlich et al., 1992).

IPFs that potentially may affect shorebirds and coastal nesting birds include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the project area would be unlikely to affect shorebirds or coastal nesting birds, as the project area is 113 statute miles (182 km) from the nearest shoreline. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on shorebirds.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters will transit coastal areas near Port Fourchon and Houma, Louisiana, where shorebirds and coastal nesting birds may be found. These activities could periodically disturb individuals or groups of birds within coastal habitats (e.g., wetlands that may support feeding, resting, or breeding birds).

Vessel traffic may disturb some foraging and resting birds with flushing distances varying among species and among individuals (Rodgers and Schwikert, 2002; Schwemmer et al., 2011; Mendel et al., 2019). The disturbances will be limited to flushing birds away from vessel pathways; known distances are from 20 to 49 m (65 to 160 ft) for personal watercrafts and 23 to 58 m (75 to 190 ft) for outboard-powered boats (Rodgers and Schwikert, 2002). Support vessels will not approach nesting or breeding areas on the shoreline, so disturbances to nesting birds, eggs, and chicks is not expected. Vessel operators are expected to use designated navigation channels and comply with posted speed and wake restrictions while transiting sensitive inland waterways. Due to the limited scope and short duration of drilling activities, any short-term impacts are not expected to be significant to coastal bird populations.

Helicopter traffic can cause some disturbance to birds onshore and offshore. Responses are highly dependent on the type of aircraft, the bird species, the activities that the animals were previously engaged in, and previous exposures to overflights (Efroymson et al., 2003). Helicopters seem to cause the most intense responses over other human disturbances (Bélanger and Bédard, 1989; Rojek et al., 2008; Fuller et al., 2018). The Federal Aviation Administration recommends (Advisory Circular No. 91-36D) that pilots maintain a minimum altitude of 610 m (2,000 ft) when flying over sound -sensitive areas such as parks, forest, primitive areas, wilderness areas, National Seashores, or National Wildlife Refuges, and maintain flight paths to reduce aircraft marine sound in these marine sound-sensitive areas. The 2,000-feet altitude minimum is greater than the distance (slant range) at which aircraft overflights have been reported to cause behavioral effects on most species of birds studied by Efroymson et al. (2000). It is assumed that adherence to these guidelines would reduce potential behavioral disturbances (such as temporary displacement or avoidance behavior) of individual birds in coastal and inshore areas. The potential impacts from helicopter traffic are not expected to be significant to coastal bird populations or species in the project area.

Impacts of Large Oil Spill

The 30-day OSRA results summarized in **Table 3** estimate that shorelines in Texas and Louisiana could be contacted within 30 days (1% to 3% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts that shorelines between Cameron County, Texas, and Miami-Dade County, Florida, have up to a 13% probability of contact within 60 days of a spill.

Coastal birds can be exposed to oil as they float on the water surface, dive during foraging, or wade in oiled coastal waters. Oil interferes with the water repellency of feathers and can cause hypothermia in the right conditions. As birds groom themselves, they can ingest and inhale the oil on their bodies. Scavengers such as Bald Eagles and gulls can be exposed to oil by feeding on carcasses of contaminated fish and wildlife. While ingestion can kill animals immediately, more often it results in lung, liver, and kidney damage, which can lead to death (BOEM, 2017). Bird eggs may be damaged if an oiled adult sits on the nest.

Brown and White Pelicans (*Pelecanus erythrorhynchos*) are especially at risk from direct and indirect impacts from spilled oil within inner shelf and inshore waters, such as embayments. The range of these species is generally limited to these waters and surrounding coastal habitats. Brown Pelicans feed on mid-sized fish that they capture by diving from above ("plunge diving") and then scooping the fish into their expandable gular pouch, while White Pelicans feed from the surface by dipping their beaks in the water. These behaviors make pelicans susceptible to plumage oiling if they feed in areas with surface oil or an oil sheen. They may also capture prey that has been physically contaminated with oil or has ingested oil. Issues for Brown and White Pelicans include direct contact with oil, disturbance by cleanup activities, and long-term habitat contamination (BOEM, 2017).

Coastal fishing birds of prey such as bald eagles, ospreys (*Pandon haliaetus*), etc. may also be at risk from direct and indirect impacts from spilled oil. This species often captures fish within shallow water areas (snatching prey from the surface or wading into shallow areas to capture prey with their bill) and so may be susceptible to plumage oiling and, as with the Brown and White Pelicans, they may also capture prey that has been physically contaminated with oil or has ingested oil (BOEM, 2017). It is expected that impacts to coastal birds from a large oil spill resulting in the death of individual birds would be adverse but not significant at population levels.

C.5 Fisheries Resources

C.5.1 Pelagic Communities and Ichthyoplankton

Biggs and Ressler (2000) reviewed the biology of pelagic communities in the deepwater environment of the northern Gulf of Mexico. The biological oceanography of the region is dominated by the influence of the Loop Current, whose surface waters are among the most oligotrophic in the world's oceans. Superimposed on this low-productivity condition is productive "hot spots" associated with entrainment of nutrient-rich Mississippi River water and mesoscale oceanographic features. Anticyclonic and cyclonic hydrographic features play an important role in determining biogeographic patterns and controlling primary productivity in the northern Gulf of Mexico (Biggs and Ressler, 2000).

Most fishes inhabiting shelf or oceanic waters of the Gulf of Mexico have planktonic eggs and larvae (Ditty, 1986; Ditty et al., 1988; Richards et al., 1989; Richards et al., 1993). A study by Ross et al. (2012) on midwater fauna to characterize vertical distribution of mesopelagic fishes in selected deepwater areas in the Gulf of Mexico substantiated high species richness but general domination by relatively few families and species.

IPFs that potentially may affect pelagic communities and ichthyoplankton include drilling rig/installation vessel presence, marine sound, and lights; effluent discharges; water intake; and two types of accidents (a small fuel spill and a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

The drilling rig and installation vessel, as floating structures in the deepwater environment, will act as fish aggregating devices (FADs). In oceanic waters, the FAD effect would be most pronounced for epipelagic fishes such as tunas, dolphin, billfishes, and jacks, which are commonly attracted to fixed and drifting surface structures (Holland, 1990; Higashi, 1994; Relini et al., 1994). Positive fish associations with offshore rigs and platforms in the Gulf of Mexico are well documented (Gallaway and Lewbel, 1982; Wilson et al., 2003; 2006; Edwards and Sulak, 2006). The FAD effect could possibly enhance the feeding of epipelagic predators by attracting and concentrating smaller fish species. Drilling rig/installation vessel sound could potentially cause masking in fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). The only defined acoustic threshold levels for non-impulsive sound are given by Popper et al. (2014) and apply only to species of fish with swim bladders that provide some hearing (pressure detection) function. Popper et al. (2014) estimated an SPL threshold level of 170 dB re 1 µPa over a 48-hour period for onset of recoverable injury and 158 dB re 1 µPa over a 12-hour period for onset temporary auditory threshold shifts. However, no consistent behavioral thresholds for fish resulting from non-impulsive sound have been established (Hawkins and Popper, 2014) and the current recommended behavioral threshold for fish is SPL of 150 dB re 1 µPa defined by the Fisheries Hydroacoustic Working Group (2008) for impulsive sound sources. Sound may also influence fish behaviors, such as predator-avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010; Bruintjes and Radford, 2013; McLaughlin and Kunc, 2015). Fish aggregation is likely to occur to some degree due to the presence of the drilling rig and installation vessel, but the impacts would be limited in geographic scope and no population level impacts are expected.

Few data exist regarding the impacts of sound on pelagic larvae and eggs. Generally, it is believed that larval fish will have similar hearing sensitivities as adults, but may be more susceptible to barotrauma injuries associated with impulsive sound (Popper et al., 2014). Larval fish were experimentally exposed to simulated impulsive sounds by Bolle et al. (2012). The controlled playbacks produced SEL_{24h} of 206 dB re 1 μPa^2 s but resulted in no increased mortality between the exposure and control groups. Non-impulsive sound sources (such as drilling rig and subsea installation operations) are expected to be far less injurious than impulsive sound. Because of the periodic and transient nature of ichthyoplankton, they are not expected to remain in proximity to the source for a full 24-hour period to receive above-threshold sound, and no impacts to these life stages are expected.

Impacts of Effluent Discharges

Muds and cuttings discharges may have a slight effect on the benthic environment near the wellsite, including a localized increase in water turbidity, the limited blanketing of seafloor sediments, and slightly increased concentrations of hydrocarbons and metals. Treated cuttings are monitored for visible sheen prior to discharge. Contaminants released into the water column will be diluted rapidly within the open ocean environment. Minimal impacts on pelagic communities are anticipated.

Treated sanitary and domestic wastes may have a slight effect on the pelagic environment in the immediate vicinity of these discharges. These wastes may have elevated levels of nutrients, organic matter, and chlorine, but should be diluted rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Deck drainage may have a slight effect on the pelagic environment in the immediate vicinity of these discharges. Deck drainage from contaminated areas will be passed through an oil-and-water separator prior to release, and discharges will be monitored for visible sheen. The discharges may have slightly elevated levels of hydrocarbons but should be diluted rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Other discharges in accordance with the NPDES permit, such as desalination unit brine and uncontaminated cooling water, fire water, and ballast water, are expected to be diluted rapidly and have little or no impact on pelagic communities.

Impacts of Water Intake

Seawater will be drawn from the ocean for once-through, non-contact cooling of machinery on the drilling rig. The intake of seawater for cooling water will entrain plankton though per the NPDES permit GMG290000 the linear velocities should be less than 5 ft second^{-1}. The low intake velocity should allow most strong-swimming juvenile fishes and smaller adults to escape entrainment or impingement (Electric Power Research Institute, 2000). However, drifting plankton would not be able to escape entrainment with the exception of a few fast-swimming larvae of certain taxonomic groups. Those organisms entrained may be stressed or killed (Cada, 1990; Mayhew et al., 2000), primarily through changes in water temperature during the route from cooling intake structure to discharge structure and mechanical damage (turbulence in pumps and condensers). The cooling water systems and operating procedures are designed such that a maximum return temperature of the seawater being discharged back into the ocean does not exceed 120°F; thus, minimizing the chance that plankton will be stressed/killed. Due to the limited scope and short duration of drilling activities, any short-term impacts of entrainment are not expected to be significant to plankton or ichthyoplankton populations (BOEM, 2017). The drilling rig ultimately chosen for this project is expected to be in compliance with all cooling water intake requirements including NPDES permit GMG290000.

Impacts of a Small Fuel Spill

Potential spill impacts on fisheries resources are discussed by BOEM (2017). For this EP, there are no unique site-specific issues with respect to spill impacts.

The probability of a fuel spill is expected to be minimized by Chevron’s preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of Chevron’s OSRP is expected to mitigate the potential for impacts on pelagic communities, including ichthyoplankton. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area, the duration of a small spill will be brief and the potential for impacts to occur would be minimal.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would dissipate naturally within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

A small fuel spill could have localized impacts on phytoplankton, zooplankton, and nekton. Determining the impact of a diesel spill on phytoplankton is a complex issue as some phytoplankton species are more tolerant of oil exposure than others (Ozhan et al., 2014). Phytoplankton populations can change quickly on small temporal and spatial scales, making it difficult to predict how a phytoplankton community as a whole will respond to an oil spill. Due to the limited areal extent and short duration of water quality impacts, a small fuel spill would be unlikely to produce detectable impacts on pelagic communities and ichthyoplankton.

Impacts of a Large Oil Spill

Potential spill impacts on pelagic communities and ichthyoplankton are discussed by BOEM (2017). A large oil spill could affect water column biota including phytoplankton, zooplankton, ichthyoplankton, and nekton. A large spill that persisted for weeks or months would be more likely to affect these communities. While adult and juvenile fishes may actively avoid a large spill, planktonic eggs and larvae would be unable to avoid contact. Eggs and larvae of fishes are especially vulnerable to oiling because they inhabit the upper layers of the water column, and they will die if exposed to certain toxic fractions of spilled oil. Impacts potentially would be greater if local-scale currents retained planktonic larval assemblages (and the floating oil slick) within the same water mass. Impacts to ichthyoplankton from a large spill would be greatest during spring and summer when shelf concentrations peak (BOEM, 2016b).

Oil spill impacts to phytoplankton include changes in community structure and increases in biomass, which have been attributed to the effects of oil contamination and of decreased predation due to zooplankton mortality (Abbriano et al., 2011; Ozhan et al., 2014). Ozhan et al. (2014) reported that the formation of oil films on the water surface can limit gas exchange through the air-sea interface and can reduce light penetration into the water column which will limit phytoplankton photosynthesis.

Mortality of zooplankton has been shown to be positively correlated with oil concentrations (Lennuk et al., 2015). Spills that are not immediately lethal can have short- or long-term impacts on biomass and community composition, behavior, reproduction, feeding, growth and development, immune response and respiration (Harvell et al., 1999; Wootton et al., 2003; Auffret et al., 2004; Hannam et al., 2010; Bellas et al., 2013; Blackburn et al., 2014). Zooplankton are especially vulnerable to acute oil pollution, showing increased mortality and sublethal changes in physiological activities (e.g., egg production; Moore and Dwyer, 1974; Linden, 1976; Lee et al., 1978; Suchanek, 1993). Bioaccumulation of hydrocarbons can lead to additional impacts among those higher trophic level consumers that rely on zooplankton as a food source (Almeda et al., 2013; Blackburn et al., 2014).

Planktonic communities have a high capacity for recovery from the effects of oil spill pollution due to their short life cycle and high reproductive capacity (Abbriano et al., 2011). Planktonic communities drift with water currents and recolonize from adjacent areas. Because of these attributes, plankton usually recover relatively rapidly to normal population levels following hydrocarbon spill events. Research in the aftermath of the *Deepwater Horizon* incident found that phytoplankton population recovered within weeks to months and zooplankton populations may have only been minimally affected (Abbriano et al., 2011).

C.5.2 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Under the Magnuson-Stevens Fishery Conservation and Management Act, as amended, federal agencies are required to consult on activities that may adversely affect EFH designated in Fishery Management Plans developed by the regional Fishery Management Councils.

The Gulf of Mexico Fishery Management Council (GMFMC) has prepared Fishery Management Plans for corals and coral reefs, shrimps, spiny lobster (*Panulirus argus*), reef fishes, coastal migratory pelagic fishes, and red drum (*Sciaenops ocellatus*). In 2005, the EFH for these managed species was redefined in Generic Amendment No. 3 to the various Fishery Management Plans (GMFMC, 2005). The EFH for most of these GMFMC-managed species is on the continental shelf in waters shallower than 183 m (600 ft). The shelf edge is the outer boundary for coastal migratory pelagic fishes, reef fishes, and shrimps. EFH for corals and coral reefs includes some shelf-edge topographic features on the Texas-Louisiana OCS located approximately 47 statute miles (76 km) from the project area (**Figure 3**).

Highly migratory pelagic fishes, which occur as transients in the project area, are the only remaining group for which EFH has been identified in the deepwater Gulf of Mexico. Species in this group, including tunas, swordfishes, billfishes, and sharks, are managed by NMFS. **Table 7** lists the highly migratory fish species and their life stages with EFH at or near the project area.

Research indicates the central and western Gulf of Mexico may be important spawning habitat for Atlantic bluefin tuna (*Thunnus thynnus*), and (NMFS, 2009c) has designated a Habitat Area of Particular Concern (HAPC) for this species. The HAPC covers much of the deepwater Gulf of Mexico, including the project area (**Figure 3**). The areal extent of the HAPC is approximately 300,000 km^2 (115,831 mi^2). Atlantic bluefin tuna follow an annual cycle of foraging in June through March off the eastern U.S. and Canadian coasts, followed by migration to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009c). The Atlantic bluefin tuna has also been designated as a species of concern (NMFS, 2011). An amendment to the original EFH Generic Amendment was finalized in 2005 (GMFMC, 2005). One of the most significant proposed changes in this amendment reduced the extent of EFH relative to the 1998 Generic Amendment by removing the EFH description and identification from waters between 100 fathoms and the seaward limit of the Exclusive Economic Zone (EEZ). The Highly Migratory Species Fisheries Management Plan was amended in 2009 to update EFH and HAPC to include the bluefin tuna spawning area (NMFS, 2009c).

