UNITED STATES GOVERNMENT October 28, 2021
MEMORANDUM

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

Subject: Public Information copy of plan

Control #	-	S-08059
Type	-	Supplemental Development Operations Coordinations Document
Lease(s)	-	OCS-G16764 Block - 609 Green Canyon Area OCS-G18402 Block - 608 Green Canyon Area
Operator	-	BHP Billiton Petroleum (GOM) Inc.
Description	-	Subsea Wells N-A4, N-A5, and SN101
Rig Type	-	Not Found

Attached is a copy of the subject plan.

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

Leslie Wilson
Plan Coordinator

Site Type/Name	**Botm Lse/Area/Blk**	**Surface Location**	**Surf Lse/Area/Blk**
WELL/N-A5	G16764/GC/609	4993 FNL, 819 FWL	G16764/GC/609
WELL/SN101	G18402/GC/608	4799 FNL, 871 FWL	G16764/GC/609
WELL/SN102	G16764/GC/609	4944 FNL, 827 FWL	G16764/GC/609

PUBLIC COPY
September,2021

SUPPLEMENTAL DEVELOPMENT OPERATIONS

COORDINATION DOCUMENT

BHP

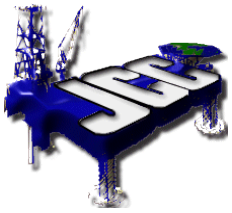
Green Canyon Blocks 608 / 609
OCS-G 18402 / 16764
Prospect Name: Shenzi North

Estimated Startup Date: February 15 , 2022

SUBMITTED BY:
BHP Billiton Petroleum (GOM) Inc.
1500 Post Oak Boulevard
Houston, Texas 77056

Melissa Blaikie
Melissa.blaikie@bhp.com

AUTHORIZED REPRESENTATIVE:
Kelley Pisciola
J. Connor Consulting, Inc.
19219 Katy Freeway, Suite 200
Houston, Texas 77094
281-698-8519
kelley.pisciola@jccteam.com



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SECTION 1
PLAN CONTENTS

1.1 PLAN INFORMATION

BHP Billiton Petroleum (GOM) Inc. (BHP) is the designated operator of Leases OCS-G 16764, 16765, 21810, 20084 and 20085, Green Canyon (GC) Blocks 609, 610, 652, 653 and 654. These blocks have been unitized to comprise the GC 654 Unit (Agreement No. 754307012). Additionally, BHP is the designated operator of Lease OCS-G 18402, all of GC Block 608 from 13,200' True Vertical Depth (TVD) to 50,000' TVD.

BHP's Initial Development Operations Coordination Document (DOCD) for the Shenzi Development, Control No. N-9001 was approved September 18, 2007. Subsequently, BHP has received approval for multiple Supplemental and Revised DOCDs for the Shenzi Development.

Under this Supplemental DOCD, BHP proposes to commence production of existing Well No. SN101, GC 608 (API No. 608114074500). The drilling, abandonment and completion of GC 608, Well No. SN101 (previously known as N-A3) were provided for under Supplemental Exploration Plan (EP), Control No. S-8026, approved on November 6, 2020. To date, BHP has drilled and temporarily abandoned GC 608, Well No. SN101.

Further, BHP proposes to drill, abandon, complete and commence production of Well Location N-A4 *(to be drilled, completed and produced as Well No. SN102, GC 609)*, and Well Location N-A5. Well Location N-A5 is intended as a respud well location should complications occur while drilling the planned N-A4 Well Location.

BHP also proposes to install one right-of-way pipeline with an associated umbilical and two 9-inch lease term jumper pipelines, each approximately 90 feet in length.

The proposed operations will not utilize pile-driving, nor is BHP proposing any new pipelines expected to make landfall.

The wells will be drilled with a dynamically positioned drillship (*Transocean Deepwater Invictus* or equivalent), and are located in approximately 4,293 feet of water.

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

1.2 LOCATION

Well Location Plats depicting the surface locations and bottomhole locations of the proposed wells, measured depths/true vertical depths and water depths are included as **Attachment 1-B**.

No anchors are associated with the activities proposed in this plan. A Bathymetry Map depicting the surface locations and water depths of the proposed wells are included as **Attachment 1-C**.

1.3 SAFETY AND POLLUTION PREVENTION FEATURES

BHP will drill the wells with a Dynamically Positioned (DP) Drillship equipped with a Subsea BOP. Once a rig is determined, BOP information and schematics will be included as a part of the Application for Permit to Drill.

The rig will be equipped with safety and fire-fighting equipment required to comply with United States Coast Guard (USCG) regulations. Appropriate life saving equipment such as life rafts, life jackets, ring buoys, etc. as prescribed by the USCG, will be maintained on the rig at all times.

Safety features on the drilling unit will include well control, pollution prevention, and blowout prevention equipment as described in BSEE regulations 30 CFR 250 C, D, E, O, Q and S; and as further clarified by BSEE Notices to Lessees, and current policy making invoked by the BSEE, Environmental Protection Agency (EPA) and the USCG.

Pollution prevention measures include installation of curbs, gutters, drip pans, and drains on drilling deck areas to collect all contaminants and debris. Compliance will be maintained with the EPA NPDES Permit. The rig will be monitored daily 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. All spills will be reported to the appropriate governmental agencies.

1.4 STORAGE TANKS AND PRODUCTION VESSELS

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

Type of Storage Tank	Type of Facility	Tank Capacity (bbl)	Number of Tanks	Total Capacity (bbl)	Fluid Gravity (API)
Lube Oil Tank P/S	Drillship	371, 123, 183 & 164	4	841	29-39°
Dirty Oil Tank		48, 658 & 243	3	949	29-39°
Diesel Oil		14,960 (1) 14,268 (2) 1,336 (2) 1,413 (2) 1,145 (2)	9	51,284	30-45°
Base Oil		5,058 & 398	2	5,456	45°

1.5 POLLUTION PREVENTION MEASURES

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

1.6 ADDITIONAL MEASURES

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

1.7 COST RECOVERY FEE

Documentation of the $12,714.00 cost recovery fee payment is included as **Attachment 1-D.**

Attachment 1-A

U.S. Department of the Interior
Bureau of Ocean Energy Management

OMB Control Number: 1010-0151
OMB Approval Expires: 6/30/2021

OCS PLAN INFORMATION FORM

General Information

Type of OCS Plan:		Exploration Plan (EP)	XX	Development Operations Coordination Document (DOCD)	
Company Name: BHP Billiton Petroleum (GOM) Inc.				BOEM Operator Number: 02010	
Address: 1500 Post Oak Boulevard				Contact Person: Kelley Pisciola	
Houston, Texas 77056				Phone Number: 28-698-8519	
				E-Mail Address: kelley.pisciola@jccteam.com	
If a service fee is required under 30 CFR 550.125(a), provide the		Amount paid	$12,714.00	Receipt No.	26TCFN50

Project and Worst Case Discharge (WCD) Information

Leases: OCS-G 18402 / 16764				Area: Green Canyon			Blocks: 608 / 609		Project Name (If Applicable): Shenzi North
Objective(s)	X	Oil	X	Gas		Sulphur		Salt	Onshore Support Base(s): Port Fourchon, LA
Platform / Well Name: N-C1				Total Volume of WCD: 13,373,500 bbls					API Gravity: 31°
Distance to Closest Land (Miles): 117				Volume from uncontrolled blowout: 133,735 bbls/day					

Have you previously provided information to verify the calculations and assumptions for your WCD?	XX	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	S-07704			
Do you propose to use new or unusual technology to conduct your activities?		Yes	XX	No
Do you propose to use a vessel with anchors to install or modify a structure?		Yes	XX	No
Do you propose any facility that will serve as a host facility for deepwater subsea development?		Yes	XX	No

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

Proposed Activity	Start Date	End Date	No. of Days
Drill and TA Well N-A4 (SN102)	02/15/2022	05/26/2022	100 days
Drill, TA and Complete Well N-A5	06/01/2022	09/09/2022	100 days
Complete Well N-A4 (SN102)	11/01/2022	01/15/2023	75 days
Complete Well SN101	01/16/2023	04/01/2023	75 days
Installation of Lease Term Jumper Pipelines	04/02/2023	08/30/2023	150 days
Commence Production Wells SN101 and SN102	09/15/2023	09/15/2037	14 years
Miscellaneous Well Interventions Well SN101 and SN102	01/01/2024	07/19/2031	200 days / year
Well Location N-A5 is intended as a respud location only.			

Description of Drilling Rig

	Jackup	XX	Drillship		Caisson		Tension leg platform
	Gorilla Jackup		Platform rig		Fixed platform		Compliant tower
	Semisubmersible		Submersible		Spar		Guyed tower
	DP Semisubmersible		Other (Attach description)		Floating production system		Other (Attach description)
Drilling Rig Name (If known): Invictus (or equivalent)							

Description of Lease Term Pipelines

From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)
SN 101 Well, GC 609	Manifold, GC 609	9-inch	90 feet
SN 102 Well, GC 609	Manifold, GC 609	9-inch	90 feet

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

Proposed Well/Structure Location

Well Name/Number (If renaming well or structure, reference previous name): N-A4 (to be drilled as SN102)					Previously reviewed under an approved EP or DOCD?		Yes	XX	No
Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						XX	Yes		No

WCD Info	For wells, volume of uncontrolled blowout (Bbls/Day): 133,735 bbls/day	For structures, volume of all storage and pipelines (Bbls): NA	API Gravity of fluid	31°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 16764		OCS OCS
Area Name	Green Canyon		
Block No.	609		
Blockline Departures (in feet)	N/S Departure: 4944' FNL	N/S Departure:	N/S Departure F __ L N/S Departure F __ L N/S Departure F __ L
	E/W Departure: 827' FWL	E/W Departure:	E/W Departure F __ L E/W Departure F __ L E/W Departure F __ L
Lambert X-Y coordinates	X: 2,566,907'	X:	X: X: X:
	Y: 9,942,576'	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27° 22' 12.61" N	Latitude:	Latitude Latitude Latitude
	Longitude: 90° 8' 42.16" W	Longitude:	Longitude Longitude Longitude

Water Depth (Feet): 4293'	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): N-A5					Previously reviewed under an approved EP or DOCD?		Yes	XX	No
Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						XX	Yes		No

WCD Info	For wells, volume of uncontrolled blowout (Bbls/Day): 133,735 bls/day	For structures, volume of all storage and pipelines (Bbls): NA	API Gravity of fluid	31°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 16764		OCS OCS
Area Name	Green Canyon		
Block No.	609		
Blockline Departures (in feet)	N/S Departure: 4993' FNL	N/S Departure:	N/S Departure F __ L N/S Departure F __ L N/S Departure F __ L
	E/W Departure: 819' FWL	E/W Departure:	E/W Departure F __ L E/W Departure F __ L E/W Departure F __ L
Lambert X-Y coordinates	X: 2,556,899'	X:	X: X: X:
	Y: 9,942,527'	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27° 22' 12.12" N	Latitude:	Latitude Latitude Latitude
	Longitude: 90° 8' 42.27" W	Longitude:	Longitude Longitude Longitude

Water Depth (Feet): 4293'	MD (Feet):	TVD (Feet):	TVD (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, reference previous name): SN101 (previously N-A3)					Previously reviewed under an approved EP or DOCD?	XX S-8026	Yes		No
Is this an existing well or structure?	XX	Yes		No	If this is an existing well or structure, list the Complex ID or API No.	60-811-40745-00			
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						XX	Yes		No

WCD Info	For wells, volume of uncontrolled blowout (Bbls/Day): 133,735 bbls/day	For structures, volume of all storage and pipelines (Bbls): NA	API Gravity of fluid	31°

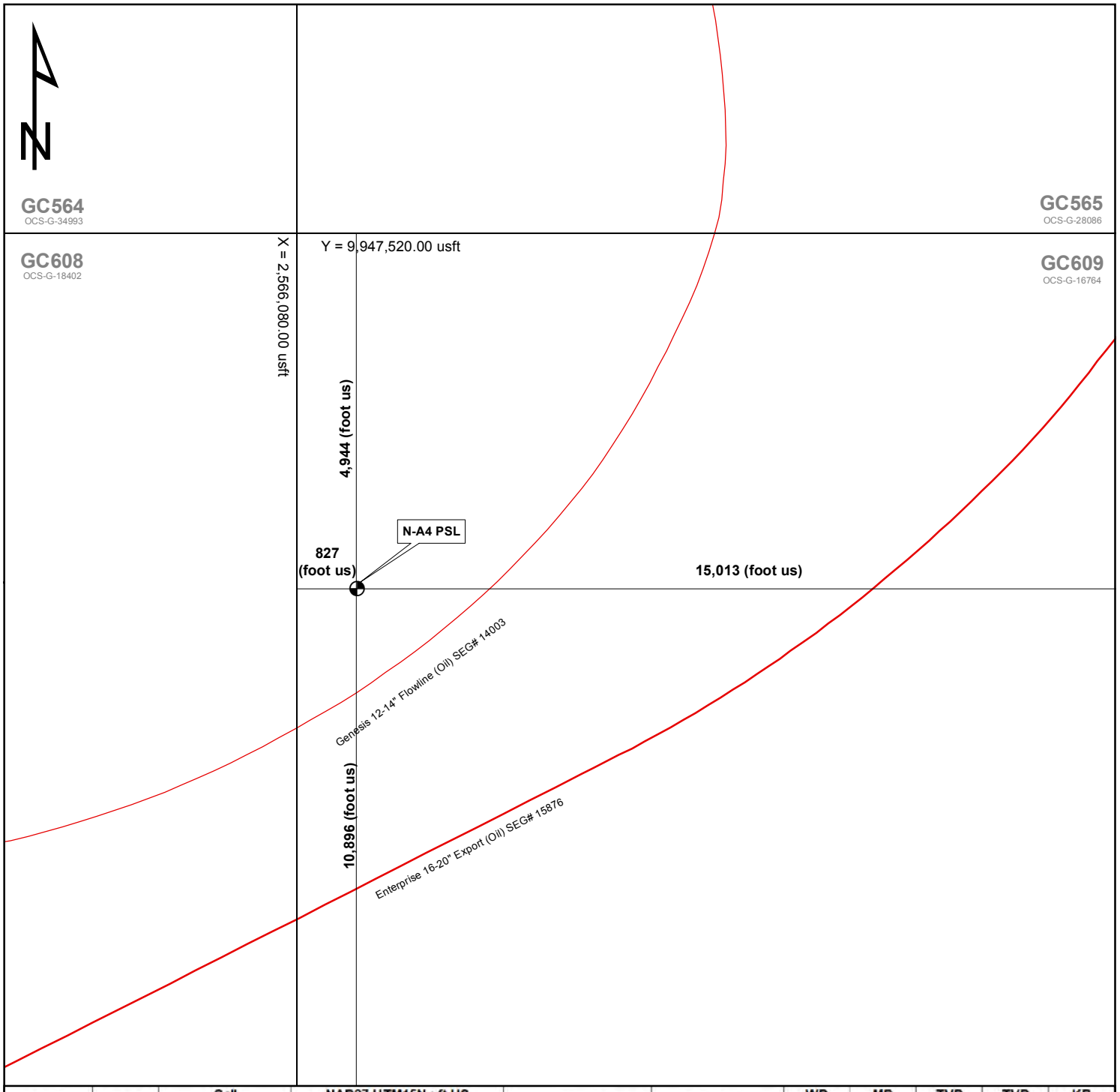
	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 16764		OCS OCS
Area Name	Green Canyon		
Block No.	609		
Blockline Departures (in feet)	N/S Departure: 4799' FNL	N/S Departure:	N/S Departure F __ L N/S Departure F __ L N/S Departure F __ L
	E/W Departure: 871' FWL	E/W Departure:	E/W Departure F __ L E/W Departure F __ L E/W Departure F __ L
Lambert X-Y coordinates	X: 2,566,951'	X:	X: X: X:
	Y: 9,942,121'	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27° 22' 14.033" N	Latitude:	Latitude Latitude Latitude
	Longitude: 90° 8' 41.638" W	Longitude:	Longitude Longitude Longitude

Water Depth (Feet): 4293'	MD (Feet):	TVD (Feet):	TVD (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:	

Attachment 1-B



Well	Block	Call		NAD27 UTM15N : ft US		Latitude	Longitude	WD	MD	TVD	TVD	KB
		ft US	ft US	X ft US	Y ft US			ft	RKB ft	RKB ft	SS ft	ASL ft
N-A4 PSL	GC609	827	4944	2,566,907	9,942,576	27° 22' 12.61" N	90° 8' 42.16" W	4,293	4,396	4,396	4,293	103
		FWL	FNL									

- Proposed Surface Hole Location
- Offsets SHL
- GOM Blocks
- Flowline, Oil
- Export Pipeline, Oil

0 500 1,000 2,000 3,000 4,000

Feet

1 " = 2,000 ft

Convergence: 1.3136°

BHP

PROPOSED Well: N-A4
Green Canyon, BLOCK GC609
OCS-G-16764

GULF OF MEXICO

NOTES:

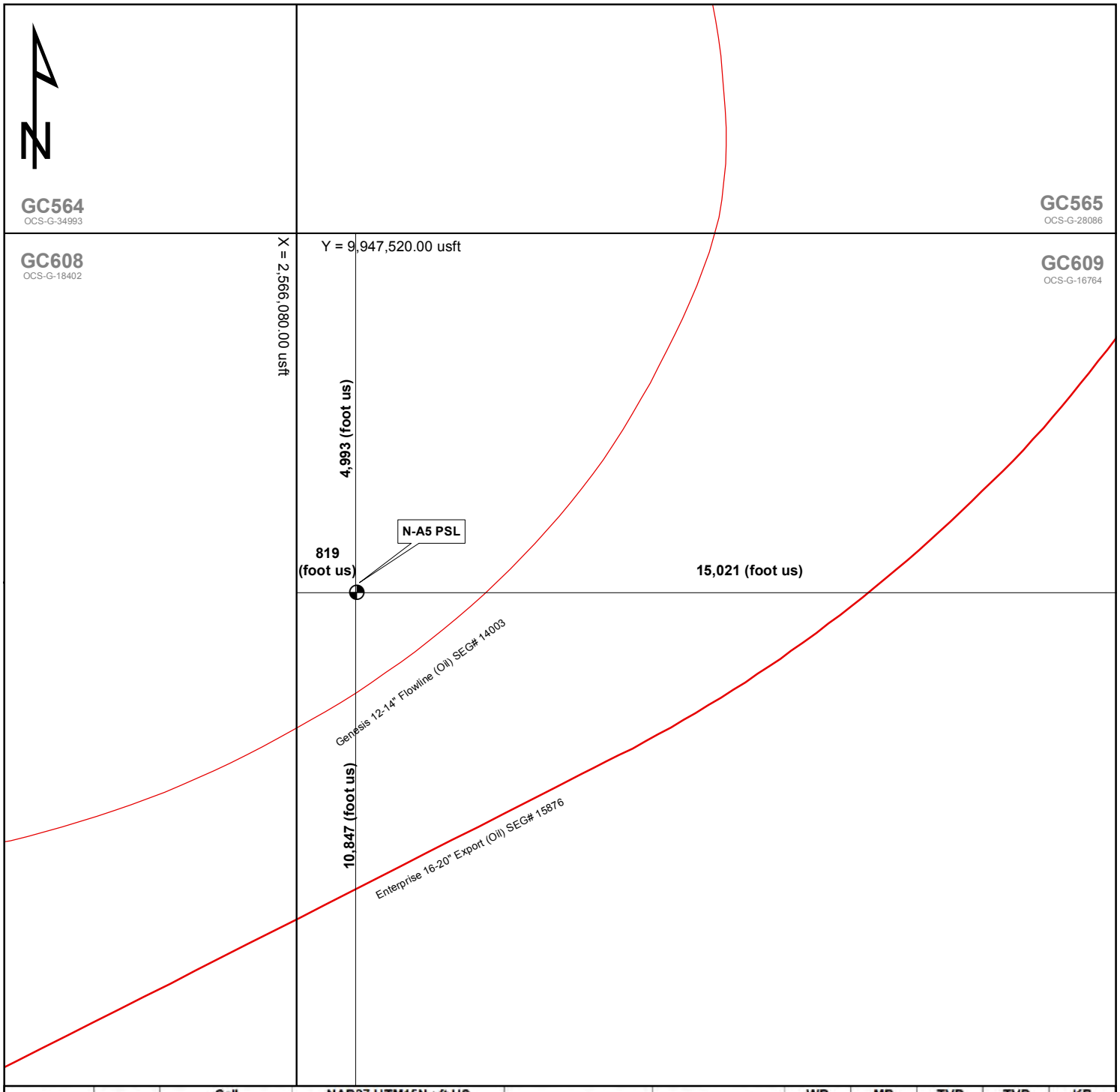
Coordinate System: NAD 1927 BLM Zone 15N
Projection: Transverse Mercator
Datum: North American 1927
False Easting: 1,640,416.6667
False Northing: 0.0000
Central Meridian: -93.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Foot US

DRAWN BY: N Lovely
CHECKED BY: M Michell

Date: 8/30/2021

REV: 2

Page 1 of 1



Well	Block	Call		NAD27 UTM15N : ft US		Latitude	Longitude	WD	MD	TVD	TVD	KB
		ft US	ft US	X ft US	Y ft US			ft	RKB ft	RKB ft	SS ft	ASL ft
N-A5 PSL	GC609	819 FWL	4993 FNL	2,566,899	9,942,527	27° 22' 12.12" N	90° 8' 42.27" W	4,293	4,396	4,396	4,293	103

- Proposed Surface Hole Location
- Offsets SHL
- GOM Blocks
- Flowline, Oil
- Export Pipeline, Oil

0 500 1,000 2,000 3,000 4,000

Feet

1 " = 2,000 ft

Convergence: 1.3136°

BHP

PROPOSED Well: N-A5
Green Canyon, BLOCK GC609
OCS-G-16764

GULF OF MEXICO

Coordinate System: NAD 1927 BLM Zone 15N
Projection: Transverse Mercator
Datum: North American 1927
False Easting: 1,640,416.6667
False Northing: 0.0000
Central Meridian: -93.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Foot US

DRAWN BY: N Lovely
CHECKED BY: M Michell

Date: 8/26/2021

REV: 1

564 565
608

Y 9947520

GREEN CANYON AREA

BLOCK 609

OCS-G-16764

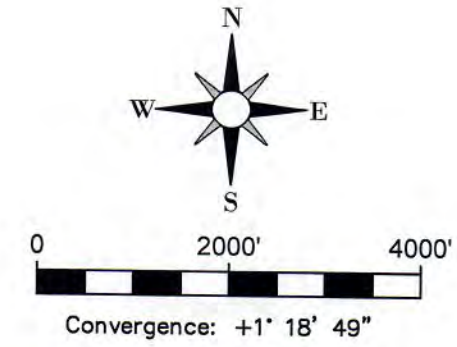
4798.64

870.76

SN101
Final Surface Location
X: 2566950.76ft
Y: 9942721.36ft
Lat: 27°22'14.033"N
Lon: 90°08'41.638"W

SN101
NAD 83 (Nadcon)
N: 3030746.52m
E: 782398.40m
Lat: 27°22'15.015"N
Lon: 90°08'41.775"W

X 2566080



Convergence: +1° 18' 49"

608 609
652 653

Y 9931680

I hereby certify, the above well location is correct.

STATE OF TEXAS REGISTERED TERRY C. SCHULTZ 5161 PROFESSIONAL LAND SURVEYOR

Terry C. Schultz, RPLS
Texas Reg. Professional Land Surveyor
No. 5161

GEODETICS

DATUM: NAD 27
SPHEROID: CLARKE 1866
ZONE: UTM 15 NORTH
UNITS: US SURVEY FEET

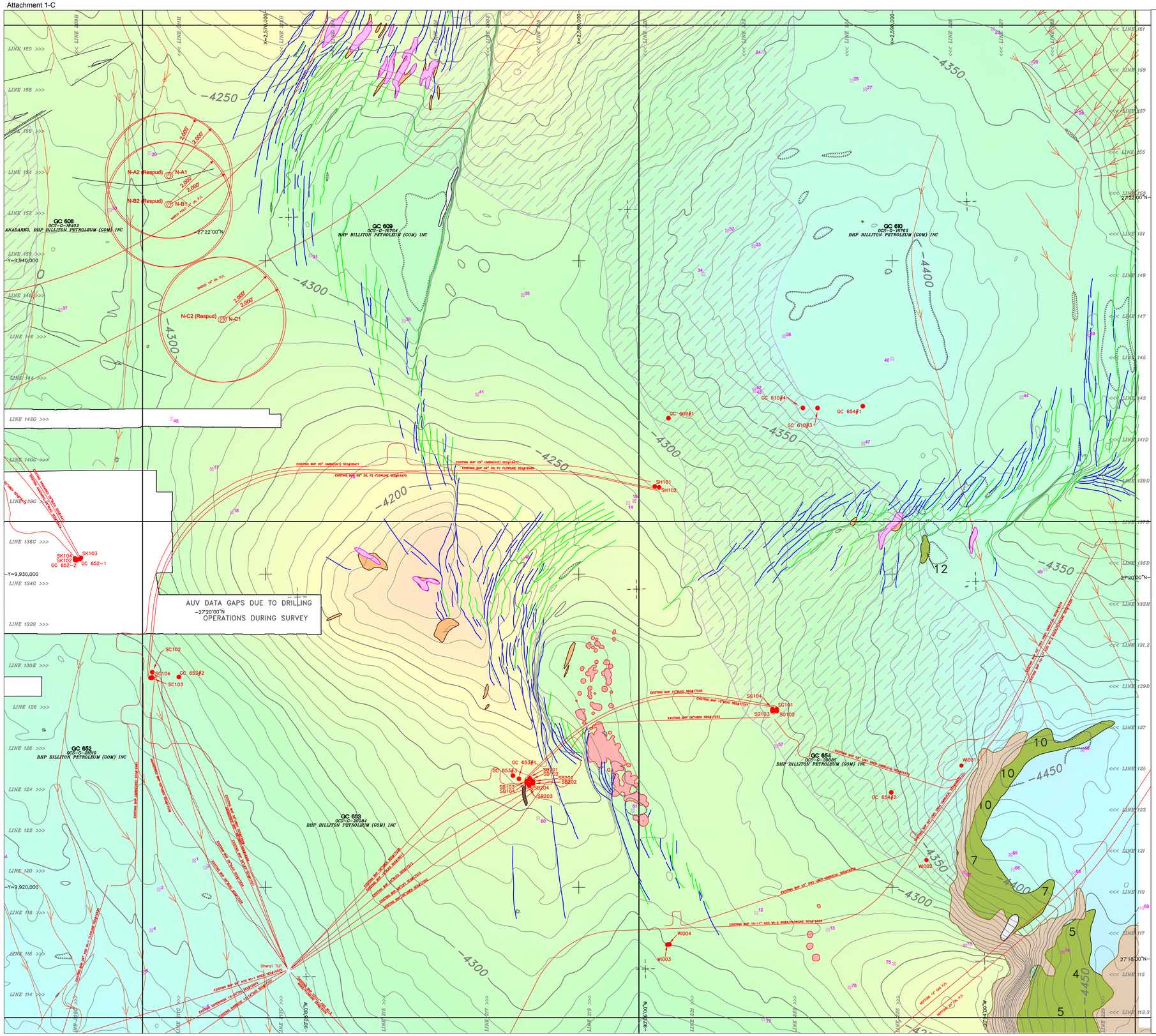
NOTES:

NAD 83 coordinates calculated using NADCON

BHP

FINAL WELL LOCATION
SN101-GC608
OCS-G-18402
GREEN CANYON, BLOCK 608
GULF OF MEXICO

Rev: 0	File Ref: ShenziNorth-GC608-101	Date: 11/25/2020
Drawn by: TCS	Project: Shenzi North – 101	Scale: 1"=2000ft
Drawing: ShenziNorth-GC608-101-BOEM-Final.dwg		Sheet: 1 of 1



Attachment 1-C

WATER DEPTH CONTOUR, IN FEET. CONTOUR INTERVAL IS 10 FEET.

WEST/NORTHWEST DIPPING FAULT WITH SEAFLOOR EXPRESSION.

EAST/SOUTHEAST DIPPING FAULT WITH SEAFLOOR EXPRESSION.

BURIED SEDIMENT TRANSPORT CHANNELS.

BURIED CHANNELS POSSIBLY RELATED TO BRINE-SEEPAGE.

ANCHOR/DRAG SCARS.

EXPULSION MOUNDS AND DEPRESSIONS WITH RELATIVELY HIGH ACOUSTIC BACKSCATTER.

TAR MOUNDS.

ZONE OF SEAFLOOR EROSION.

SEAFLOOR LANDSLIDE DEPOSITS.

DRILLING-MUD DEPOSITS NEAR SHENZI-2 WELL.

SHALLOW-BURIED GAS ACCUMULATIONS.

SHALLOW-BURIED (POST-TRIPLET) LANDSLIDE DEPOSITS. NUMBER INDICATES SHALLOWEST DEPTH OF BURIAL IN FEET.

IRREGULAR SEAFLOOR ASSOCIATED WITH BURIED (PRE-M4) LANDSLIDE DEPOSITS.

MULTI-BEAM
WATER DEPTH

NOTES:

1. NAVIGATION WAS SUPPLIED THROUGH BHP, IN CONJUNCTION WITH THE AUV DATA COLLECTED BY C&C TECHNOLOGIES (2005).
2. REPORTED LOCATION OF EXISTING INFRASTRUCTURE BASED ON AS-BUILT DRAWING (601W-11-001 shenzi new_041912_BACKGROUND.dwg) PROVIDED TO BHP BILLITON BY UTEC.

LINE 170 >>> AUV SURVEY LINE NUMBER.

EXISTING WELLSITE AND DESIGNATION.

18"-20" REPORTED LOCATION OF EXISTING PIPELINE.

21 SIDE-SCAN SONAR TARGET INTERPRETED TO BE MODERN DEBRIS (GEMS ARCHAEOLOGICAL ASSESSMENT, 2011).

N-A1 PROPOSED WELL LOCATION AND DESIGNATION

2000' RADII AROUND PROPOSED WELL LOCATION

EXISTING INFRASTRUCTURE

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4 m	SCALE FACTOR:	0.99960
PROJECTION:	UTM	CENTRAL MERIDIAN:	93° W
DATUM:	NAD 1927	LAT. ORIGIN:	0.00000 N
ZONE:	15	FALSE EASTING:	500,000 m
GRID UNITS:	FEET	FALSE NORTHING:	000000 m

SCALE = 1:12,000

0 1,000 2,000 3,000 4,000 5,000
FEET

WATER DEPTH AND SEAFLOOR/ NEAR SEAFLOOR FEATURES MAP

SHENZI FIELD

BLOCKS 609, 610, 653, AND 654
GREEN CANYON AREA
GULF OF MEXICO

BHP BILLITON PETROLEUM (GOM) INC

CONTOUR INTERVAL: 10	
DATUM: SEA SURFACE	
VELOCITY: CTD CASTS FROM AUV SURVEY	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: M.JOHNSON/B.DILLARD/R.GARZA/P.P
INTERPRETATION BY: T. HEWITT\J. SMITH	CHECKED BY: S. WILLIAMSON
DATE: 22-JULY-2014	REVISION NO.: A
JOB NO.: 2405-2079	DWG NO.: 2079WDSF24_WI-C-TO-WI-O-12.DWG

MAP 1

SHEET NO. 1 OF 4

bhpbilliton
resourcing the future

FUGRO

MODIFIED FROM:
MAP PREPARED BY:
FUGRO GEOSERVICES, INC.
6100 HILLCROFT
HOUSTON, TEXAS 77081
PHONE: 713-369-5800
WWW.FUGRO.COM

Pay.gov Payment Confirmation: BOEM Development/DOCD Plan - BD

notification@pay.gov
Sent: Monday, September 20, 2021 3:52 AM
To: Kelley Pisciola

An official email of the United States government

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Region: Gulf of Mexico
Contact: Kelley Pisciola 281-698-8519
Company Name/No: BHP Billiton Petroleum (GOM) Inc., 02010
Lease Number(s): 16764, 18402, , ,
Area-Block: Green Canyon GC, 609: Green Canyon GC, 608: , : , : ,
Type-Wells: Supplemental Plan, 3

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SECTION 2
GENERAL INFORMATION

2.1 APPLICATIONS AND PERMITS

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

Application/Permit	Issuing Agency	Status
Application for Permit to Drill (APD)	BSEE	*To be submitted*
Application for Permit to Modify (APM)	BSEE	*To be submitted*
Deepwater Operations Plan	BSEE	*To be submitted*
Conservation Information Document	BOEM	*To be submitted*
Lease Term Pipeline Applications	BSEE	*To be submitted*
ROW Pipeline Application	BSEE	*To be submitted*

2.2 DRILLING FLUIDS

See Sections 7 and 14, Tables 7-A and 14-A for drilling fluids to be used and disposal of same.

2.3 PRODUCTION

Proprietary Information

2.4 OIL CHARACTERISTICS

Proprietary Information

2.5 NEW OR UNUSUAL TECHNOLOGY

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

2.6 BONDING STATEMENT

The bond requirements for the activities and facilities proposed in this DOCD are satisfied by an area-wide bond, furnished and maintained according to 30 CFR 556.900 (a) and 30 CFR 556.901 (a) and (b) and NTL No. 2015-BOEM-N04, "General Financial Assurance"; and additional security under 30 CFR 556.901(d) – (f) and NTL No. 2016—BOEM-N01, “Requiring Additional Security” as required by BOEM.

2.7 OIL SPILL FINANCIAL RESPONSIBILITY (OSFR)

BHP Billiton Petroleum (GOM) Inc. (Company No. 02010) has demonstrated oil spill financial responsibility for the facilities proposed in this DOCD according to 30 CFR 553.15 (a); and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities".

2.8 DEEPWATER WELL CONTROL STATEMENT

BHP Billiton Petroleum (GOM) Inc. (Company No. 02010) has the financial capability to drill a relief well and conduct other emergency well control operations.

2.9 SUSPENSION OF PRODUCTION

BHP does not anticipate filing any requests for Suspension of Production to hold the leases addressed in this DOCD in active status.

2.10 BLOWOUT SCENARIO AND WORST CASE DISCHARGE CALCULATIONS

In accordance with NTL No. 2015-BOEM-N01, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge and Blowout Scenarios" the Blowout Scenario and Worst Case Discharge Assumptions and Calculations were submitted and accepted under Supplemental DOCD, Control No. S-7704.

The previously approved GC Block 609, Well Location N-C1, Control No. S-7704, is addressed in this blowout scenario since it is the location with the highest potential Worst Case Discharge in the Shenzi North subject area. A similar approach would be taken in the event of a blowout for the wells requested under this plan.

Estimated maximum flow rate

The estimated maximum flow rate would occur if a kick were taken and the well blew out. The maximum Worst Case Discharge (WCD) modeled for GC 609, Well Location N-C1 is 133,735 barrels of crude.

Maximum duration of blowout (days)

The proposed wells will penetrate the objective hydrocarbon bearing sands with a 12-1/4 by 14-inch under-reaming drilling assembly below the 14-inch intermediate casing shoe. It is assumed that a hydrocarbon influx is taken while tripping out of the hole, and subsequently an uncontrolled well control event occurs in which the BOPs fail to function as designed and subsequently the marine riser fails. The end result is an uncontrolled blowout at the sea floor.

The expected spill rate for this scenario would be 133,735 STB/day of 31° API gravity oil (peak oil rate within 100 days). It is assumed that the well will not bridge over and will continue to flow until the well is either capped by subsea containment devices or is killed via a relief well. Due to the complex nature of the flux calculation and mechanical earth modeling, BHP considers that it is not possible to predict with certainty if the open hole section will collapse and bridge off. BHP has a Master Service Agreement (MSA) with Transocean Ltd. that will allow access to the multiple rigs of opportunity operating in the Gulf of Mexico. It is estimated that it would take **7-10 days to acquire a rig and move onto location** with approximately **90 days** to drill the relief well and perform kill operations for a total of **100 days**.

Based on 100 days, the estimate cumulative discharge volume is 13,373,500 barrels. The WCD volume was previously submitted and accepted under Supplemental DOCD, Control No. S-7704.

Relief Rig Availability

BHP has an MSA with Transocean Ltd. that will allow access to the multiple rigs of opportunity operating in the Gulf of Mexico.

The rigs listed below are currently contracted in the GOM:

Rig Name	Contractor	Rated Water Depth	MODU Type	Rig Status
Deepwater Pontus	Transocean	12,000	Drillship	Contracted
Deepwater Asgard	Transocean	12,000	Drillship	Contracted
Deepwater Conqueror	Transocean	12,000	Drillship	Contracted
Deepwater Proteus	Transocean	10,000	Drillship	Contracted
West Neptune	Seadrill	12,000	Drillship	Contracted
West Vela	Seadrill	12,000	Drillship	Contracted

Relief Rig Package Constraints

No constraints have been identified. Any of the above listed MODUs are capable of drilling a relief well in the covered area. Furthermore, BHP actively maintains operational agreements with multiple stimulation vessel providers in the GOM which are configured for high rate and pressure pumping operations required in dynamic kill operations.

Relief Rig Timing (Contract) and Rig Mobilization

A reasonable estimate of 7 to 10 days will be required for the above listed or similar MODUs to safely suspend ongoing operations and arrive at the relief well location. Upon arrival at relief well location, approximately 90 days will be required to drill the relief well and perform kill operations.

Location & Strategy of Relief Well

The proposed wells are located approximately 117 statute miles off the coast of Louisiana; a relief well from an onshore location is not an option.

There are no structures in the vicinity of this project to use for relief well drilling operations.

Summary of Prevention Measures

BHP maintains and adheres to an ISO 14001 / OSHAS 18001 Conformance Certified Management System which includes Well Control, Well Integrity (including barrier analyses), and Well Design Standards which have been updated to include the initial learnings from the Deepwater Horizon Incident. BHP has established procedures for performing drilling operations that are continually updated and designed to be “fit for purpose” to ensure each well is planned to prevent a well control scenario:

- BHP employs industry leading practices to provide initial pore pressure and fracture gradient predictions.

- Well hazard assessments are performed on every well focusing particularly on well integrity, well control and emergency response arrangements.

- A well risk assessment is conducted as part of the well planning process, and a risk register is completed and documented in the drilling program addressing each of the risks.

- If while drilling a well, situations change such that the original drilling program requires to be amended, a Management of Change is issued, and if necessary, a barrier analysis is conducted. The Management of Change form is signed off by management and issued to operations personnel for implementation.

- BHP Senior Leadership personnel are actively engaged in daily rig operations.

- BHP employs experienced and trained Field Operations Personnel.

- BHP conducts periodic well control audits of our contracted drilling rigs by both BHP drilling management and independent third party (well examiner) auditors.

Reduce the Likelihood of a Blowout

Real time pressure and well data is monitored from the BHP Houston office during drilling operations. This includes utilizing Gamma Ray and Resistivity LWD and in certain cases formation pressure while drilling tools.

The following BHP policies directly reduce the likelihood of a blowout:

- Liners will be run across hydrocarbon bearing formations.
- No auto-fill float equipment will be run when hydrocarbon zones are exposed.
- All displacements to less dense fluids will be performed on a closed system where fluid volumes can be closely and accurately monitored.

A well control drill matrix is maintained on the rig as per 30 CFR 250 Subpart O.

The BOP stacks on the Invictus (or equivalent) rig are six (6) ram stacks configured to provide enhanced well control and emergency response capability, including dual blind shear rams, casing shear rams, and three variable bore pipe rams. Procedures pertinent to these BOP configurations are well established and familiar to the drillers, tool pushers, and BHP Drilling Supervisors.

Likelihood for Surface Intervention to Stop the Blowout

The likelihood for surface intervention to stop the blowout is high. The 14” (or 23” x 16.25” inch, as applicable) intermediate string will design for a full column of oil to the mudline in both blowout scenarios. As a result, it would be possible to install a containment devise (such as a capping stack) which would subsequently allow for the blowout to be stopped.

BHP has standardized the BOP wellhead connector for the Invictus (or equivalent), to ensure that the rig is capable of latching onto an existing BHP wellhead.

Plans for Effective and Early Intervention

The Invictus, contracted by BHP, has a Deadman / Autoshear which will function in the event of an LMRP disconnect or a loss of both hydraulic pressure and electrical communication with the BOP control system on surface.

"Surface" deployment of ROVs to close any open BOPs which could affect well closure:

- The ROV panel will be tested subsea with the BOP on a wellhead.
- BHP has upgraded the pump skid on the rig's ROVs with a more powerful pump capable of producing higher flow rates. Additionally, the receptacles have been changed to allow for more flow rate to reduce closing times.
- BHP has designed, built, tested and deployed dedicated subsea accumulator banks to the seafloor to further improve the ROV closure response times.

BHP is a member of the Marine Well Containment Company (MWCC) group, which maintains capping and well control equipment for its member companies.

Relief Well Arrangements

Suitable surface locations for a relief well would fall within the stand-off zone defined by a 5000' radius with its center at the proposed surface location. Shallow hazards analysis indicates favorable relief well locations within this area provided that existing infrastructure, localized areas of steep sea floor slope, and scattered gas anomalies are avoided.

The well design should reflect the original well, depending on the root cause of the blowout.

Other Measures Taken

Prior to drilling, BHP will have readily available all of the materials and equipment needed to spud, drill, case and cement a relief well.

BHP has established commercial relationships with those suppliers of contingency equipment and services that we have identified as necessary to kill a blown out well.

SECTION 3
GEOLOGICAL AND GEOPHYSICAL INFORMATION

3.1 GEOLOGICAL DESCRIPTION
Proprietary Information

3.2 STRUCTURE CONTOUR MAP
Proprietary Information

3.3 INTERPRETED SEISMIC LINES
Proprietary Information

3.4 GEOLOGICAL STRUCTURE CROSS-SECTION
Proprietary Information

3.5 SHALLOW HAZARDS REPORT
In accordance with NTL No. 2008-G05, "Shallow Hazards Program," a shallow hazards survey for Drill center N located in GC 609, Lease OCS-G 16764, was prepared by Shawn C. Williamson, P.G., Geohazards Interpreter for BHP on September 5, 2014. The shallow hazards report was previously approved under Supplemental DOCD, Control No. S-7704.

3.6 SHALLOW HAZARDS ASSESSMENT
In accordance with NTL NO.2008-G05, Shallow Hazards Program," site-specific shallow hazards assessments have been prepared for the proposed surface locations evaluating seafloor and subsurface geological and manmade features and conditions that may adversely affect drilling operations. The shallow hazards assessments and archaeological assessments are included as **Attachment 3-D**. *Please note: the proposed locations are covered by the previous site clearance letters, provided for under Supplemental DOCD, Control No. S-7704, approved on May 9, 2017.*

3.7 HIGH-RESOLUTION SEISMIC LINES
Proprietary Information

3.8 STRATIGRAPHIC COLUMN
Proprietary Information

3.9 TIME VS DEPTH TABLES
Proprietary Information

Attachment 3-D

SHALLOW HAZARDS AND BENTHIC COMMUNITY ASSESSMENT PROPOSED N-A, -B, AND -C LOCATIONS SHENZI FIELD

GREEN CANYON BLOCK 609
OCS-G-16764

BHP Billiton Petroleum (GOM) Inc.
September 2014

bhpbilliton
resourcing the future

September 5, 2014

U. S. Department of the Interior
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
Office of Field Operations
Attention: Plans Section (MS 5230)
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

BHP Billiton Petroleum (GOM) Inc.
1360 Post Oak Boulevard, Suite 150
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Shallow Hazards and Benthic Community Assessment
Proposed N-A, -B, and -C Locations
Shenzi Field
Green Canyon Block 609
OCS-G-16764

Summary

BHP Billiton Petroleum (BHPB) submits this shallow hazards assessment in support of a Supplemental Development Operations Coordination Document (DOCD) for the proposed N-A, -B, and -C well locations. This report satisfies shallow hazards and benthic community assessment requirements defined in Notice to Lessees (NTL) No. 2008-G05 and 2009-G40 issued by the Minerals Management Service (MMS). The Shenzi Field is not located within an area designated to have a high probability for archaeological resources as defined by NTL No. 2005-G07 and 2011-JOINT-G01. However, BHPB is aware of the Bureau of Ocean Energy Management's (BOEM) March 2011 Pre-Seabed Disturbance Survey Mitigation and has submitted an archaeological assessment report prepared by Geoscience Earth & Marine Services (GEMS) under separate cover. None of the sonar contacts identified in the Shenzi Autonomous Underwater Vehicle (AUV) survey area were recommended for archaeological avoidance or investigation.

The water depths at the proposed wellsites range from approximately 4,287 feet (ft) to 4,292 ft. Each proposed well has a contingent re-spud location 66 ft west of the primary surface location (e.g. N-A1 primary, N-A2 re-spud). One site clearance letter is presented for each set of primary and re-spud locations. All of these surface locations have been chosen after careful examination of the data to confirm the absence of drilling hazards and environmental constraints.

Introduction

The Shenzi Field lies 120 miles south of Fourchon, Louisiana, on the continental slope approximately 5 miles northwest of the Sigsbee Escarpment in Green Canyon Blocks 608-610 and 652-654. The initial Shenzi exploration well (GC 654 #1) was spud during July 2002 from a surface location in southern Block 610. Seven appraisal wells were subsequently drilled to evaluate and delineate the field.

Maps 1, 2, 3, and 4 show the Shenzi field layout relative to bathymetry and seafloor features. The field development concept for the initial phase of Shenzi production consisted of multiple subsea wells around three drill centers (B, C, and G) tied back to a dedicated Tension Leg Platform (TLP) processing facility via production flowlines, gas lift/injection flowlines, and umbilicals. Third party oil and gas export pipelines provide transportation back to market.

Subsequently, flowlines and umbilicals were installed to tie production from Drill Center H in Block 610 back to the Shenzi TLP via Drill Center C in Block 653. Also, flowlines and umbilicals associated with the water injection system were installed on the southern perimeter of the field in Blocks 652-654, 696, and 697.

To date, seventeen development wells have been drilled in the Shenzi Field and are actively producing via subsea tieback to the Shenzi TLP. Two additional wells are currently producing at Drill Center K in Block 652, which is tied back to the Marco Polo TLP in Block 608. In addition, four water injection wells (WI001, WI002, WI003, and WI004) were drilled in Block 654.

Previous Reports

Numerous shallow hazards reports have been prepared in support of regulatory submittals for the Shenzi Field. Following is a chronological listing of the previous reports:

A shallow drilling hazards report titled "BHP Billiton, Green Canyon Blocks 608-611, 652-655, 696-699, Shenzi Prospect, Geohazards Review Study, January/February 2002" was prepared by Gardline Surveys and submitted by BHPB in support of the Initial Exploration Plan (EP) Control No. N 7383 for Locations A, B, and C. The GC 654 #1 (Shenzi-1) well was spud at Location A.

A second report, "Shenzi Prospect, Green Canyon Block 653, OCS-G-20084, Shallow Drilling Hazard Assessment for Supplemental Locations D and E" was prepared by Robert J. Bruce (Consulting Geophysicist) and submitted in conjunction with EP Control No. S 6112. The GC 653 #1 (Shenzi-2) well was drilled from Location D and the GC 653 #3 (Shenzi-4) well was spud from Location B', which was moved within 500 ft of Location D.

A third report entitled "Shenzi Prospect, Green Canyon Blocks 653, 654, OCS-G-20084, OCS-G-20085, Shallow Drilling Hazard Assessment for Supplemental Locations F, G, H, and I" was prepared by Robert J. Bruce (Consulting Geophysicist) and submitted in support of EP Control No. S 6232. The GC 653 #2 (Shenzi-3) well was drilled within 500 ft of Location H. BHPB submitted "Shallow Drilling Hazard Assessment, Supplemental Location J - Shenzi Prospect, Green Canyon Block 653, OCS-G-20084," as part of EP Control No. S 6532.

BHPB submitted the report titled "Shallow Drilling Hazard Assessment, Supplemental Locations K, L, M, and N - Shenzi Prospect, Green Canyon Blocks 609 and 654, OCS-G-16764 and -20085," in support of EP Control No. N 8281. The GC 654 #2 (Shenzi-5) well was drilled within 500 ft of Location N.

BHPB submitted the report titled "Shallow Drilling Hazard Assessment, Supplemental Locations O, P, and Q - Shenzi Field, Green Canyon Blocks 609 and 610, OCS-G-16764 and -20085," in support of EP Control No. N 8664. The GC 609 #1 (Shenzi-6) well was spud within 500 ft of Location O.

BHPB submitted the report titled "Shallow Drilling Hazard Assessment, Supplemental Location T - Shenzi Field, Green Canyon Block 653, OCS-G-20084," in support of EP Control No. S 6865. The Shenzi SC102, SC103, and SC104 wells were spud within 500 ft of Location T.

BHPB submitted the report titled "Shallow Drilling Hazard Assessment, Revised Location L' - Shenzi Field, Green Canyon Block 610, OCS-G-16765" in support of EP Control No. R 4849. The GC 610 #3 well (Shenzi-7) was spud and re-spud as GC 610 #4 (Shenzi-8, M') within 500 ft of Location L'.

BHPB submitted the report titled "Shallow Drilling Hazard Assessment, Revised Locations X', Y', and Z' - Shenzi Water Injection Project, Green Canyon Block 654, OCS-G-20085" in support of Revised EP Control No. R 5054. The Shenzi WI001 well was spud within 500 ft of Location Z', the WI002 well was spud within 500 ft of Location Y', and the WI003 and WI004 wells were spud within 500 ft of Location X'.

BHPB submitted the report titled “Shallow Drilling Hazard Assessment, Drill Center H - Shenzi Field, Green Canyon Block 610, OCS-G-16765” in support of Revised DOCD Control No. S 7487. The Shenzi SH101 and SH102 wells were spud within 500 ft of Drill Center H.

GEMS issued a report entitled, “Archaeological Assessment - Shenzi Water Injection System, Blocks 652-654 and 696-697, Green Canyon Area, Gulf of Mexico” in September 2011. This report concluded that there were no side-scan sonar contacts evident from the Shenzi AUV survey within 1,000 ft of the proposed well locations.

GEMS issued a report entitled, “Archaeological Assessment - Shenzi Field, Blocks 564-566, 608-610, 652-654, and 696-698, Green Canyon Protraction Area, U.S. Gulf of Mexico” in November 2011. BHPB submitted this report to the BOEM in December 2011 and it was assigned Control No. 23512. None of the sonar contacts observed in the Shenzi AUV survey area were recommended for archaeological avoidance or investigation.

BHPB submitted the report titled “Shallow Hazards and Benthic Community Assessment, Proposed WI-B Location - Shenzi Water Injection Project, Green Canyon Block 654, OCS-G-20085” in support of Supplemental DOCD Control No. S 7573. This DOCD was approved by the BOEM on October 15, 2012.

BHPB submitted the report titled “Shallow Drilling Hazard Assessment, Proposed WI-C, -D, -E, -F, -G, -H, -I, and -J Locations - Shenzi Water Injection Project, Green Canyon Blocks 652 and 654, OCS-G-16765 and -20085” in support of DOCD Control No. S 7667. This DOCD was approved by the BOEM on June 23, 2014.

BHPB submitted the report titled “Shallow Drilling Hazard Assessment, Proposed WI-K and -L Locations - Shenzi Water Injection Project, Green Canyon Block 654, OCS-G-20085” in support of DOCD Control No. S 7678. This DOCD was approved by the BOEM on August 8, 2014.

Locations

The table below lists the surface location coordinates for the proposed wells (UTM Zone 15 North Projection, Clarke 1866 Spheroid, NAD 1927 Datum):

Proposed Location	Block	Latitude	Longitude	Easting X (feet)	Northing Y (feet)	Block Calls (feet)	
N-A1	GC 609	27° 22' 14.020” N	90° 08' 41.658” W	2,566,949.00	9,942,720.00	4800.00 FNL	869.00 FWL
N-A2	GC 609	27° 22' 14.035” N	90° 08' 42.389” W	2,566, 883.00	9,942,720.00	4800.00 FNL	803.00 FWL
N-B1	GC 609	27° 22' 04.917” N	90° 08' 41.891” W	2,566,949.00	9,941,800.00	5720.00 FNL	869.00 FWL
N-B2	GC 609	27° 22' 04.932” N	90° 08' 42.623” W	2,566,883.00	9,941,800.00	5720.00 FNL	803.00 FWL
N-C1	GC 609	27° 21' 28.178” N	90° 08' 23.921” W	2,568,655.00	9,938,126.00	6446.00 FSL	2575.00 FWL
N-C2	GC 609	27° 21' 28.193” N	90° 08' 24.652” W	2,568,589.00	9,938,126.00	6446.00 FSL	2509.00 FWL

Data Set

3-D Seismic Data. The 3-D seismic data used for this report are the same as used for the previous reports. The 3-D time volume was derived from Green Canyon Phase 13 of WesternGeco's Ultra 3-D seismic survey acquired in 1998. The survey was acquired in a northwest-southeast orientation with source strength of 100 bar-m (3-128 Hz) at a shot interval of 75 meters (m) per source (37.5 m alternating). The offset range was 6,000 m resulting in a nominal fold of 40. Nominal cable depth was approximately 33 ft (10 m +/- 1.5 m) with nominal sound source depth of about 23 feet (7 m +/-1 m). A 24-bit digital recording instrument was used with a record length of 12 seconds (sec) although the volume loaded for shallow hazards interpretation was limited to 5 sec.

The full-fold migrated 3-D volume contains 4-msec sample rate data at a bin spacing of 41.0 x 65.6 ft (12.5 m x 20 m). BHPB post-processed the conventional 3-D exploration seismic data to enhance vertical resolution by applying spectral whitening and FX deconvolution for noise reduction. The spectrally enhanced volume was rotated to approximate zero-phase. These data have been processed to preserve relative amplitudes and are suitable for shallow hazards interpretation. The bandwidth in the tophole section around the N-A, -B, and -C locations is 8 – 61 Hz at 50% power (Figures A1, B1, and C1).

In addition to the spectrally enhanced 3-D seismic volume, an AUV survey was acquired over the Shenzi Field. The survey encompassed a 73 square mile area and acquired excellent quality, high-resolution multi-beam bathymetry with backscatter, side-scan sonar, and subbottom profiler data. The Water Depth and Seafloor/Near Seafloor Features Map (Map 1) and Seafloor Rendering (Map 2) were derived from this high-resolution data set. The Side-Scan Sonar Mosaic and Seafloor Backscatter Rendering (Maps 3 and 4) were also generated from the AUV survey. The water depth predictions for the proposed locations are based on AUV multi-beam bathymetry data.

Offset Well Data. To date, thirty-four exploration, appraisal, and development wells have been drilled in the Shenzi Field. Offset well data (including LWD logs, mud logs, wellsite geological reports, daily drilling reports, paleontological reports, and scout tickets) have been integrated to calibrate the suprasalt seismic interpretation. The most analogous wells for the suprasalt section at the N-A, -B, and -C locations are the Shenzi-8, -6, and -1 wells in GC 610. Figure 1 is an arbitrary seismic profile between the these existing wells and the proposed locations with LWD logs and casing points posted for correlation. None of these wells encountered flows while drilling the riserless section. However, the Shenzi-7 well observed flow after cementing the 22" casing and was re-spud approximately 470 ft to the west as Shenzi-8.