Table 7. Migratory fish species with designated Essential Fish Habitat (EFH) at or near Green Canyon Block 596 and 641, including life stage(s) potentially present within the project area.

Common Name	Scientific Name	Life Stage(s) Potentially Present Within or Near the Project Area
Bigeye Thresher Shark	*Alopias superciliosus*	All
Bluefin tuna	*Thunnus thynnus*	Adults, Spawning, Eggs, Larvae
Bigeye tuna	*Thunnus obesus*	Adults, juveniles
Bigeye thresher shark	*Alopias superciliosus*	All
Blue marlin	*Makaira nigricans*	Juveniles, adults
Longbill spearfish	*Tetrapturus pfluegeri*	Juveniles, adults
Longfin mako shark	*Isurus paucus*	All
Oceanic whitetip shark	*Carcharhinus longimanus*	All
Sailfish	*Istiophorus spp.*	Adult
Shortfin Mako Shark	*Isurus oxyrinchus*	All
Silky shark	*Carcharhinus falciformis*	All
Skipjack tuna	*Katsuwonus pelamis*	Spawning, adults
Swordfish	*Xiphias gladius*	Larvae, juveniles, adults
Tiger Shark	*Galeocerdo cuvier*	Adult
Whale shark	*Rhincodon typus*	All
White marlin	*Tetrapturus albidus*	Adults
Yellowfin tuna	*Thunnus albacares*	Spawning, juveniles, adults

NTLs 2009-G39 and 2009-G40 provide guidance and clarification of the regulations (i.e., 50 CFR 600 Subpart J) with respect to biologically sensitive underwater features and areas and benthic communities that are considered EFH. As part of an agreement between BOEM and NMFS to complete a new programmatic EFH consultation for each new Five-Year Program, an EFH consultation was initiated between BOEM's Gulf of Mexico Region and NOAA's Southeastern Region during the preparation, distribution, and review of BOEM's 2024-2029 National OCS oil and gas leasing program Final Programmatic EIS (BOEM, 2023a).

Other HAPCs to protect corals and coral reefs have been identified by the GMFMC (2005). These include the Florida Middle Grounds, Madison-Swanson Marine Reserve, Tortugas North and South Ecological Reserves, Pulley Ridge, and several individual reefs and banks of the northwestern Gulf of Mexico. Jakkula Bank is the HAPC located nearest to the project area (approximately 62 statute miles [100 km]).

IPFs that potentially may affect EFH include drilling rig/installation vessel presence, marine sound, and lights; effluent discharges; water intake; and two types of accidents (a small fuel spill and a large oil spill).

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

The drilling rig and installation vessel, as a floating structures in the deepwater environment, will act as FADs with most pronounced effects on epipelagic fishes that include species with EFH designation (Holland, 1990; Higashi, 1994; Relini et al., 1994; Gates et al., 2017). The FAD effect would likely attract and concentrate smaller fish species and thus enhance feeding of epipelagic predators.

Drilling rig and installation vessel sound could potentially cause acoustic masking for fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). Sound may also influence fish behaviors such as predator avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010; Bruintjes and Radford, 2013; McLaughlin and Kunc, 2015). The only defined acoustic threshold levels for non-impulsive sound are given by Popper et al. (2014) and apply only to species of fish with swim bladders, including some species with EFH designation, that provide some hearing (pressure detection) function. Popper et al. (2014) recommended SPL threshold levels of 170 dB re 1 µPa over a 48-hour period for onset of recoverable injury and an SPL threshold of 158 dB re 1 µPa over a 12-hour period for onset temporary auditory threshold shifts. No consistent behavioral thresholds for fish resulting from non-impulsive sound have been established (Hawkins and Popper, 2014) and the current recommended behavioral threshold for fish is SPL of 150 dB re 1 µPa defined by the Fisheries Hydroacoustic Working Group (2008) for impulsive sound sources. Because the drilling rig and installation vessel are temporary structures, any impacts on EFH for managed species are considered negligible.

Impacts of Effluent Discharges

Other effluent discharges affecting EFH by diminishing ambient water quality include drilling muds and cuttings, treated sanitary and domestic wastes, deck drainage, and miscellaneous discharges such as desalination unit brine and uncontaminated cooling water, fire water, and ballast water. Impacts on water quality have been discussed previously. No detectable impacts on EFH for managed species are expected from these discharges.

Impacts of Water Intake

As noted previously, cooling water intake will cause entrainment and impingement of plankton, including fish eggs and larvae (ichthyoplankton). Due to the limited scope and short duration of drilling activities, any short-term impacts on EFH for highly migratory pelagic fishes are not expected to be biologically significant. The multisale EIS (BOEM, 2017) discusses cooling water discharge. Water with an elevated temperature may accumulate around the discharge pipe. However, the warmer water should be diluted rapidly to ambient temperature levels within 100 m (328 ft) of the discharge pipe. Any impacts to pelagic species would be localized and brief (BOEM, 2014a).

Impacts of a Small Fuel Spill

Potential spill impacts on EFH are discussed by BOEM (2017). For this EP, there are no unique site-specific issues with respect to spill impacts.

The probability of a fuel spill is expected to be minimized by Chevron's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of Chevron's EP is expected to help diminish the potential for impacts on EFH. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area, the duration of a small spill would be brief and the potential for impacts to EFH minimal.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be dissipated naturally within 24 hours (NOAA, 2022). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

A small fuel spill could have localized impacts on EFH for highly migratory pelagic fishes, including tunas, swordfishes, billfishes, and sharks. These species occur as transients in the project area. A spill would produce short-term impact on water quality in the HAPC for spawning bluefin tuna, which covers much of the deepwater Gulf of Mexico. The areal extent of impact from a small fuel spill would represent a negligible portion of the HAPC.

A small fuel spill would not likely affect EFH for corals and coral reefs, the nearest EFH being the topographic features located approximately 47 statute miles (76 km) from the project area. A small fuel spill would float and dissipate on the sea surface and would not contact these features.

Impacts of a Large Oil Spill

Potential spill impacts on EFH are discussed by BOEM (2017; 2023). For this EP, there are no unique site-specific issues with respect to EFH.

An oil spill in offshore waters would temporarily increase hydrocarbon concentrations on the water surface and potentially in the subsurface as well. Given the extent of EFH designations in the Gulf of Mexico (Gulf of Mexico Fishery Management Council, 2005; NMFS, 2009c), some impact from a large oil spill on EFH would be unavoidable.

A large spill could affect EFH for many managed species including shrimps, stone crab, spiny lobster, reef fishes, coastal migratory pelagic fishes, and red drum. It would result in adverse impacts on water quality and consequentially on water column biota including phytoplankton, zooplankton, and nekton. In coastal waters, sediments could be contaminated and result in persistent degradation of the seafloor habitat for managed demersal fish and shellfish species.

The project area is within the HAPC for spawning Atlantic bluefin tuna (NMFS, 2009c). A large spill could temporarily degrade the HAPC due to increased hydrocarbon concentrations in the water column, with the potential for lethal or sublethal impacts on spawning tuna. Potential impacts would depend in part on the timing of a spill, as this species migrates to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009c).

The topographic features located 4 statute miles (100 km) from the project area are designated as EFH under the corals and coral reefs management plan (GMFMC, 2005). An accidental spill would be unlikely to affect these features, since an oil spill plume or surface slick would be unlikely to reach them due to their shallower depth relative to the project area.

C.6 Archaeological Resources

C.6.1 Shipwreck Sites

The archeological assessment identified no archaeologically significant artifacts or shipwrecks within 610 m (2,000 ft) of the proposed wellsites based on an autonomous underwater vehicle survey (GEMS, 2024a,b). Chevron and its contractors will abide by the applicable requirements of NTL 2005-G07 and 30 CFR § 550.194I, which stipulate that work be stopped at the project site if any previously undetected archaeological resource is discovered after work has begun until appropriate surveys and evaluations have been completed.

Because there are no shipwreck sites within 610 m (2,000 ft) of the proposed wellsites, there are no routine IPFs that are likely to affect shipwrecks. The only IPF of relevance to shipwrecks is a large oil spill as listed in **Table 2** are discussed below. A small fuel spill would not affect shipwrecks because the fuel would float and dissipate on the sea surface.

Impacts of a Large Oil Spill

The 2017-2023 EIS (BOEM, 2017) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 300-meter (984-feet) radius. Because there are no historic shipwrecks within a 300-meter radius of the proposed wellsite, this impact would not be relevant. Should there be any indication that potential shipwreck sites could be affected, in accordance with NTL 2005-G07, Chevron will immediately halt drilling or other project operations, take steps to ensure that the site is not disturbed in any way, and contact the BOEM Regional Supervisor, Leasing and Environment, within 48 hours of its discovery. Following shipwreck discovery, all operations within 305 m (1,000 ft) of the site would cease until the Regional Supervisor provides instructions on steps to take to protect the site and assess the potential historic significance.

Beyond this 300-meter (984-feet) radius, there is the potential for impacts from oil, dispersants, and depleted oxygen levels. These impacts could include chemical contamination, alteration of the rates of microbial activity (BOEM, 2017), and reduced biodiversity at shipwreck-associated sediment microbiomes (Hamdan et al., 2018). During the *Deepwater Horizon* incident, subsurface plumes were reported at a water depth of about 1,100 m (3,600 ft), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). While the behavior and impacts of subsurface plumes are not well known, a subsurface plume could have the potential to contact shipwreck sites beyond the 300-meter (984-feet) radius estimated by BOEM (2012a), depending on its extent, trajectory, and persistence.

A spill entering shallow coastal waters could conceivably contaminate an undiscovered or known coastal shipwreck site. BOEM (2012a) stated that if an oil spill contacted a coastal historic site, such as a fort or a lighthouse, the major impact would be a visual impact from oil contact and contamination of the site and its environment.

C.6.2 Prehistoric Archaeological Sites

With a water depth at the location of the proposed wellsites of approximately 1,213 to 1,223 m (3,980 to 4,012 ft), the proposed project area is well beyond the 60-meter (197-feet) depth contour used by BOEM as the seaward extent for potential prehistoric archaeological sites in the Gulf of Mexico. Because prehistoric archaeological sites are not found in the project area, the only relevant IPF is a large oil spill. A small fuel spill would not affect prehistoric archaeological resources because the oil would float and dissipate on the sea surface.

Impacts of a Large Oil Spill

Because prehistoric archaeological sites are not found in the project area, they would not be affected by the physical effects of a subsea blowout. BOEM (2012a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 300-meter (984-feet) radius.

Along the northern Gulf Coast, prehistoric sites exist along the barrier islands and mainland coast and along the margins of bays and bayous (BOEM, 2017). The 30-day OSRA results summarized in **Table 3** estimate that shorelines in Texas and Louisiana could be contacted within 30 days (1% to 3% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts that shorelines between Cameron County, Texas, and Miami-Dade County, Florida, have up to a 13% probability of contact within 60 days of a spill.

If a spill did reach a prehistoric site along these shorelines, it could coat fragile artifacts or site features and compromise the potential for radiocarbon dating of organic materials (other dating methods are available, and it is possible to decontaminate an oiled sample for radiocarbon dating). Coastal prehistoric sites could also be damaged by spill cleanup operations (e.g., by destroying fragile artifacts and disturbing the provenance of artifacts and site features).

C.7 Coastal Habitats and Protected Areas

Coastal habitats in the northeastern Gulf of Mexico that may be affected by oil and gas activities are described by BOEM (2017) and by Mendelssohn et al (2017). Coastal habitats inshore of the project area include barrier beaches and dunes, wetlands, oyster reefs, and submerged seagrass beds. Generally, most of the northeastern Gulf is fringed by barrier beaches, with wetlands, oyster reefs and/or submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries.

Due to the distance from shore, the only IPF associated with routine activities in the project area that potentially may affect beaches and dunes, wetlands, oyster reefs, seagrass beds, coastal wildlife refuges, wilderness areas, or any other managed or protected coastal area is support vessel traffic from support bases at Port Fourchon and Houma, Louisiana that are not in wildlife refuges or wilderness areas. Potential impacts of support vessel traffic are addressed briefly below.

The only other IPF of relevance for coastal habitats and protected areas is an accidental large oil spill. A small fuel spill in the project area would not affect coastal habitats, as the project area is 113 statute miles (182 km) from the nearest shoreline (Louisiana). As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Support Vessel Traffic

Support operations, including crew boats and supply boats as detailed in EP Section 13, may have a minor incremental impact on barrier beaches and dunes, wetlands, oyster reefs and protected areas. Over time, with a large number of vessel trips, vessel wakes can erode shorelines along inlets, channels, and harbors, resulting in localized land loss. Impacts to barrier beaches and dunes, wetlands, oyster reefs and protected areas will be minimized by following the speed and wake restrictions in harbors and channels.

Support operations, including crew boats and supply boats are not anticipated to have a significant impact on submerged seagrass beds. While submerged seagrass beds could be uprooted, scarred, or lost due to direct contact from vessels, use of navigation channels and adherence to local requirements and implemented programs will decrease the likelihood of impacts to these resources (BOEM, 2017).

Impacts of a Large Oil Spill

Potential spill impacts on coastal habitats are discussed by BOEM (2017; 2023a,b). Coastal habitats inshore of the project area include barrier beaches and dunes, wetlands, oyster reefs and submerged seagrass beds. For this EP, there are no unique site-specific issues with respect to coastal habitats.

The 30-day OSRA results summarized in **Table 3** estimate that shorelines in Texas and Louisiana could be contacted within 30 days of a spill (1% to 3% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts that shorelines between Cameron County, Texas, and Miami-Dade County, Florida, have up to a 13% probability of contact within 60 days of a spill.

NWRs and other protected areas along the coast are discussed in BOEM (2017) and Chevron's OSRP. Coastal and near-coastal wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts based on the 30-day OSRA model (**Table 3**) are presented in **Table 8**. The level of impacts from oil spills on coastal habitats depends on many factors, including the oil characteristics, the geographic location of the landfall, and the weather and oceanographic conditions at the time of the spill (BOEM, 2017).

Table 8. Wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts after 30 days of a hypothetical spill from Launch Area 46 based on the 30-day OSRA model.