Time-to-depth conversion for the sediment column is based on a second order polynomial function relating travel time to depth below seafloor. The equation is:

$$D_{BML} = (486.73 * T_{BML}^{2}) + (2502.5 * T_{BML})$$

where D_{BML} is depth below seafloor (ft) and T_{BML} is two-way time below seafloor (sec). This velocity function is based on checkshot and Seismic Velocity While Drilling (SVWD) data acquired across the suprasalt section at the Shenzi-6 well. The expected accuracy is $\pm$ 200 ft in the tophole section at the proposed location.

Man-Made Features

The Shenzi field layout and existing wellheads are shown on Maps 1, 2, 3, and 4. The closest man-made feature to the N-A, -B, and -C locations is an anchor drag scar approximately 160 ft southeast of N-A1. The closest seabed infrastructure is the 14" Marco Polo oil export pipeline approximately 520 ft southeast of N-B1 and 1270 ft southeast of N-A1. The 16" Shenzi oil export pipeline is approximately 1,010 ft northwest of N-C2.

Two side-scan sonar targets were identified in the GEMS Archaeological Assessment within 2,000 ft of the proposed locations. Sonar Contact No. 29 is approximately 930 ft northwest of N-A2 and Contact No. 30 is approximately 1,850 ft west of N-B2. Both contacts are linear features approximately 6 ft long by 1 ft wide. All of the contacts identified by GEMS were interpreted to represent modern debris and none were recommended for archaeological avoidance or further investigation.

Water Depth and Seafloor Conditions

The Water Depth and Seafloor/Near Seafloor Features Map (Map 1) is presented at a scale of 1:12,000 showing a 2,000 ft radius circle around the proposed locations to satisfy the requirements of MMS NTL 2009-G40 "Deepwater Benthic Communities". Since the proposed wells are planned to be drilled from a dynamically positioned (DP) rig, no anchor pattern is shown. Water depths range from approximately 4,150 ft in north-central Block 653 to approximately 4,470 ft in the southeast corner of Block 654.

Map 2 is a Seafloor Rendering of the Shenzi Field. The most prominent seafloor features in the study area are fault scarps that trend generally north-south across central Block 609 and eastern Block 653 while exhibiting a northeast-southwest orientation in northeast Block 653 and along the boundary separating Blocks 610 and 654. The closest seafloor fault to the proposed locations is approximately 2,340 ft northeast of N-A1. Subtle lineations in eastern Blocks 608/652, the northwest corner of Block 609, eastern Blocks 610/654, and western Block 653 are the seafloor expression of shallow-buried channels related to sediment transport and possible brine seepage locally. The closest shallow buried channel is approximately 1,200 ft west of N-A2 and –B2. All of these features are delineated on the Water Depth and Seafloor/Near Seafloor Features Map (Map 1).

Deepwater Benthic Communities

Maps 3 and 4 are the Side-Scan Sonar Mosaic and Seafloor Backscatter Rendering, respectively. Black areas on Side-Scan Sonar Mosaic and red patches on the Seafloor Backscatter Rendering indicate seafloor with high reflectivity. Radial patterns emanating from the existing wellsites represent splays of drilling mud and cuttings. Isolated areas of high reflectivity in the northern portions of Blocks 609, 653, and 654 are locally associated with faults and/or shallow gas evident on the subbottom profiler records. These areas are interpreted to be hydrocarbon seepage sites that likely contain authigenic carbonate rock outcrops and may support chemosynthetic and other benthic communities (Map 1).

Low-relief mounds in eastern Block 653 and southern Block 654 exhibit significantly lower reflectivity than the hydrocarbon seepage sites in northern Blocks 609, 653, and 654. Piston core samples acquired from several of these mounds recovered solid tar plugs. Subsequent ROV video surveys confirmed that the AUV data accurately constrained the extent of the mounds, which were visually observed to consist of numerous small tar pillows. Deepwater sea fans were seen attached to some of the tar pillows, which provide a hard substrate to which the soft corals can attach. However, no chemosynthetic organisms were observed.

A meeting was held with the MMS on August 18, 2005, to present the results of the ROV survey. It was confirmed that there was no MMS regulation at that time requiring that seafloor disturbance be avoided in the vicinity of the tar mounds and associated sea fans. The MMS concurred with the Shenzi Project's proposed field layout and approved all of the regulatory submittals required to permit installation of the wells and facilities related to field development. After the Shenzi Field began production, the MMS issued NTL 2009-G40 "Deepwater Benthic Communities", which superseded NTL 2000-G20 "Deepwater Chemosynthetic Communities" and broadened the scope to cover all high-density deepwater benthic communities including corals such as those observed on the tar mounds in the Shenzi Field. Therefore, the N-A, -B, and -C locations were carefully chosen to avoid the tar mounds and other potential benthic community habitats by at least 2,000 ft (Map 1).

Stratigraphy

3-D seismic data examples are included to compliment the stratigraphic discussion. Figure 1 is an arbitrary line correlating conditions at nearby offset wells to the proposed N-A, -B, and -C locations. Key horizons are annotated to separate units of distinct seismic character discussed in the following paragraphs. Horizon nomenclature is consistent with the previous reports. The gamma ray and resistivity logs (and casing seats) from the existing wells are also shown for calibration of the lithologic interpretation. The subbottom profiler record from the closest AUV survey line to the proposed locations is included with the site clearance letter (Figures A2, B2, and C2) to detail the shallow soil conditions (to ~100 ft BML). Annotated 3-D seismic profiles of the inline and crossline through the proposed location are presented as Figures A3, B3, and C3.

The following discussion is a generic stratigraphic description of the suprasalt section in the Shenzi Field. The tophole prognosis chart presented with each site clearance letter (Figures A4, B4, and C4) contains specific lithologic predictions at the proposed locations.

The interval from the seafloor to Horizon A is characterized by low amplitude, parallel stratified to discontinuous reflectors interpreted to represent predominantly normal marine clay with thickness variations indicative of higher energy deposits containing clay and silt. The 36" conductor casing was jetted to over 300 ft BML in the upper portion of this unit at the Shenzi-6, -8, and -1 wells (Figure 1). Geotechnical soil borings acquired at the drill centers and TLP site recovered predominantly olive gray clay with a few thin silt seams and partings in the equivalent of the conductor foundation zone. The MWD logs from the offset wells (Figure 1) indicate predominantly clay with interbedded silts between the 36" casing shoe and Horizon A.

The interval from Horizon A to Horizon G is characterized by a basin fill unit that is unique to Blocks 609 and 610 and absent elsewhere in the Shenzi Field. Erosional events represented by a complex series of unconformities have locally removed Horizons D and E and portions of the stratigraphic units these horizons bound elsewhere in the field. The erosional low has been filled by mass transport and channel deposits interbedded with normal marine clays. While Horizon E is present at the proposed N-A, -B, and -C locations, it represents an unconformity between amalgamated channel deposits. MWD logs from the Shenzi-8, -6, and -1 wells (Figure 1) indicate that this interval is primarily comprised of clay interbedded with silts and sands. The thickest sands in this interval exhibit a low gamma ray, low resistivity response indicative of saltwater at Shenzi-6 and -8. However, these sands cannot be correlated directly to the proposed N-A, -B, and -C locations due to the highly variable seismic character in this high-energy depositional unit. At Shenzi-8, the 28" casing shoe was set just below Horizon A (Figure 1).

The interval between Horizons G and H is generally characterized by an upper unit of moderate-amplitude semi-continuous reflectors overlying a lower unit of low amplitude, chaotic reflectors. The upper unit is interpreted to consist of channel deposits and could contain sands. The lower unit is interpreted to be consist of clay-prone mass transport deposits. At Shenzi-1, the 22" casing seat was set just below Horizon G (Figure 1).

The section between Horizons H and I ranges in seismic character and exhibits variable lithology between the existing wells. The 22" casing shoe was set in upper portion of this interval at the Shenzi-6 and -8 wells (Figure 1). Although no appreciable sand was encountered in the remainder of this interval at the Shenzi-6 well, the mud log from the Shenzi-1 well noted sands in the lower portion of this interval.

Horizon I is near the depth limit of the shallow hazards assessment at the proposed locations (Figure 1), where it locally marks the top of a sandy unit. The Shenzi-6 well encountered some thick, wet sands below Horizon I.

Shallow Gas

The pressure and temperature regime of the shallow sedimentary section in the Deepwater GOM is conducive for the accumulation of gas hydrates. No obvious bottom-simulating reflectors (BSR's) marking the base of the gas hydrate stability zone (GHSZ) have been observed in the 3-D seismic data over the Shenzi Field. However, amplitude anomalies in the western half of Block 653 generally occur at a constant offset of approximately 520 milliseconds below seafloor (~1,430 ft BML). These anomalies are interpreted to represent shallow free-phase gas trapped at the base of the GHSZ.

Map 5 is a Suprasalt Geologic Features Map that shows high-amplitude anomalies representing possible shallow gas from seafloor to approximately 3,000 ft BML as well as from 3,000 ft BML to Top of Salt (or 6,000 ft BML where Top Salt was not well imaged). The proposed locations were carefully chosen to avoid amplitude anomalies that could represent shallow gas by at least 300 ft. The tophole prognosis charts (Figures A4, B4, and C4) summarizes the assessment of gas potential at the proposed N-A, -B, and -C locations. Free phase gas is not expected in the suprasalt section at the proposed locations. However, interpreted sand-bearing intervals at the proposed locations are assessed to have low gas potential to account for the possibility of solution gas.

Shallow Water Flow

Shallow water flow (SWF) potential exists for all of the interpreted sand-bearing intervals in the suprasalt section. The suprasalt section is likely to be somewhat overpressured because portions of the Shenzi Field are in an area of rapid Plio-Pleistocene deposition at the fringes of the Mississippi Fan. As a result, SWF could occur from sands in the suprasalt section if mitigation measures are not in place.

None of the existing Shenzi wells have observed SWF while drilling the riserless sections. However, the potential for SWF was noted in pre-drill predictions and mitigated by drilling rapidly to maintain high ECD's and/or using weighted mud according to the pre-drill plan. The tophole prognosis charts (Figures A4, B4, and C4) summarizes the assessment of SWF potential at the proposed locations.

It should be noted that Shenzi-1 did encounter 4 flows in the deeper part of the suprasalt section (below the 22" casing, Figure 1). Also, the BOEM SWF database indicates that the GC 610 #3 (Shenzi-7) well reported a low severity flow at 6,340 ft TVDSS (1,951 ft BML). However, no flows were observed while drilling the riserless section of the Shenzi-7 well. In accordance with the pre-drill plan, the riserless section of this well was drilled with seawater to 6,330 ft TVDSS (1,941 ft BML) followed by "pump and dump" mud to the planned section TD at 8,389 ft TVDSS (4,000 ft BML). The 22" casing was run to a shoe depth of 8,339 ft TVDSS (3,950 ft BML) and cemented. The rig moved off location to batch set another well in the field, but returned at a later date to discover that the Shenzi-7 well was flowing. Periodic ROV visual observations confirmed that the well continued to flow for more than a month. BHPB decided to re-spud the well approximately 470 ft to the west as GC 610 #4 (Shenzi-8).

The source depth of the Shenzi-7 flow is uncertain because it was not observed while drilling. Post-drill analysis of the LWD logs indicates a wet sand at 6,419 ft TVDSS (2,030 ft BML) that may have been the source of flow. A wet sand was encountered at a similar depth in the Shenzi-8 well (Figure 1), but no flow was observed.

Conclusions and Recommendations

Seafloor and shallow subsurface conditions are favorable for drilling operations at the proposed N-A, -B, and –C well locations. No man-made obstructions were identified from the AUV data in the immediate vicinity of the proposed locations. There are no hydrocarbon macro-seeps or hard bottom areas capable of supporting high-density benthic communities within 2,000 ft of the proposed locations. Appropriate drilling precautions should be taken to mitigate SWF potential associated with interpreted sandy intervals. There are no indications of free-phase gas in the suprasalt section at the proposed locations. Site clearance letters detailing the shallow hazards assessment of the proposed N-A, -B, and -C locations follow.

Site Clearance Letter - Shenzi N-A1 and –A2 Locations
Green Canyon Block 609 (OCS-G-16764)

The proposed N-A1 and –A2 surface locations are adjacent to one another with N-A2 representing a contingent re-spud location 66 ft west of N-A1. Therefore, one site clearance letter is presented for the N-A1 and –A2 locations. The tophole prognosis chart (Figure A4) summarizes the shallow hazards assessment of the proposed locations down to approximately 4,849 ft BML (1.5 sec TWT BML). The proposed N-A1 and –A2 locations are in the northwest quadrant of Green Canyon Block 609 as defined by the following coordinates (UTM Zone 15 North Projection, Clarke 1866 Spheroid, NAD 1927 Datum):

Proposed Location	Block	Latitude	Longitude	Easting X (feet)	Northing Y (feet)	Block Calls (feet)	
N-A1	GC 609	27° 22' 14.020" N	90° 08' 41.658" W	2,566,949.00	9,942,720.00	4800.00 FNL	869.00 FWL
N-A2	GC 609	27° 22' 14.035" N	90° 08' 42.389" W	2,566, 883.00	9,942,720.00	4800.00 FNL	803.00 FWL

The predicted water depth at the proposed N-A1 location is 4,287 ft based on AUV multi-beam bathymetry (Map 1). The local seafloor gradient is approximately 1º to the south. The closest man-made feature is an anchor drag scar approximately 160 ft southeast of N-A1. The closest seabed infrastructure is the 14" Marco Polo oil export pipeline approximately 1,270 ft southeast of N-A1.

One side-scan sonar target was identified in the GEMS Archaeological Assessment within 2,000 ft of the proposed location. Sonar Contact No. 29 is approximately 930 ft northwest of N-A2. This contact is a linear feature approximately 6 ft long by 1 ft wide. All of the contacts identified by GEMS were interpreted to represent modern debris and none were recommended for archaeological avoidance or further investigation.

The closest seafloor fault to the proposed location is approximately 2,340 ft northeast of N-A1. The closest shallow buried channel is approximately 1,200 ft west of N-A2.

There are no hydrocarbon macro-seeps or hard bottom areas capable of supporting high-density benthic communities within 2,000 ft of the N-A locations. The N-A1 location is approximately 6,340 ft southwest of the closest interpreted hydrocarbon seepage site (Map 1), which is an area of high acoustic backscatter (Maps 3 and 4) associated with seafloor faults.

Figure A2 is a data example from a portion of the subbottom profiler record for AUV Line 154, which is approximately 110 ft north of the N-A1 and –A2 locations. Several regional marker horizons (M1, M2, M3, and M4) are annotated on this figure. Age-dating results from the Shenzi and Atlantis geotechnical investigations indicate that these horizons are approximately 16,434, 19,750, 22,500, and 24,200 years old, respectively. Horizon M2 marks the top of the "Triplet", which is a distinct set of closely-spaced, strong reflectors that represent a regional unit containing several silt-rich layers. The shallow sediments are expected to be predominantly clay with occasional thin silt seams to at least 110 ft BML at the proposed location.

Figure 1 is an arbitrary 3-D seismic line correlating the proposed N-A location with the existing Shenzi-6, -8, and -1 wells. Figure A3 displays 3-D seismic data examples of the inline and crossline through the proposed location. The low-amplitude interval between Seafloor and Horizon A is interpreted to consist of parallel-stratified, normal marine clays and poorly stratified mass transport deposits containing clay and silt (Figure A4). Higher energy channel deposits between Horizons A and I may contain sand. The best developed sands at the offset wells cannot be correlated directly to the proposed locations due to the highly variable seismic character and prevalence of unconformities between the amalgamated channel deposits (Figure 1). The tophole prognosis chart for the proposed N-A location highlights reflections that appear most likely to represent individual sands (Figure A4).

No active faults intersect the proposed vertical wellbore in the suprasalt section. However, a buried fault is intersected by a vertical wellbore at the proposed N-A location below the tophole section near the Top of Salt (Figure 1). This fault will be penetrated below the 22" casing shoe and is not interpreted to pose a hazard to drilling operations. In general, faults could represent potential zones of lost circulation.

No free-phase gas is expected in the suprasalt section. There are no BSR's or other seismic indications of gas hydrate evident in the vicinity of the proposed locations. The base of the GHSZ is estimated to be at approximately 1,433 ft BML based on a predictive model developed for the Shenzi Field.

The N-A1 and –A2 locations were carefully chosen to avoid high amplitude anomalies in the suprasalt section. The closest high amplitude anomalies are approximately 1,760 ft southeast and west of the N-A1 and –A2 locations, respectively (Map 5). These anomalies are associated with channel deposits between Horizons A and G. The proposed N-A1 and –A2 locations are assessed to have negligible gas potential between Seafloor and Horizon A and in the clay-prone mass transport deposit above Horizon H (Figure A4). The proposed locations are interpreted to have low gas potential below Horizon A to account for the possibility of solution gas in potential sand-bearing intervals.

Shallow water flow (SWF) was not observed while drilling the riserless sections at any of the existing Shenzi wells, which mitigated potential overpressure in the interpreted sand-bearing intervals by drilling rapidly to maintain high ECD's and/or using weighted mud according to the pre-drill plan. The N-A1 and –A2 locations are assessed to have negligible SWF potential between Seafloor and Horizon A, moderate SWF potential in the interpreted sand-bearing intervals between Horizon A and Horizon I, and low SWF potential in the interpreted clay-prone mass transport deposit above Horizon H (Figure A4) assuming no mitigation measures are in place. It should be noted that Shenzi-1 did encounter 4 flows in the deeper part of the suprasalt section (below the 22" casing, Figure 1). Also, the BOEM SWF database indicates that the GC 610 #3 (Shenzi-7) well reported a low severity flow at 6,340 ft TVDSS (1,951 ft BML). However, no flows were observed while drilling the riserless section of the Shenzi-7 well; the flow began after running and cementing the 22" casing.

Seafloor and shallow subsurface conditions are favorable for drilling operations at the proposed N-A1 and –A2 locations. Standard drilling precautions successfully utilized at previous Shenzi wells should be taken to mitigate SWF potential associated with interpreted sandy intervals below Horizon A. An anchor clearance assessment should be conducted if the well is drilled from a moored vessel.

BHP Billiton Petroleum (GOM) Inc.

Shawn C. Williamson

Shawn C. Williamson, P.G.
Geohazards Interpreter
September 5, 2014

Attachments

- Figure 1: Arbitrary Line Between the Proposed N-A, -B, and –C Locations and the Existing Shenzi-6, -8, and -1 Wells
- Figure A1: 3-D Seismic Power Spectrum – Proposed N-A Location
- Figure A2: AUV Subbottom Profile Line 154 Through the Proposed N-A Location
- Figure A3: 3-D Seismic Inline 4986 and Crossline 5165 Through the Proposed N-A Location
- Figure A4: Tophole Prognosis Chart – Proposed N-A Location
- Map 1: Water Depth and Seafloor/Near Seafloor Features Map – Shenzi Field
- Map 2: Seafloor Rendering – Shenzi Field
- Map 3: Side-Scan Sonar Mosaic – Shenzi Field
- Map 4: Seafloor Backscatter Rendering – Shenzi Field
- Map 5: Suprasalt Geologic Features Map – Shenzi Field

Figure 1 – Arbitrary Line Between the Proposed N-A, -B, and –C Locations and the Existing Shenzi-6, -8, and -1 Wells

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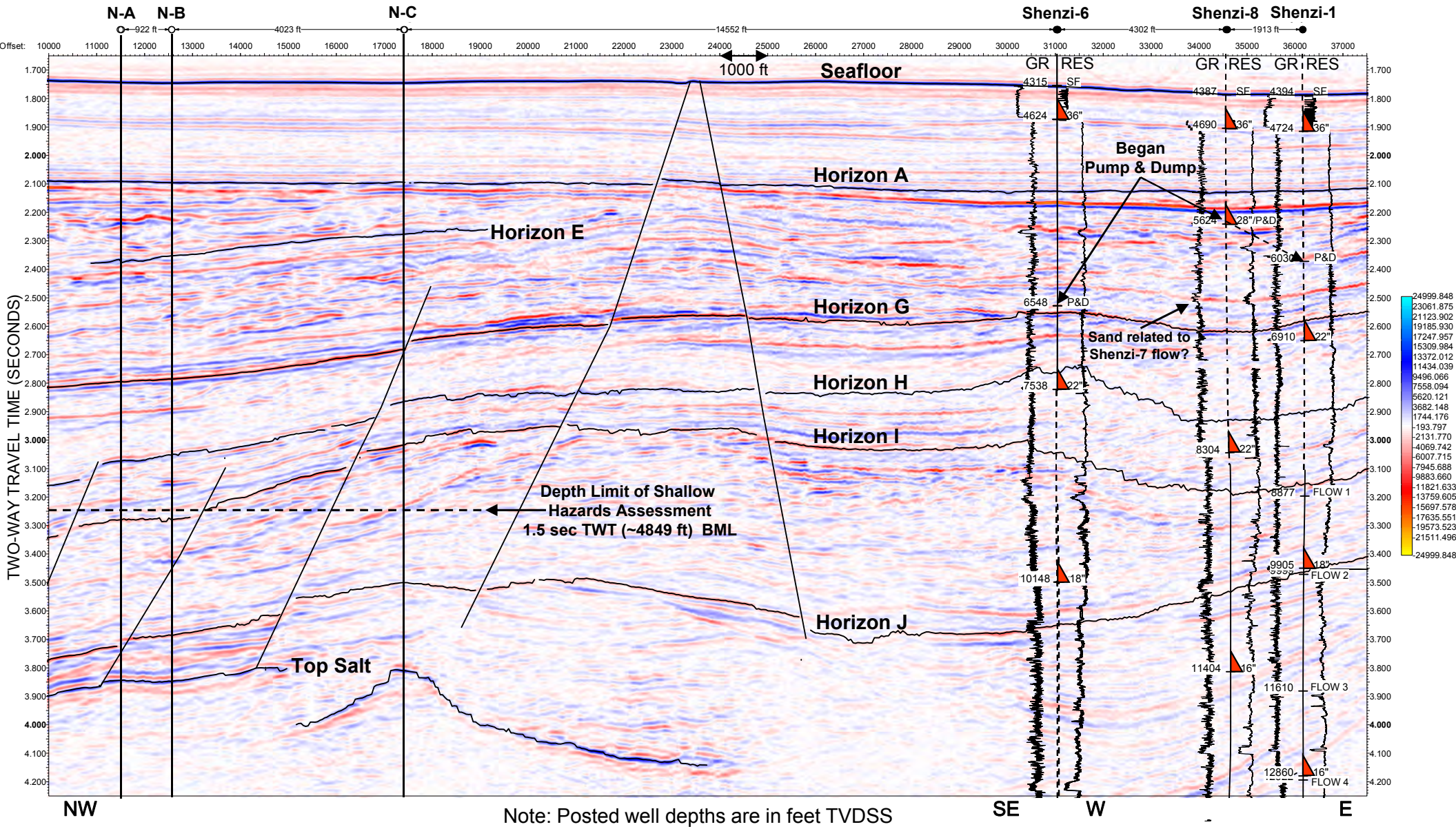

Figure A1 – 3-D Seismic Power Spectrum
Proposed N-A Location

Inline Range 4936 – 5036, Crossline Range 5515 – 5215, Time Range 1.744 – 2.744 seconds

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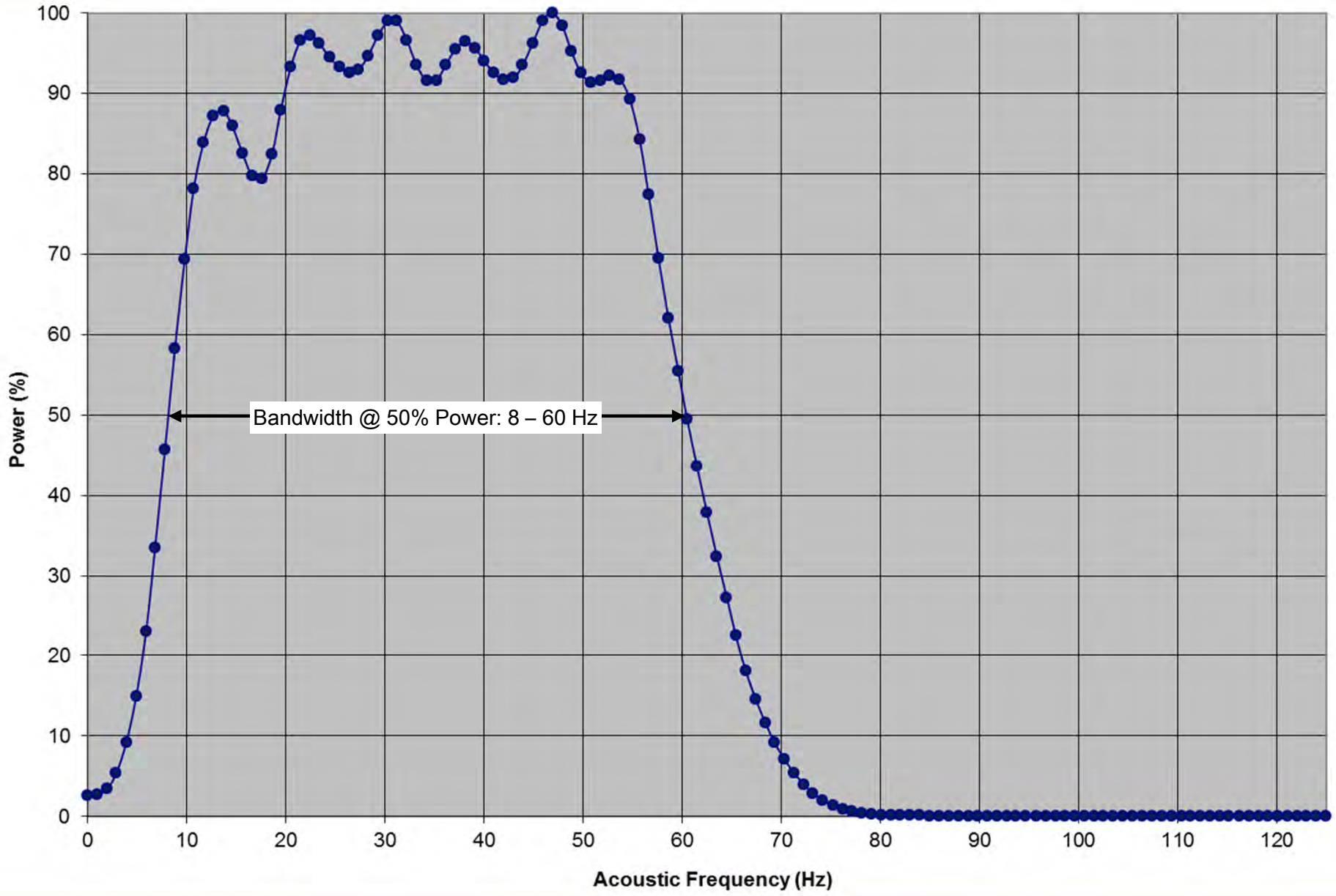

Figure A2 – AUV Subbottom Profile Line 154 Through the Proposed N-A Location (V.E. ~5X)