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Matagorda, Texas	Big Boggy National Wildlife Refuge
	Matagorda Bay Nature Park
	San Bernard National Wildlife Refuge
	West Moring Dock Park
Brazoria, Texas	Brazoria National Wildlife Refuge
	Christmas Bay Coastal Preserve
	Justin Hurst Wildlife Management Area
	San Bernard National Wildlife Refuge
Galveston, Texas	Anahuac National Wildlife Refuge South unit
	Bolivar Flats Shorebird Sanctuary
	Fort Travis Seashore Park
	Galveston Island State Park
	Horseshoe Marsh Bird Sanctuary
	Mundy Marsh Bird Sanctuary
	R.A. Apffel Park
	Seawolf Park
Jefferson, Texas	McFaddin National Wildlife Refuge
	Sea Rim State Park
	Texas Point National Wildlife Refuge
Cameron, Louisiana	Lacassine National Wildlife Refuge
	Sabine National Wildlife Refuge
	Rockefeller State Wildlife Refuge and Game Preserve
	Peveto Woods Sanctuary

Table 8. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Vermilion, Louisiana	Paul J. Rainey Wildlife Refuge and Game Preserve
	Rockefeller State Wildlife Refuge and Game Preserve
	State Wildlife Refuge
Terrebonne, Louisiana	Isles Dernieres Barrier Islands Refuge
	Pointe aux Chenes Wildlife Management Area
Lafourche, Louisiana	Pointe-aux-Chenes Wildlife Management Area
	Wisner State Wildlife Management Area (Includes Picciola Tract)
Plaquemines, Louisiana	Breton National Wildlife Refuge
	Delta National Wildlife Refuge
	Pass-a-Loutre Wildlife Management Area

Coastal wetlands are highly sensitive to oiling and can be significantly affected because of the inherent toxicity of hydrocarbon and non-hydrocarbon components of the spilled substances (Beazley et al., 2012; Lin and Mendelssohn, 2012; Mendelssohn et al., 2012). Numerous variables such as oil concentration and chemical composition, vegetation type and density, season or weather, preexisting stress levels, soil types, and water levels may influence the impacts of oil exposure on wetlands. Impacts to slightly oiled vegetation are considered short term and reversible as recent studies suggest that they will experience plant die-back, followed by recovery without replanting (BOEM, 2012a). Vegetation exposed to oil that persists in wetlands could take years to recover (BOEM, 2017). Vegetation coated with oil experiences the highest mortality rates due to decreased photosynthesis (BOEM, 2012a). A review of the literature and new studies indicated that oil spill impacts to seagrass beds are often limited and may be limited to when oil is in direct contact with these plants (Fonseca et al., 2017). Entrained oil within the sediments of a submerged vegetation area may pose the risk of periodic re-releases of oil in the area, causing potential secondary impacts to the localized area (BOEM, 2023). In addition to the direct impacts of oil, cleanup activities in marshes may accelerate rates of erosion and retard recovery rates (BOEM, 2017). Impacts associated with an extensive oiling of coastal wetland habitat from a large oil spill are expected to be significant.

C.8 Socioeconomic and Other Resources

C.8.1 Recreational and Commercial Fishing

Potential impacts to recreational and commercial fishing were assessed by BOEM (2017). The main commercial fishing activity in deep waters of the northern Gulf of Mexico is pelagic longlining for tunas, swordfishes, and other billfishes (Continental Shelf Associates, 2002; Beerkircher et al., 2009). Pelagic longlining has occurred historically in the project area, primarily during spring and summer seasons. In August 2000, the federal government closed two areas, outside the project area, in the northeastern Gulf of Mexico to longline fishing (65 FR 47214).

Longline gear consists of monofilament line deployed from a moving vessel and generally allowed to drift for 4 to 5 hours (Continental Shelf Associates, 2002). As the mainline is put out, baited leaders and buoys are clipped in place at regular intervals. It takes 8 to 10 hours to deploy a longline and about the same time to retrieve it. Longlines are often set near oceanographic features such as fronts or downwellings, with the aid of sophisticated on-board temperature sensors, depth finders, and positioning equipment. Vessels typically are 10 to 30 m (33 to 98 ft) long, and their fishing trips last from about 1 to 3 weeks.

It is unlikely that any commercial fishing activity other than longlining occurs at or near the project area. Benthic species targeted by commercial fishers occur predominantly on the upper continental slope, well inshore of the project area. Royal red shrimp (*Pleoticus robustus*) are caught by trawlers in water depths of about 250 to 550 m (820 to 1,804 ft) (Stiles et al., 2007). Tilefishes (primarily *Lopholatilus chamaeleonticeps*) are caught by bottom longlining in water depths from about 165 to 450 m (540 to 1,476 ft) (Continental Shelf Associates, 2002).

Most recreational fishing activity in the region occurs in water depths less than 200 m (656 ft) (Continental Shelf Associates, 1997; 2002; Keithly and Roberts, 2017). In deeper water, the main attraction to recreational fishers would be petroleum platforms offshore Texas and Louisiana. Due to the distance from shore, it is unlikely that recreational fishing activity is occurring in the project area.

The only IPFs associated with routine operations that potentially may affect fishing is drilling rig/installation vessel presence which may present an entanglement risk for pelagic longlining. Two types of potential accidents (a small fuel spill and a large oil spill) are the other IPFs of relevance. These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig/Installation Vessel Presence, Marine Sound, and Lights

There is a slight possibility of pelagic longlines drifting into and becoming entangled in the drilling rig or installation vessel. For example, in January 1999, a portion of a pelagic longline snagged on the acoustic Doppler current profiler of a drillship working in the Gulf of Mexico (Continental Shelf Associates, 2002) and the line was removed without incident. Generally, longline fishers use radar and are aware of offshore structures and ships when placing their sets. Therefore, little or no impact on pelagic longlining is expected.

Because it is unlikely that any recreational fishing activity is occurring in the project area, no adverse impacts are anticipated. Other rig-related factors such as marine sound and lights are not relevant IPFs to commercial or recreational fishing.

Impacts of a Small Fuel Spill

The probability of a fuel spill is expected to be minimized by Chevron's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to potentially mitigate and reduce the potential for impacts. EP Appendix G provides detail on spill response measures. Given the open ocean location of the project area, the duration of a small spill would be brief and opportunity for impacts to fishing activities would be minimal.

Pelagic longlining activities in the project area, if any, could be interrupted in the event of a small fuel spill. The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions (see **Section A.9.1**). Fishing activities could be interrupted due to the activities of response vessels operating in the project area. A small fuel spill would not affect coastal water quality because the spill would not be expected to make landfall or reach coastal waters prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Potential spill impacts on fishing activities are discussed by BOEM (2017; 2023a,b). For this EP, there are no unique site-specific issues with respect to this activity.

Pelagic longlining activities in the project area and other fishing activities in the northern Gulf of Mexico could be interrupted in the event of a large oil spill. A spill may or may not result in fishery closures, depending on the duration of the spill, the oceanographic and meteorological conditions at the time of the spill, and the effectiveness of spill response measures. The *Deepwater Horizon* incident provides information about the maximum potential extent of fishery closures in the event of a large oil spill in the Gulf of Mexico (NMFS, 2010a). At its peak on 12 July 2010, closures encompassed 217,821 km^2 (84,101 mi^2), or 34.8% of the U.S. Gulf of Mexico EEZ.

According to BOEM (2012a; 2017), the potential impacts on commercial and recreational fishing activities from an accidental oil spill are anticipated to be minimal because the potential for oil spills is very low, the most typical events are small and of short duration, and the effects are so localized that fishers are typically able to avoid the affected area. Fish populations may be affected by an oil spill event should it occur, but they would be primarily affected if the oil reaches the productive shelf and estuarine areas where many fishes spend a portion of their life cycle (BOEM, 2012a). The probability of an offshore spill affecting these nearshore environments is also low. Should a large oil spill occur, economic impacts on commercial and recreational fishing activities would likely occur, but are difficult to predict because impacts would differ by fishery and season (BOEM, 2016b).

C.8.2 Public Health and Safety

There are no IPFs associated with routine operations that are expected to affect public health and safety. A small fuel spill would be unlikely to cause any impacts on public health and safety because it would affect only a small area of the open ocean 113 statute miles (182 km) from the nearest shoreline, and nearly all of the diesel fuel would evaporate or disperse naturally within 24 hours (see **Section A.9.1**). Impacts of a large oil spill are addressed below.

Impacts of a Large Oil Spill

In the event of a large spill from a blowout, the main safety and health concerns are those of the offshore personnel involved in the incident and those responding to the spill. Once released into the water column, crude oil weathers rapidly (National Research Council, 2003a). Depending on many factors such as spill rate and duration, the physical/chemical characteristics of the oil, meteorological, and oceanographic conditions at the time, and the effectiveness of spill response measures, weathered oil may remain present on the sea surface and reach coastal shorelines.

Based on data collected during the *Deepwater Horizon* incident, the health risks resulting from a large oil spill appear to be minimal (Centers for Disease Control and Prevention, 2010). Health risks for spill responders and wildlife rehabilitation workers responding to a major oil spill are similar to the health risks incurred by response personnel during any large-scale emergency or disaster response (U.S. Department of Homeland Security, 2014), which includes the following:

- Possible accidents associated with response equipment;
- Hand, shoulder, or back pain, along with scrapes and cuts;

- Itchy or red skin or rashes due to potential chemical exposure;
- Heat or cold stress depending upon the working environment; and
- Possible upper respiratory symptoms due to potential dust inhalation, allergies, or potential chemical exposure.

Krishnamurthy et al. (2019) identified that exposure to both crude oil and oil dispersant among USCG spill responders during the *Deepwater Horizon* incident was more strongly associated with the suite of acute neurological symptoms that were evaluated than was exposure to oil alone. Those acute neurological symptoms noted in 1% to 3% of responders surveyed included headaches, lightheadedness/dizziness, difficulty concentrating, numbness/tingling sensation, blurred/double vision, and memory loss/confusion. Krishnamurthy et al. (2019) did conduct sensitivity analyses to exclude responders in the highest environmental heat categories and responders with relevant pre-existing conditions due to the symptoms being similar to heat stress.

McGowan et al. (2017) found approximately 1% of responders surveyed were still experiencing symptoms of coughing, wheezing, tightness in chest, shortness of breath, burning in nose, throat, and lungs, burning eyes, itching eyes, and skin irritation within 30 days of the 2011 to 2013 study (1 to 3 years after the oil spill cleanup response).

C.8.3 Employment and Infrastructure

There are no IPFs associated with routine operations that are expected to affect employment and infrastructure. The project involves drilling with support from existing shorebase facilities in Louisiana. No new or expanded facilities will be constructed, and no new employees are expected to move permanently into the area. The project will have a negligible impact on socioeconomic conditions such as local employment, existing offshore and coastal infrastructure (including major sources of supplies, services, energy, and water), and minority and lower income groups. A small fuel spill that dissipates within a few days would have little or no economic impact as the spill response would use existing facilities, resources, and personnel. Impacts of a large oil spill are addressed below.

Impacts of a Large Oil Spill

Potential socioeconomic impacts of an oil spill are discussed by BOEM (2017). For this EP, there are no unique site-specific issues with respect to employment and coastal infrastructure. A large spill could cause economic impacts in several ways: it could result in extensive fishery closures that put fishermen out of work; it could result in temporary employment as part of the response effort (including the establishment of spill response staging areas); it could result in adverse publicity that affects employment in coastal recreation and tourism industries; and it could result in suspension of OCS drilling activities, including service and support operations that are an important part of local economies.

Non-market effects such as traffic congestion, strains on public services, shortages of commodities or services, and disruptions to the normal patterns of activities or expectations could also occur in the short-term. These negative, short-term social and economic consequences of a spill are expected to be modest in terms of projected cleanup expenditures and the number of people employed in cleanup and remediation activities (BOEM, 2017). Net employment impacts from a spill would not be expected to exceed 1% of baseline employment in any given year (BOEM, 2017).

C.8.4 Recreation and Tourism

There are no known recreational uses of the project area. Recreational resources and tourism in coastal areas would not be affected by any routine activities due to the distance from shore. Compliance with NTL BSEE-2015-G03 is intended to minimize the chance of trash or debris being lost overboard from the drilling rig/installation vessel and subsequently washing up on beaches. A small fuel spill in the project area would be unlikely to affect recreation and tourism because, as explained in **Section A.9.1**, it would not be expected to make landfall or reach coastal waters prior to dispersing naturally.

Impacts of a Large Oil Spill

Potential impacts of an oil spill on recreation and tourism are discussed by BOEM (2017; 2023). For this EP, there are no unique site-specific issues with respect to these impacts.

Impacts on recreation and tourism would vary depending on the duration of the spill and its fate, including the effectiveness of response measures. A large spill that reached coastal waters and shorelines could adversely affect recreation and tourism by contaminating beaches and wetlands, resulting in negative publicity that encourages people to stay away. The 30-day OSRA results summarized in **Table 3** estimate that shorelines in Texas and Louisiana could be contacted within 30 days (1% to 3% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts that shorelines between Cameron County, Texas, and Miami-Dade County, Florida, have up to a 13% probability of contact within 60 days of a large spill.

According to BOEM (2017), should an oil spill occur and contact a beach area or other recreational resource, it could cause some disruption during the impact and cleanup phases of the spill. In the unlikely event that a spill occurs that is sufficiently large to affect large areas of the coast and, through public perception, have effects that reach beyond the damaged area, effects to recreation and tourism could be significant (BOEM, 2012a).

C.8.5 Land Use

Land use along the northern Gulf coast is discussed by BOEM (2017; 2023a,b). There are no routine IPFs that potentially may affect land use. The project will use existing onshore support facilities in Louisiana where land use is industrial. The project will not involve any new construction or changes to existing land use and, therefore, will not have any impacts. Levels of boat and helicopter traffic as well as demand for goods and services including scarce coastal resources, will represent a small fraction of the level of activity occurring at the shorebases.

A large oil spill is the only relevant IPF. A small fuel spill should not have any impacts on land use, as the response would be staged out of existing shorebases and facilities.

Impacts of a Large Oil Spill

The initial response for a large oil spill would be staged out of existing facilities, with no expected effects on land use. A large spill could have limited temporary impacts on land use along the coast if additional staging areas were needed. For example, during the *Deepwater Horizon* incident, temporary staging areas were established in Louisiana, Mississippi, Alabama, and Florida for spill response and cleanup efforts. In the event of a large spill in the project area, similar temporary staging areas could be needed. These areas would eventually return to their original use as the response is demobilized. It is not expected that a large oil spill and subsequent cleanup would substantially reduce available space in nearby landfills or decrease their usable life (BOEM, 2014a).

An accidental oil spill is not likely to significantly affect land use and coastal infrastructure in the region, in part because an offshore spill would have a small probability of contacting onshore resources. BOEM (2016b) states that landfill capacity would probably not be an issue at any phase of an oil spill event or the long-term recovery. In the case of the *Deepwater Horizon* incident and response, the USEPA reported that existing landfills receiving oil spill waste had plenty of capacity to handle waste volumes; the wastes that were disposed of in landfills represented less than 7% of the total daily waste normally accepted at these landfills (USEPA, 2016).

C.8.6 Other Marine Uses

The project area is not located within any USCG-designated fairway, shipping lane. The project area is located within Military Warning Area. Shell will comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft. Chevron intends to comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft. The site clearance letter for the proposed wellsites identified numerous existing wellsites and associated subsea infrastructure in the vicinity of the project area (GEMS, 2024a,b).

There are no IPFs from routine project activities that are likely to affect other marine uses of the project area. A large oil spill is the only relevant IPF. A small fuel spill would not have any impacts on other marine uses because spill response activities would be mainly within the project area and the duration would be brief.

Impacts of a Large Oil Spill

A large accidental spill would be unlikely to significantly affect shipping or other marine uses. The project area is not located within any USCG-designated fairway, shipping lane, or Military Warning Area. In the event of a large spill requiring numerous response vessels, coordination would be required to manage the vessel traffic for safe operations. Chevron and its contractor intend to comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft.

C.9 Cumulative Impacts[3]

Prior Studies. BOEM prepared a multi-lease sale EIS in which it analyzed the environmental impact of activities that might occur in the multi-lease sale area. The level and types of activities planned in Chevron's EP are within the range of activities described and evaluated by BOEM in the 2024 to 2029 Programmatic Environmental Impact Statement for the OCS Oil and Gas Leasing Program (BOEM, 2023a) and the 2017 to 2022 Programmatic Environmental Impact Statement for the OCS Oil and Gas Leasing Program (BOEM, 2016a), and the Final Programmatic EIS for Gulf of Mexico OCS Oil and Gas Lease Sales 2017-2022 (BOEM, 2017). Past, present, and reasonably foreseeable activities were identified in these documents, which are incorporated by reference. The proposed action should not result in any additional impacts beyond those

[3] On May 20, 2022, the National Environmental Policy Act (NEPA) original requirements came into effect and were reinstated by the Council on Environmental Quality (CEQ), which is responsible for Federal agency implementation of NEPA.

evaluated in the multi-lease sale and Final EISs (BOEM, 2012a; 2013; 2014a; 2015; 2016b; 2017; 2023a,b).