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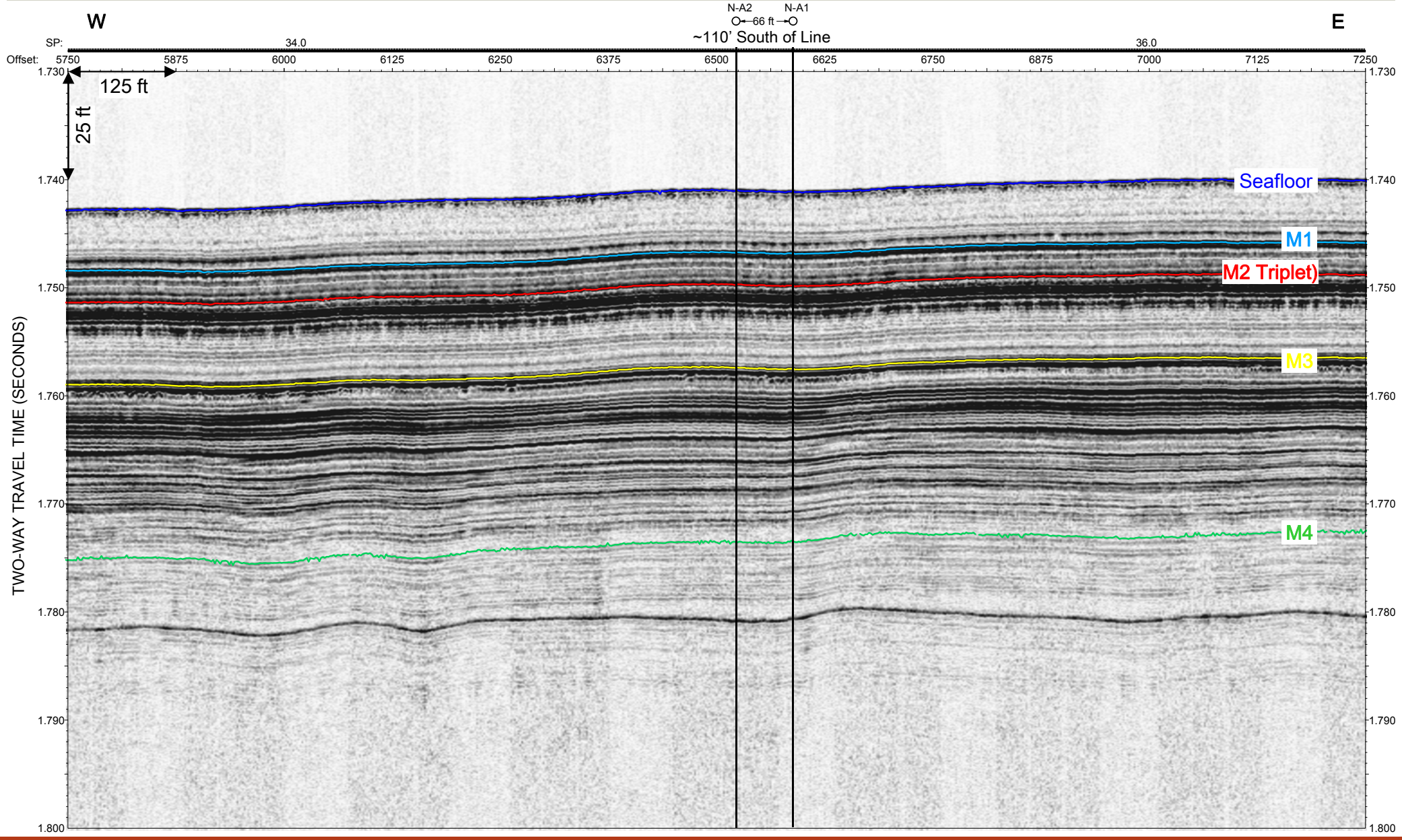

Figure A3 - Inline 4986 and Crossline 5165 Through the Proposed N-A Location

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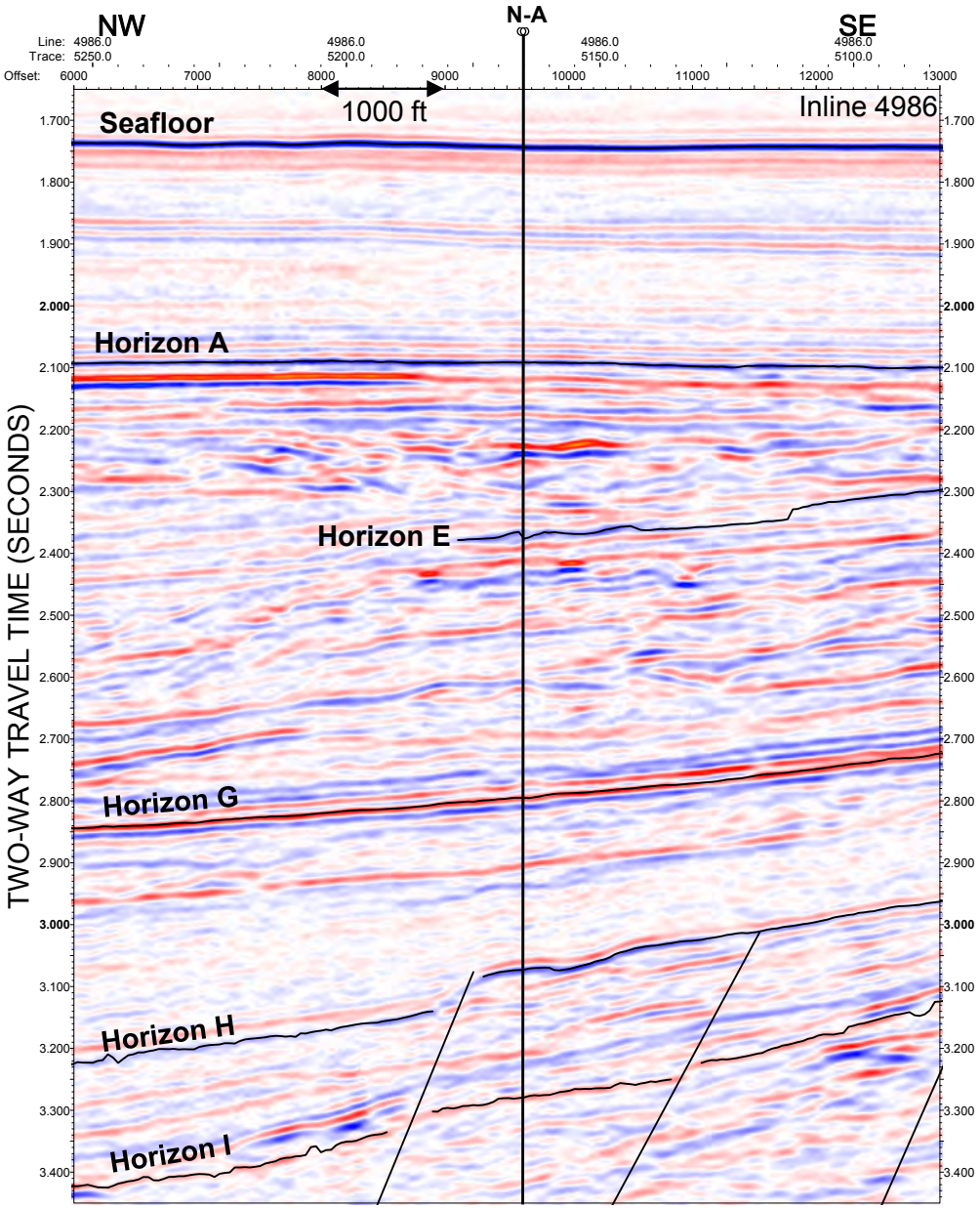

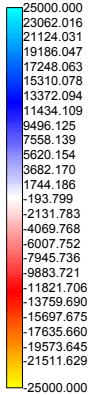

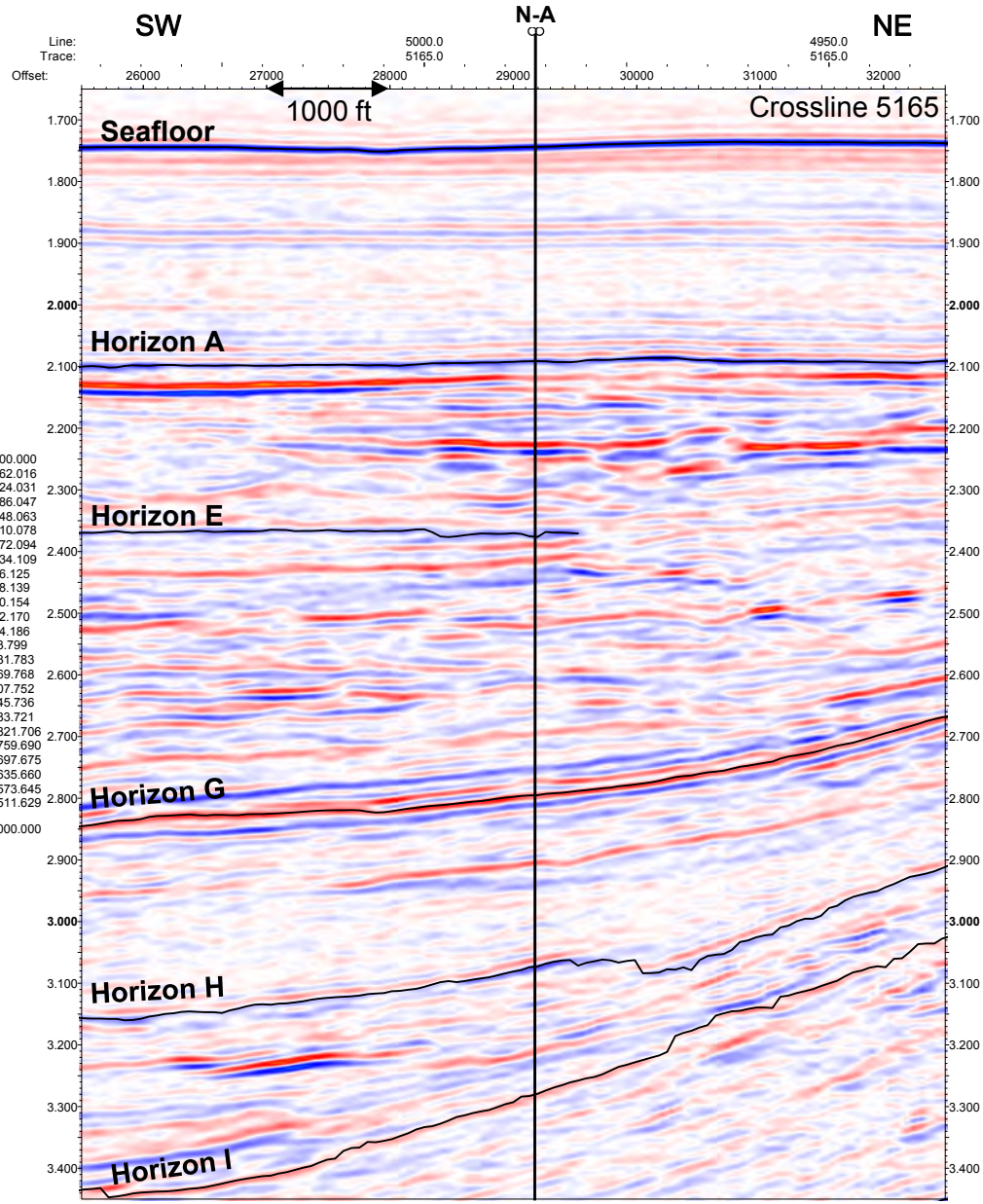

Figure A4 - Tophole Prognosis Chart
Proposed N-A Location

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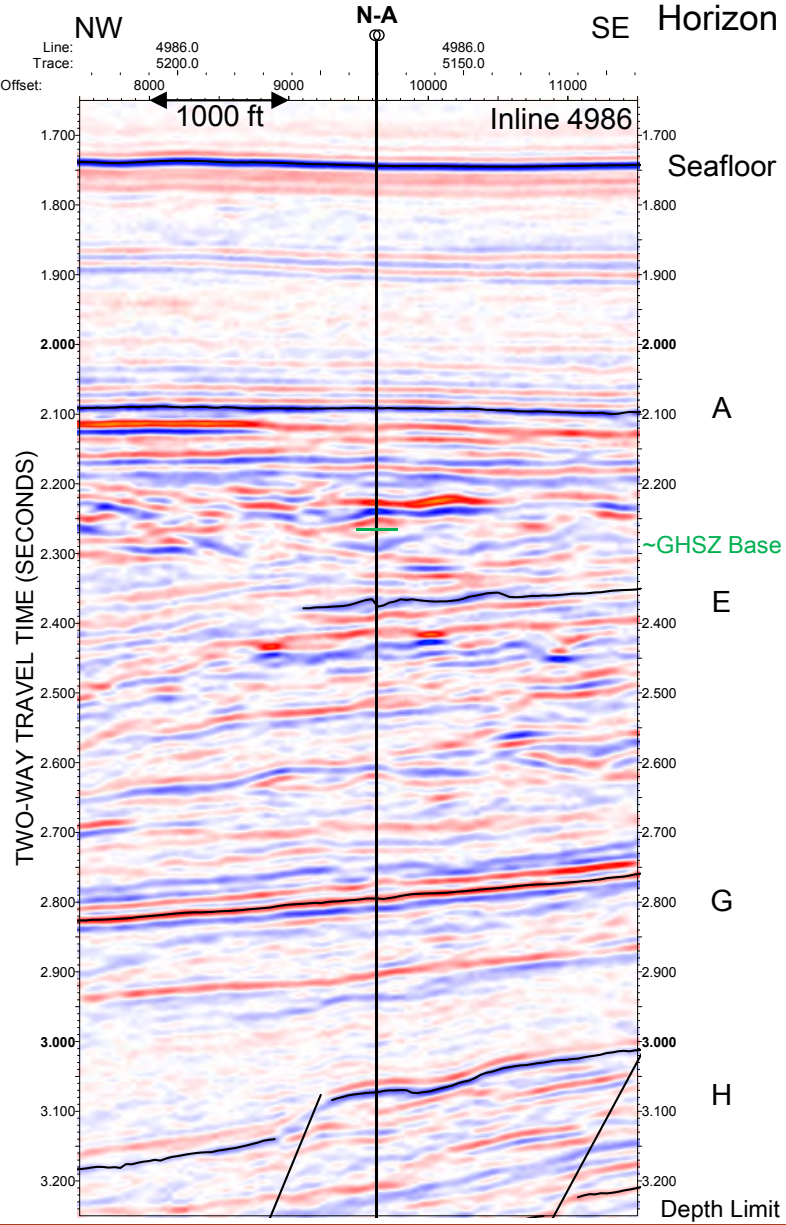
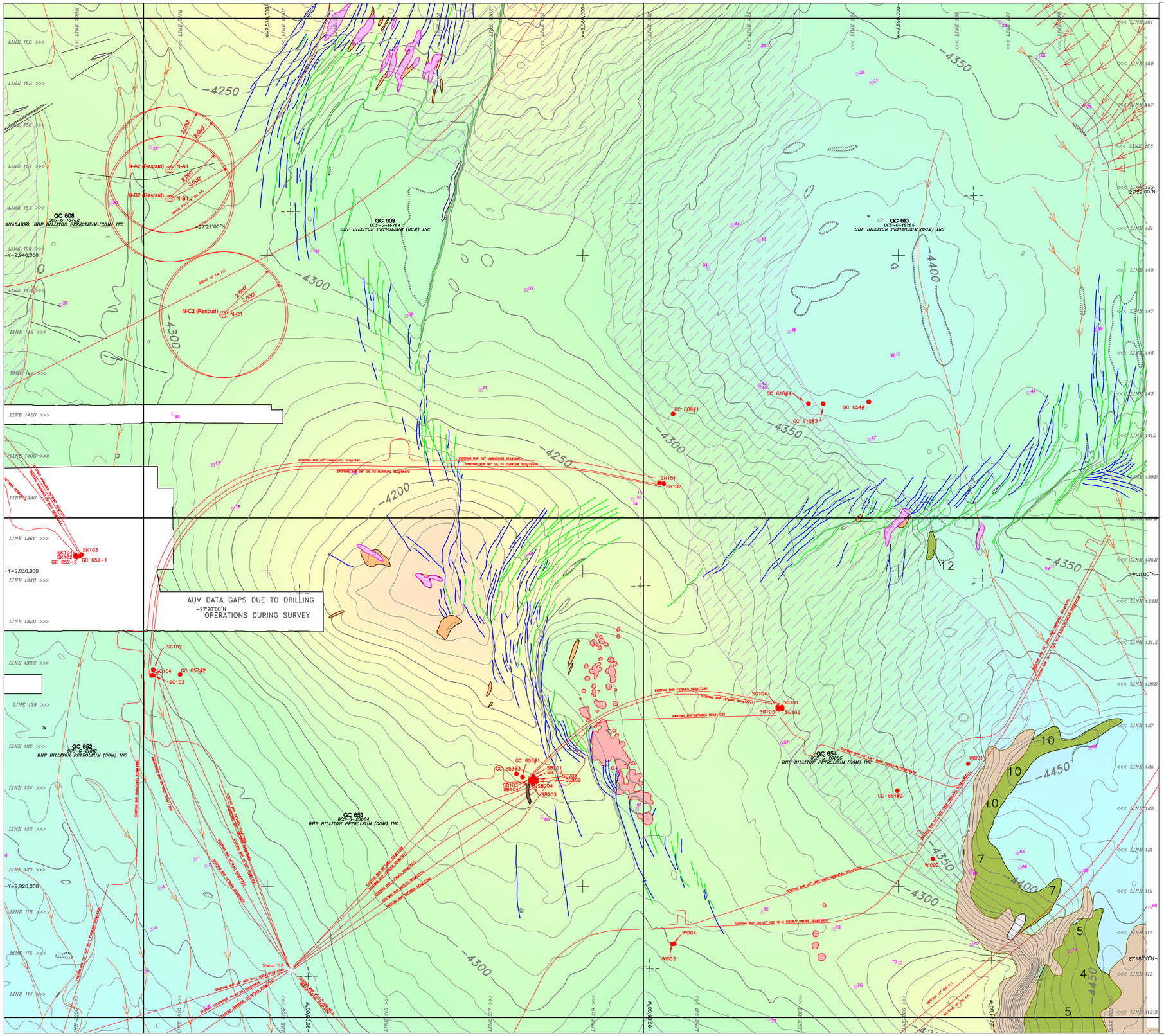


Horizon	Lithology	Time (sec)	TVD SS (ft)	TVD BML (ft)	Thickness (ft)	Gas Potential	SWF Potential
Seafloor		1.744	4287	0			
	clay and silt				927	Negligible	Negligible
A		2.091	5214	927			
	clay, silt, and sand				395	Low	Moderate
		2.227	5609	1322			
	sand				36		
		2.239	5645	1358			
~GHSZ Base	clay, silt, and sand	2.264	5720	1433	418		
E		2.376	6063	1776			
	clay, silt, and sand				1392		
G		2.795	7455	3168			
	clay, silt, and sand				426		
		2.914	7881	3594			
	clay and silt				592	Negligible	Low
H		3.073	8473	4186			
	clay, silt, and sand				663	Low	Moderate
Depth Limit		3.244	9136	4849			



-4350	WATER DEPTH CONTOUR, IN FEET. CONTOUR INTERVAL IS 10 FEET.
🟩	WEST/NORTHWEST DIPPING FAULT WITH SEAFLOOR EXPRESSION.
🟦	EAST/SOUTHEAST DIPPING FAULT WITH SEAFLOOR EXPRESSION.
	BURIED SEDIMENT TRANSPORT CHANNELS.
	BURIED CHANNELS POSSIBLY RELATED TO BRINE-SEEPAGE.
	ANCHOR/DRAG SCARS.
	EXPULSION MOUNDS AND DEPRESSIONS WITH RELATIVELY HIGH ACOUSTIC BACKSCATTER.
	TAR MOUNDS.
	ZONE OF SEAFLOOR EROSION.
	SEAFLOOR LANDSLIDE DEPOSITS.
	DRILLING-MUD DEPOSITS NEAR SHENZI-2 WELL.
	SHALLOW-BURIED GAS ACCUMULATIONS.
12	SHALLOW-BURIED (POST-TRIPLET) LANDSLIDE DEPOSITS. NUMBER INDICATES SHALLOWEST DEPTH OF BURIAL IN FEET.
▨	IRREGULAR SEAFLOOR ASSOCIATED WITH BURIED (PRE-M4) LANDSLIDE DEPOSITS.

MULTI-BEAM WATER DEPTH

NOTES:

1. NAVIGATION WAS SUPPLIED THROUGH BHP, IN CONJUNCTION WITH THE AUV DATA COLLECTED BY C&C TECHNOLOGIES (2005).
2. REPORTED LOCATION OF EXISTING INFRASTRUCTURE BASED ON AS-BUILT DRAWING (601W-11-001 shenzi new_041912_BACKGROUND.dwg) PROVIDED TO BHP BILLITON BY UTEC.

LINE 170 >>>	AUV SURVEY LINE NUMBER.
● 1	EXISTING WELLSITE AND DESIGNATION.
18"-20"	REPORTED LOCATION OF EXISTING PIPELINE.
☒ 21	SIDE-SCAN SONAR TARGET INTERPRETED TO BE MODERN DEBRIS (GEMS ARCHAEOLOGICAL ASSESSMENT, 2011).
N-A1 ○	PROPOSED WELL LOCATION AND DESIGNATION
○	2000' RADII AROUND PROPOSED WELL LOCATION

EXISTING INFRASTRUCTURE

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4 m	SCALE FACTOR:	0.99960
PROJECTION:	UTM	CENTRAL MERIDIAN:	93° W
DATUM:	NAD 1927	LAT. ORIGIN:	0.00000 N
ZONE:	15	FALSE EASTING:	500,000 m
GRID UNITS:	FEET	FALSE NORTHING:	000000 m

SCALE = 1:12,000

0 1,000 2,000 3,000 4,000 5,000

FEET

WATER DEPTH AND SEAFLOOR/ NEAR SEAFLOOR FEATURES MAP

SHENZI FIELD

BLOCKS 609, 610, 653, AND 654
GREEN CANYON AREA
GULF OF MEXICO

BHP BILLITON PETROLEUM (GOM) INC

CONTOUR INTERVAL: 10	
DATUM: SEA SURFACE	
VELOCITY: CTD CASTS FROM AUV SURVEY	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: M.JOHNSON/B.DILLARD/R.GARZA/P.P
INTERPRETATION BY: T. HEWITT\J. SMITH	CHECKED BY: S. WILLIAMSON
DATE: 22-JULY-2014	REVISION NO.: A
JOB NO.: 2405-2079	DWG NO.: 2079WDSF24_WI-C-TO-WI-O-12.DWG

MAP 1

SHEET NO. 1 OF 4

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MAP PREPARED BY:
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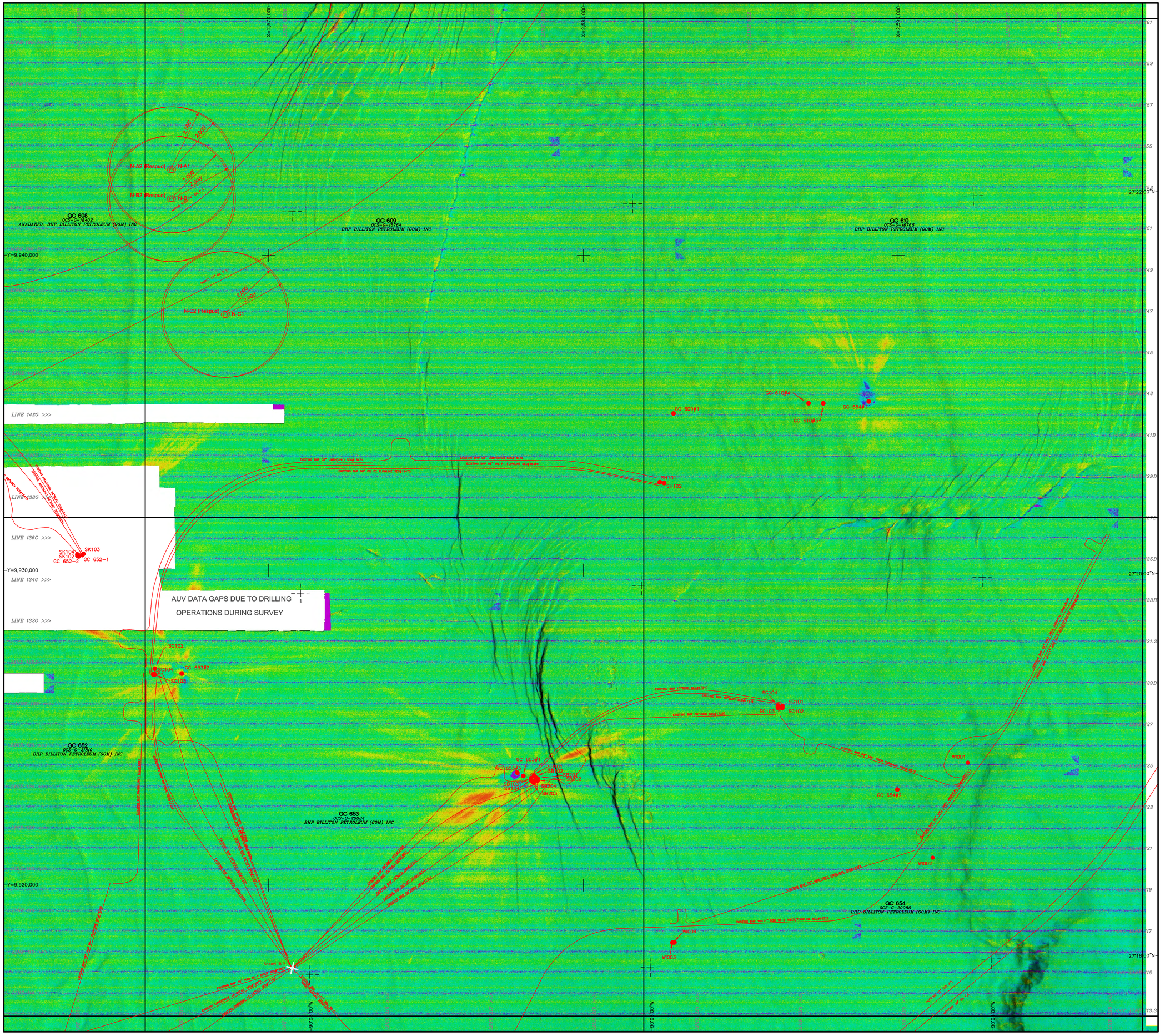
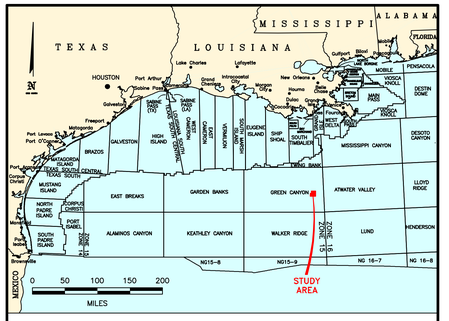
6100 HILLCROFT
HOUSTON, TEXAS 77081
PHONE: 713-369-5800
WWW.FUGRO.COM





BASE MAP INFORMATION

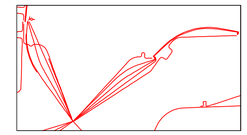
LINE 170 >>> AUV SURVEY LINE NUMBER.

1 EXISTING WELLSITE AND DESIGNATION.

18"-20" REPORTED LOCATION OF EXISTING PIPELINE.

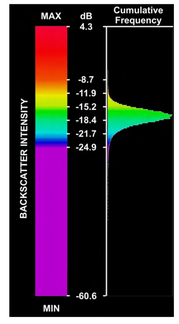
N-A1 PROPOSED WELL LOCATION AND DESIGNATION

2000' RADII AROUND PROPOSED WELL LOCATION



EXISTING INFRASTRUCTURE

INTERPRETIVE INFORMATION



NOTES:

1. NAVIGATION WAS SUPPLIED THROUGH BHP, IN CONJUNCTION WITH THE AUV DATA COLLECTED BY C&C TECHNOLOGIES (2005).
2. REPORTED LOCATION OF EXISTING INFRASTRUCTURE BASED ON AS-BUILT DRAWING (601W-11-001 shenzi new_041912_BACKGROUND.dwg) PROVIDED TO BHP BILLITON BY UTEC.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4 m	SCALE FACTOR:	0.99960
PROJECTION:	UTM	CENTRAL MERIDIAN:	93°W
DATUM:	NAD 1927	LAT. ORIGIN:	0.00000 N
ZONE:	15	FALSE EASTING:	500,000 m
GRID UNITS:	FEET	FALSE NORTHING:	000000 m

SCALE = 1:12,000

0 1,000 2,000 3,000 4,000 5,000

FEET

SEAFLOOR BACKSCATTER RENDERING

SHENZI FIELD

BLOCKS 609, 610, 653, AND 654
GREEN CANYON AREA
GULF OF MEXICO

BHP BILLITON PETROLEUM (GOM) INC

CONTOUR INTERVAL:	
DATUM: SEA SURFACE	
VELOCITY: CTD CASTS FROM AUV SURVEY	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: M.JOHNSON/B.DILLARD/R.GARZA/P.P
INTERPRETATION BY: T. HEWITT\J. SMITH	CHECKED BY: S. WILLIAMSON
DATE: 22-JULY-2014	REVISION NO.: A
JOB NO.: 2405-2079	DWG NO.: 2079COLORBACK24_WI-C-TO-WI-O-12.DWG

MAP 4 SHEET NO. 4 OF 4

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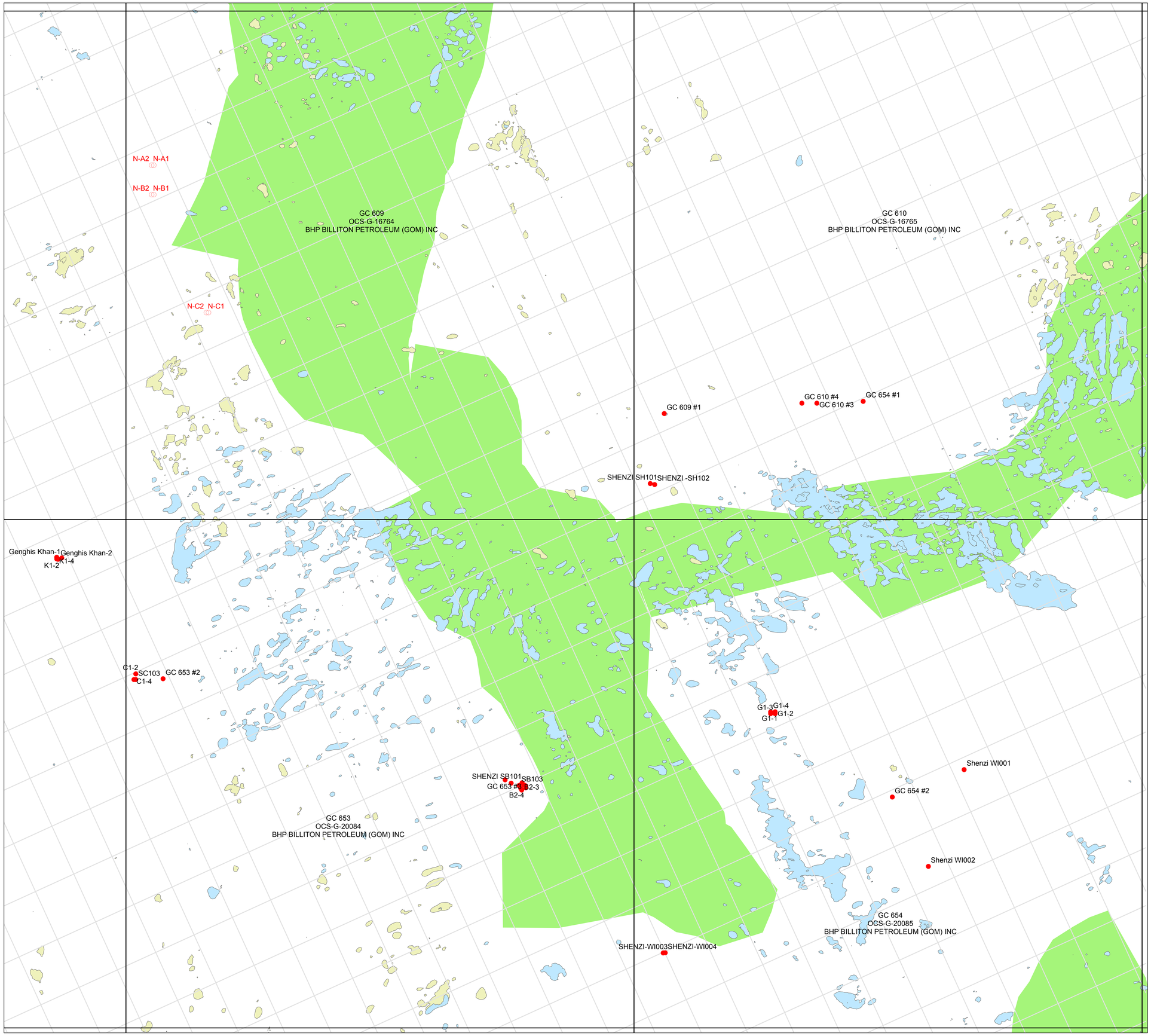


N
W E
S

Legend

- Proposed Well Location
- Existing Wellsite
- Possible Gas Anomaly Between Seafloor and 3000 ft BML
- Possible Gas Anomaly Between 3000 ft BML and Top Salt (or 6000 ft BML Where Top Salt Not Identified)
- Seafloor Fault Plane in Suprasalt Section

1:12,000

0 1,250 2,500 5,000 Feet

MAP 5

Suprasalt Geologic Features Map
Shenzi Field

Blocks 609, 610, 653, and 654
Green Canyon Area

UTM Zone 15N Projection
Clarke 1866 Spheroid
NAD 1927 DATUM

SECTION 4
HYDROGEN SULFIDE INFORMATION

4.1 CONCENTRATION

BHP anticipates encountering zero ppm H_2S during the proposed operations.

4.2 CLASSIFICATION

In accordance with Title 30 CFR 250.490(c), BHP requests that the area of proposed operations be classified by the BOEM as H_2S **absent**.

4.3 H_2S CONTINGENCY PLAN

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

4.4 MODELING REPORT

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

SECTION 5
MINERAL RESOURCE CONSERVATION INFORMATION

5.1 TECHNOLOGY & RESERVOIR ENGINEERING PRACTICES AND PROCEDURES

Proprietary Information

5.2 TECHNOLOGY AND RECOVERY PRACTICES AND PROCEDURES

Proprietary Information

5.3 RESERVOIR DEVELOPMENT

Proprietary Information

SECTION 6
BIOLOGICAL, PHYSICAL AND SOCIOECONOMIC INFORMATION

6.1 DEEPWATER BENTHIC COMMUNITIES

The seafloor disturbing activities proposed in this plan are in water depths greater than 300 meters (984'). GEMS was contracted to provide an assessment of the shallow conditions at the proposed surface locations. The purpose of the assessment was to address seafloor conditions that may impact exploratory drilling operations within 2,000 feet of the proposed well sites. BHP will avoid all high-density deepwater benthic communities by 2,000 feet from each proposed mud and cuttings discharge location and 250 feet from the location of all other seafloor disturbances. As per NTL No. 2009-G40, "Deepwater Benthic Communities," a map showing the 2,000 foot radius around the well site and the maximum anchor radius plus the 1,000 foot buffer zone is included as **Attachment 3-D.**

6.2 TOPOGRAPHIC FEATURES (BANKS)

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

6.3 TOPOGRAPHIC FEATURES STATEMENT (SHUNTING)

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

6.4 LIVE-BOTTOMS (PINNACLE TREND FEATURES)

GC Blocks 608 / 609 are not located within 61 meters (200 feet) of any pinnacle trend feature; therefore, a separate bathymetric map is not required per NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas."

6.5 LIVE BOTTOMS (LOW RELIEF)

GC Blocks 608 / 609 are not located within 30 meters (100 feet) of any live bottom (low relief) feature with vertical relief equal to or greater than 8 feet; therefore, live bottom (low relief) maps are not required per NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas."

6.6 POTENTIALLY SENSITIVE BIOLOGICAL FEATURES

GC Blocks 608 / 609 are not located within 30 meters (100 feet) of potentially sensitive biological features. In accordance with NTL No. 2009-G39, "Biologically Sensitive Underwater Features and Areas," biologically sensitive area maps are not required.

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

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

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

Abbreviations: E = Endangered; T = Threatened

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

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

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

6.8 ARCHAEOLOGICAL REPORT

GC Blocks 608 / 609 are not located in an area determined to have any historic or prehistoric cultural resources; however, an archaeological resource survey was previously submitted with Supplemental DOCD, Control No. S-7487.

6.9 AIR AND WATER QUALITY INFORMATION

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

6.10 SOCIOECONOMIC INFORMATION

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

SECTION 7
WASTES AND DISCHARGES INFORMATION

7.1 PROJECTED GENERATED WASTES

"Wastes You Will Generate, Treat and Downhole Dispose or Discharge to the Gulf of Mexico" is included as **Attachment 7-A.**

7.2 MODELING REPORT

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

Attachment 7-A

TABLE 1: WASTES YOU WILL GENERATE, TREAT AND DOWNHOLE DISPOSE OR DISCHARGE TO THE GOM - Deepwater Invictus

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

Amount is per well **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	NaCl brine; Evaporated Salt; Xanthan Gum; Barite	30,794 bbls	308 bbl/day	overboard / seafloor	No
Cuttings wetted with water-based fluid	Cuttings wetted with seawater, gel, and fresh water pad mud residue from riserless hole sections	2,913 bbls	29 bbl/day	seafloor	No
Synthetic-based drilling fluid amount adhering to cuttings	Baroid Accolade SBM	4,288 bbls	43 bbl/day	overboard	No
Cuttings wetted with synthetic-based fluid	Cuttings wetted with residue of Baroid Accolade SBM	6,727 bbls	67 bbl/day	overboard	No
Will humans be there? If yes, expect conventional waste					
Domestic waste	Kitchen waste	39,700 bbls	397 bbl/day	remove floating solids and discharge	No
Sanitary waste	Sanitary waste	4,800 bbls	48 bbl/day	chlorinate and discharge	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Rainfall & potable water	22,100 bbls	221 bbl/day	filter oil and grease and discharge	No
Will you conduct well treatment, completion, or workover?					
Well treatment fluids	N/A	N/A	N/A	N/A	No
Well completion fluids	N/A	N/A	N/A	N/A	No
Workover 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	Max capacity	132,800 bbls	1,328 bbl/day	overboard	No
Blowout prevent fluid	Stack Magic ECO-FV2	400 bbls	4 bbl/day	overboard	No
Ballast water	Sea Water	50,000 bbls	500 bbl/day	overboard	No
Bilge water	Oil/Water Mixture	2,500 bbls	25 bbl/day	0<15ppm overboard	No
Excess cement at seafloor	Class H	1,364 bbls	5 bbl/min	seafloor	No
Fire water	Sea Water	107,800 bbls	1,078 bbl/day	overboard	No
Cooling water	Sea Water	66,344,900 bbls	663,449 bbl/day	overboard	No
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced water	N/A	N/A	N/A	N/A	No
Will you be covered by an individual or general NPDES permit ?		General Permit			

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

SECTION 8
AIR EMISSIONS INFORMATION

8.1 EMISSIONS WORKSHEETS AND SCREENING QUESTIONS

Screen Questions for DOCD's	Yes	No
Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed development activities more than 90% of the amounts calculated using the following formulas: CT = $3400D^{2/3}$ for CO, and CT = 33.3D for the other air pollutants (where D = distance to shore in miles)?		X
Do your emission calculations include any emission reduction measures or modified emission factors?		X
Does or will the facility complex associated with your proposed development and production activities process production from eight or more wells?		X
Do you expect to encounter H_2S at concentrations greater than 20 parts per million (ppm)?		X
Do you propose to flare or vent natural gas for more than 48 continuous hours from any proposed well?		X
Do you propose to burn produced hydrocarbon liquids?		X
Are your proposed development and production activities located within 25 miles (40 kilometers) from shore?		X
Are your proposed development and production activities located within 124 miles (200 kilometers) of the Breton Wilderness Area?		X

8.2 SUMMARY INFORMATION

Included as **Attachment 8-A** are Air Emission Worksheets which show the emissions calculations for the Plan Emissions and if different, a set of worksheets showing the emissions calculations for the Complex Total Emissions.

This information was calculated by: Kelley Pisciola
(281) 578-3388
Kelley.pisciola@jccteam.com

Attachment 8-A

DOCD/DPP - AIR QUALITY

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

COMPANY	BHP Billiton Petroleum (GOM) Inc.
AREA	Green Canyon
BLOCK	609 (Surface Location)
LEASE	OCS-G 16764
FACILITY	NA
WELL	N-A4 (SN 102), respud/relief well N-A5 and SN 101
COMPANY CONTACT	Kelley Pisciola
TELEPHONE NO.	281-698-8519
REMARKS	2022 - Planned Activities: Spud, drill to TD, log production hole, run production liner and tieback, and temporarily suspend / abandon GC 609 well SN102 (N-A4). Drill , complete and abandon respud/relief Well N-A5 (note: Location N-A5 is a mirror location of Well Location N-A4 and is intended as a respud location only). 2023 - Planned Activities: Complete Well GC 608 (GC 609 Surface Location) Well SN101, complete GC 609 Well SN102, and subsea/jumper installation. 2024- 2030 - Planned Activities: Provide for miscellaneous well intervention, sidetrack drilling, recompletion, workovers, abandonment, maintenance/inspection of well equipment and pipeline relating to GC 608 (GC 609 SL) Well SN101 and GC 609 Well SN102 utilizing a DP Drillship **(Deepwater Invictus or Equivalent)**.

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:		
YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2022		
2023	2	150
2024		
2025		
2026		
2027		
2028		
2029		
2030		

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.apiwebstore.org/publications/item.cgi?9879d38a-8bc0-4abe-bb5c-9b623870125d
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
On-Ice – Other Construction Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Other Survey Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Tractor	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Truck (for gravel island)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Truck (for surveys)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
Man Camp - Operation (max people/day	tons/person/day		0.0004	0.0004	0.0004	0.006	0.001	N/A	0.001	N/A	BOEM 2014-1001	2014	https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2014-1001.pdf
Vessels - Ice Management Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-
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-

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

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

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

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

AIR EMISSIONS CALCULATIONS - 2022

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL				CONTACT	PHONE	REMARKS
BHP Billiton Petroleum (GOM) Inc.	Green Canyon		609 (Surface Location)	OCS-G 16764	NA	N-A4 (SN 102), respud/relief well N-A5 and SN 101				Kelley Pisciola	281-698-8519	2022 - Planned Activities: Spud, drill to TD, log production hole, run production liner and tieback, and temporarily suspend / abandon GC 609 well SN102 (N-A4). Drill , complete and abandon respud/relief Well N-A5 (note: Location N-A5 is a mirror location of Well Location N-A4 and is intended as a respud location only). 2023 - Planned Activities: Complete Well GC 608 (GC 609 Surface Location) Well SN101, complete GC 609 Well SN102, and subsea/jumper installation. 2024- 2030 - Planned Activities: Provide for miscellaneous well intervention, sidetrack drilling, recompletion, workovers, abandonment, maintenance/inspection of well equipment and pipeline relating to GC 608 (GC 609 SL) Well SN101 and GC 609 Well SN102 utilizing a DP Drillship (Deepwater Invictus or Equivalent).

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		64865	3337.045	80089.08	24	260	45.76	27.61	26.78	0.67	1096.39	31.52	0.00	171.97	0.32	142.77	86.14	83.55	2.08	3420.75	98.35	0.01	536.54	1.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - LCV - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4350		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4360		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4370		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Essential Generator ZAN 8890		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Fire Pump ZZZ-1605		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fire Pump ZZZ-1606		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AG Comp ZZZ 1610		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	MGC ZZZ 2610		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler					0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				10000	24	365	--	--	--	--	--	5.00	--	--	--	--	--	--	--	--	21.90	--	--	--
	GLYCOL DEHYDRATOR					1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	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		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2022	**Facility Total Emissions**							**45.76**	**27.61**	**26.78**	**0.67**	**1,096.39**	**36.52**	**0.00**	**171.97**	**0.32**	**142.77**	**86.14**	**83.55**	**2.08**	**3,420.75**	**120.25**	**0.01**	**536.54**	**1.00**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**3,896.10**			**3,896.10**	**3,896.10**	**3,896.10**		**81,333.51**	
	117.0																								
DRILLING	VESSELS- Crew Diesel		9000	463.014	11112.34	24	260	6.35	3.83	3.72	0.09	152.12	4.37	0.00	23.86	0.04	19.81	11.95	11.59	0.29	474.63	13.65	0.00	74.44	0.14
	VESSELS- Crew Diesel		1083	55.71602	1337.18	24	260	0.76	0.46	0.45	0.01	18.31	0.53	0.00	2.87	0.01	2.38	1.44	1.40	0.03	57.11	1.64	0.00	8.96	0.02
	VESSELS - Supply Diesel		13196	678.8814	16293.15	24	260	9.31	5.62	5.45	0.14	223.05	6.41	0.00	34.98	0.07	29.05	17.52	17.00	0.42	695.91	20.01	0.00	109.15	0.20
	VESSELS - Supply Diesel		4881	251.1079	6026.59	24	260	3.44	2.08	2.02	0.05	82.50	2.37	0.00	12.94	0.02	10.74	6.48	6.29	0.16	257.41	7.40	0.00	40.37	0.08
	VESSELS - Supply Diesel		2200	113.1812	2716.35	24	260	1.55	0.94	0.91	0.02	37.19	1.07	0.00	5.83	0.01	4.84	2.92	2.83	0.07	116.02	3.34	0.00	18.20	0.03
	VESSELS - Supply Diesel		502	25.82589	619.82	24	260	0.35	0.21	0.21	0.01	8.49	0.24	0.00	1.33	0.00	1.10	0.67	0.65	0.02	26.47	0.76	0.00	4.15	0.01
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	**Non-Facility Total Emissions**							**21.77**	**13.14**	**12.74**	**0.32**	**521.65**	**15.00**	**0.00**	**81.82**	**0.15**	**67.93**	**40.98**	**39.75**	**0.99**	**1,627.55**	**46.80**	**0.00**	**255.28**	**0.47**

AIR EMISSIONS CALCULATIONS - 2023

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL				CONTACT	PHONE	REMARKS
BHP Billiton Petroleum (GOM) Inc.	Green Canyon		609 (Surface Location)	OCS-G 16764	NA	N-A4 (SN 102), respud/relief well N-A5 and SN 101				Kelley Pisciola	281-698-8519	2022 - Planned Activities: Spud, drill to TD, log production hole, run production liner and tieback, and temporarily suspend / abandon GC 609 well SN102 (N-A4). Drill , complete and abandon respud/relief Well N-A5 (note: Location N-A5 is a mirror location of Well Location N-A4 and is intended as a respud location only). 2023 - Planned Activities: Complete Well GC 608 (GC 609 Surface Location) Well SN101, complete GC 609 Well SN102, and subsea/jumper installation. 2024- 2030 - Planned Activities: Provide for miscellaneous well intervention, sidetrack drilling, recompletion, workovers, abandonment, maintenance/inspection of well equipment and pipeline relating to GC 608 (GC 609 SL) Well SN101 and GC 609 Well SN102 utilizing a DP Drillship (Deepwater Invictus or Equivalent).

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		64865	3337.045	80089.08	24	90	45.76	27.61	26.78	0.67	1096.39	31.52	0.00	171.97	0.32	49.42	29.82	28.92	0.72	1184.11	34.05	0.00	185.72	0.35
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		30173	1552.28	37254.72	24	150	21.29	12.84	12.46	0.31	510.01	14.66	0.00	79.99	0.15	38.32	23.12	22.42	0.56	918.01	26.39	0.00	143.99	0.27
	VESSELS - LCV - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4350		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4360		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4370		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Essential Generator ZAN 8890		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Fire Pump ZZZ-1605		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fire Pump ZZZ-1606		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AG Comp ZZZ 1610		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	MGC ZZZ 2610		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler					0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR					1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00		--	0.00	--
DRILLING	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		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2023	**Facility Total Emissions**							**67.05**	**40.45**	**39.24**	**0.98**	**1,606.40**	**46.19**	**0.00**	**251.96**	**0.47**	**87.74**	**52.93**	**51.35**	**1.28**	**2,102.11**	**60.44**	**0.01**	**329.71**	**0.61**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**3,896.10**			**3,896.10**	**3,896.10**	**3,896.10**		**81,333.51**	
	117.0																								
DRILLING	VESSELS- Crew Diesel		9000	463.014	11112.34	24	90	6.35	3.83	3.72	0.09	152.12	4.37	0.00	23.86	0.04	6.86	4.14	4.01	0.10	164.29	4.72	0.00	25.77	0.05
	VESSELS- Crew Diesel		1083	55.71602	1337.18	24	90	0.76	0.46	0.45	0.01	18.31	0.53	0.00	2.87	0.01	0.83	0.50	0.48	0.01	19.77	0.57	0.00	3.10	0.01
	VESSELS - Supply Diesel		13196	678.8814	16293.15	24	90	9.31	5.62	5.45	0.14	223.05	6.41	0.00	34.98	0.07	10.05	6.07	5.88	0.15	240.89	6.93	0.00	37.78	0.07
	VESSELS - Supply Diesel		4881	251.1079	6026.59	24	90	3.44	2.08	2.02	0.05	82.50	2.37	0.00	12.94	0.02	3.72	2.24	2.18	0.05	89.10	2.56	0.00	13.98	0.03
	VESSELS - Supply Diesel		2200	113.1812	2716.35	24	90	1.55	0.94	0.91	0.02	37.19	1.07	0.00	5.83	0.01	1.68	1.01	0.98	0.02	40.16	1.15	0.00	6.30	0.01
	VESSELS - Supply Diesel		502	25.82589	619.82	24	90	0.35	0.21	0.21	0.01	8.49	0.24	0.00	1.33	0.00	0.38	0.23	0.22	0.01	9.16	0.26	0.00	1.44	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		13750	707.3825	16977.18	24	150	9.70	5.85	5.68	0.14	232.41	6.68	0.00	36.45	0.07	17.46	10.53	10.22	0.25	418.34	12.03	0.00	65.62	0.12
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		**kW**			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	**Non-Facility Total Emissions**							**31.47**	**18.99**	**18.42**	**0.46**	**754.06**	**21.68**	**0.00**	**118.27**	**0.22**	**40.97**	**24.72**	**23.98**	**0.60**	**981.73**	**28.23**	**0.00**	**153.98**	**0.29**

AIR EMISSIONS CALCULATIONS - 2024-2031

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS
BHP Billiton Petroleum (GOM) Inc.	Green Canyon		609 (Surface Location)	OCS-G 16764	NA	N-A4 (SN 102), respud/relief well N-A5 and SN 101	Kelley Pisciola	281-698-8519	2022 - Planned Activities: Spud, drill to TD, log production hole, run production liner and tieback, and temporarily suspend / abandon GC 609 well SN102 (N-A4). Drill , complete and abandon respud/relief Well N-A5 (note: Location N-A5 is a mirror location of Well Location N-A4 and is intended as a respud location only). 2023 - Planned Activities: Complete Well GC 608 (GC 609 Surface Location) Well SN101, complete GC 609 Well SN102, and subsea/jumper installation. 2024- 2030 - Planned Activities: Provide for miscellaneous well intervention, sidetrack drilling, recompletion, workovers, abandonment, maintenance/inspection of well equipment and pipeline relating to GC 608 (GC 609 SL) Well SN101 and GC 609 Well SN102 utilizing a DP Drillship (Deepwater Invictus or Equivalent).

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		64865	3337.045	80089.08	24	200	45.76	27.61	26.78	0.67	1096.39	31.52	0.00	171.97	0.32	109.83	66.26	64.27	1.60	2631.34	75.66	0.01	412.72	0.77
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4350		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4360		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Pipeline Pp PAX 4370		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine (Turbo Gen ZAN 8830)		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Essential Generator ZAN 8890		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Fire Pump ZZZ-1605		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fire Pump ZZZ-1606		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AG Comp ZZZ 1610		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	MGC ZZZ 2610		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler					0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				10000	24	365	--	--	--	--	--	5.00	--	--	--	--	--	--	--	--	21.90	--	--	--
	GLYCOL DEHYDRATOR					1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2024-2031	**Facility Total Emissions**							**45.76**	**27.61**	**26.78**	**0.67**	**1,096.39**	**36.52**	**0.00**	**171.97**	**0.32**	**109.83**	**66.26**	**64.27**	**1.60**	**2,631.34**	**97.56**	**0.01**	**412.72**	**0.77**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**3,896.10**			**3,896.10**	**3,896.10**	**3,896.10**		**81,333.51**	
	117.0																								
DRILLING	VESSELS- Crew Diesel		9000	463.014	11112.34	24	200	6.35	3.83	3.72	0.09	152.12	4.37	0.00	23.86	0.04	15.24	9.19	8.92	0.22	365.10	10.50	0.00	57.26	0.11
	VESSELS- Crew Diesel		1083	55.71602	1337.18	24	200	0.76	0.46	0.45	0.01	18.31	0.53	0.00	2.87	0.01	1.83	1.11	1.07	0.03	43.93	1.26	0.00	6.89	0.01
	VESSELS - Supply Diesel		13196	678.8814	16293.15	24	200	9.31	5.62	5.45	0.14	223.05	6.41	0.00	34.98	0.07	22.34	13.48	13.08	0.33	535.32	15.39	0.00	83.96	0.16
	VESSELS - Supply Diesel		13196	678.8814	16293.15	24	200	9.31	5.62	5.45	0.14	223.05	6.41	0.00	34.98	0.07	22.34	13.48	13.08	0.33	535.32	15.39	0.00	83.96	0.16
	VESSELS - Supply Diesel		4881	251.1079	6026.59	24	200	3.44	2.08	2.02	0.05	82.50	2.37	0.00	12.94	0.02	8.26	4.99	4.84	0.12	198.00	5.69	0.00	31.06	0.06
	VESSELS - Supply Diesel		2200	113.1812	2716.35	24	200	1.55	0.94	0.91	0.02	37.19	1.07	0.00	5.83	0.01	3.72	2.25	2.18	0.05	89.25	2.57	0.00	14.00	0.03
	VESSELS - Supply Diesel		502	25.82589	619.82	24	200	0.35	0.21	0.21	0.01	8.49	0.24	0.00	1.33	0.00	0.85	0.51	0.50	0.01	20.36	0.59	0.00	3.19	0.01
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024-2031	**Non-Facility Total Emissions**							**31.08**	**18.75**	**18.19**	**0.45**	**744.70**	**21.41**	**0.00**	**116.80**	**0.22**	**74.60**	**45.01**	**43.66**	**1.09**	**1,787.28**	**51.39**	**0.01**	**280.33**	**0.52**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
BHP Billiton Petroleum (GOM) Inc.	609 (Surface Location)	OCS-G 16764	NA	N-A4 (SN 102), respud/relief well N-A5 and SN 101		

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2022	142.77	86.14	83.55	2.08	3420.75	120.25	0.01	536.54	1.00
2023	87.74	52.93	51.93	1.28	2102.11	60.44	0.01	329.71	0.61
2024-2031	109.83	66.26	64.27	1.60	2631.34	97.56	0.01	412.72	0.77
Allowable	3896.10			3896.10	3896.10	3896.10		81333.51	

SECTION 9
OIL SPILL INFORMATION

9.1 OIL SPILL RESPONSE PLANNING

All the proposed activities and facilities in this DOCD will be covered by the Oil Spill Response Plan (OSRP) filed by BHP Billiton Petroleum (GOM) Inc. (Company No. 02010) dated September, 2019 and last approved on May 18, 2016, and found in compliance December 9, 2019 (OSRP Control No. O-43). The OSRP Biennial update was submitted September 24, 2021.