Description of Activities Reasonably Expected to Occur in the Vicinity of Project Area. Other exploration and development activities may occur in the vicinity of the project area but Chevron does not anticipate other projects beyond the types analyzed in the lease sale and Supplemental EISs (BOEM, 2012a; 2013; 2014a; 2015; 2016b; 2017; 2023a,b).

Cumulative Impacts of Planned Actions. The BOEM (2017) Final EIS included a discussion of cumulative impacts, which analyzed the incremental environmental and socioeconomic impacts of the 10 proposed lease sales, in addition to all activities (including non-OCS activities) projected to occur from past, proposed, and future lease sales. The EIS considered exploration, delineation, and development wells; platform installation; service vessel trips; and oil spills. The EIS examined the potential cumulative effects on each specific resource for the entire Gulf of Mexico.

The level and type of activity proposed in Chevron's EP are within the range of activities described and evaluated in the recent lease sale EISs. The EIA incorporates and builds on these analyses by examining the potential impacts on physical, biological, and socioeconomic resources from the work planned in Chevron's EP, in conjunction with the other reasonably foreseeable activities expected to occur in the Gulf of Mexico. For all impacts, the incremental contribution of Chevron's proposed actions to the analyses in these prior reports are not expected to be significant.

D. Environmental Hazards

D.1 Geologic Hazards

The site clearance letter did not identify geologic hazards at the location of the proposed wellsites (GEMS, 2024a,b). See EP Section C for supporting geological and geophysical information.

D.2 Severe Weather

Under most circumstances, weather is not expected to have any effect on the proposed activities. Extreme weather, including high winds, strong currents, and large waves, was considered in the design criteria for the drilling rig/installation vessel selected for this project. High winds and limited visibility during a severe storm could disrupt support activities (vessel and helicopter traffic) and make it necessary to implement Chevron contingency plans to suspend some activities on the drilling rig/installation vessel for safety reasons until the storm or weather event passes. From 1992 to 2022, 48 tropical storms and/or hurricanes have shut down oil and gas activities in the Gulf of Mexico (BSEE, 2023). Damage was minimal from the storms in 2017 to 2023, and only Hurricane Ida in 2021 caused an accidental release from a ruptured pipeline and wellhead off the Louisiana coastline (BOEM, 2023b).

In the event of severe weather, guidance as outlined in Chevron's and/or Chevron's drilling contractor's site-specific Environmental Emergency Plan, its site-specific hurricane preparation checklist, and the Gulf of Mexico Region Severe Weather Contingency Plan would be adhered to.

D.3 Currents and Waves

Meteorology and physical oceanography conditions such as sea states, wind speed, ocean currents, etc. will be continuously monitored. Under most circumstances, physical oceanographic conditions are not expected to have any effect on the proposed activities. Strong currents (e.g., caused by Loop Current eddies and intrusions) and large waves were considered in the design criteria for the drilling rig/installation vessel selected for this project. High waves during a severe storm could disrupt support activities (i.e., vessel and helicopter traffic), and risks to the drilling program brought on by such conditions would be closely monitored and managed by the team managing the project. In some cases, it may be necessary to suspend some activities on the drilling rig/installation vessel for safety reasons until the storm or weather event passes.

E. Alternatives

No formal alternatives were evaluated in the EIA for the proposed project. However, various technical and operational options, including the location of the wellsite and the selection of a potential drilling unit, were considered by Chevron. The activity being proposed is the result of a rigorous screening and right-scoping process. It was selected as the best design candidate to reduce risk and optimize deliverability, chosen from numerous options with varying well locations, trajectories, construction designs, and drilling strategies, amongst other variables.

F. Mitigation Measures

The proposed program includes numerous processes and actions that are intended to mitigate potential impact to the environment. The project is expected to comply with applicable federal, state, and local requirements as well as permit conditions of approval concerning protected species, air pollutant emissions, discharges to water, and waste management.

In addition, Chevron and its drilling contractor intend to implement the following specific measures to prevent marine pollution:

- Proper job planning is an important overall mitigation measure. The fundamental concept and discussion in the pre-tour and pre-job safety meetings is the prevention of harm to people and the environment. Personnel are reminded daily to inspect work areas for safety issues as well as potential pollution issues.
- Per Safety and Environmental Management System requirements, the skills and knowledge of personnel are assessed prior to working offshore for Chevron.

- Equipment transferred to and from the drilling rig/installation vessel will be inspected to ensure pollution pans have been cleaned and to confirm that plugs have been installed prior to leaving the dock and prior to loading on the boat.
- Preventive maintenance of rig and vessel equipment and other service equipment, including visual inspection of hydraulic lines and reservoirs, will be conducted on a scheduled basis.
- Items deemed safety and environmentally critical are listed and managed on a schedule recommended by the manufacturer/operator.
- Waste generation and storage will be managed as per the Chevron Gulf of Mexico Waste Management procedures and/or the drilling contractor's established waste management procedures. Wastes are expected to be categorized, packaged, labeled, stored, manifested, and shipped to an appropriately permitted disposal site.
- Municipal trash containers will be kept covered. Where applicable, trash destined for recycling will be compacted.
- Chemical drums and totes will be stored on containment skids in designated areas of the rig.
- Hazardous waste shall be placed in approved containers on the rig.
- Rig fuel vents will have containment boxes.
- All municipal, non-hazardous, hazardous, and universal wastes are placed in an applicable recycling bag or box, Omega bin, Department of Transportation Drum, cutting box, universal box, waste bin, E&P Drum, tote tank or NORM container, labelled, and shipped to shore via a rig support vessel.
- Tank overflow, discharge overflow spill prevention fittings, as well as quick disconnect hoses will be installed on hydrocarbon-based fluid hoses and liquid mud hoses to ensure isolation of any hose failures.
- On-site spill kits are inspected regularly and re-stocked as needed.
- Drills are conducted regularly, often engaging the IMT onshore to measure the effectiveness and quality of processes deployed to address oil spill scenarios.
- Fuel hoses and SBM hoses will be changed based on the maintenance schedule of the drilling rig and in accordance with USCG regulation annual inspection.

G. Consultation

No persons or agencies other than those listed as Preparers (**Section H**) were consulted during the preparation of the EIA.

H. Preparers

The EIA was prepared by CSA Ocean Sciences Inc. Contributors included:

- John M. Tiggelaar II (Project Scientist);
- Kathleen Gifford (Project Scientist);
- Steven Greaves (Project Scientist);
- Cairra Martin (GIS Analyst);
- Deborah Murray (Document Production); and
- Kristen L. Metzger (Library and Information Services Director).

I. References

Abbriano, R.M., M.M. Carranza, S.L. Hogle, R.A. Levin, A.N. Netburn, K.L. Seto, S.M. Snyder, and P.J.S. Franks. 2011. Deepwater Horizon oil spill: A review of the planktonic response. Oceanography 24(3): 294-301.

Almeda, R., Z. Wambaugh, Z. Wang, C. Hyatt, Z. Liu, and E.J. Buskey. 2013. Interactions between zooplankton and crude oil: toxic effects and bioaccumulation of polycyclic aromatic hydrocarbons. PLoS ONE 8(6): e67212.

Anderson, C.M., M. Mayes, and R. LaBelle. 2012. Update of Occurrence Rates for Offshore Oil Spills. U.S. Department of the Interior, Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement. OCS Report BOEM 2012-069, BSEE 2012-069.

Auffret, M., M. Duchemin, S. Rousseau, I. Boutet, A. Tanguy, D. Moraga, and A. Marhic. 2004. Monitoring of immunotoxic responses in oysters reared in areas contaminated by the Erika oil spill. Aquatic Living Resources 17(3): 297-302.

Azzara, A.J., W.M. von Zharen, and J.J. Newcomb. 2013. Mixed-methods analytic approach for determining potential impacts of vessel noise on sperm whale click behavior. Journal of the Acoustical Society of America 134(6): 4566-4574.

Barkaszi, M.J., M. Butler, R. Compton, A. Unietis, and B. Bennett. 2012. Seismic Survey Mitigation Measures and Marine Mammal Observer Reports. New Orleans, LA. OCS Study BOEM 2012-015.

Barkaszi, M.J. and C.J. Kelly. 2019. Seismic Survey Mitigation Measures and Protected Species Observer Reports: Synthesis Reports. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study BOEM 2019-012. 141 pp + apps.

Barkuloo, J.M. 1988. Report on the Conservation Status of the Gulf of Mexico sturgeon, *Acipenser oxyrinchus desotoi*. U.S. Department of the Interior, U.S. Fish and Wildlife Service. Panama City, FL.

Baum, J.K. and R.A. Myers. 2004. Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. Ecology Letters 7(2): 135-145.

Beazley, M.J., R.J. Martinez, S. Rajan, J. Powell, Y.M. Piceno, L.M. Tom, G.L. Andersen, T.C. Hazen, J.D. Van Nostrand, J. Zhou, B. Mortazavi, and P.A. Sobecky. 2012. Microbial community analysis of a coastal salt marsh affected by the Deepwater Horizon oil spill. PLoS One 7(7): e41305.

Beerkircher, L., C.A. Brown, and V. Restrepo. 2009. Pelagic observer program data summary, Gulf of Mexico bluefin tuna (Thunnus thynnus) spawning season 2007 and 2008; and analysis of observer coverage levels. NOAA Technical Memorandum NMFS-SEFSC-588. 33 pp.

Bélanger, L. and J. Bédard. 1989. Responses of staging greater snow geese to human disturbance. Journal of Wildlife Management 53(3): 713-719.

Bellas, J., L. Saco-Álvarez, Ó. Nieto, J.M. Bayona, J. Albaigés, and R. Beiras. 2013. Evaluation of artificially-weathered standard fuel oil toxicity by marine invertebrate embryo-genesis bioassays. Chemosphere 90: 1103-1108.

Belter, M., J. Blondeau, C. Donovan, K. Edwards, I. Enochs, N. Formel, E. Geiger, S. Gittings, J. Grove, S. Groves, E. Hickerson, M. Johnston, H. Kelsey, K. Lohr, N. Miller, M. Nuttall, G.P. Schmahl, E. Towle, and S. Viehman. 2020. Coral Reef Condition: A Status Report for the Flower Garden Banks. NOAA Coral Reef Conservation Program. 7 pp.

Bergman, D.A. and P.A. Moore. The role of chemical signals in the social behavior of crayfish. Chemical Senses 30: i305-i306.

Berry, M., D.T. Booth, and C.J. Limpus. 2013. Artificial lighting and disrupted sea-finding behaviour in hatchling loggerhead turtles (Caretta caretta) on the Woongarra coast, south-east Queensland, Australia. Australian Journal of Zoology 61(2): 137-145.

Biggs, D.C. and P.H. Ressler. 2000. Water column biology. In: Deepwater: Gulf of Mexico Environmental and Socioeconomic Data Search and Literature Synthesis. Volume I: Narrative Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-049. 340 pp.

BirdLife International. 2018. *Pterodroma hasitata*. The IUCN Red List of Threatened Species 2018: e.T22698092A132624510. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698092A132624510.en.

BirdLife International 2020. *Charadrius melodus* . The IUCN Red List of Threatened Species 2020. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22693811A131930146.en.

Blackburn, M., C.A.S. Mazzacano, C. Fallon, and S.H. Black. 2014. Oil in Our Oceans. A Review of the Impacts of Oil Spills on Marine Invertebrates. The Xerces Society for Invertebrate Conservation, Portland, OR. 160 pp.

Blackstock, S.A., J.O. Fayton, P.H. Hulton, T.E. Moll, K. Jenkins, S. Kotecki, E. Henderson, V. Bowman, S. Rider, and C. Martin. 2018. Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing. NUWC-NPT Technical Report August 2018. N.U.W.C. Division. Newport, RI. 109 pp.

Blackwell, S.B. and C.R. Greene Jr. 2003. Acoustic measurements in Cook Inlet, Alaska, during August 2001. Greeneridge Sciences, Inc., for NMFS, Anchorage, AK. 43 pp.

Boehm, P., D. Turton, A. Raval, D. Caudle, D. French, N. Rabalais, R. Spies, and J. Johnson. 2001. Deepwater Program: Literature Review, Environmental Risks of Chemical Products used in Gulf of Mexico Deepwater Oil and Gas Operations. Volume I: Technical Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2001-011. 326 pp.

Bolle, L.J., C.A.F. de Jong, S.M. Bierman, P.J.G. Van Beek, O.A. van Keeken, P.W. Wessels, C.J.G. van Damme, H.V. Winter, D. de Haan, and R.P.A. Dekeling. 2012. Common Sole Larvae Survive High Levels of Pile-Driving Sound in Controlled Exposure Experiments. PLoS One 7(3): e33052.

Bonde, R.K. and T.J. O'Shea. 1989. Sowerby's beaked whale (*Mesoplodon bidens*) in the Gulf of Mexico. Journal of Mammology 70: 447-449.

Brame, A.B., T.R. Wiley, J.K. Carlson, S.V. Fordham, R.D. Grubbs, J. Osborne, R.M. Scharer, D.M. Bethea, and G.R. Poulakis. 2019. Biology, ecology, and status of the smalltooth sawfish Pristis pectinata in the USA. Endangered Species Research 39: 9-23.

Brooke, S. and W.W. Schroeder. 2007. State of deep coral ecosystems in the Gulf of Mexico region: Texas to the Florida Straits, pp 271-306. In: S.E. Lumdsen, T.F. Hourigan, A.W. Bruckner and G. Dorr (Eds.), The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3, Silver Spring, MD.

Brooks, J.M., C. Fisher, H. Roberts, E. Cordes, I. Baums, B. Bernard, R. Church, P. Etnoyer, C. German, E. Goehring, I. McDonald, H. Roberts, T. Shank, D. Warren, S. Welsh, and G. Wolff. 2012. Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard-bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs, and Wrecks — "Lophelia II" Interim Report. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study BOEM 2012-106. 126 pp.

Bruintjes, R. and A.N. Radford. 2013. Context-dependent impacts of anthropogenic noise on individual and social behaviour in a cooperatively breeding fish. Animal Behaviour 85(6): 1343-1349.

Bureau of Ocean Energy Management. 2012a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017. Western Planning Area Lease Sales 229, 233, 238, 246, and 248. Central Planning Area Lease Sales 227, 231, 235, 241, and 247. Final Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2012-019. 3 volumes.

Bureau of Ocean Energy Management. 2012b. Gulf of Mexico OCS Oil and Gas Lease Sale: 2012. Central Planning Area Lease Sale 216/222. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2012-058. 2 volumes.

Bureau of Ocean Energy Management. 2013. Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014. Western Planning Are Lease Sale 233. Central Planning Area 231. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2013-0118. 526 pp.

Bureau of Ocean Energy Management. 2014a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2015-2017. Central Planning Area Lease Sales 235, 241, and 247. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2014-655.

Bureau of Ocean Energy Management. 2014b. Programmatic Environmental Impact Statement for Atlantic OCS Proposed Geological and Geophysical Activities in the Mid-Atlantic and South Atlantic Planning Areas. www.boem.gov/Oil-and-Gas-Energy-Program/GOMR/GandG.aspx.

Bureau of Ocean Energy Management. 2015. Gulf of Mexico OCS Oil and Gas Lease Sales: 2016 and 2017. Central Planning Area Lease Sales 241 and 247; Eastern Planning Area Lease Sale 226. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2015-033. 748 pp.

Bureau of Ocean Energy Management. 2016a. Outer Continental Shelf Oil and Gas Leasing Program: 2017-2022. Final Programmatic Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EIA BOEM 2016-060.

Bureau of Ocean Energy Management. 2016b. Gulf of Mexico OCS Oil and Gas Lease Sale: 2016. Western Planning Area Lease Sale 248. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2016-005.

Bureau of Ocean Energy Management. 2016c. Essential Fish Habitat Assessment for the Gulf of Mexico. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Report BOEM 2016-016. 62 pp.

Bureau of Ocean Energy Management. 2017. Gulf of Mexico OCS Oil and 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. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2017-009. 3 volumes.

Bureau of Ocean Energy Management. 2023. Gulf of Mexico OCS Oil and Gas Lease Sale: Lease Sales 259 and 261. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, New Orleans Office. OCS EIS/EA BOEM 2023-001.

Bureau of Safety and Environmental Enforcement. 2021. Offshore Incident Statistics. U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement. https://www.bsee.gov/stats-facts/offshore-incident-statistics.

Bureau of Safety and Environmental Enforcement (BSEE). 2023. Hurricane History. https://www.bsee.gov/resources-tools/planning-preparedness/hurricane/hurricane-history.

Cada, G. 1990. A review of studies relating to the effects of propeller-type turbine passage on fish early life stages. North American Journal of Fisheries Management 10(4): 418-426.

Camhi, M.D., E.K. Pikitch, and E.A. Babcock, (eds.) 2008. Sharks of the Open Ocean: Biology, Fisheries, and Conservation. Blackwell Publishing Ltd. Oxford, UK.

Camilli, R., C.M. Reddy, D.R. Yoerger, B.A. Van Mooy, M.V. Jakuba, J.C. Kinsey, C.P. McIntyre, S.P. Sylva, and J.V. Maloney. 2010. Tracking hydrocarbon plume transport and biodegradation at Deepwater Horizon. Science 330(6001): 201-204.

Carlson, J.K., J. Osborne, and T.W. Schmidt. 2007. Monitoring of the recovery of smalltooth sawfish, Pristis pectinata, using standardized relative indices of abundance. Biological Conservation 136: 195-202.

Carlson, J.K. and J. Osborne. 2012. Relative abundance of smalltooth sawfish (Pristis pectinata) based on Everglades National Park Creel Survey. NOAA Technical Memorandum NMFS-SEFSC-626. 15 pp.

Carr, A. 1996. Suwanee River sturgeon, pp 73-83. In: M.H. Carr, A Naturalist in Florida. Yale University Press, New Haven, CT.

Carvalho, R., C.-L. Wei, G.T. Rowe, and A. Schulze. 2013. Complex depth-related patterns in taxonomic and functional diversity of polychaetes in the Gulf of Mexico. Deep Sea Research Part I: Oceanographic Research Papers 80: 66-77.

Casper, B.M., P.S. Lobel, and H.Y. Yan. 2003. The hearing sensitivity of the little skate, Raja erinacea: a comparison of two methods. Environmental Biology of Fishes 68: 371-379.

Casper, B.M. and D.A. Mann. 2006. Evoked potential audiograms of the nurse shark (Ginglymostoma cirratum) and the yellow stingray (Urobatis jamaicensis). Environmental Biology of Fishes 76: 101-108.

Cave, E.J. and S.M. Kajiura. 2018. Effect of Deepwater Horizon crude oil water accomodated fraction on olfactory function in the Atlantic stingray, Hypanus sabinus. Scientific Reports 8:15786.

Centers for Disease Control and Prevention. 2010. Health Hazard Evaluation of Deepwater Horizon Response Workers. HETA 2010-0115. http://www.cdc.gov/niosh/hhe/pdfs/interim_report_6.pdf.

Clapp, R.B., R.C. Banks, D. Morgan-Jacobs, and W.A. Hoffman. 1982a. Marine Birds of the Southeastern United States and Gulf of Mexico. Part I. Gaviiformes through Pelicaniformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, DC. . FWS/OBS-82/01.

Clapp, R.B., D. Morgan-Jacobs, and R.C. Banks. 1982b. Marine Birds of the Southeastern United States and Gulf of Mexico. Part II. Anseriformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington DC. FWS/OBS 82/20.

Clapp, R.B., D. Morgan-Jacobs, and R.C. Banks. 1983. Marine Birds of the Southeastern United States and Gulf of Mexico. Part III. Charadriiformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, DC. FWS/OBS-83/30.

Colman, L.P., P.H. Lara, J. Bennie, A.C. Broderick, J.R. de Freitas, A. Marcondes, M.J. Witt, and B.J. Godley. 2020. Assessing coastal artificial light and potential exposure of wildlife at a national scale: the case of marine turtles in Brazil. Biodiversity and Conservation 29: 1135-1152.

Conn, P.B., and G.K. Silber. 2013. Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales. Ecosphere 4(4): 1–16.

Continental Shelf Associates, Inc,. 1997. Characterization and Trends of Recreational and Commercial Fishing from the Florida Panhandle. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. USGS/BRD/CR 1997 0001 and OCS Study MMS 97-0020.

Continental Shelf Associates, Inc. 2002. Deepwater Program: Bluewater fishing and OCS Activity, Interactions Between the Fishing and Petroleum Industries in Deepwaters of the Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2002 078. 193 pp. + apps.

Continental Shelf Associates, Inc. 2004. Final Report: Gulf of Mexico Comprehensive Synthetic Based Muds Monitoring Program. 3 volumes.

Continental Shelf Associates, Inc. 2006. Effects of Oil and Gas Exploration and Development at Selected Continental Slope Sites in the Gulf of Mexico. Volume II: Technical Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2006-045.

Cruz-Kaegi, M.E. 1998. Latitudinal Variations in Biomass and Metabolism of Benthic Infaunal Communities. Ph.D. Dissertation, Texas A&M University, College Station, TX.

CSA International, Inc. 2007. Characterization of Northern Gulf of Mexico Deepwater Hard-bottom Communities with Emphasis on Lophelia Coral. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2007-044.

Daling, P.S., F. Leirvik, I.K. Almås, P.J. Brandvik, B.H. Hansen, A. Lewis, and M. Reed. 2014. Surface weathering and dispersability of MC252 crude oil. Marine Pollution Bulletin 15(87): 1-2.

Davis, R.W. and G.S. Fargion, (Eds.). 1996. Distribution and Abundance of Cetaceans in the North-central and Western Gulf of Mexico: Technical report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 96-0026.

Davis, R.W., W.E. Evans, and B. Würsig. 2000. Cetaceans, Sea Turtles, and Seabirds in the Northern Gulf of Mexico: Distribution, Abundance and Habitat Associations. Volume II: Technical Report. U.S. Geological Survey, Biological Resources Division, USGS/BRD/CR 1999-0006 and U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-003.

De Guise, S., M. Levin, E. Gebhard, L. Jasperse, L. Burdett Hart, C.R. Smith, S. Venn-Watson, R. Townsend, R. Wells, B. Balmer, E. Zolman, T. Rowles, and L. Schwacke. 2017. Changes in immune functions in bottlenose dolphins in the northern Gulf of Mexico associated with the Deepwater Horizon oil spill. Endangered Species Research 33: 291-303.

Ditty, J.G. 1986. Ichthyoplankton in neritic waters of the northern Gulf of Mexico off Louisiana: Composition, relative abundance, and seasonality. Fishery Bulletin 84(4): 935-946.

Ditty, J.G., G.G. Zieske, and R.F. Shaw. 1988. Seasonality and depth distribution of larval fishes in the northern Gulf of Mexico above 26°00'N. Fishery Bulletin 86(4): 811-823.

Dow Piniak WE, Eckert SA, Harms CA, Stringer EM. 2012a. Underwater Hearing Sensitivity of the Leatherback Sea Turtle (Dermochelys coriacea): Assessing the Potential Effect of Anthropogenic Noise. Headquarters, Herndon, VA: U.S. Department of the Interior, ureau of Ocean Energy Management. OCS Study BOEM 2012-01156. 35 pp.

Dow Piniak WE, Mann DA, Eckert SA, Harms CA. 2012. Amphibious hearing in sea turtles. In: AN Popper, A Hawkins (Eds.), The Effects of Noise on Aquatic Life. Advances in Experimental Medicine and Biology. New York, NY: Springer. pp. 83-87.

Du, M. and J.D. Kessler. 2012. Assessment of the spatial and temporal variability of bulk hydrocarbon respiration following the Deepwater Horizon oil spill. Environmental Science & Technology 46: 10499-10507.

Dubinsky, E.A., M.E. Conrad, R. Chakraborty, M. Bill, S.E. Borglin, J.T. Hollibaugh, O.U. Mason, Y.M. Piceno, F.C. Reid, W.T. Stringfellow, L.M. Tom, T.C. Hazen, and G.L. Andersen. 2013. Succession of hydrocarbon-degrading bacteria in the aftermath of the Deepwater Horizon oil spill in the Gulf of Mexico. Environmental Science & Technology 47.

Edwards, R.E. and K.J. Sulak. 2006. New paradigms for yellowfin tuna movements and distributions - implications for the Gulf and Caribbean region. Proceedings of the Gulf annd Caribbean Fisheries Research Institute 57: 283-296.

Efroymson, R.A., J.P. Nicolette, and G.W. Sutter II. 2003. A Framework for Net Environmental Benefit Analysis for Remediation or Restoration of Petroleum-contaminated Sites. ORNL/TM- 2003/17.

Efroymson, R.A., W.H. Rose, S. Nemeth, and G.W. Sutter II. 2000. Ecological Risk Assessment Framework for Low Altitude Overflights by Fixed-wing and Rotary-wing Military Aircraft. Oak Ridge National Laboratory. Oak Ridge, TN. ORNL/TM-2000/289 ES-5048. 116 pp.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1992. Birds in Jeopardy: The Imperiled and Extinct Birds of the United States and Canada, including Hawaii and Puerto Rico. Palo Alto, CA, Stanford University Press. 259 pp.

Electric Power Research Institute. 2000. Technical Evaluation of the Utility of Intake Approach Velocity as an Indicator of Potential Adverse Environmental Impact under Clean Water Act Section 316(b). Technical Report 1000731.

Ellison, W.T., B.L. Southall, C.W. Clark, and A.S. Frankel. 2012. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology, 26(1): 21-28.

Equinor Australia B.V. (Equinor). 2019. Environment plan, Appendix 6-1, Underwater Sound Modelling Report. Stromlo-1 Exploration Drilling Program. Rev 1. April 2019. 49 pp.

Fertl, D., A.J. Schiro, G.T. Regan, C.A. Beck, and N. Adimey. 2005. Manatee occurrence in the northern Gulf of Mexico, west of Florida. Gulf and Caribbean Research 17(1): 69-94.

Finneran JJ, Henderson EE, Houser DS, Jenkins K, Kotecki S, Mulsow J. 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical report by Space and Naval Warfare Systems Center Pacific (SSC Pacific). 183 pp.

Fink, J. (ed.). 2015. Chapter 10 – Cement Additives, pp. 317-367. In: Petroleum Engineer's Guide to Oil Field Chemicals and Fluids, Second Edition. Elsevier Science, San Diego, CA.

Fisheries Hydroacoustic Working Group (FHWG). 2008. Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities. Memorandum to Applicable Agency Staff. 12 June 2008. 4 pp.

Florida Fish and Wildlife Conservation Commission. nd. Florida Salt Marsh Vole, *Microtus pennsylvanicus dekecampbelli.* https://myfwc.com/wildlifehabitats/profiles/mammals/land/florida-salt-marsh-vole/.

Florida Fish and Wildlife Conservation Commission. 2021. Florida's Endangered and Threatened Species. https://myfwc.com/media/1945/threatend-endangered-species.pdf.

Florida Fish and Wildlife Conservation Commission. 2016. Draft Panama City Crayfish Management Plan. *Procambarus econfinae*.

Florida Fish and Wildlife Conservation Commission. nd-a. Loggerhead Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/.

Florida Fish and Wildlife Conservation Commission. nd-b. Statewide Atlas of Sea Turtle Nesting Occurrence and Density. https://myfwc.com/research/wildlife/sea-turtles/nesting/nesting-atlas/.

Florida Fish and Wildlife Conservation Commission. nd-c. Leatherback Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/leatherback/.

Florida Fish and Wildlife Conservation Commission. nd-d. Listed Invertebrates. https://myfwc.com/wildlifehabitats/profiles/.

Florida Fish and Wildlife Conservation Commission. nd-e. Florida Salt Marsh Vole, Microtus pennsylvanicus dekecampbelli. https://myfwc.com/wildlifehabitats/profiles/mammals/land/florida-salt-marsh-vole/.

Foley, K.A., C. Caldow, and E.L. Hickerson. 2007. First confirmed record of Nassau Grouper Epinephelus striatus (Pisces: Serranidae) in the Flower Garden Banks National Marine Sanctuary. Gulf of Mexico Science 25(2): 162-165.

Fonseca, M., G.A. Piniak, and N. Cosentino-Manning. 2017. Susceptibility of seagrass to oil spills: A case study with eelgrass, Zostera marina, in San Francisco Bay, USA. Marine Pollution Bulletin 115(1-2): 29-38.

Fox, D.A., J.E. Hightower, and F.M. Parauka. 2000. Gulf sturgeon spawning migration and habitat in the Choctawhatchee River System, Alabama–Florida. Transactions of the American Fisheries Society 129(3): 811-826.

Fritts, T.H. and R.P. Reynolds. 1981. Pilot Study of the Marine Mammals, Birds, and Turtles in OCS Areas of the Gulf of Mexico. U.S. Department of the Interior, Fish and Wildlife Service, Biological Services Program. FWS/OBS 81/36. 150 pp.

Fuller, A.R., G.J. McChesney, and R.T. Golightly. 2018. Aircraft disturbance to Common Murres (Uria aalge) at a breeding colony in central California, USA. Waterbirds 41(3): 257-267.

Gallaway, B.J. and G.S. Lewbel. 1982. The Ecology of Petroleum Platforms in the Northwestern Gulf of Mexico: a Community Profile. U.S. Fish and Wildlife Service, Biological Services Program and U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. FWS/OBS-82/27 and USGS Open File Report 82-03.

Gallaway, B.J., J.G. Cole, and R.G. Fechhelm. 2003. Selected Aspects of the Ecology of the Continental Slope Fauna of the Gulf of Mexico: A Synopsis of the Northern Gulf of Mexico Continental Slope Study, 1983-1988. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2003-072. 44 pp.

Gallaway, B.J., (ed.). 1988. Northern Gulf of Mexico Continental Slope Study, Final report: Year 4. Volume II: Synthesis report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 88-0053.

Gates, A.R., M.C. Benfield, D.J. Booth, A.M. Fowler, D. Skropeta, and D.O.B. Jones. 2017. Deep-sea observations at hydrocarbon drilling locations: Contributions from the SERPENT Project after 120 field visits. Deep-Sea Research Part II: Topical Studies in Oceanography 137:463-479.

Geoscience Earth & Marine Services. 2024a. Site Clearance Letter, Proposed Wellsite AT 596 IN-A. Block 596 (OCS-G-16759), Green Canyon, Gulf of Mexico. Project No. GHZ3246.

Geoscience Earth & Marine Services. 2024b. Site Clearance Letter, Proposed Wellsite AT 641 RW-A. Block 641 (OCS-G-16770), Atwater Valley Area, Gulf of Mexico. Project No. GHZ3246.

Geraci, J.R. and D.J. St. Aubin. 1990. Sea Mammals and Oil: Confronting the Risks. Academic Press, San Diego, CA. 282 pp.

Gibson, D., D.H. Catlin, K.L. Hunt, J.D. Fraser, S.M. Karpanty, M.J. Friedrich, M.K. Bimbi, J.B. Cohen, and S.B. Maddock. 2017. Evaluating the impact of man-made disasters on imperiled species: Piping plovers and the Deepwater Horizon oil spill. Biological Conservation 2012: 48-62.

Gitschlag, G., B. Herczeg, and T. Barcack. 1997. Observations of sea turtles and other marine life at the explosive removal of offshore oil and gas structures in the Gulf of Mexico. Gulf Research Reports 9(4): 247-262.

Gomez, C., J.W. Lawson, A.J. Wright, A.D. Buren, D. Tollit, and V. Lesage. 2016. A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy. Canadian Journal of Zoology 94: 801-819.