9.2 SPILL RESPONSE SITES

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

9.3 OSRO INFORMATION

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

9.4 WORST-CASE DISCHARGE SCENARIO DETERMINATION

Category	Drilling		Production	
	Regional OSRP WCD	DOCD WCD	Regional OSRP WCD	DOCD WCD
Type of Activity	Drilling	Drilling	>10 Miles Production	>10 Miles Production
Facility location (Area/Block)	GC 564	GC 609	GC 564	GC 609
Facility designation	D1	N-C1	J1-1	SN 102
Distance to nearest shoreline (miles)	114	117	114	117
Storage tanks & flowlines (bbl)	NA	NA	NA	NA
Lease term pipelines (bbl)	NA	NA	NA	NA
Uncontrolled blowout (bbl)	269,263	133,735	26,155	24,620
Total Volume (bbl)	**269,263**	**133,735**	**26,155**	**24,620**
Type of oil(s) (crude, condensate, diesel)	Crude Oil	Crude Oil	Crude Oil	Crude Oil
API gravity	31°	31°	32°	32°

The DOCD Drilling WCD calculations were previously accepted under Supplemental DOCD, Control No. S-7704.

BHP has determined that the drilling worst-case scenario from the activities proposed in this DOCD does not supersede the worst-case scenario from our approved Regional OSRP.

BHP submitted the OSRP Biennial update and a new production worst-case scenario to the BSEE GOMR for inclusion in our regional OSRP on September 24, 2021.

Since BHP has the capability to respond to the worst-case spill scenario included in our Regional OSRP approved on May 18, 2016 and found in compliance on December 9, 2019, and since the worst-case scenario determined for our DOCD does not replace the worst-case scenario in our Regional OSRP, BHP hereby certifies that BHP has the capability to respond, to the maximum extent practicable, to a worst-case discharge, or a substantial threat of such a discharge, resulting

9.5 OIL SPILL RESPONSE DISCUSSION

The Oil Spill Response Discussion is included as **Attachment 9-A.**

9.6 MODELING REPORT

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

SPILL RESPONSE DISCUSSION

For the purpose of NEPA and Coastal Zone Management Act analysis, the largest spill volume originating from the proposed activity would be a well blowout during drilling operations, estimated to be 133,735 barrels of crude oil with an API gravity of 31°.

Land Segment and Resource Identification

Trajectories of a spill and the probability of it impacting a land segment have been projected utilizing information in the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico available on the BOEM website. The results are shown in **Figure 1.** The BOEM OSRAM identifies a 3% probability of impact to the shorelines of Cameron Parish and/or Plaquemines Parish, Louisiana within 30 days. Cameron Parish includes the east side of Sabine Lake, Sabine National Wildlife Refuge, Calcasieu Lake, Lacassine National Wildlife Refuge (inland) and Grand Lake. Cameron Parish also includes the area along the coastline from Sabine Pass to Big Constance Lake in Rockefeller Wildlife Refuge. This region is composed of open public beaches, marshlands and swamps. It serves as a habitat for numerous birds, finfish and other animals, including several rare, threatened and endangered species. Plaquemines Parish includes Barataria Bay, the Mississippi River Delta, Breton Sound and the affiliated islands and bays. This region is an extremely sensitive habitat and serves as a migratory, breeding, feeding and nursery habitat for numerous species of wildlife. Beaches in this area vary in grain particle size and can be classified as fine sand, shell or perched shell beaches. Sandy and muddy tidal flats are also abundant.

Response

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

Using the estimated chemical and physical characteristics of crude oil, an ADIOS weathering model was run on a similar product from the ADIOS oil database. The results indicate 16% or approximately 21,398 barrels of crude oil would be evaporated/dispersed within 24 hours, with approximately 112,337 barrels remaining.

Spill Response GC 609, Location C-1	**Barrels of Oil**
WCD Volume	133,735
Less 16% natural evaporation/dispersion	21,398
Remaining volume	112,337

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

BHP ’s Oil Spill Response Plan includes alternative response technologies such as dispersants and in-situ burn. Strategies will be decided by Unified Command based on an operations safety

analysis, the size of the spill, weather and potential impacts. If aerial dispersants are utilized, 8 sorties (9,600 gallons) from two of the DC-3 aircrafts and 4 sorties (8,000 gallons) from the Basler aircraft would provide a daily dispersant capability of 7,540 barrels. If the conditions are favorable for in-situ burning, the proper approvals have been obtained and the proper planning is in place, in-situ burning of oil may be attempted. Slick containment boom would be immediately called out and on-scene as soon as possible. The pre-selected load-out location is C-Port in Port Fourchon, LA. Offshore response strategies may include attempting to skim utilizing CGA's and MSRC's spill response equipment with a total derated skimming capacity of 725,868 barrels. Temporary storage associated with skimming equipment equals 142,796 barrels. If additional storage is needed, various tank barges with a total of 587,000+ barrels of storage capacity may be mobilized and centrally located to provide temporary storage and minimize off-loading time. **Safety is first priority. Air monitoring will be accomplished and operations deemed safe prior to any containment/skimming attempts.**

If the spill went unabated, shoreline impact in Cameron and/or Plaquemines Parish, Louisiana would depend upon existing environmental conditions. Shoreline protection would include the use of CGA's near shore and shallow water skimmers with a total derated skimming capacity of 88,273 barrels. Temporary storage associated with skimming equipment equals 1,282 barrels. If additional storage is needed, various tank barges with a total of 94,000 barrels of storage capacity may be mobilized and centrally located to provide temporary storage and minimize off-loading time. Onshore response may include the deployment of shoreline boom on beach areas, or protection and sorbent boom on vegetated areas. A Master Service Agreement with ES&H and a Letter of Intent from USES will ensure access will ensure access to 144,300 feet of 18" shoreline protection boom. **Figure 2** outlines individual times needed for procurement, load out, travel time to the site and deployment. Strategies would be based upon surveillance and real time trajectories that depict areas of potential impact given actual sea and weather conditions. Applicable Area Contingency Plans (ACPs), Geographic Response Plans (GRPs), and Unified Command (UC) will be consulted to ensure that environmental and special economic resources are correctly identified and prioritized to ensure optimal protection. Shoreline protection strategies depict the protection response modes applicable for oil spill clean-up operations. As a secondary resource, the State of Louisiana Initial Oil Spill Response Plan will be consulted as appropriate to provide detailed shoreline protection strategies and describe necessary action to keep the oil spill from entering Louisiana's coastal wetlands. The UC should take into consideration all appropriate items detailed in Tactics discussion of this Appendix. The UC and their personnel have the option to modify the deployment and operation of equipment to allow for a more effective response to site-specific circumstances. BHP's Incident Management Team has access to the applicable ACP(s) and GRP(s).

Based on the anticipated worst case discharge scenario, BHP 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 72 hours (based on the equipment's Effective Daily Recovery Capacity (EDRC)).

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

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

Company Name will take action to provide a safe, aggressive response to contain and recover as much of the spilled oil as quickly as it is safe to do so. In an effort to protect the environment, response actions will be designed to provide an "in-depth" protection strategy meant to recover as much oil as possible as far from environmentally sensitive areas as possible. Safety will take precedence over all other considerations during these operations.

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

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

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

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

Offshore Response Actions

Equipment Deployment

Surveillance

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

Dispersant application assets

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

Containment boom

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

Oceangoing Boom Barge

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

In-situ Burn assets

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

Dedicated off-shore skimming systems
General

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

CGA HOSS Barge

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

CGA 95' Fast Response Vessels (FRVs)

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

CGA FRUs

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

T&T Koseq Skimming Systems

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

Storage Vessels

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

Vessels of Opportunity (VOO)

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

Adverse Weather Operations:

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

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

Maximization of skimmer-oil encounter rate

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

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

Maximize skimmer system efficiency

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

Recovered Oil Storage

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

Command, Control, and Communications (C^3)

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

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

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

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

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

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

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

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

Initial set-up and potential actions:

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

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

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

TF 1

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

TF 2

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

TF 3

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

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

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

TF 4

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

TF 5

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

TF 6

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

TF 7

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

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

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

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

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

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

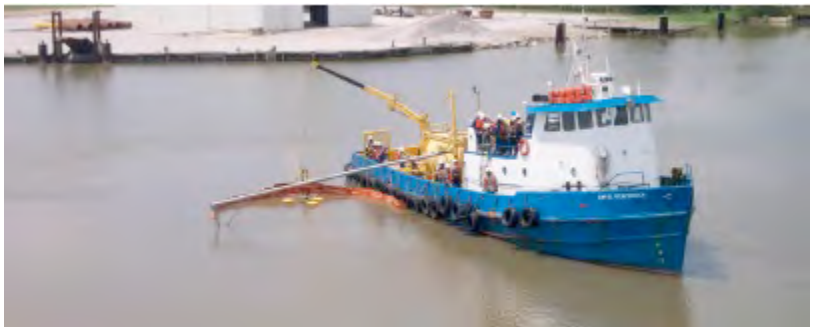
Tactical Overview

Mechanical Recovery – The FRU is designed to provide fast response skimming capability in the offshore and nearshore environment in a stationary or advancing mode. It provides a rated daily recovery capacity of 4,100 barrels. An additional boom reel with 440' of offshore boom can be deployed along with the FRU, and a second support vessel for boom towing, to extend the swath width when attached to the end of the fixed boom. The range and sustainability offshore is dependent on the VOO that the unit is placed on, but generally these can stay offshore for extended periods. The FRU works well independently or assigned with other on-water recovery assets in a task force. In either case, it is most effective when a designated aircraft is assigned to provide tactical direction to ensure the best placement in recoverable oil.

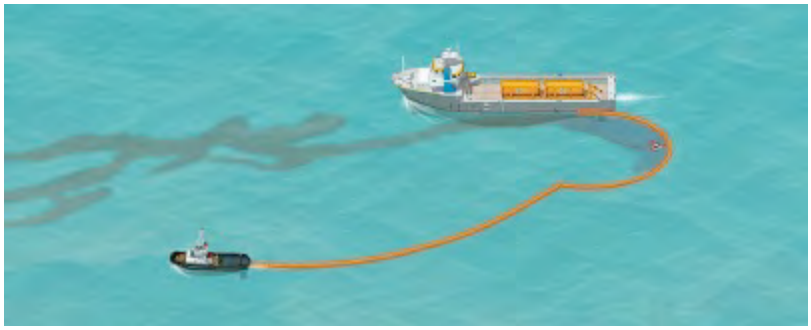
Maximum Sea Conditions – Under most circumstances the FRU can maintain standard oil spill recovery operations in 2' to 4' seas. Ultimately, the Coast Guard licensed Captain in charge of the VOO (with input from the CGAS Supervisor assigned) will be responsible to determine when the sea conditions have surpassed the vessel's safe operating capabilities.

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

1 – VOO (100' to 165' Utility or Supply Vessel)
1 – Boom reel w/support vessel for towing
1 – Tank barge (offshore) for temporary storage
1 – Utility/Crewboat (supply)
1 – Designated spotter aircraft



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



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

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

Tactical Overview

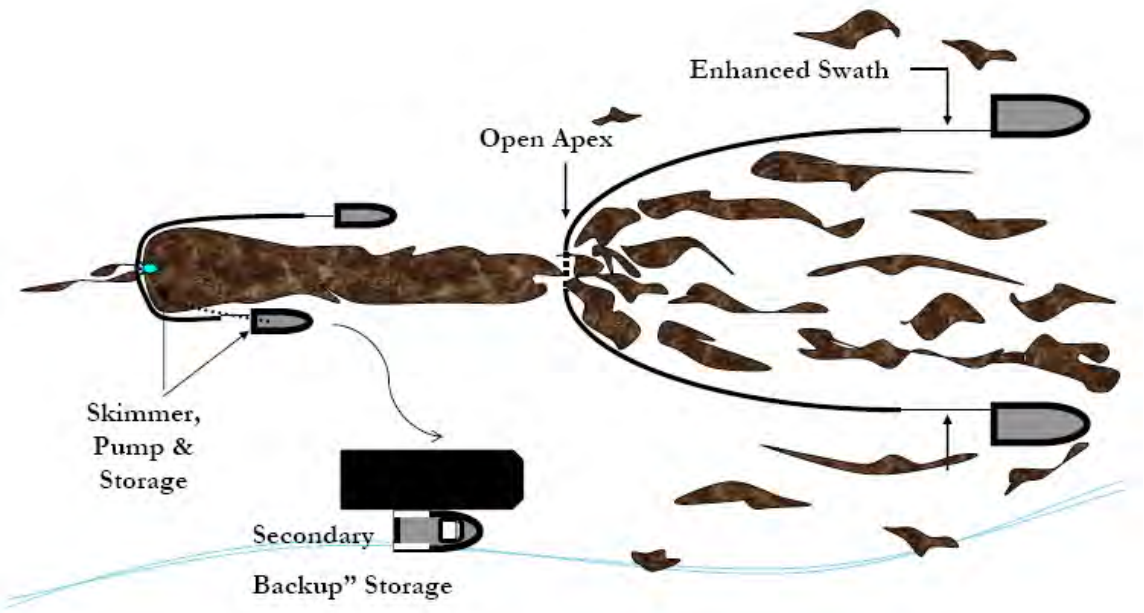
Mechanical Recovery – Deployed on large vessels of opportunity (VOO) the Koseq Rigid Sweeping Arms are high volume surge capacity deployed to increase recovery capacity at the source of a large oil spill in the offshore and outer nearshore environment of the Gulf of Mexico. They are highly mobile and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

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

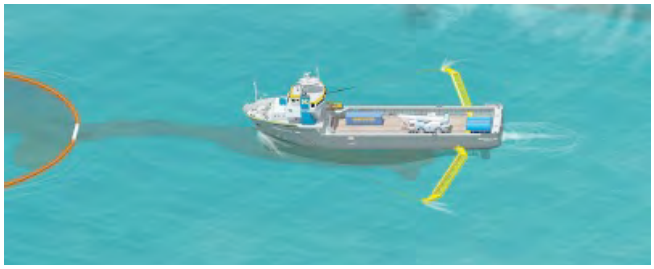
Command and Control – The large OSVs in many cases have state of the art communication and electronic systems, as well as the accommodations to support the function of directing all skimming operations offshore and reporting back to the command post.

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

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



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



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

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

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

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

Near Shore Response Actions

Timing

- Put near shore assets on standby and deployment in accordance with planning based on the actual situation, actual trajectories and oil budgets
- VOO identification and training in advance of spill nearing shoreline if possible
- Outfitting of VOOs for specific missions
- Deployment of assets based on actual movement of oil

Considerations

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

Surveillance

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

Dispersant Use

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

Dedicated Near Shore skimming systems

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

VOO

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

Shoreline Protection Operations

Response Planning Considerations

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

Placement of boom

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

Beach Preparation - Considerations and Actions

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

- Staging of equipment and housing of response personnel as close to the job site as possible to maximize on-site work time
- Boom tending, repair, replacement and security (use of local assets may be advantageous)
- Constant awareness of weather and oil movement for resource re-deployment as necessary
- Earthen berms and shoreline protection boom may be considered to protect sensitive inland areas
- Requisitioning of earth moving equipment
- Plan for efficient and safe use of personnel, ensuring:
    - A continual supply of the proper Personal Protective Equipment
    - Heating or cooling areas when needed
    - Medical coverage
    - Command and control systems (i.e. communications)
    - Personnel accountability measures
- Remediation requirements, i.e., replacement of sands, rip rap, etc.
- Availability of surface washing agents and associated protocol requirements for their use (see National Contingency Plan Product Schedule for list of possible agents)
- Discussions with all stakeholders, i.e., land owners, refuge/park managers, and others as appropriate, covering the following:
    - Access to areas
    - Possible response measures and impact of property and ongoing operations
    - Determination of any specific safety concerns
    - Any special requirements or prohibitions
    - Area security requirements
    - Handling of waste
    - Remediation expectations
    - Vehicle traffic control
    - Domestic animal safety concerns
    - Wildlife or exotic game concerns/issues

Inland and Coastal Marsh Protection and Response Considerations and Actions

- All considered response methods will be weighed against the possible damage they may do to the marsh. Methods will be approved by the Unified Command only after discussions with local Stakeholder, as identified above.
    - In-situ burn may be considered when marshes have been impacted
- Passive clean up of marshes should considered and appropriate stocks of sorbent boom and/or sweep obtained.
- Response personnel must be briefed on methods to traverse the marsh, i.e.,
    - use of appropriate vessel
    - use of temporary walkways or road ways
- Discuss and gain approval prior cutting or moving vessels through vegetation
- Discuss use of vessels that may disturb wildlife, i.e, airboats
- Safe movement of vessels through narrow cuts and blind curves

- Consider the possibility that no response in a marsh may be best
- In the deployment of any response asset, actions will be taken to ensure the safest, most efficient operations possible. This includes, but is not limited to:
    - Placement of recovered oil or waste storage as near to vessels or beach cleanup crews as possible.
    - Planning for stockage of high use items for expeditious replacement
    - Housing of personnel as close to the work site as possible to minimize travel time
    - Use of shallow water craft
    - Use of communication systems appropriate ensure command and control of assets
    - Use of appropriate boom in areas that I can offer effective protection
    - Planning of waste collection and removal to maximize cleanup efficiency
- Consideration or on-site remediation of contaminated soils to minimize replacement operations and impact on the area

FIGURE 1
TRAJECTORY BY LAND SEGMENT

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

Area/Block	OCS-G	Launch Area	Land Segment and/or Resource	Conditional Probability (%) within 30 days
GC 609, **Well Location C-1** *117 miles from shore*	G16764	C46	Matagorda County, TX Brazoria County, TX Galveston County, TX Jefferson County, TX **Cameron Parish, LA** Vermilion Parish, LA Terrebonne Parish, LA Lafourche Parish, LA **Plaquemines Parish, LA**	1 1 2 1 **3** 1 1 1 **3**

WCD Scenario– <u>BASED ON WELL BLOWOUT DURING DRILLING OPERATIONS</u> (117 miles from shore)
112,337 bbls of crude oil (Volume considering natural weathering)
API Gravity 31°

FIGURE 2 – Equipment Response Time to GC 609, Well Location C-1

Dispersants/Surveillance

Dispersant/Surveillance	Dispersant Capacity (gal)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI							
Basler 67T	2000	2	Houma	2	2	0.8	4.8
DC 3	1200	2	Houma	2	2	1	5
DC 3	1200	2	Houma	2	2	1	5
Aero Commander	NA	2	Houma	2	2	0.8	4.8
MSRC							
C-130 Spray AC	3,250	2	Kiln	3	0.2	0.6	3.8
King Air BE90 Spray AC	250	2	Kiln	3	0.3	1	4.3

Offshore Response

Offshore Equipment Pre-Determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
HOSS Barge	76285	4000	3 Tugs	12	Harvey	6	0	12	14.4	2	34.4
95' FRV	22885	249	NA	6	Leeville	2	0	2	6	1	11
95' FRV	22885	249	NA	6	Venice	2	0	3	6	1	12
95' FRV	22885	249	NA	6	Vermilion	2	0	3	7.5	1	13.5
95' FRV	22885	249	NA	6	Galveston	2	0	2	16	1	21
Boom Barge (CGA-300) 42" Auto Boom (25000')	NA	NA	1 Tug 50 Crew	4 (Barge) 2 (Per Crew)	Leeville	8	0	4	17	2	31

Recovered Oil Storage Pre-Determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2604	NA	20000	1 Tug	6	Amelia	21	0	6	20	1	48
CTCo 2605	NA	20000	1 Tug	6	Amelia	21	0	6	20	1	48
CTCo 2606	NA	20000	1 Tug	6	Amelia	21	0	6	20	1	48
CTCo 5001	NA	47000	1 Tug	6	Amelia	21	0	6	20	1	48
Kirby Offshore (available through contract with CGA)											
RO Barge	NA	80000+	1 Tug	6	Venice	41	0	4	14	1	60
RO Barge	NA	80000+	1 Tug	6	Venice	41	0	4	14	1	60
RO Barge	NA	80000+	1 Tug	6	Venice	41	0	4	14	1	60
RO Barge	NA	80000+	1 Tug	6	Venice	41	0	4	14	1	60
RO Barge	NA	160000+	1 Tug	6	Venice	41	0	4	14	1	60

Loadout/Staging Area: C-Port in Port Fourchon

Offshore Equipment With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
CGA											
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Galveston	4	12	12	10	2	40
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Harvey	4	12	3	10	2	31
Koseq Skimming Arms (10) Lamor brush	228850	60000	10 OSV	60	Galveston, TX	24	24	12	10	2	72
Koseq Skimming Arms (6) Lamor brush	137310	36000	6 OSV	36	Harvey, LA	24	24	3	10	2	63
Koseq Skimming Arms (6) MariFlex 150 HF	108978	36000	6 OSV	36	Harvey, LA	24	24	3	10	2	63
CGA											
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Vermilion	2	6	5.5	10	1	24.5
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Galveston	2	6	12	10	1	31
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Aransas Pass	2	6	16.5	10	1	35.5
FRU (3) + 100 bbl Tank (6)	12753	600	3 Utility	18	Leeville	2	6	2	10	1	21
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Venice	2	6	5	10	1	24
Hydro-Fire Boom	NA	NA	8 Utility	40	Harvey	0	24	3	10	6	43

Nearshore Response

Nearshore Equipment Pre-determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
Mid-Ship SWS	22885	249	NA	4	Leeville	2	0	N/A	48	1	51
46' FRV	15257	65	NA	4	Morgan City	2	0	2	5	1	10
46' FRV	15257	65	NA	4	Lake Charles	2	0	2	10	1	15
46' FRV	15257	65	NA	4	Venice	2	0	2	2	1	7
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2603	NA	25000	1 Tug	6	Amelia	25	12	6	16	1	60
CTCo 2607	NA	23000	1 Tug	6	Amelia	25	12	6	16	1	60
CTCo 2608	NA	23000	1 Tug	6	Amelia	25	12	6	16	1	60
CTCo 2609	NA	23000	1 Tug	6	Amelia	25	12	6	16	1	60

Staging Area: Venice

Nearshore Equipment With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
SWS Egmopol	1810	100	NA	3	Galveston	2	2	13	2	1	20
SWS Egmopol	1810	100	NA	3	Morgan City	2	2	4.5	2	1	11.5
SWS Marco	3588	20	NA	3	Vermilion	2	2	8	2	1	15
SWS Marco	3588	34	NA	3	Leeville	2	2	4.5	2	1	11.5
SWS Marco	3588	34	NA	3	Venice	2	2	2	2	1	7
Foilex Skim Package (TDS 150)	1131	50	NA	3	Vermilion	4	12	8	2	2	28
Foilex Skim Package (TDS 150)	1131	50	NA	3	Galveston	4	12	13	2	2	33
Foilex Skim Package (TDS 150)	1131	50	NA	3	Harvey	4	12	2	2	2	22
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Vermilion	2	2	8	2	1	15
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Harvey	2	2	2	2	1	9
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Vermilion	2	2	8	2	1	15
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Harvey	2	2	2	2	1	9

Staging Area: Venice

Shoreline Protection Boom	VOO	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
ES&H (available through MSA)									
13,000' 18" Boom	6 Crew	12	Golden Meadow, LA	.5	.5	4	2	4	11
14,000' 18" Boom	6 Crew	12	LaPlace, LA	.5	.5	3	2	4	10
16,000' 18" Boom	6 Crew	12	Lake Charles, LA	.5	.5	8	2	4	15
500' 18" Boom	1 Crew	2	Lafayette, LA	.5	.5	6	2	1	10
100' 18" Boom	1 Crew	2	Morgan City, LA	.5	.5	5	2	1	9
1,000' 18" Boom	1 Crew	2	Fourchon, LA	.5	.5	5	2	1	9
10,100' 18" Boom	6 Crew	12	Belle Chasse, LA	.5	.5	2	2	4	7
52,000' 18" Boom	12 Crew	24	Houma, LA	.5	.5	4	2	4	11
2,100' 18" Boom	1 Crew	2	Venice, LA	.5	.5	0	2	4	7
USES (available through LOI)									
6,000' 18" Boom	3 Crew	6	Meraux, LA	.5	.5	2	2	2	6
5,000' 18" Boom	3 Crew	8	Mobile, AL	.5	.5	6	2	2	10
1,000' 18" Boom	1 Crew	2	Geismar, LA	.5	.5	4	2	1	8
2,000' 18" Boom	1 Crew	2	Shreveport, LA	.5	.5	11.5	2	1	15.5
1,000' 18" Boom	1 Crew	2	Lafitte, LA	.5	.5	2.5	2	1	6.5
10,000' 18" Boom	4 Crew	8	Venice, LA	.5	.5	0	2	2	4
2,000' 18" Boom	1 Crew	2	Jackson, MS	.5	.5	7.5	2	1	11.5
3,000' 18" Boom	1 Crew	2	Memphis, TN	.5	.5	13.5	2	1	17.5
2,500' 18" Boom	1 Crew	2	Birmingham, AL	.5	.5	12	2	1	16
1,000' 18" Boom	1 Crew	2	Little Rock, AR	.5	.5	14.5	2	1	18.5
2,000' 18" Boom	1 Crew	2	Biloxi, MS	.5	.5	5	2	1	9

Wildlife Response	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
					CGA						
Wildlife Support Trailer	NA	NA	NA	2	Harvey	2	2	2	1	2	9
Bird Scare Guns (24)	NA	NA	NA	2	Harvey	2	2	2	1	2	9
Bird Scare Guns (12)	NA	NA	NA	2	Galveston	2	2	13	1	2	20
Bird Scare Guns (12)	NA	NA	NA	2	Aransas Pass	2	2	18	1	2	25
Bird Scare Guns (48)	NA	NA	NA	2	Vermilion	2	2	8	1	2	15
Bird Scare Guns (24)	NA	NA	NA	2	Leeville	2	2	4.4	1	2	11.4

Response Asset	Total
Offshore EDRC	725,868
Offshore Recovered Oil Capacity	729,796+
Nearshore / Shallow Water EDRC	88,273
Nearshore / Shallow Water Recovered Oil Capacity	95,282

SECTION 10
ENVIRONMENTAL MONITORING INFORMATION

10.1 MONITORING SYSTEMS

BHP will monitor loop currents per the requirements set forth in NTL No. 2018-G01, "Ocean Current Monitoring."

BHP will utilize a DP drillship, which will have a typical moon pool utilized in all Deepwater DP drillships. Accordingly, BHP will comply with the Reasonable and Prudent Measures implementing Terms and Conditions of the Biological Opinion issued by the National Marine Fisheries Service (NMFS) on March 13, 2020, and the amendment issued on April 26, 2021.

The moon pool will be regularly monitored while open to the water column and when the vessel is not underway. If water conditions are such that observers are unable to see within a meter of the surface, operations requiring lowering or retrieval of equipment through the moon pool will be conducted at a rate that will minimize potential harm, if safety allows.

BHP and/or its contractor representatives will attempt to keep hull doors closed when no activity is occurring within the moon pool, unless the safety of the crew or vessel require otherwise. This will prevent protected species from entering the confined area during periods of non-activity.

Prior to and following hull door closure, the moon pool will be monitored continuously for a minimum of 30 minutes, by a dedicated crew observer with no other tasks to ensure that no individual Endangered Species Act (ESA) listed species is trapped within the hull closed moon pool doors. If visibility is not clear to the hull door from above (e.g., turbidity or low light), 30 minutes of monitoring will be conducted prior to hull door closure. Prior to movement of the vessel and/or deployment/retrieval of equipment through the moon pool during riserless operations, the moon pool will be monitored continuously for a minimum of 30 minutes, by a dedicated crew observer with no other tasks, to ensure no ESA listed species are present in the moon pool area.

If an ESA listed species is observed in the moon pool, prior to movement of the vessel, the vessel will not be moved and equipment will not be deployed or retrieved, to the extent practicable, unless the safety of the crew or vessel requires otherwise. If the observed animal leaves the moon pool, activities will commence. If the observed animal remains in the moon pool, BHP will contact BSEE prior to planned movement of the vessel according to reporting requirements.