Gulf of Mexico Fishery Management Council. 2005. Generic Amendment Number 3 for addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and adverse effects of fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp fishery of the Gulf of Mexico, United States waters red drum fishery of the Gulf of Mexico, reef fish fishery of the Gulf of Mexico coastal migratory pelagic resources (mackerels) in the Gulf of Mexico and South Atlantic, stone crab fishery of the Gulf of Mexico, spiny lobster in the Gulf of Mexico and South Atlantic, coral and coral reefs of the Gulf of Mexico. Tampa, FL. Gulf of Mexico Fishery Management Council. 104 pp. https://gulfcouncil.org/wp-content/uploads/March-2005-FINAL3-EFH-Amendment.pdf.

Hamdan, L.J., J.L. Salerno, A. Reed, S.B. Joye, and M. Damour. 2018. The impact of the Deepwater Horizon blowout on historic shipwreck-associated sediment microbiomes in the northern Gulf of Mexico. Scientific Reports 8: 9057.

Haney, C.J., H.J. Geiger, and J.W. Short. 2014. Bird mortality from the Deepwater Horizon oil spill. Exposure probability in the Gulf of Mexico. Marine Ecology Progress Series 513: 225-237.

Hannam, M.L., S.D. Bamber, A.J. Moody, T.S. Galloway, and M.B. Jones. 2010. Immunotoxicity and oxidative stress in the Arctic scallop Chlamys islandica: Effects of acute oil exposure. Ecotoxicology and Environmental Safety 73: 1440-1448.

Harvell, C.D., K. Kim, J.M. Burkholder, R.R. Colwell, P.R. Epstein, D.J. Grimes, E.E. Hoffmann, E.K. Lipp, A.D.M.E. Osterhaus, R.M. Overstreet, J.W. Porter, G.W. Smith, and G.R. Vasta. 1999. Emerging marine diseases: climate links and anthropogenic factors. Science 285(5433): 1505-1510.

Hawkins, A.D. and A.N. Popper. 2014. Assessing the impact of underwater sounds on fishes and other forms of marine life. Acoustics Today. Spring 2014: 30-41.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, B. Byrd, S. Chavez-Rosales, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, C. Orphanides, R.M. Pace, D.L. Palka, J. Powell, and F.W. Wenzel. 2019. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2018. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-258.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, B. Byrd, S. Chavez-Rosales, T.V.N. Cole, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, C. Orphanides, R.M. Pace, D.L. Palka, J. Powell, and F.W. Wenzel. 2020. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2019. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA. NOAA Technical Memorandum NMFS-NE-264. 479 pp.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, J. Turek, B. Byrd, S. Chavez-Rosales, T.V.N. Cole, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, C. Orphanides, J. Ortega-Ortiz, R.M. Pace, D.L. Palka, J. Powell, G. Rappucci, and F.W. Wenzel. 2021. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2020. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-271.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, J.W. Wallace, A. Brossard, S. Chavez-Rosales, T.V.N. Cole, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, K. Murray, C. Orphanides, J. Ortega-Ortiz, R.M. Pace, D.L. Palka, J. Powerll, G. Rappicci, M. Soldevilla, and F.W. Wenzel. 2022. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2021. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-288. 387 pp.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, J. McCordic, J.W. Wallace, A. Brossard, S. Chavez-Rosales, T.V.N. Cole, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, D. Linden, J. Litz, M.C. Lyssikatos, K.D. Mullin, K. Murray, C. Orphanides, R.M. Pace, D.L. Palka, J. Powell, K. Precoda, M. Soldevilla, and F.W. Wenzel. 2023. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2022. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-304. 262 pp.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. 2007. Vessel speed increases collision risk for the green turtle Chelonia mydas. Endangered Species Research 3:105-113.

Hazen, T.C., E.A. Dubinsky, T.Z. DeSantis, G.L. Andersen, Y.M. Piceno, N. Singh, J.K. Jansson, A. Probst, S.E. Borglin, J.L. Fortney, W.T. Stringfellow, M. Bill, M.E. Conrad, L.M. Tom, K.L. Chavarria, T.R. Alusi, R. Lamendella, D.C. Joyner, C. Spier, J. Baelum, M. Auer, M.L. Zemla, R. Chakraborty, E.L. Sonnenthal, P. D'Haeseleer, H.Y. Holman, S. Osman, Z. Lu, J.D. Van Nostrand, Y. Deng, J. Zhou, and O.U. Mason. 2010. Deep-sea oil plume enriches indigenous oil-degrading bacteria. Science 330(6001): 204-208.

Higashi, G.R. 1994. Ten years of fish aggregating device (FAD) design development in Hawaii. Bulletin of Marine Science 55(2-3): 651-666.

Hildebrand, J.A. 2005. Impacts of anthropogenic sound, pp 101-124. In: J.E. Reynolds III, W.F. Perrin, R.R. Reeves, S. Montgomery and T.J. Ragen (Eds.), Marine Mammal Research: Conservation Beyond Crisis. Johns Hopkins University Press, Baltimore, MD.

Hildebrand, J.A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series 395: 5-20.

Hildebrand, J.A., S. Baumann-Pickering, K.E. Frasier, J.S. Trickey, K.P. Merkens, S.M. Wiggins, M.A. McDonald, L.P. Garrison, D. Harris, T.A. Marques, and L. Thomas. 2015. Passive acoustic monitoring of beaked whale densities in the Gulf of Mexico. Scientific Reports 5: 16343.

Hinwood, J.B., A.E. Poots, L.R. Dennis, J.M. Carey, H. Houridis, R.J. Bell, J.R. Thomson, P. Boudreau, and A.M. Ayling. 1994. Part 3: Drilling activities, pp. 123-207. In: J.M.Swan, J.M. Neff and P.C. Young (eds.) Environmental Implications of Offshore Oil and Gas Development in Australia: Findings of an Independent Scientific Review. Australian Petroleum Production and Exploration Association. Canberra, Australia.

Holland, K.N. 1990. Horizontal and vertical movements of yellowfin and bigeye tuna associated with fish aggregating devices. Fishery Bulletin 88: 493-507.

Horn, K.N., C. Karnauskas, M. Doerr, J. C. Miller, M. H. Neuman, M. Hill, R. McCarthy, K. J. 2022. Endangered species act status review report: Queen conch (*Aliger gigas*). NOAA Technical Memorandum NMFS-SEFSC-756.

Intergovernmental Panel on Climate Change. 2014. Climate Change 2014: Impacts, Adaptation and Vulnerability. http://www.ipcc.ch/report/ar5/wg2/.

International Association of Oil & Gas Producers. 2010. Risk assessment data directory: Blowout frequencies. OGP Report No. 434 2. 13 pp.

International Tanker Owners Pollution Federation Limited. 2018. Weathering. https://www.itopf.org/knowledge-resources/documents-guides/fate-of-oil-spills/weathering/.

Jensen, A.S. and G.K. Silber. 2004. Large Whale Ship Strike Database. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland. NOAA Technical Memorandum NMFS-OPR-25. 39 pp.

Ji, Z.-G., W.R. Johnson, C.F. Marshall, and E.M. Lear. 2004. Oil-Spill Risk Analysis: Contingency Planning Statistics for Gulf of Mexico OCS Activities. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Report MMS 2004-026. 62 pp.

Jochens, A., D.C. Biggs, D. Benoit-Bird, D. Engelhaupt, J. Gordon, C. Hu, N. Jaquet, M. Johnson, R.R. Leben, B. Mate, P. Miller, J.G. Ortega-Ortiz, A. Thode, P. Tyack, and B. Würsig. 2008. Sperm Whale Seismic Study in the Gulf of Mexico: Synthesis Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2008-006. 341 pp.

Johnsgard, P.A. 1990. Hawks, Eagles, and Falcons of North America; Biology and Natural History. Washington, D.C., Smithsonian Institution Press. 456 pp.

Keithly, W.R. and K.J. Roberts. 2017. Commercial and recreational fisheries of the Gulf of Mexico., pp 1039-1188. In: C.H. Ward (Ed.), Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill. Volume 2: Fish Resources, Fisheries, Sea Turtles, Avian Resources, Marine Mammals, Diseases and Mortalities. Springer, New York, NY.

Kennicutt, M.C. 2000. Chemical oceanography, pp. 123-139. In: Continental Shelf Associates, Inc., Deepwater Program: Gulf of Mexico deepwater Information Resources Data Search and Literature Synthesis. Volume I: Narrative Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-049. 340 pp.

Keppner, E.J. and L.A. Keppner. 2004. A Summary of the Panama City Crayfish, Procambarus econfina Hobbs, 1942. Prepared for The Candidate Conservation Agreement with Assurances.

Kessler, J.D., D.L. Valentine, M.C. Redmond, M. Du, E.W. Chan, S.D. Mendes, E.W. Quiroz, C.J. Villanueva, S.S. Shusta, L.M. Werra, S.A. Yvon-Lewis, and T.C. Weber. 2011. A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico. Science 331: 312-315.

Ketten, D.R. and S.M. Bartol. 2005. Functional Measures of Sea Turtle Hearing, Woods Hole Oceanographic Institution, Woods Hole, MA. ONR Award No: N00014-02-0510.

Kiszka, J., M. Caputo, J. Vollenweider, M.R. Heithaus, L.A. Dias, and L.P. Garrison. 2023. Critically endangered Rice's whales (Balaenoptera ricei) selectively feed on high-quality prey in the Gulf of Mexico. Scientific Reports 13: 6710. https://www.nature.com/articles/s41598-023-33905-6#Abs1.

Krishnamurthy J., L.S. Engel, L. Wang, E.G. Schwartz, K. Christenbury, B. Kondrup, J. Barrett, and J.A. Rusiecki. 2019. Neurological symptoms associated with oil spill response exposures: results from the *Deepwater Horizon* Oil Spill Coast Guard Cohort Study. Environment International. 131: 104963. doi:10.1016/j.envint.2019.104963.

Kyhn, L.A., S. Sveegaard, and J. Tougaard. 2014. Underwater noise emissions from a drillship in the Arctic. Marine Pollution Bulletin 86: 424-433.

Ladich, F. and R.R. Fay. 2013. Auditory evoked potential audiometry in fish. Reviews in Fish Biology and Fisheries 23(3): 317-364.

Laist, D.W., A R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17(1):35-75.

Lee, W.Y., K. Winters, and J.A.C. Nicol. 1978. The biological effects of the water soluble fractions of a No. 2 fuel oil on the planktonic shrimp, Lucifer faxoni. Environmental Pollution 15: 167-183.

Lennuk, L., J. Kotta, K. Taits, and K. Teeveer. 2015. The short-term effects of crude oil on the survival of different size-classes of cladoceran Daphnia magna (Straus, 1820). Oceanologia 57(1): 71-77.

Lin, Q. and I.A. Mendelssohn. 2012. Impacts and recovery of the Deepwater Horizon oil spill on vegetation structure and function of coastal salt marshes in the northern Gulf of Mexico. Environmental Science & Technology 46(7): 3737-3743.

Linden, O. 1976. Effects of oil on the reproduction of the amphipod Gammarus oceanicus. Ambio 5: 36-37.

Liu, J., H.P. Bacosa, and Z. Liu. 2017. Potential environmental factors affecting oil-degrading bacterial populations in deep and surface waters of the northern Gulf of Mexico. Frontiers in Microbiology 7:2131.

Lohoefener, R., W. Hoggard, K.D. Mullin, C. Roden, and C. Rogers. 1990. Association of Sea Turtles with Petroleum Platforms in the North Central Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 90-0025. 90 pp.

Louisiana Wildlife & Fisheries. 2020. Rare Species and Natural Communities by Parish. https://www.wlf.louisiana.gov/page/rare-species-and-natural-communities-by-parish.

Lutcavage, M.E., P.L. Lutz, G.D. Bossart, and D.M. Hudson. 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. Archives of Environmental Contamination and Toxicology 28(4): 417-422.

Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz. 1997. Human impacts on sea turtle survival, pp. 387-409. In: P.L. Lutz and J.A. Musick (Eds.), The Biology of Sea Turtles. CRC Press, Boca Raton, FL.

MacDonald, I.R. 2002. Stability and Change in Gulf of Mexico Chemosynthetic Communities. Volume II: Technical Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2002-036. 456 pp.

Main, C.E., H.A. Ruhl, D.O.B. Jones, A. Yool, B. Thornton, and D.J. Mayor. 2015. Hydrocarbon contamination affects deep-sea benthic oxygen uptake and microbial community composition. Deep Sea Research. Part I: Oceanographic Research Papers 100: 79-87.

Marine Mammal Commission. 2011. Assessing the long-term effects of the BP Deepwater Horizon oil spill on marine mammals in the Gulf of Mexico: A statement of research needs. http://www.mmc.gov/wp-content/uploads/longterm_effects_bp_oilspil.pdf.

Marshall, A., M.B. Bennett, G. Kodja, S. Hinojosa-Alvarez, F. Galvan-Magana, M. Harding, G. Stevens, and T. Kashiwagi. 2018. *Mobula birostris* (amended version of 2011 assessment). The IUCN Red List of Threatened Species. http://www.iucnredlist.org/details/198921/0.

Martin KJ, Alessi SC, Gaspard JC, Tucker AD, Bauer GB, Mann DA. 2012. Underwater hearing in the loggerhead turtle (Caretta caretta): A comparison of behavioral and auditory evoked potential audiograms. Journal of Experiment Biology 215(17):3001-3009.

Mayhew, D.A., L.D. Jensen, D.F. Hanson, and P.H. Muessig. 2000. A comparative review of entrainment survival studies at power plants in estuarine environments, pp. S295–S302. In: J. Wisniewski (Ed.), Environmental Science & Policy; Power Plants & Aquatic Resources: Issues and Assessment, Vol. 3, Supplement 1. Elsevier Science Ltd., New York, New York.

McCauley, R. 1998. Radiated Underwater Noise Measured from the Drilling Rig Ocean General, Rig Tenders Pacific Ariki and Pacific Frontier, Fishing Vessel Reef Venture and Natural Sources in the Timor Sea, northern Australia. Prepared for Shell Australia, Melbourne. 52 pp. http://cmst.curtin.edu.au/local/docs/pubs/1998-19.pdf.

McCauley R.D, Fewtrell J, Duncan AJ, Jenner C, Jenner M.N, Penrose JD, Prince R.I.T, Adhitya A, Murdoch J, McCabe K. 2000. Marine seismic surveys—a study of environmental implications. APPEA Journal 40(1):692-708.

McDonald, T.L., F.E. Hornsby, T.R. Speakman, E.S. Zolman, K.D. Mullin, C. Sinclair, P.E. Rosel, L. Thomas, and L.H. Schwacke. 2017. Survival, density, and abundance of common bottlenose dolphins in Barataria Bay (USA) following the Deepwater Horizon oil spill. Endangered Species Research 33: 193-209.

McGowan, C.J., R.K. Kwok, L.S. Engel, M.R. Stenzel, P.A. Stewart, and D.P. Sandler. 2017. Respiratory, Dermal, and Eye Irritation Symptoms Associated with Corexit™ EC9527A/EC9500A following the Deepwater Horizon Oil Spill: Findings from the GuLF STUDY. Environmental Health Perspectives. 125(9): 097015-1-097015-7. https://ehp.niehs.nih.gov/doi/10.1289/EHP1677.

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: 92-103.

McLaughlin, K.E. and H.P. Kunc. 2015. Changes in the acoustic environment alter the foraging and sheltering behaviour of the cichlid *Amititlania nigrofasciata*. Behavioural processes 116: 75-79.

Mendel, B., P. Schwemmer, V. Peschko, S. Muller, H. Schwemmer, M. Mercker, and S. Garthe. 2019. Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of Loons (*Gavia* spp.). Journal of Environmental Management 231: 429-438.

Mendelssohn, I.A., G.L. Andersen, D.M. Baltx, R.H. Caffey, K.R. Carman, J.W. Fleeger, S.B. Joyce, Q. Lin, E. Maltby, E.B. Overton, and L.P. Rozas. 2012. Oil impacts on coastal wetlands: Implications for the Mississippi River delta ecosystem after the Deepwater Horizon oil spill. BioScience 62(6): 562-574.

Mendelssohn, I.A., M.R. Byrnes, R.T. Kneib, and B.A. Vittor. 2017. Coastal Habitats of the Gulf of Mexico, pp. 359-640. In: C.H. Ward (ed.), Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill. Springer, New York, NY.

Mississippi Natural Heritage Program. 2018. Natural Heritage Program Online Database. Museum of Natural Science, Mississippi Deptartment of Wildlife, Fisheries, and Parks. https://www.mdwfp.com/media/255911/ms-listed-species-2018.pdf.

Møhl, B., M. Wahlberg, and P.T. Madsen. 2003. The monopulsed nature of sperm whale clicks. Journal of the Acoustical Society of America 114(2): 1143-1154.

Moore, S.F. and R.L. Dwyer. 1974. Effects of oil on marine organisms: a critical assessment of published data. Water Research 8: 819-827.

Morrow, J.V.J., J.P. Kirk, K.J. Killgore, H. Rugillio, and C. Knight. 1998. Status and recovery of Gulf sturgeon in the Pearl River system, Louisiana-Mississippi. North American Journal of Fisheries Management 18: 798-808.

Mullin, K.D., W. Hoggard, C. Roden, R. Lohoefener, C. Rogers, and B. Taggart. 1991. Cetaceans on the Upper Continental Slope in the North-central Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 91-0027. 118 pp.

Mullin, K.D. 2007. Abundance of Cetaceans in the Oceanic Gulf of Mexico Based on 2003-2004 Ship Surveys. U.S. Department of Commerce, National Marine Fisheries Service, Southeast Fisheries Science Center. Pascagoula, MS.

National Marine Fisheries Service and National Oceanic and Atmospheric Administration. 2005. Endangered fish and wildlife: Notice of intent to prepare an environmental impact statement. Federal Register 70(7): 1871-1875. https://www.govinfo.gov/content/pkg/FR-2005-01-11/pdf/05-525.pdf https://www.federalregister.gov/documents/2005/01/11/05-525/endangered-fish-and-wildlife-notice-of-intent-to-prepare-an-environmental-impact-statement.

National Marine Fisheries Service. 2007. Endangered Species Act, Section 7 Consultation – Biological Opinion. Gulf of Mexico Oil and Gas Activities: Five Year Leasing Plan for Western and Central Planning Areas 2007 2012. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. St. Petersburg, FL.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (Caretta caretta), Second Revision. https://www.fisheries.noaa.gov/action/recovery-plans-loggerhead-sea-turtle.

National Marine Fisheries Service. 2009a. Sperm Whale (Physeter macrocephalus) 5-Year Review: Summary and Evaluation. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Sustainable Fisheries, Highly Migratory Species Management Division. Silver Spring, MD. 61 pp.

National Marine Fisheries Service. 2009b. Smalltooth Sawfish Recovery Plan (Pristis pectinata). Prepared by the Smalltooth Sawfish Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 102 pp. https://repository.library.noaa.gov/view/noaa/15983.

National Marine Fisheries Service. 2009c. Final Amendment 1 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan Essential Fish Habitat. Highly Migratory Species Management Division, Office of Sustainable Fisheries. Silver Spring, MD. http://pbadupws.nrc.gov/docs/ML1219/ML12195A241.pdf.

National Marine Fisheries Service. 2010a. Deepwater Horizon/BP oil spill: size and percent coverage of fishing area closures due to BP oil spill.

National Marine Fisheries Service. 2010b. Final Recovery Plan for the Sperm Whale (Physeter macrocephalus). Silver Spring, MD. https://www.fisheries.noaa.gov/resource/document/recovery-plan-sperm-whale-physeter-macrocephalus.

National Marine Fisheries Service. 2011. Species of concern: Western Atlantic bluefin tuna, Thunnus thynnus. https://www.fisheries.noaa.gov/resource/document/endangered-species-act-status-review-atlantic-bluefin-tuna-thunnus-thynnus.

National Marine Fisheries Service. 2015. Recovery Plan for Elkhorn Coral (Acropora palmata) and Staghorn Coral (A. cervicornis). Protected Resources Division. Southeast Regional Office. Saint Petersburg, FL. https://data.nodc.noaa.gov/coris/library/NOAA/CRCP/project/2160/final_acropora_recovery_plan.pdf.

National Marine Fisheries Service. 2016. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. NOAA Technical Memorandum NMFS-OPR-55. 189 pp.

National Marine Fisheries Service. 2018a. Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. NOAA Technical Memorandum NMFS-OPR-59. 178 pp.

National Marine Fisheries Service. 2018b. Smalltooth Sawfish (Pristis pectinata) 5-Year Review: Summary and Evaluation of United States Distinct Population Segment of Smalltooth Sawfish. Southeast Regional Office, St. Petersburg, Florida. 63 pp. https://repository.library.noaa.gov/view/noaa/19253/Print.

National Marine Fisheries Service. 2020a. Endangered Species Act, Section 7 Consultation – Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. St. Petersburg, FL. https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-and-gas-program-activities-gulf-mexico.

National Marine Fisheries Service. 2020b. Sea turtles, dolphins, and whales - 10 years after the Deepwater Horizon oil spill. https://www.fisheries.noaa.gov/national/marine-life-distress/sea-turtles-dolphins-and-whales-10-years-after-deepwater-horizon-oil.

National Marine Fisheries Service. 2021a. Amended ITS on BOEM Gulf of Mexico Oil and Gas Program. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. Tracking No. FPR-2017-92341, Amended 26 April 2021. 245 pp.

National Marine Fisheries Service. 2021b. Critical Habitat for Loggerhead Sea Turtle. https://www.fisheries.noaa.gov/action/critical-habitat-loggerhead-sea-turtle.

National Marine Fisheries Service, U.S. Fish and Wildlife Service and Secretaría de Medio Ambiente y Recursos

National Marine Fisheries Service. 2022. Gulf Sturgeon (*Acipenser oxyrinchus desotoi)*. https://www.fisheries.noaa.gov/species/gulf-sturgeon.

National Marine Fisheries Service. 2023. Oceanic Whitetip Shark. https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark.

Naturales. 2011. Bi-National Recovery Plan for the Kemp‘s Ridley Sea Turtle (Lepidochelys kempii), Second Revision. https://www.fisheries.noaa.gov/resource/document/bi-national-recovery-plan-kemps-ridley-sea-turtle-2nd-revision.

National Oceanic and Atmospheric Administration. 2006. Fact Sheet: Small Diesel Spills (500-5,000 gallons). NOAA Scientific Support Team, Hazardous Materials Response and Assessment Division. Seattle, WA. 2 pp.

National Oceanic and Atmospheric Administration. 2010. Oil and Sea Turtles. Biology, Planning, and Response. U.S Department of Commerce, National Ocean Service, Office of Response and Restoration. 111 pp. https://response.restoration.noaa.gov/sites/default/files/Oil_Sea_Turtles_2021.pdf.

National Oceanic and Atmospheric Administration. 2011a. Joint Analysis Group. Deepwater Horizon Oil Spill: Review of Preliminary Data to Examine Subsurface Oil in the Vicinity of MC252#1, May 19 to June 19, 2010. U.S. Department of Commerce, National Ocean Service. Silver Spring, MD. NOAA Technical Report NOS OR&R 25. 169 pp.

National Oceanic and Atmospheric Administration. 2011b. Joint Analysis Group, Deepwater Horizon Oil Spill: Review of R/V Brooks McCall Data to Examine Subsurface Oil. U.S. Department of Commerce, National Ocean Service. Silver Spring, MD. NOAA Technical Report NOS OR&R 24. 69 pp.

National Oceanic and Atmospheric Administration. 2011c. Joint Analysis Group, Deepwater Horizon Oil Spill: Review of Preliminary Data to Examine Oxygen Levels in the Vicinity of MC252#1 May 8 to August 9, 2010. U.S. Department of Commerce, National Ocean Service. Silver Spring, MD. NOAA Technical Report NOS OR&R 26. 107 pp. https://repository.library.noaa.gov/view/noaa/133.

National Oceanic and Atmospheric Administration. 2014. Flower Garden Banks National Marine Sanctuary. http://flowergarden.noaa.gov/about/cnidarianlist.html.

National Oceanic and Atmospheric Administration. 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

National Oceanic and Atmospheric Administration. 2017a. Small Diesel Spills (500 - 5,000 gallons). U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Response and Restoration. https://response.restoration.noaa.gov/sites/default/files/Small-Diesel-Spills.pdf.

National Oceanic and Atmospheric Administration. 2017b. Oil Types. Office of Response and Restoration. http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/oil-types.html.

National Oceanic and Atmospheric Administration. 2018. Giant Manta Ray. https://www.fisheries.noaa.gov/species/giant-manta-ray.

National Oceanic and Atmospheric Administration. 2022. WebGNOME. https://gnome.orr.noaa.gov/.

National Oceanic and Atmospheric Administration. 2024a. Nassau Grouper. https://www.fisheries.noaa.gov/species/nassau-grouper.

National Oceanic and Atmospheric Administration. 2024b. Queen Conch. https://www.fisheries.noaa.gov/species/queen-conch.

National Research Council. 1983. Drilling Discharges in the Marine Environment. Washington, DC. National Academy Press. 180 pp.

National Research Council. 2003a. Oil in the Sea III: Inputs, Fates, and Effects. Washington, DC. National Academy Press. 182 pp. + app.

National Research Council. 2003b. Ocean Noise and Marine Mammals. Washington, DC. National Academy Press. 204 pp.

National Wildlife Federation. 2016. Wildlife Library: Whooping Crane. https://www.nwf.org/Educational-Resources/Wildlife-Guide/Birds/Whooping-Crane.

Nedwell, J.R. and B. Edwards. 2004. A Review of Measurements of Underwater Man-made Noise Carried Out by Subacoustech Ltd, 1993 - 2003. Prepared by Subacoustech Report Reference: 565R00109, September 2004; prepared for ChevronTexaco Ltd, Total Final Elf Exploration UK PLC, DSTL, DTI, Shell UK.

Nedwell, J.R. and D. Howell. 2004. A Review of Offshore Windfarm Related Underwater Noise Sources. Report No. 544 R 0308. Subacoustech Ltd., Southampton, UK. 63 pp.

Nedwell, J.R., K. Needham, and B. Edwards. 2001. Report on Measurements of Underwater Noise from the Jack Bates Drill Rig. Report No. 462 R 0202. Subacoustech Ltd., Southhampton, UK. 49 pp.

Neff, J.M. 1987. Biological effects of drilling fluids, drill cuttings and produced waters, pp 469-538. In: D.F. Boesch and N.N. Rabalais (Eds.), Long Term Effects of Offshore Oil and Gas Development. Elsevier Applied Science Publishers, London, UK.

Neff, J.M., S. McKelvie, and R.C. Ayers. 2000. Environmental Impacts of Synthetic Based Drilling Fluids. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-064. 141 pp.

Neff, J.M., A.D. Hart, J.P. Ray, J.M. Limia, and T.W. Purcell (2005). An Assessment of Seabed Impacts of Synthetic Based Drilling-mud Cuttings in the Gulf of Mexico. 2005 SPE/EPA/DOE Exploration and Production Environmental Conference, 7-9 March 2005, Galveston, TX. SPE 94086.

NOAA Fisheries. 2020. Species Directory – ESA Threatened and Endangered. www.fisheries.noaa.gov/species-directory/threatened-endangered.

NOAA Fisheries (National Marine Fisheries Service). 2023. Smalltooth Sawfish. https://www.fisheries.noaa.gov/species/smalltooth-sawfish.

Nowlin, W.D.J., A.E. Jochens, S.F. DiMarco, R.O. Reid, and M.K. Howard. 2001. Deepwater Physical Oceanography Reanalysis and Synthesis of Historical Data: Synthesis Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2001-064. 528 pp.

Operational Science Advisory Team, 2011. Summary Report for Fate and Effects of Remnant Oil Remaining in the Beach Environment. Prepared for Lincoln D. Stroh, Capt., U.S. Coast Guard, Federal On-Scene Coordinator, Deepwater Horizon MC252.

Ozhan, K., M.L. Parsons, and S. Bargu. 2014. How were phytoplankton affected by the Deepwater Horizon oil spill? Bioscience 64: 829-836.

Pabody, C.M., R.H. Carmichael, L. Rice, and M. Ross. 2009. A new sighting network adds to 20 years of historical data on fringe West Indian Manatee (Trichechus manatus) populations in Alabama waters. Gulf of Mexico Science 1:52-61.

Picciulin, M., L. Sebastianutto, A. Codarin, A. Farina, and E.A. Ferrero. 2010. In situ behavioural responses to boat noise exposure of Gobius cruentatus (Gmelin, 1789; fam. Gobiidae) and Chromis (Linnaeus, 1758; fam. Pomacentridae) living in a Marine Protected Area. Journal of Experimental Marine Biology and Ecology 386(1): 125-132.

Piniak WED, Mann DA, Harms CA, Jones TT, Eckert SA. 2016. Hearing in the juvenile green sea turtle (Chelonia mydas): A comparison of underwater and aerial hearing using auditory evoked potentials. PLoS One 11(10):e0159711.

Pitman, R.L. and R.L. Brownell Jr. 2020. Mesoplodon bidens. The IUCN Red List of Threatened Species 2020: eT13241A50363686. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13241A50363686.en.

Poot, H., B.J. Ens, H. de Vries, M.A. Donners, M.R. Wernand, and J.M. Marquenie. 2008. Green light for nocturnally migrating birds. Ecology and Society 13(2): 47.

Popper, A.N., A.D. Hawkins, R.R. Fay, D. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D. Zeddies, and W.N. Tavolga. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report. ASA S3/SC1.4 TR-2014 prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. ASA Press, Springer.

Powers, S.P., F.J. Hernandez, R.H. Condon, J.M. Drymon, and C.M. Free. 2013. Novel pathways for injury from offshore oil spills: Direct, sublethal and indirect effects of the Deepwater Horizon oil spill on pelagic Sargassum communities. PLoS One 8(9): e74802.

Prince, R.C. 2014. Crude oil Releases to the Environment: Natural Fate and Remediation Options. Reference Module in Earth Systems and Environmental Sciences. Elsevier. https://doi.org/10.1016/B978-0-12-409548-9.09112-0.

Pritchard, P.C.H. 1997. Evolution, phylogeny, and current status, pp. 1-28. In: P.L. Lutz and J.A. Musick (Eds.), The Biology of Sea Turtles. CRC Press, Boca Raton, FL.

Radford, A.N., E. Kerridge, and S.D. Simpson. 2014. Acoustic communication in a noisy world: Can fish compete with anthropogenic noise? . Behavioral Ecology 25(5): 1,022-1,030.

Ramseur, J.L. 2011. Deepwater Horizon Oil Spill: The Fate of the Oil. Congressional Research Service Report prepared for Members and COmmittees of Congress. https://crsreports.congress.gov/product/pdf/R/R41531.

Rathbun, G.B. 1988. Fixed-wing airplane versus helicopter surveys of manatees. Marine Mammal Science 4(1): 71-75.

Reddy, C.M., J.S. Arey, J.S. Seewald, S.P. Sylva, K.L. Lemkau, R.K. Nelson, C.A. Carmichael, C.P. McIntyre, J. Fenwick, G.T. Ventura, A.S. Van Mooy, and R. Camilli. 2012. Composition and fate of gas and oil released to the water column during the Deepwater Horizon oil spill. Proceedings of the National Academy of Sciences USA109(50):20229-20234.

Relini, M., L.R. Orsi, and G. Relini. 1994. An offshore buoy as a FAD in the Mediterranean. Bulletin of Marine Science 55(2-3): 1099-1105.

Reşitoğlu, İ.A., K. Altinişik, and A. Keskin. 2015. The pollutant emissions from diesel-engine vehicles and exhaust after treatment systems. Clean Technologies and Environmental Policy 17(1): 15-27.