Should an ESA listed species be observed in a moon pool prior to activity commencement, recovery of the animal or other actions specific to the scenario may be required to prevent interaction with the animal. No action will be taken except at the direction of and after contact with NMFS.

Should an interaction with equipment or entanglement/entrapment of any ESA listed species occur (e.g., the animal cannot or does not leave the moon pool on its own volition), the interaction will be reported immediately. Any observation of a leatherback sea turtle within a moon pool,

regardless of whether interaction with equipment or entanglement/entrapment is observed, will be reported immediately to the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov). Further, any interaction with equipment or entanglement/entrapment of any ESA listed species (i.e., the animal cannot or does not leave the moon pool of its own volition) will be reported immediately. For assistance with marine mammals and sea turtles, the stranding network listed at www.fisheries.noaa.gov/report and BSEE at protectedspecies@bsee.gov will be contacted for additional guidance on monitoring requirements, recovery assistance (if required), and incidental report information. Other ESA listed species (e.g., giant manta ray) will be reported to relevant state agency wildlife lines, the ESA Section 7 biologist and BSEE at protectedspecies@bsee.gov. The vessel will not be moved and equipment will not be deployed or retrieved to/from the pool, to the extent practicable, until NMFS and BSEE are contacted and provide input on how to proceed.

Any ESA listed species observed within a moon pool that then leaves the moon pool of its own volition will be reported within 24 hours to NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov. If the observed animal is no longer observed in the moon pool, monitoring will take place for at least 30 minutes to ensure it has left the moon pool. After 30 minutes, activities will commence.

10.2 INCIDENTAL TAKES

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

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

BHP 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:

- Appendices to the Biological Opinion on the Federally Regulated Oil and Gas Program in the Gulf of Mexico issued on March 13, 2020
  - Appendix A: "Seismic Survey Mitigation and Protected Species Observer Protocols"
  - Appendix B: "Marine Trash and Debris Awareness and Elimination Survey Protocols"
  - Appendix C: "Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols"
  - Appendix J: "Sea Turtle Handling and Resuscitation Guidelines"

10.3 FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY

GC Blocks 608 / 609 are not located in the Flower Garden Banks National Marine Sanctuary; therefore, relevant information is not required in this DOCD.

SECTION 11
LEASE STIPULATIONS INFORMATION

The BOEM did not invoke lease stipulations on Leases OCS-G 18402 / 16764, Green Canyon Blocks 608 / 609.

SECTION 12
ENVIRONMENTAL MITIGATION MEASURES INFORMATION

12.1 MEASURES TAKEN TO AVOID, MINIMIZE, AND MITIGATE IMPACTS

BHP will adhere to the requirements as set forth in the following documents, as applicable, to avoid or minimize impacts to any marine and coastal environments and habitats, biota, and threatened and endangered species:

- Appendices to the Biological Opinion on the Federally Regulated Oil and Gas Program in the Gulf of Mexico issued on March 13, 2020, and the amendment issued on April 26, 2021

  - o Appendix A: "Seismic Survey Mitigation and Protected Species Observer Protocols"
  - o Appendix B: "Marine Trash and Debris Awareness and Elimination Survey Protocols"
  - o Appendix C: "Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols"
  - o Appendix J: "Sea Turtle Handling and Resuscitation Guidelines"

12.2 INCIDENTAL TAKES

BHP will adhere to the requirements 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:

- Appendices to the Biological Opinion on the Federally Regulated Oil and Gas Program in the Gulf of Mexico issued on March 13, 2020, and the amendment issued on April 26, 2021

  - o Appendix A: "Seismic Survey Mitigation and Protected Species Observer Protocols"
  - o Appendix B: "Marine Trash and Debris Awareness and Elimination Survey Protocols"
  - o Appendix C: "Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols"
  - o Appendix J: "Sea Turtle Handling and Resuscitation Guidelines"

SECTION 13
RELATED FACILITIES AND OPERATIONS INFORMATION

13.1 RELATED OCS FACILITIES AND OPERATIONS

The wells will initially be drilled as appraisal wells, then left in Temporary Abandonment (TA) status without subsea trees installed. Later, the subsea facilities will be installed to enable safe operation of the wells. The facilities will include the following key elements:

1) A subsea tree, installed onto the wells;
2) Completion of the wells, including production tubulars and downhole safety valves and sensors;
3) A central manifold, which will serve as a gathering point for the current well and a future well and ability for expansion;
4) An integrated control and distribution system, consisting of a new control umbilical and subsea control system, to control, monitor, and service the well with required production chemicals;
5) A new right-of-way production flowline, approximately 6 miles in length, connected to the manifold, which will transport the produced fluids from the well to the host platform

13.2 TRANSPORTATION SYSTEM

There are no new pipelines going to shore or new onshore facilities planned for this project.

A new right-of-way pipeline segment (*submittal pending*), approximately 6 miles in length, will connect the new subsea facilities to the existing Shenzi subsea infrastructure. The production will be received by the existing Platform A (MTLP Shenzi), Complex ID No. 1899, for processing and the oil and gas will continue to depart Platform A (MTLP Shenzi) via the existing Pipeline Segment Nos. 17107 (gas) and 15876 (oil) for ultimate delivery to shore.

No new processing hosts or export facilities are planned.

Production chemicals will be transported via a new right-of-way umbilical, approximately 10 miles in length, which will consist of several tubes to accommodate several types of chemicals. The new umbilical will connect the new subsea facility to the existing Shenzi subsea facility.

13.3 PRODUCED LIQUID HYDROCARBONS TRANSPORTATION VESSELS

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

SECTION 14
SUPPORT VESSELS AND AIRCRAFT INFORMATION

14.1 GENERAL

The vessels, crew boats and supply boats associated with the operations proposed in this plan will not transit the Bryde's whale area.

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

Type	Maximum Fuel Tank Capacity	Maximum Number in Area at Any Time	Trip Frequency or Duration
Crew boat	15,000 gals	1	7 times per week
Supply boat	370,000 gals	2	7 times per week
Helicopter	800 gals	1	4 times per week

14.2 DIESEL OIL SUPPLY VESSELS

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

Size of Fuel Supply Vessel (ft)	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
312'	259,823 gals	2 times per month	Shortest route from Shorebase to block
300'	359,386 gals	2 times per month	Shortest route from Shorebase to block
280'	295,161 gals	2 times per month	Shortest route from Shorebase to block

14.3 DRILLING FLUID TRANSPORTATION

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

14.4 SOLID AND LIQUID WASTE TRANSPORTATION

A table, "Wastes You Will Transport and/or Dispose of Onshore," is included as **Attachment 14-A.**

14.5 VICINITY MAP

A vicinity map showing the location of the activities proposed herein relative to the shoreline with the distance of the proposed activities from the shoreline and the primary routes of the support vessels and aircraft that will be used when traveling between the onshore support facilities and the wells and drilling unit are included as **Attachment 14-B.**

Attachment 14-A

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

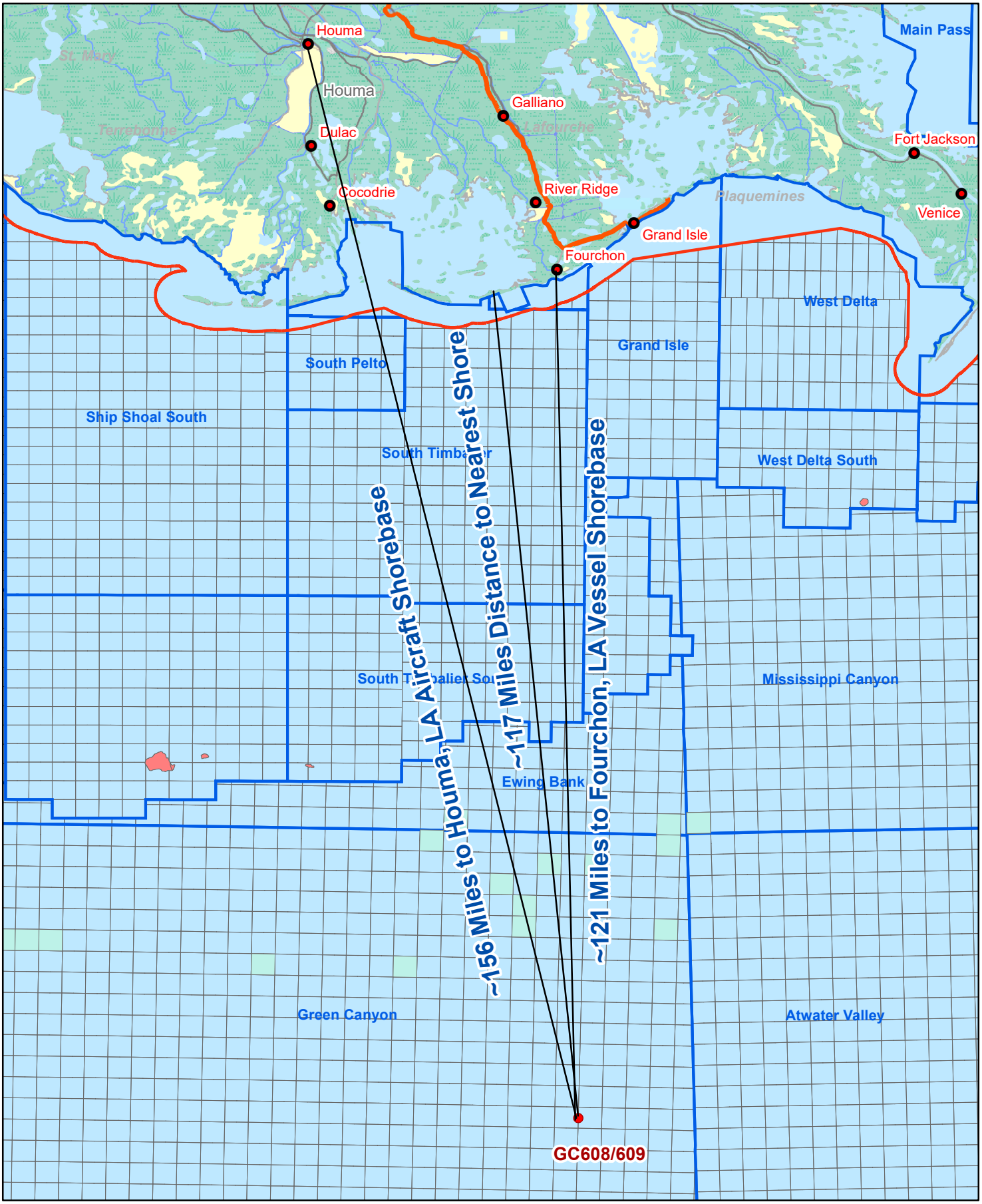
please specify whether the amount reported is a total or per well

	Projected generated waste	Solid and Liquid Wastes transportation	Waste Disposal		
Type of Waste - based on (1) 90-day well	**Composition**	**Transport Method**	**Name/Location of Facility**	**Amount**	**Disposal Method**
Will drilling occur ? If yes, fill in the muds and cuttings.					
Cuttings wetted with Water-based fluid	N/A	N/A	N/A	N/A	N/A
Oil-based drilling fluid or mud	N/A	N/A	N/A	N/A	N/A
Cuttings wetted with oil-based fluids	N/A	N/A	N/A	N/A	N/A
Water-based drilling fluid or mud	Tank washing form offshore workboats	Solids- Transported to private facility Liquids- are treated by RCS and dischanged overboard via permit	Riverbirch Jefferson, LA	800 bbls/well	Landfill
Synthetic-based drilling fluid or mud	Whole mud sent back in after well has been abandoned for reconditioning & reuse	Below deck storage tanks on offshore support vessels	Baroid Facility Fourchon, LA	7,500 bbls/well	recycled
Synthetic-based drilling fluid or mud	Tank washings from offshore workboats (9.0 ppg Baroid Accolade SBM)	Below deck storage tanks on offshore support vessels	Ecoserv LLC & R360 Fourchon, LA Ecoserv LLC Cameron, LA	1,750 bbls/well	injected
Cuttings wetted with Synthetic-based fluid	Cuttings wetted with residue of Baroid 9.0 ppg Accolade	Cuttings boxes on offshore support vessels	Ecoserv LLC & R360 Fourchon, LA Ecoserv LLC Cameron, LA	750 bbls/well	injected
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.					
Trash and debris	non-recyclable / non-hazardous refuse generated by personnel on board MODU	transport in bags / baskets on vessel to shorebase - picked up at shorebase and trucked to private facility	River Birch Landfill Avondale, LA Republic Services Fresno, TX	180 cu yds / well	Landfill
Trash and debris	Scrap metal	transport in bags / baskets on vessel to shorebase - picked up at shorebase and trucked to private facility	C-Port / Fourchon, LA	250 lbs / well	Recycled
Regulated Waste (Garbage)	Waste in contact with food	Transported in Supersacks on vessel to shorebase- picked up at shorebase and transported via USDA Carriage Agreement	Total Waste Solutions Cutt Off, LA Reliable Disposal Jefferson, LA	250 lbs / well	Landfill
Waste and used oil	oil filters, rags, pads, empty drums	transfer for recycle or fuel blending	Martin Energy Fourchon, LA Safety-Kleen Systems, Inc. Kenner, LA	360 lbs / well	Recycle or fuel blend
Wash water	water with trace amounts of internal olefin & ester	Picked up at shorebase & trucked to private facility	Ecoserv LLC & R360 Fourchon, LA Ecoserv LLC Cameron, LA	1000 bbls/well	injected
Chemical product wastes	paint waste, chemicals, solvents, etc.	N/A	N/A	N/A	N/A

Attachment 14-B

BHP Billiton Petroleum (GOM) Inc.

Vicinity Map
Green Canyon 608/609



SECTION 15
ONSHORE SUPPORT FACILITIES INFORMATION

15.1 GENERAL

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

Name	Location	Existing/New/Modified
Chouest Base	Fourchon, Louisiana	Existing
Petroleum Helicopters, Inc.	Houma, Louisiana	Existing

15.2 SUPPORT BASE CONSTRUCTION OR EXPANSION

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

15.3 SUPPORT BASE CONSTRUCTION OR EXPANSION TIMETABLE

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

15.4 WASTE DISPOSAL

A table, “Wastes You Will Transport and/or Dispose of Onshore,” is included as **Attachment 14-A.**

SECTION 16
COASTAL ZONE MANAGEMENT (CZM) INFORMATION

Coastal Zone Management certification is not required for activities proposed in this plan.

SECTION 17
ENVIRONMENTAL IMPACT ANALYSIS (EIA)

The Environmental Impact Analysis is included as **Attachment 17-A.**

Attachment 17-A

BHP Billiton Petroleum (GOM) Inc. (BHP)

Supplemental Development Operations Coordination Document
Green Canyon Blocks 608 and 609
OCS-G 18402 / OCS-G 16764

(A) IMPACT PRODUCING FACTORS

ENVIRONMENTAL IMPACT ANALYSIS WORKSHEET

Environment Resources	Impact Producing Factors (IPFs) Categories and Examples Refer to recent GOM OCS Lease Sale EIS for a more complete list of IPFs					
	Emissions (air, noise, light, etc.)	**Effluents (muds, cutting, other discharges to the water column or seafloor)**	**Physical disturbances to the seafloor (rig or anchor emplacements, etc.)**	**Wastes sent to shore for treatment or disposal**	**Accidents (e.g., oil spills, chemical spills, H_2S releases)**	**Discarded Trash & Debris**
Site-specific at Offshore Location						
Designated topographic features		(1)	(1)		(1)	
Pinnacle Trend area live bottoms		(2)	(2)		(2)	
Eastern Gulf live bottoms		(3)	(3)		(3)	
Benthic communities			(4)			
Water quality		X			X	
Fisheries		X			X	
Marine Mammals	X(8)	X			X(8)	X
Sea Turtles	X(8)	X			X(8)	X
Air quality	X(9)					
Shipwreck sites (known or potential)			(7)			
Prehistoric archaeological sites			(7)			
Vicinity of Offshore Location						
Essential fish habitat		X			X(6)	
Marine and pelagic birds					X	X
Public health and safety					(5)	
Coastal and Onshore						
Beaches					X(6)	X
Wetlands					X(6)	
Shore birds and coastal nesting birds					X6)	
Coastal wildlife refuges						
Wilderness areas						

Footnotes for Environmental Impact Analysis Matrix

1) Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well or platform site or any anchors will be on the seafloor within the:
   - 4-mile zone of the Flower Garden Banks, or the 3-mile zone of Stetson Bank;
   - 1000-meter, 1-mile or 3-mile zone of any topographic feature (submarine bank) protected by the Topographic Features Stipulation attached to an OCS lease;
   - Essential Fish Habitat (EFH) criteria of 500 feet from any no-activity zone; or
   - Proximity of any submarine bank (500 foot buffer zone) with relief greater than two meters that is not protected by the Topographic Features Stipulation attached to an OCS lease.
2) Activities with any bottom disturbance within an OCS lease block protected through the Live Bottom (Pinnacle Trend) Stipulation attached to an OCS lease.
3) Activities within any Eastern Gulf OCS block where seafloor habitats are protected by the Live Bottom (Low-Relief) Stipulation attached to an OCS lease.
4) Activities on blocks designated by the BOEM as being in water depths 300 meters or greater.
5) Exploration or production activities where H_2S concentrations greater than 500 ppm might be encountered.
6) All activities that could result in an accidental spill of produced liquid hydrocarbons or diesel fuel that you determine would impact these environmental resources. If the proposed action is located a sufficient distance from a resource that no impact would occur, the EIA can note that in a sentence or two.
7) All activities that involve seafloor disturbances, including anchor emplacements, in any OCS block designated by the BOEM as having high-probability for the occurrence of shipwrecks or prehistoric sites, including such blocks that will be affected that are adjacent to the lease block in which your planned activity will occur. If the proposed activities are located a sufficient distance from a shipwreck or a prehistoric site that no impact would occur, the EIA can note that in a sentence or two.
8) All activities that you determine might have an adverse effect on endangered or threatened marine mammals or sea turtles or their critical habitats.
9) Production activities that involve transportation of produced fluids to shore using shuttle tankers or barges.

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

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

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico	Gulf of Mexico Range
			Lease Area	Coastal		
Marine Mammals						
Manatee, West Indian	*Trichechus manatus latirostris*	T	--	X	Florida (peninsular)	Coastal Louisiana, Mississippi, Alabama, and Florida
Whale, Blue	*Balaenoptera masculus*	E	X[1]	--	None	GOM
Whale, Bryde's[4]	*Balaenoptera brydei/edeni*	E	X	--	None	Eastern GOM
Whale, Fin	*Balaenoptera physalus*	E	X[1]	--	None	GOM
Whale, Humpback	*Megaptera novaeangliae*	E	X[1]	--	None	GOM
Whale, North Atlantic Right	*Eubalaena glacialis*	E	X[1]	--	None	GOM
Whale, Rice's[4]	*Balaenoptera ricei*	E	X	--	None	GOM
Whale, Sei	*Balaenopiera borealis*	E	X[1]	--	None	GOM
Whale, Sperm	*Physeter catodon (=macrocephalus)*	E	X	--	None	GOM
Terrestrial Mammals						
Mouse, Beach (Alabama, Choctawatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	-	X	Alabama, Florida (panhandle) beaches	Alabama, Florida (panhandle) beaches
Birds						
Plover, Piping	*Charadrius melodus*	T	-	X	Coastal Texas, Louisiana, Mississippi, Alabama and Florida (panhandle)	Coastal GOM
Crane, Whooping	*Grus Americana*	E	-	X	Coastal Texas	Coastal Texas and Louisiana
Crane, Mississippi sandhill	*Grus canadensis pulla*	E	-	X	Coastal Mississippi	Coastal Mississippi
Curlew, Eskimo	*Numenius borealis*	E	-	X	none	Coastal Texas
Falcon, Northern Aplomado	*Falco femoralis septentrionalis*	E	-	X	none	Coastal Texas

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico	Gulf of Mexico Range
			Lease Area	Coastal		
Knot, Red	*Calidris canutus rufa*	T	-	X	None	Coastal GOM
Stork, Wood	*Mycteria americana*	T	-	X	None	Coastal Alabama and Florida
Reptiles						
Sea Turtle, Green	*Chelonia mydas*	T/E[3]	X	X	None	GOM
Sea Turtle, Hawksbill	*Eretmochelys imbricata*	E	X	X	None	GOM
Sea Turtle, Kemp's Ridley	*Lepidochelys kempli*	E	X	X	None	GOM
Sea Turtle, Leatherback	*Dermochelys coriacea*	E	X	X	None	GOM
Sea Turtle, Loggerhead	*Caretta caretta*	T	X	X	Texas, Louisiana, Mississippi, Alabama, Florida	GOM
Fish						
Sturgeon, Gulf	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	T	X	X	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)
Shark, Oceanic Whitetip	Carcharhinus longimanus	E	X	_	None	GOM
Sawfish, Smalltooth	Pristis pectinate	E	-	X	None	Florida
Grouper, Nassau	Epinephelus striatus	T	-	X	None	Florida
Ray, Giant Manta	Manta birostris	E	X	--	None	GOM
Corals						
Coral, Elkhorn	*Acopora palmate*	T	X[2]	X	Florida Keys and Dry Tortugas	Flower Garden Banks, Florida, and the Caribbean
Coral, Staghorn	*Acopora cervicornis*	T	X	X	Florida	Flower Garden Banks, Florida, and the Caribbean
Coral, Boulder Star	*Orbicella franksi*	T	X	X	none	Flower Garden Banks and Florida
Coral, Lobed Star	*Orbicella annularis*	T	X	X	None	Flower Garden Banks and Caribbean
Coral, Mountainous Star	*Orbicella faveolate*	T	X	X	None	Flower Garden Banks and Gulf of Mexico
Coral, Rough Cactus	*Mycetophyllia ferox*	T	-	X	None	Florida and Southern Gulf of Mexico

Abbreviations: E = Endangered; T = Threatened

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

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

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

4 The Bryde's whale, also known as the Bryde's whale complex, is a collection of baleen whales that are still being researched to determine if they are the same species or if they are individual species of whales. In 2021, the Rice's whale, formerly known as the Gulf of Mexico Bryde's whale, was determined to be a separate species. There are less than 100 Rice's whales living in the Gulf of Mexico year-round. These whales retain all the protections of the Gulf of Mexico Bryde's whale under the Endangered Species Act while the regulations are being updated to reflect the name change. Other Bryde's whales are migratory and may enter the Gulf of Mexico; however, the migratory Bryde's whales are rare or extralimital in the Gulf of Mexico and are unlikely to be present in the lease area.

(B) Analysis

Site-Specific at Green Canyon Blocks 608 and 609

Proposed operations consist of the commencement of production of existing Green Canyon Block 608 (GC 608), Well No. SN101 (API No. 608114074500). The drilling, abandonment, and completion of GC 608, Well No. SN101 (previously known as N-A3) was provided for under Supplemental Exploration Plan (EP), Control No. S-8026, and approved on November 6, 2020. To date, BHP has drilled and temporarily abandoned GC 608, Well No. SN101.

Additionally, BHP proposes to drill, abandon, complete, and commence production of Well Location N-A4 (to be drilled, completed and produced as Well No. SN102, GC 609), and Well Location N-A5 in Green Canyon Block 609. Well Location N-A5 is intended as a re-spud / relief well location should complications occur while drilling the planned N-A4 Well Location.

BHP also proposes to install the following pipelines and umbilical:

- One (1) right-of-way (ROW) pipeline, approximately six miles in length.
- One (1) umbilical associated with the ROW pipeline, approximately 11 miles in length.
- Two (2) 9-inch lease term jumper pipelines, each approximately 90 feet in length.

The operations will be conducted with a dynamically positioned drillship.

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

1. Designated Topographic Features

Potential IPFs to topographic features as a result of the proposed operations include physical disturbances to the seafloor, effluents, and accidents.

Physical disturbances to the seafloor: Green Canyon Blocks 608 and 609 are 59.2 miles and 61 miles, respectively, from the closest designated Topographic Features Stipulation Block (Diaphus Bank); therefore, no adverse impacts are expected. Additionally, a dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Effluents: Green Canyon Blocks 608 and 609 are 59.2 miles and 61 miles, respectively, from the closest designated Topographic Features Stipulation Block (Diaphus Bank); therefore, no adverse impacts are expected.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed activities (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to benthic organisms only if the oil contacts the organisms. Oil from a surface spill can be driven into the water column; measurable amounts have been documented down to a 10-meter depth. At this depth, the oil is found only at concentrations several orders of magnitude lower than the amount shown to have an effect on corals. Because the crests of topographic features in the

Northern Gulf of Mexico are found below 10 meters, oil from a surface spill is not expected to reach their sessile biota. Oil from a subsurface spill is not applicable due to the distance of these blocks from a topographic area. The activities proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9**).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. Dispersants have been utilized in previous spill response efforts and were used extensively in the response to the Deepwater Horizon oil spill, with both surface and sub-surface applications. Reports on dispersant usage on surface oil indicate that a majority of the dispersed oil remains in the top 10 meters of the water column, with 60 percent of the oil in the top two meters of water (McAuliffe et al, 1981; Lewis and Aurand, 1997; OCS Report BOEM 2017-007). Lubchenco et al. (2010) report that most chemically dispersed surface oil from the Deepwater Horizon explosion and oil spill remained in the top six meters of the water column where it mixed with surrounding waters and biodegraded (BOEM 2017-007). None of the topographic features or potentially sensitive biological features in the GOM are shallower than 10 meters (33 feet), and only the Flower Garden Banks are shallower than 20 meters (66 feet).

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

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

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

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

Chemical dispersants may increase the risk of toxicity to subsurface organisms by increasing bioavailability of the oil. However, it is important to note that at the 1:20 dispersant-to-oil ratio recommended for use during response operations, the dispersants currently approved for use are

far less acutely toxic than oil is. Toxicity of chemically dispersed oil is primarily due to the oil itself and its enhanced bioavailability (Lee et al., 2015; NAS 2020).

With the exception of special Federal management areas or designated exclusion areas, dispersants have been preapproved for surface use, which provides the USCG On-Scene Coordinator with the authority to approve the use of dispersants. However, that approval would only be granted upon completion of the protocols defined in the appropriate Area Contingency Plan (ACP) and the Regional Response Team (RRT) Dispersant Plan. The protocols include conducting an environmental benefit analysis to determine if the dispersant use will prevent a substantial threat to the public health or welfare or minimize serious environmental damage. The Regional Response Team would be notified immediately to provide technical support and guidance in determining if the dispersant use meets the established criteria and provide an environmental benefit. Additionally, there is currently no preapproval for subsea dispersant injection and the USCG On-Scene Coordinator must approve use of this technology before any subsea application. Due to the unprecedented volume of dispersants applied for an extended period of time, the U.S. National Response Team has developed guidance for atypical dispersant operations to ensure that planning and response activities will be consistent with national policy (BOEM 2017-007).

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

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

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

2. Pinnacle Trend Area Live Bottoms

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

Physical disturbances to the seafloor: Green Canyon Blocks 608 and 609 are 164.5 miles and 162.8 miles, respectively, from the closest live bottom (pinnacle trend) area; therefore, no

adverse impacts are expected. Additionally, a dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, drilling, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms. Although there is little information available on sound detection and sound-mediated behaviors for marine invertebrates, the overall impacts on pinnacle and low-relief feature communities from anthropogenic noise are expected to be negligible (BOEM 2017-009). Additionally, Green Canyon Blocks 608 and 609 are 164.5 miles and 162.8 miles, respectively, from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected.

Effluents: Green Canyon Blocks 608 and 609 are 164.5 miles and 162.8 miles, respectively, from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected.

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

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

There are no other IPFs (including wastes sent to shore for treatment or disposal) from the proposed activities that are likely to impact a live bottom (pinnacle trend) area.

3. Eastern Gulf Live Bottoms

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

Physical disturbances to the seafloor: Green Canyon Blocks 608 and 609 are not located in an area characterized by the existence of live bottoms, and this lease does not contain a Live-

Bottom Stipulation requiring a photo documentation survey and survey report. Additionally, a dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, drilling, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms. Although there is little information available on sound detection and sound-mediated behaviors for marine invertebrates, the overall impacts on pinnacle and low-relief feature communities from anthropogenic noise are expected to be negligible (BOEM 2017-009). Additionally, Green Canyon Blocks 608 and 609 are not located in an area characterized by the existence of live bottoms; therefore, no adverse impacts are expected.

Effluents: Green Canyon Blocks 608 and 609 are not located in an area characterized by the existence of live bottoms; therefore, no adverse impacts are expected.

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

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

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

4. Deepwater Benthic Communities

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

Green Canyon Blocks 608 and 609 are located in water depths of 984 feet (300 meters) or greater. At such depth high-density, deepwater benthic communities may sometimes be found.

However, Green Canyon Blocks 608 and 609 are approximately 22.5 miles and 25.5 miles, respectively, from a known deepwater benthic community site (Green Canyon Block 600), listed in NTL 2009-G40. Additionally, a dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Due to the distance from the closest known deepwater benthic community and because physical disturbances to the seafloor will be minimized by the use of a dynamically positioned drillship, BHP's proposed operations in Green Canyon Blocks 608 and 609 are not likely to impact deepwater benthic communities.

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

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

5. Water Quality

Potential IPFs that could result in water quality degradation from the proposed operations in Green Canyon Blocks 608 and 609 include disturbances to the seafloor, effluents, and accidents.

Physical disturbances to the seafloor: Bottom area disturbances resulting from the emplacement of drill rigs, the drilling of wells and the installation of platforms and pipelines would increase water-column turbidity and re-suspension of any accumulated pollutants, such as trace metals and excess nutrients. This would cause short-lived impacts on water quality conditions in the immediate vicinity of the emplacement operations. Additionally, a dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Effluents: Levels of contaminants in drilling muds and cuttings and produced water discharges, discharge-rate restrictions and monitoring and toxicity testing are regulated by the EPA NPDES permit, thereby eliminating many significant biological or ecological effects. Operational discharges are not expected to cause significant adverse impacts to water quality. Additionally,

an analysis of the best available information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (NMFS, 2020) concludes that exposures to toxicants in discharges from oil and gas activities are not likely to adversely affect ESA-listed species.

Accidents: IPFs related to OCS oil- and gas-related accidental events primarily involve drilling fluid spills, chemical spills, and oil spills.

Drilling Fluid Spills

Water-based fluid (WBF) and Synthetic-based fluid (SBF) spills may result in elevated turbidity, which would be short term, localized, and reversible. The WBF is normally discharged to the seafloor during riserless drilling, which is allowable due to its low toxicity. For the same reasons, a spill of WBF would have negligible impacts. The SBF has low toxicity, and the discharge of SBF is allowed to the extent that it adheres onto drill cuttings. Both USEPA Regions 4 and 6 permit the discharge of cuttings wetted with SBF as long as the retained SBF amount is below a prescribed percent, meets biodegradation and toxicity requirements, and is not contaminated with the formation oil or PAH. A spill of SBF may cause a temporary increase in biological oxygen demand and locally result in lowered dissolved oxygen in the water column. Also, a spill of SBF may release an oil sheen if formation oil is present in the fluid. Therefore, impacts from a release of SBF are considered to be minor. Spills of SBF typically do not require mitigation because SBF sinks in water and naturally biodegrades, seafloor cleanup is technically difficult, and SBF has low toxicity. (BOEM 2017-009)

Chemical Spills

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

Oil Spills

Oil spills have the greatest potential of all OCS oil-and gas-related activities to affect water quality. Small spills (<1,000 barrels) are not expected to substantially impact water quality in coastal or offshore waters because the oil dissipates quickly through dispersion and weathering while still at sea. Reasonably foreseeable larger spills (≥1,000 barrels), however, could impact water quality in coastal and offshore waters (BOEM 2017-007). However, based on data provided in the BOEM 2016 Update of Occurrence Rates for Offshore Oil Spills, it is unlikely that an accidental surface or subsurface spill of a significant volume would occur from the

proposed activities. Between 2001 and 2015 OCS operations produced eight billion barrels of oil and spilled 0.062 percent of this oil, or one barrel for every 1,624 barrels produced. (The overall spill volume was almost entirely accounted for by the 2010 Deepwater Horizon blowout and subsequent discharge of 4.9 million barrels of oil. Additional information on unlikely scenarios and impacts from very large oil spills are discussed in the Catastrophic Spill Event Analysis white paper (BOEM 2017-007).

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

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

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

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

Oil that is chemically dispersed at the surface moves into the top six meters of the water column where it mixes with surrounding waters and begins to biodegrade (U.S. Congress, Office of Technology Assessment, 1990). Dispersant use, in combination with natural processes, breaks up oil into smaller components that allows them to dissipate into the water and degrade more rapidly (Nalco, 2010). Dispersant use must be in accordance with an RRT Preapproved Dispersant Use Manual and with any conditions outlined within an RRT's site-specific, dispersant approval given after a spill event. Consequently, dispersant use must be in accordance with the restrictions for specific water depths, distances from shore, and monitoring requirements. At this time, neither the Region IV nor the Region VI RRT dispersant use

manuals, which cover the GOM region, give preapproval for the application of dispersant use subsea (BOEM 2017-009).

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

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

6. Fisheries

There are multiple species of fish in the Gulf of Mexico, including the endangered and threatened species listed in **Table 1** at the beginning of this Environmental Impact Assessment. More information regarding the endangered gulf sturgeon (**Item 20.2**), oceanic whitetip shark (**Item 20.3**), and giant manta ray (**Item 20.4**) can be found below. Potential IPFs to fisheries as a result of the proposed operations in Green Canyon Blocks 608 and 609 include physical disturbances to the seafloor, emissions (noise / sound), effluents, and accidents.

Physical disturbances to the seafloor: The emplacement of a structure or drilling rig results in minimal loss of bottom trawling area to commercial fishermen. Pipelines cause gear conflicts which result in losses of trawls and shrimp catch, business downtime and vessel damage. Most financial losses from gear conflicts are covered by the Fishermen's Contingency Fund (FCF). The emplacement and removal of facilities are not expected to cause significant adverse impacts to fisheries. Additionally, a dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, drilling, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms by stimulating behavioral response, masking biologically important signals, causing temporary or permanent hearing loss (Popper et al., 2005; Popper et al., 2014), or causing physiological injury (e.g., barotrauma) resulting in mortality (Popper and Hastings, 2009). The potential for anthropogenic sound to affect any individual organism is dependent on the proximity to the source, signal characteristics, received peak pressures relative to the static pressure, cumulative sound exposure, species, motivation, and the receiver's prior experience. In addition, environmental conditions (e.g., temperature, water depth, and substrate) affect sound speed, propagation paths, and attenuation, resulting in temporal and spatial variations in the received signal for organisms throughout the ensonified area (Hildebrand, 2009).

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

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

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

Support vessel traffic, drilling, production facilities, and other sources of continuous sounds contribute to a chronic increase in background noise, with varying areas of effect that may be influenced by the sound level, frequencies, and environmental factors (Hildebrand, 2009; Slabbekoorn et al., 2010; McKenna et al., 2012). These sources have a low potential for causing physiological injury or injuring hearing in fishes and invertebrates (Popper et al., 2014). However, continuous sounds have an increased potential for masking biologically relevant sounds than do pulsed signals. The potential effects of masking on fishes and invertebrates is difficult to assess in the natural setting for communities and populations of species, but evidence indicates that the increase to background noise as a result of OCS oil and gas operations would be relatively minor. Therefore, it is expected that the cumulative impact to fishes and invertebrate resources would be minor and would not extend beyond localized disturbances or behavioral modification.

Despite the importance of many sound-mediated behaviors and the potential biological costs associated with behavioral response to anthropogenic sounds, many environmental and

biological factors limit potential exposure and the effects that OCS oil-and gas-related sounds have on fishes and invertebrate resources. The overall impact to fishes and invertebrate resources due to anthropogenic sound introduced into the marine environment by OCS oil-and gas-related routine activities is expected to be minor.

Effluents: Effluents such as drilling fluids and cuttings discharges contain components and properties which are detrimental to fishery resources. Moderate petroleum and metal contamination of sediments and the water column can occur out to several hundred meters down-current from the discharge point. Offshore discharges are expected to disperse and dilute to very near background levels in the water column or on the seafloor within 3,000 meters of the discharge point, and are expected to have negligible effect on fisheries. Additionally, an analysis of the best available information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (NMFS, 2020) concludes that exposures to toxicants in discharges from oil and gas activities are not likely to adversely affect ESA-listed species.

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

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

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

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

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

7. Marine Mammals

The latest population estimates for the Gulf of Mexico revealed that cetaceans of the continental shelf and shelf-edge were almost exclusively bottlenose dolphin and Atlantic spotted dolphin. Squid eaters, including dwarf and pygmy killer whale, Risso's dolphin, rough-toothed dolphin, and Cuvier's beaked whale, occurred most frequently along the upper slope in areas outside of anticyclones. The Rice's whale (née Gulf of Mexico Bryde's whale) is the only commonly occurring baleen whale in the northern Gulf of Mexico and has been sighted off western Florida and in the De Soto Canyon region. Florida manatees have been sighted along the entire northern GOM but are mainly found in the shallow coastal waters of Florida, which are unassociated with the proposed actions. A complete list of all endangered and threatened marine mammals in the GOM may be found in **Table 1** at the beginning of this Environmental Impact Assessment. More information regarding the endangered Rice's whale can be found in **Item 20.1** below. Potential IPFs to marine mammals as a result of the proposed operations in Green Canyon Blocks 608 and 609 include emissions (noise / sound), effluents, discarded trash and debris, and accidents.

Emissions (noise / sound): Noises from drilling activities, support vessels and helicopters (i.e. non-impulsive anthropogenic sound) may elicit a startle reaction from marine mammals. This reaction may lead to disruption of marine mammals' normal activities. Stress may make them more vulnerable to parasites, disease, environmental contaminants, and/or predation (Majors and Myrick, 1990). Responses to sound exposure may include lethal or nonlethal injury, temporary hearing impairment, behavioral harassment and stress, or no apparent response. Noise-induced stress is possible, but it is little studied in marine mammals. Tyack (2008) suggests that a more significant risk to marine mammals from sound are these less visible impacts of chronic exposure. There is little conclusive evidence for long-term displacements and population trends for marine mammals relative to noise.

Vessels are the greatest contributors to increases in low-frequency ambient sound in the sea (Andrew et al. 2011). Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Cetacean responses to aircraft depend on the animals' behavioral state at the time of exposure (e.g.,

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

Drilling and production noise would contribute to increases in the ambient noise environment of the GOM, but they are not expected in amplitudes sufficient to cause either hearing or behavioral impacts (BOEM 2017-009). There is the possibility of short-term disruption of movement patterns and/or behavior caused by vessel noise and disturbance; however, these are not expected to impact survival and growth of any marine mammal populations in the GOM. Additionally, the National Marine Fisheries Service published a final recovery plan for the sperm whale, which identified anthropogenic noise as either a low or unknown threat to sperm whales in the GOM (USDOC, NMFS, 2010b). Sirenians (i.e. manatees) are not located within the area of operations. Additionally, there were no specific noise impact factors identified in the latest BOEM environmental impact statement for sirenians related to GOM OCS operations (BOEM 2017-009). See **Item 20.1** for details on the Rice's whale.

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

Effluents: Drilling fluids and cuttings discharges contain components which may be detrimental to marine mammals. Most operational discharges are diluted and dispersed upon release. Any potential impact from drilling fluids would be indirect, either as a result of impacts on prey items or possibly through ingestion in the food chain (API, 1989).

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

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

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

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

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

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

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

These proposed operations may utilize a moon pool(s) to conduct various subsea activities. Details on moon pool operations, monitoring, and descriptions are included in **Sections 10** and **12** of the Supplemental Development Operations Coordination Document. If any marine mammal is detected in the moon pool, BHP will cease operations and contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov and 985-722-7902 for additional guidance and incident report information.

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

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

NMFS Protected Resources Contacts for the Gulf of Mexico:

- Marine mammals – Southeast emergency stranding hotline 1-877-433-8299

- Other endangered or threatened species – ESA section 7 consulting biologist: nmfs.ser.emergency.consult@noaa.gov

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

8. Sea Turtles

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

Emissions (noise / sound): Noise from drilling activities, support vessels, and helicopters (i.e. non-impulsive anthropogenic sound) may elicit a startle reaction from sea turtles, but this is a temporary disturbance. Responses to sound exposure may include lethal or nonlethal injury, temporary hearing impairment, behavioral harassment and stress, or no apparent response. Vessels are the greatest contributors to increases in low-frequency ambient sound in the sea (Andrew et al. 2011). Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Routine OCS helicopter traffic would not be expected to disturb animals for extended periods, provided pilots do not alter their flight patterns to more closely observe or photograph marine mammals. Helicopters, while flying offshore, generally maintain altitudes above 700 feet during transit to and from a working area, and at an altitude of about 500 feet between platforms. The duration of the effects resulting from a startle response is expected to be short-term during routine flights and the potential effects will be insignificant to sea turtles. Therefore, we find that any disturbance that may result from aircraft associated with the proposed action is not likely to adversely affect sea turtles. Construction and operational sounds other than pile driving should have insignificant effects on sea turtles; effects would be limited to short-term avoidance of construction activity itself rather than the sound produced. As a result, sound sources associated with support vessel movement as part of the proposed operations are insignificant and therefore are not likely to adversely affect sea turtles.

Overall noise impacts on sea turtles from the proposed activities are expected to be negligible to minor depending on the location of the animal(s) relative to the sound source and the frequency, intensity, and duration of the source. The National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion Appendix C explains how operators must implement measures to minimize the risk of vessel strikes to protected species and report observations of

injured or dead protected species. This guidance should also minimize the chance of sea turtles being subject to the increased noise level of a service vessel in very close proximity.

Effluents: Drilling fluids and cuttings discharges are not known to be lethal to sea turtles. Most operational discharges are diluted and dispersed upon release. Any potential impact from drilling fluids would be indirect, either as a result of impacts on prey items or possibly through ingestion in the food chain (API, 1989).

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

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

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

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

Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

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

These proposed operations may utilize a moon pool(s) to conduct various subsea activities. Details on moon pool operations, monitoring, and descriptions are included in **Sections 10** and **12** of the Supplemental Development Operations Coordination Document. If any sea turtle is detected in the moon pool, BHP will cease operations and contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov and 985-722-7902 for additional guidance and incidental report information. The procedures found in Appendix J of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion will be employed to free entrapped or entangled marine life safely.

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

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

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

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

9. Air Quality

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

The projected air emissions identified in **Section 8** are not expected to affect the OCS air quality primarily due to distance to the shore or to any Prevention of Significant Deterioration Class I air quality area such as the Breton Wilderness Area. Green Canyon Blocks 608 and 609 are beyond the 200 kilometer (124 mile) buffer for the Breton Wilderness Area and are approximately 117 miles from the coastline. Therefore, no special mitigation, monitoring, or reporting requirements apply with respect to air emissions.

Accidents and blowouts can release hydrocarbons or chemicals, which could cause the emission of air pollutants. However, these releases should not impact onshore air quality because of the prevailing atmospheric conditions, emission height, emission rates, and the distances of Green Canyon Blocks 608 and 609 from the coastline.

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

10. Shipwreck Sites (known or potential)

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

Potential IPFs to known or unknown shipwreck sites as a result of the proposed operations in Green Canyon Blocks 608 and 609 include physical disturbances to the seafloor and accidents.

Physical disturbances to the seafloor: A dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Because physical disturbances to the seafloor will be minimized by the use of a dynamically positioned drillship, BHP's proposed operations in Green Canyon Blocks 608 and 609 are not likely to impact shipwreck sites.

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

Additionally, Green Canyon Blocks 608 and 609 are not located in or adjacent to OCS blocks designated by BOEM as having a high probability for occurrence of shipwrecks. Should BHP discover any evidence of a shipwreck, they will immediately halt operations within a 1,000-foot radius, report to BOEM within 48 hours, and make every reasonable effort to preserve and protect that cultural resource.

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

11. Prehistoric Archaeological Sites

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

Potential IPFs to prehistoric archaeological sites as a result of the proposed operations in Green Canyon Blocks 608 and 609 include disturbances to the seafloor and accidents. Green Canyon Blocks 608 and 609 are located outside the Archaeological Prehistoric high probability line, therefore, no adverse impacts are expected. Although these blocks are outside the high probability line, an archaeological resource survey was previously submitted with S-DOCD, Control No. S-7487. Should BHP discover any object of prehistoric archaeological significance, they will immediately halt operations within a 1,000-foot radius, report to BOEM within 48 hours, and make every reasonable effort to preserve and protect that cultural resource.

Physical disturbances to the seafloor: A dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Because physical disturbances to the seafloor will be minimized by the use of a dynamically positioned drillship, BHP's proposed operations in Green Canyon Blocks 608 and 609 are not likely to cause impacts to prehistoric archaeological sites.

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

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

Vicinity of Offshore Location

12. Essential Fish Habitat (EFH)

Potential IPFs to EFH as a result of the proposed operations in Green Canyon Blocks 608 and 609 include physical disturbances to the seafloor, effluents, and accidents. EFH includes all estuarine and marine waters and substrates in the Gulf of Mexico.

Physical disturbances to the seafloor: Turbidity and sedimentation resulting from the bottom disturbing activities included in the proposed operations would be short term and localized. Fish are mobile and would avoid these temporarily suspended sediments. Additionally, the Live Bottom Low Relief Stipulation, the Live Bottom (Pinnacle Trend) Stipulation, and the Eastern Gulf Pinnacle Trend Stipulation have been put in place to minimize the impacts of bottom disturbing activities. Additionally, a dynamically positioned drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Therefore, the bottom disturbing activities from the proposed operations would have a negligible impact on EFH.

Effluents: The Live Bottom Low Relief Stipulation, the Live Bottom (Pinnacle Trend) Stipulation, and the Eastern Gulf Pinnacle Trend Stipulation would prevent most of the potential impacts on live-bottom communities and EFH from operational waste discharges. Levels of contaminants in drilling muds and cuttings and produced-water discharges, discharge-rate restrictions, and monitoring and toxicity testing are regulated by the EPA NPDES permit, thereby eliminating many significant biological or ecological effects. Operational discharges are not expected to cause significant adverse impacts to EFH.

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

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

13. Marine and Pelagic Birds

Potential IPFs to marine birds as a result of the proposed activities include emissions (air, noise / sound), accidental oil spills, and discarded trash and debris from vessels and the facilities.

Emissions:

Air Emissions

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

Noise / Sound Emissions

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

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

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

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

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

environmentally persistent materials such as plastic or glass. BHP will also collect and remove flotsam resulting from activities related to proposed operations.

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

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

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

14. Public Health and Safety Due to Accidents.

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

Coastal and Onshore

15. Beaches

Potential IPFs to beaches from the proposed operations include accidents and discarded trash and debris.

Accidents: Oil spills contacting beaches would have impacts on the use of recreational beaches and associated resources. Due to the distance from shore (117 miles) and the response capabilities that would be implemented, no significant adverse impacts are expected. The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9**).

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

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

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

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

16. Wetlands

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

Accidents: It is unlikely that an oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). Due to the distance from shore (117 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9**).

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

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

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

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

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

17. Shore Birds and Coastal Nesting Birds

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

Accidents: Oil spills could cause impacts to shore birds and coastal nesting birds. However, it is unlikely that an oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). Given the distance from shore (117 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9**).

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

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

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

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

18. Coastal Wildlife Refuges

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

Accidents: An accidental oil spill from the proposed activities could cause impacts to coastal wildlife refuges. However, it is unlikely that an oil spill would occur from the proposed activities (refer to Item 5, Water Quality). Due to the distance from shore (117 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9**).

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

BHP will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and

disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. BHP will also collect and remove flotsam resulting from activities related to proposed operations.

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

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

19. Wilderness Areas

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

Accidents: An accidental oil spill from the proposed activities could cause impacts to wilderness areas. However, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Due to the distances from the nearest designated Wilderness Area (155.4 miles from Green Canyon Block 608 and 154.5 miles from Green Canyon Block 609) and the response capabilities that would be implemented, no significant adverse impacts are expected. The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9).**

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

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

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

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

20. Other Environmental Resources Identified

20.1 – Rice's Whale (née Gulf of Mexico Bryde's whale)

The Bryde's whale, also known as the Bryde's whale complex, is a collection of baleen whales that are still being researched to determine if they are the same species or if they are individual species of whales. In 2021, the Rice's whale, formerly known as the Gulf of Mexico Bryde's whale, was determined to be a separate species from other Bryde's whales. There are less than 100 Rice's whales living in the Gulf of Mexico year-round. These whales retain all the protections of the Gulf of Mexico Bryde's whale under the Endangered Species Act while the regulations are being updated to reflect the name change.

The Rice's whale (née Gulf of Mexico Bryde's whale) is the only commonly occurring baleen whale in the northern Gulf of Mexico and has been sighted off western Florida and in the De Soto Canyon region. The Rice's whale area is over 167 miles from the proposed operations. Additionally, vessel traffic associated with the proposed operations will not flow through the Rice's whale area. Therefore, there are no IPFs from the proposed operations that are likely to impact the Rice's whale. Additional information on marine mammals may be found in **Item 7**.

20.2 – Gulf Sturgeon

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

Accidents: Collisions between support vessels and the Gulf sturgeon would be unusual events; however, should one occur, death or injury to the Gulf sturgeon is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a

vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

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

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

Due to the distances from the nearest identified Gulf sturgeon critical habitat (175 miles from Green Canyon Block 608 and 174.6 miles from Green Canyon Block 609) and the response capabilities that would be implemented during a spill, no significant adverse impacts are expected to the Gulf sturgeon. Considering the information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, the location of this critical habitat in relation to proposed operations, the likely dilution of oil reaching nearshore areas, and the on-going weathering and dispersal of oil over time, we do not anticipate the effects from oil spills will appreciably diminish the value of Gulf sturgeon designated critical habitat for the conservation of the species. The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9)**.

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

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

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

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

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

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

20.3 – Oceanic Whitetip Shark

Oceanic whitetip sharks may be found in tropical and subtropical waters around the world, including the Gulf of Mexico (Young 2016). According to the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, Essential Fish Habitat (EFH) for the oceanic whitetip shark includes localized areas in the central Gulf of Mexico and Florida Keys. Oceanic whitetip sharks were listed as threatened under the Endangered Species Act in 2018 due to worldwide overfishing. Oceanic whitetip sharks had an abundant worldwide population, which has been threatened in recent years by inadequate regulatory measures governing fisheries; therefore, there is little research regarding the impact of oil and gas

operations on oceanic whitetip sharks (NMFS, 2020). IPFs that have been determined by NMFS to be discountable to oceanic whitetip sharks include vessel strike, emissions (noise / sound), discharges, entanglement and entrapment, and marine debris. Potential IPFs to oceanic whitetip sharks as a result of the proposed operations in Green Canyon Blocks 608 and 609 include accidents. Additional information on ESA-listed fish may be found in **Item 6**.

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

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

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

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

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

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

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

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

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

20.4 – Giant Manta Ray

According to the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, the giant manta ray lives in tropical, subtropical, and temperate oceanic waters and productive coastlines throughout the Gulf of Mexico. While uncommon in the Gulf of Mexico, there is a population of approximately 70 giant manta rays in the Flower Garden Banks National Marine Sanctuary (Miller and Klimovich 2017). Giant manta rays were listed as

threatened under the Endangered Species Act in 2018 due to worldwide overfishing. Giant manta rays had an abundant worldwide population, which has been threatened in recent years by inadequate regulatory measures governing fisheries; therefore, there is little research regarding the impact of oil and gas operations on giant manta rays (NMFS, 2020). IPFs that have been determined by NMFS to be discountable to giant manta rays include vessel strike, emissions (noise / sound), discharges, entanglement and entrapment, and marine debris. Potential IPFs to giant manta rays as a result of the proposed operations in Green Canyon Blocks 608 and 609 include accidents. Additional information on ESA-listed fish may be found in **Item 6**.

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

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

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

There is little information available on the impacts of oil spills or dispersants on giant manta rays. It is expected that exposure of oil or dispersants to giant manta rays would likely result in effects similar to other marine species, including fitness reduction and the possibility of mortality (NMFS, 2020). It is possible that a small number of giant manta rays could be impacted by an oil spill in the Gulf of Mexico. However, due to the distances to the Flower Garden Banks (118.6 miles from Green Canyon Block 608 and 121.4 miles from Green Canyon Block 609), the low

population dispersed throughout the Gulf of Mexico, and the response capabilities that would be implemented during a spill, no significant adverse impacts are expected to impact giant manta rays. Additionally, it is unlikely that such an event would occur from the proposed activities (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9**).

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

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

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

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

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

20.5 – Loggerhead Sea Turtle

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

There are multiple IPFs that may impact loggerhead sea turtles (see **Item 8**). However, the closest loggerhead critical habitat is located 215.7 miles and 214.6 miles, respectively, from Green Canyon Blocks 608 and 609; therefore, no adverse impacts are expected to the critical habitat. Additionally, considering the information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, we do not expect proposed operations to affect the ability of *Sargassum* to support adequate prey abundance and cover for loggerhead turtles.

20.6 - Protected Corals

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

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed operations (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to corals only if the oil contacts the organisms. Due to the distances from the Flower Garden Banks (118.6 miles from Green Canyon Block 608 and 121.4 miles from Green Canyon Block 609) and other critical coral habitats, no adverse impacts are expected. The operations proposed in this plan will be covered by BHP's Regional OSRP (refer to information submitted in **Section 9**).

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

20.7 - Endangered Beach Mice

There are four subspecies of endangered beach mouse that are found in the dune systems along parts of Alabama and northwest Florida. Due to the locations of Green Canyon Blocks 608 and

609 and the beach mouse critical habitat (above the intertidal zone), there are no IPFs that are likely to impact endangered beach mice.

20.8 - Navigation

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

(C) IMPACTS ON PROPOSED ACTIVITIES

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

(D) ENVIRONMENTAL HAZARDS

During the hurricane season, June through November, the Gulf of Mexico is impacted by an average of ten tropical storms (39-73 mph winds), of which six become hurricanes (> 74 mph winds). Due to their locations in the Gulf, Green Canyon Blocks 608 and 609 may experience hurricane and tropical storm force winds and related sea currents. These factors can adversely impact the integrity of the operations covered by this plan. A significant storm may present physical hazards to operators and vessels, damage exploration or production equipment, or result in the release of hazardous materials (including hydrocarbons). Additionally, the displacement of equipment may disrupt the local benthic habitat and pose a threat to local species.

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

1. Drilling & completion
    a. Secure well
    b. Secure rig / platform
    c. Evacuate personnel

Drilling activities will be conducted in accordance with NTL No.'s 2008-G09, 2009-G10, and 2010-N10.

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

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

(E) ALTERNATIVES

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

(F) MITIGATION MEASURES

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

(G) CONSULTATION

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

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(I) REFERENCES

Authors:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D.G. Zeddies, and W.N. Tavolga. 2014. ASA S3/SC1. 4 TR -2014 sound exposure guidelines for fishes and sea turtles. A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI. New York, NY: Springer. 78 pp. (Popper et al., 2014)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- Hazard Surveys

SECTION 18
ADMINISTRATIVE INFORMATION

18.1 EXEMPTED INFORMATION DESCRIPTION

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

18.2 BIBLIOGRAPHY

1. Initial Development Operations Coordination Document (Control No. N-9001).
2. Supplemental Exploration Plan (Control No. S-8026).
3. Supplemental Development Operations Coordination Document (Control No. S-7704).
4. Supplemental Development Operations Coordination Document (Control No. S-7487).
5. Oil Spill Response Plan (OSRP Control No. O-43).