Richards, W.J., T. Leming, M.F. McGowan, J.T. Lamkin, and S. Kelley-Farga. 1989. Distribution of fish larvae in relation to hydrographic features of the Loop Current boundary in the Gulf of Mexico. ICES Marine Science Symposia 191: 169-176.

Richards, W.J., M.F. McGowan, T. Leming, J.T. Lamkin, and S. Kelley-Farga. 1993. Larval fish assemblages at the Loop Current boundary in the Gulf of Mexico. Bulletin of Marine Science 53(2): 475-537.

Richardson, W.J., C.R. Greene Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. San Diego, CA, Academic Press. 592 pp.

Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Carcharhinus longimanus. The IUCN Red List of Threatened Species 2019: e.T39374A2911619.

Rodgers, J.A. and S.T. Schwikert. 2002. Buffer-Zone Distances to protect foraging and loafing waterbirds from disturbance by personal watercraft and outboard-powered boats. Conservation Biology 16(1): 216-224.

Rojek, N.A., M.W. Parker, H.R. Carter, and G.J. McChesney. 2007. Aircraft and vessel disturbances to Common Murres Uria aalge at breeding colonies in central California, 1997-1999. Marine Ornithology 35: 61-69.

Rosel, P.E., P. Corkeron, L. Engleby, D. Epperson, K.D. Mullin, M.S. Soldevilla, and B.L. Taylor. 2016. Status Review of Bryde's Whales (Balaenoptera edeni) in the Gulf of Mexico under the Endangered Species Act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center. NOAA Technical Memorandum NMFS-SEFSC-692. 133 pp.

Rosel, P.E., P. Corkeron, L. Engleby, D. Epperson, K.D. Mullin, M.S. Soldevilla, and B.L. Taylor. 2016. Status Review of Bryde's Whales (Balaenoptera edeni) in the Gulf of Mexico under the Endangered Species Act. National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-SEFSC-692.

Ross, S.W., A.W.J. Demopoulos, C.A. Kellogg, C.L. Morrison, M.S. Nizinski, C.L. Ames, T.L. Casazza, D. Gualtieri, K. Kovacs, J.P. McClain, A.M. Quattrini, A.Y. Roa-Varón, and A.D. Thaler. 2012. Deepwater Program: Studies of Gulf of Mexico lower Continental Slope Communities Related to Chemosynthetic and Hard Substrate Habitats. U.S. Department of the Interior, U.S. Geological Survey. U.S. Geological Survey Open-File Report 2012-1032. 318 pp.

Rowe, G.T. and M.C. Kennicutt. 2009. Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study. Final Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2009-039. 456 pp.

Rudd, M.B., R.N.M. Ahrens, W.E. Pine III, and S.K. Bolden. 2014. Empirical spatially explicit natural mortality and movement rate estimates for the threatened Gulf Sturgeon (*Acipenser oxyrinchus desotoi*). Canadian Journal of Fisheries and Aquatic Sciences 71: 1407-1417.

Russell, R.W. 2005. Interactions Between Migrating Birds and Offshore Oil and Gas Platforms in the Northern Gulf of Mexico: Final Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2005-009. 348 pp.

Sadovy, Y. 1997. The case of the disappearing grouper; Epinephelus striatus, the Nassau grouper in the Caribbean and western Atlantic. Proceedings of the Gulf and Caribbean Fisheries Institute 45: 5-22.

Salmon, M. and J. Wyneken. 1990. Do swimming loggerhead sea turtles (Caretta L.) use light cues for offshore orientation? Marine and Freshwater Behaviour and Physiology 17(4): 233-246.

Samuel, Y., S.J. Morreale, C.W. Clark, C.H. Greene, and M.E. Richmond. 2005. Underwater, low-frequency noise in a coastal sea turtle habitat. Journal of the Acoustical Society of America 117(3): 1465-1472.

Schwemmer, P., B. Mendel, N. Sonntag, V. Dierschke, and S. Garthe. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications 21(5): 1851-1860.

Seitz, J.C. and G.R. Poulakis. 2006. Anthropogenic effects on the smalltooth sawfish (Pristis pectinata) in the United States. Marine Pollution Bulletin 52(11): 1533-1540.

Simões, T.N., A. Candido de Silva, and C. Carneiro de Melo Moura. 2017. Influence of artificial lights on the orientation of hatchlings of *Eretmochelys imbricata* in Pernambuco, Brazil. Zoologia 34: e13727.

Simons, T.R.; Lee, D.S.; Haney, J.C. 2013. Diablotin *Pterodroma hasitata*: a biography of the endangered Black-capped Petrel. Marine Ornithology 41: 3-43.

Smithsonian Tropical Research Institute. 2015. Speices: Ariomma bondi, Silver Rag Driftfish, Silver Rage, Silver-rag driftfish. https://biogeodb.stri.si.edu/caribbean/en/thefishes/species/4273.

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

Soldevilla, M.S., Debich, A.J., Garrison, L.P., Hildebrand, J.A., and Wiggins, S.M. 2022a. Rice's whales in the northwestern Gulf of Mexico: call variation and occurrence beyond the known core habitat. Endangered Species Research 48: 155-174.

Soldevilla, M.S., Ternus, K., Cook, A., Hildebrand, J.A., Frasier, K.E., Martinex, A., and L.P. Garrison. 2022b. Acoustic localization, validation, and characterization of Rice's whale calls. Journal of the Acoustic Society of America 151(6): 4264.

Soldevilla, M.S., Debich, A.J., Perez-Carballo, I., Jarriel, S., Grasier, K.E., Garrison, L.P., Gracia, A., Hildebrand, J.A., Rosel, P.E., and A. Serrano. 2024. Rice's whale occurrence in the western Gulf of Mexico from passive acoustic recordings. Marine Mammal Science 2024:1-8.

Southall B.J., Bowles A.E., Ellison W.T., Finneran J.J., Gentry R.L., Greene Jr. C.R., Kastak D., Ketten D.R., Miller J.H., Nachtigall P.E., Richardson W.J., Thomas J.A., and Tyack P.L. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals 33(44): 411-521.

Southall, B.L., D.P. Nowacek, P.J. Miller, and P.L. Tyack. 2016. Experimental field studies to measure behavioral responses of cetaceans to sonar. Endangered Species Research 31: 293-315.

Spies, R.B., S. Senner and C.S. Robbins. 2016. An Overview of the Northern Gulf of Mexico Ecosystem. Gulf of Mexico Science 33(1):98-121. doi: 10.18785/goms.3301.09.

Stewart, J.D., M. Nuttall, E.L. Hickerson, and M.A. Johnson. 2018. Important juvenile manta ray habitat at Flower Garden Banks National Marine Sanctuary in the northwestern Gulf of Mexico. Marine Biology 165(111).

Stiles, M.L., E. Harrould-Kolieb, R. Faure, H. Tlitalo-Ward, and M.F. Hirschfield. 2007. Deep Sea Trawl Fisheries of the Southeast U.S. and Gulf of Mexico: Rock Shrimp, Royal Red Shrimp, Calico Scallops. Oceana. Washington DC. 24 pp.

Stoner, A.W., and R.S. Appeldoorn 2022. Synthesis of Research on the Reproductive biology of Queen conch (Aliger gigas): toward the goals of sustainable fisheries and species conservation. Reviews in Fisheries Science & Aquaculture 30(3): 346-390.

Suchanek, T.H. 1993. Oil impacts on marine invertebrate populations and communities. American Zoologist 33: 510-523.

Sulak, K.J. and J.P. Clugston. 1998. Early life history stages of Gulf sturgeon in the Suwanee River, Florida. Transactions of the American Fisheries Society 127: 758-771.

Taylor, B.L., R. Baird, J. Barlow, S.M. Dawson, J. Ford, J.G. Mead, G. Notarbartolo di Sciara, P. Wade, and R.L. Pitman. 2008. Mesoplodon bidens. The IUCN Red List of Threatened Species 2008: e.T13241A3424903.

Tierney, K.B., Baldwin, D.H., Hara, T.J., Ross, P.S., Scholz, N.L., and C.J. Kennedy. 2010. Olfactory toxicity in fishes. Aquatic Toxicology 96:2-26.

Todd, V.L.G., W.D. Pearse, N.C. Tegenza, P.A. Lepper, and I.B. Todd. 2009. Diel echolocation activity of harbour porpoises (*Phocoena phocoena*) around North Sea offshore gas installations. ICES Journal of Marine Science 66: 734-745.

Turtle Island Restoration Network. 2023. Kemp's Ridley Sea Turtle Count on the Texas Coast. https://seaturtles.org/turtle-count-texas-coast/.

Tuxbury, S.M. and M. Salmon. 2005. Competitive interactions between artificial lighting and natural cues during seafinding by hatchling marine turtles. Biological Conservation 121: 311-316.

U.S. Department of Homeland Security. 2014. U.S. Coast Guard Incident Management Handbook. COMDTPUB P3120.17B. U.S. Government Printing Office. Washington, D.C.

U.S. Environmental Protection Agency. 2016. Questions and answers about the BP oil spill in the Gulf Coast. https://archive.epa.gov/emergency/bpspill/web/html/qanda.html.

U.S. Environmental Protection Agency. 2023. Nonattainment Areas for Criteria Pollutants (Green Book). https://www.epa.gov/green-book.

U.S. Fish and Wildlife Service, Gulf States Marine Fisheries Commission and National Marine Fisheries Service. 1995. Gulf Sturgeon Recovery/Management Plan. U.S. Department of Interior, U.S. Fish and Wildlife Service, Southeast Region. Atlanta, GA.

U.S. Fish and Wildlife Service. 2001a. Florida manatee recovery plan (*Trichechus manatus latirostris*), Third Revision. U.S. Department of the Interior, Southeast Region. Atlanta, GA.

U.S. Fish and Wildlife Service. 2001b. Endangered and threatened wildlife and plants; Endangered status for the Florida salt marsh vole. Federal Register 56(9):1457-1459.

U.S. Fish and Wildlife Service. 2003. Recovery plan for the Great Lakes Piping Plover (*Charadrius melodus*). U.S. Department of the Interior. Fort Snelling, MN.

U.S. Fish and Wildlife Service. 2007. International Recovery Plan: Whooping Crane (*Grus americana*), Third Revision. U.S. Department of the Interior. Albequerque, NM.

U.S. Fish and Wildlife Service. 2014. West Indian Manatee (*Trichechus manatus*) Florida Stock (Florida subspecies, *Trichechus manatus latirostris*). Jacksonville, Florida. https://esadocs.defenders-cci.org/ESAdocs/misc/FR00001606_Final_SAR_WIM_FL_Stock.pdf.

U.S. Fish and Wildlife Service. 2016a. Hawksbill Sea Turtle (Eretmochelys imbricata). https://www.fws.gov/species/hawksbill-sea-turtle-eretmochelys-imbricata.

U.S. Fish and Wildlife Service. 2016b. Find Endangered Species. http://www.fws.gov/endangered/.

U.S. Fish and Wildlife Service. 2020. FWS-Listed U.S. Species by Taxonomic Group. Accessed at: https://ecos.fws.gov/ecp/report/species-listings-by-tax-group-totals.

U.S. Fish and Wildlife Service. 2023a. Whooping Crane Survey Results: Winter 2022-2023. https://www.fws.gov/sites/default/files/documents/WHCR%20Update%20Winter%202022-2023.pdf.

U.S. Fish and Wildlife Service. 2023b. Species Status Assessment Report for the Black-capped Petrel (Pterodroma hasitata). Version 1.3, May 2023. https://ecos.fws.gov/ServCat/DownloadFile/242904.

U.S. Fish and Wildlife Service. nd. Rufa Red Knot. https://www.fws.gov/species/rufa-red-knot-calidris-canutus-rufa.

Urick, R.J. 1983. Principles of underwater sound. Los Altos Hills, CA, Peninsula Publishing. 444 pp.

Valentine, D.L., G.B. Fisher, S.C. Bagby, R.K. Nelson, C.M. Reddy, S.P. Sylva, and M.A. Woo. 2014. Fallout plume of submerged oil from Deepwater Horizon. Proceedings of the National Academy of Sciences USA 111(45): 906-915.

Vanderlaan, A. S. and C. T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. Marine Mammal Science 23(1):144-156.

Van de Laar, F.J.T. 2007. Green Lights to Birds: Investigations into the Effect of Bird Friendly Lighting. NAM LOCATIE L15-FA-1. 23 pp. https://tethys.pnnl.gov/sites/default/files/publications/van-de-Laar-2007.pdf.

Wakeford, A. 2001. State of Florida Conservation Plan for Gulf sturgeon (Acipencer oxyrinchus desotoi). Florida Fish and Wildlife Conservation Commission, St. Petersburg, FL. FMRI Technical Report TR-8. 106 pp.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E.E. Rosel. 2016. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2015. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS NE 238. 361 pp.

Wartzok, D. and D.R. Ketten. 1999. Marine mammal sensory systems, pp 117-175. In: J.E. Reynolds III and S. Rommel (Eds.), Biology of Marine Mammals. Smithsonian Institution Press, Washington, DC.

Wei, C.-L. 2006. The Bathymetric Zonation and Community Structure of Deep-sea Macrobenthos in the Northern Gulf of Mexico. M.S. Thesis, Texas A&M University. http://repository.tamu.edu/handle/1969.1/4927.

Wei, C.-L., G.T. Rowe, G.F. Hubbard, A.H. Scheltema, G.D.F. Wilson, I. Petrescu, J.M. Foster, M.K. Wickstein, M. Chen, R. Davenport, Y. Soliman, and Y. Wang. 2010. Bathymetric zonation of deep-sea macrofauna in relation to export of surface phytoplankton production. Marine Ecology Progress Series 39: 1-14.

Wiese, F.K., W.A. Montevecchi, G.K. Davoren, F. Huettmann, A.W. Diamond, and J. Linke. 2001. Seabirds at risk around offshore oil platforms in the north-west Atlantic. Marine Pollution Bulletin 42(12): 1285-1290.

Wilson, C.A., A. Pierce, and M.W. Miller. 2003. Rigs and Reefs: A Comparison of the Fish Communities at Two Artificial Reefs, a Production Platform, and a Natural Reef in the Northern Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2003-009. 105 pp.

Wilson, C.A., M.W. Miller, Y.C. Allen, K.M. Boswell, and D.L. Nieland. 2006. Effects of Depth, Location, and Habitat Type on Relative Abundance and Species Composition of Fishes Associated with Petroleum Platforms and Sonnier Bank in the Northern Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2006-037. 97 pp.

Wilson, J. 2003. Manatees in Louisiana. Louisiana Conservationist July/August 2003: 7 pp.

Witherington, B., S. Hirama, R. Hardy. 2012. Young sea turtles of the pelagic Sargassum-dominated drift community: Habitat use, population density, and threats. Marine Ecology Progress Series. 463:1-22. https://www.int-res.com/articles/feature/m463p001.pdf

Wootton, E.C., E.A. Dyrynda, R.K. Pipe, and N.A. Ratcliffe. 2003. Comparisons of PAH-induced immunomodulation in three bivalve molluscs. Aquatic Toxicology 65(1): 13-25.Würsig, 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.

Würsig, B., T.A. Jefferson, and D.J. Schmidly. 2000. The Marine Mammals of the Gulf of Mexico. College Station, TX, Texas A&M University Press. 232 pp.

Würsig, B. 2017. Marine mammals of the Gulf of Mexico, pp. 1489-1587. In: C. Ward (Ed.), Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill. Springer, New York, NY.

Young, C.N. and J.K. Carlson. 2020. The biology and conservation status of the oceanic whitetip shark (Carcharhinus longimanus) and future directions for recovery. Reviews in Fish Biology and Fisheries 30:293-321.

Zykov, M.M. 2016. Modelling Underwater Sound Associated with Scotian Basin Exploration Drilling Project: Acoustic Modelling Report. JASCO Document 01112, Version 2.0. Technical report by JASCO Applied Sciences for Stantec Consulting Ltd. 90 pp.