LETTER OF AUTHORIZATION APPLICATION

LONG FORM – ASSUMES PROPRIETARY MATERIALS FROM BOEM G&G APPLICATION WILL NOT BE PROVIDED TO NOAA FISHERIES ALONG WITH THIS COMPLETED FORM

BOEM CONTROL NUMBER: L21-037

REQUESTED PERIOD OF EFFECTIVENESS:
START DATE: January 1, 2022
END DATE: August 31, 2022

A. TYPE OF SURVEY:

Please indicate which type of survey will be used in the proposed activity
_X_ Deep Penetration Seismic (greater than 1,500 in^3 total airgun array volume) • 2D Seismic-towed Streamer • 2D Seismic-Seafloor Cable or Nodes • 3D Seismic-towed Streamer • 3D Seismic-Seafloor Cable or Nodes • NAZ • WAZ • 4D (Time Lapse) • Vertical Cable • Borehole Seismic (VSP) **___ Shallow Penetration Seismic (less than 1,500 in^3 total airgun array volume)** • Surface Vessel • Surface Vessel and AUV/ROV • Borehole Seismic (VSP) **___ HRG Surveys (no airguns used)** • Surface vessel • AUV/ROV • Both **___ Other** Describe (if Other):

B. SURVEY AREA AND OPERATIONAL PLAN:

Question:	**Response**
Location: (Lease Block(s), Facility or Prospect Name, Lat/Lon, etc.)	Mississippi Canyon 392 and De Soto Canyon and surrounding 62 blocks
Overall Duration of the Activity (days):	~70 days
Areal extent of the survey area: (in OCS lease blocks or km^2) (Attach GIS file(s) of survey lines and/or survey area perimeter)	62 lease blocks
Water Depth Range:	1,700 – 2,400 m
G&G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):	Modeling Zones 5 & 7
Number of days during the overall activity period on which the sound source(s) listed in Section C will operate: (If the activity will occur in more than one Modeling Zone, provide the number of operating days within each modeling zone.)	60 days Seasonal and Zonal distribution of days used in Take Estimates shown in Section D (except where noted for sperm whales): Winter Zone 5 = 16 days Winter Zone 7 = 44 days

C. SOUND SOURCES:

List the same sound sources provided in response to question #3 in "Section D Proprietary Information Attachment" to the G&G Permit Application and indicate their Duration of Use.

Energy Source	**Manu-facturer**	**Model**	**Total Array Volume & Number of Elements** (cubic inches or Liters.)	**Source Level (SL) in dB re 1µPa@1m in water** (RMS)	**Source Level (SL) in dB re 1µPa@1m in water** (Peak to Peak)	**Operating Frequency** (Hz, kHz, range)	**Pulse Duration** (seconds, milli-seconds)	**Pulse Rate (or Cycle)** (Pulses per second or minute)	**Towing Depth of the Source** (ft or m)	**Towing Depth of the Receiver(s)** (ft or m)	**Duration of Use** (Number of Days or Percent of Active Sound Source Days)
Airgun Array	Teledyne	Bolt LLX	5110 in^3 32 elements	~239 dB	~264 dB	0-200 Hz	0.1 s	10.5 s	8-10 m	OBN receivers on seabed	60
PIES (Pressure Inverted Echo Sounder)	Sonardyne	8302-3116	N/A	190-202 dB	80-120 dB	14-19 kHz	N/A	1 pulse every 30 seconds	Placed on seabed	Placed on seabed	60

D. TAKE ESTIMATE:

Since Level B takes are based on the number of individuals exposed above the 160 dB SPL_{rms} threshold over a 24-hour period, regardless of the duration of an exposure, the area covered (in square kilometres) by a source vessel (or source vessels) within 24-hrs is directly related to the number of Level B takes that may occur. Thus, comparing the area covered over a 24-hour period by the source vessel(s) in the different Survey Types simulated in the exposure modelling (Zeddies et al. 2015) to the area expected to be covered during a planned survey provides a means to select the Survey Type most appropriate for the planned survey.

In the exposure modelling conducted by Zeddies et al. (2015; pg. D-157), the Coil survey type assumed four source vessels sailing at 4.9 knots (2.5 m/s) along a series of overlapping circles 12.5 km in diameter. This circular pattern concentrated survey activities in a smaller area relative to the patterns used to simulate 2D, 3D NAZ, and 3D WAZ Survey Types. The survey area in which the Coil survey pattern was simulated was 58 km x 58 km, or 3,364 km^2. Over the course of the 7-day simulation, 30% of the area was covered (1,009 km^2) or 144 km^2 per day.

The other Survey Types were simulated in a different sized survey area (145 km x 48 km) using 2 to 4 survey vessels sailing at 4.5 or 4.9 kts along various patterns resulting in the following estimated areas covered:

2D – 5,568 km^2 in 7 days or 795 km^2 per day;
3D NAZ – 1,392 km^2 in 7 days or 199 km^2 per day;
3D WAZ – 5,916 km^2 in 7 days or 845 km^2 per day.

The planned 3D OBN survey will involve a single source vessel sailing along closely spaced survey lines that are only 100 m apart and approximately 30 km in length. The "racetrack" path taken by the vessel will mean that consecutive survey lines sailed will be 400 m apart. With this relatively tight line spacing and at a survey speed of 4.5 knots (8.3 km/hr), the area covered by this single source vessel will be about 110 km^2 per week, or 15.7 km^2 per day. Therefore, the Coil Survey Type was selected in the take calculator because the area covered during that simulated survey most closely matches that of the area to be covered by the single source vessel operating during the planned 3D OBN survey.

To avoid potential take of killer whales, the airgun array will be shutdown for any observation of this species, at any distance from the vessel. Based on modelling of a 4,100 in^3 airgun array by Zeddies et al. (2017) at a location near this planned survey site, the distance to the 160 dB SPL_{rms} threshold level (using Type III m-weighting for mid-frequency cetaceans) was 10 m (Tables 7 and 8 in Zeddies et al. 2017). The nominal source level of the 4,100 in^3 array was 244.9 dB SPL_{rms} while the nominal source level of the planned 5,110 in^3 array may be as high as 258 dB SPL_{rms}. The ~13 dB SPL_{rms} difference between the nominal source level would result in distances to threshold levels approximately 4.5 times larger. Thus, the distance to the Type III m-weighted 160 dB SPL_{rms} could be as large as 45 m. This is well within the distance at which PSOs are likely to detect killer whales that are highly conspicuous given their large dorsal fins and tendency to occur in medium to large groups. Therefore, no take of killer whales is being requested.

Zeddies, D., S. Denes, C. Pyc. 2017. Gulf of Mexico Acoustic Exposure Model Variable Analysis. Prepared by JASCO Applied Sciences (USA) Inc. for International Association of Geophysical Contractors and American Petroleum Institute. 171 pp.

Zone 5 and 7 Take Estimate Summary Table:

	Winter		
Hearing Group / Species	**Zone 5**	**Zone 7**	**Total**
Low-Frequency Hearing Group			
Bryde's whale	7	< 0.01	7
Mid-Frequency Functional Hearing Group			
Beaked whales (Cuvier/Blainville/Gervais)	1857	208	2065
Bottlenose dolphin	1513	3	1516
Short-finned pilot whale	171	15	186
Sperm whale*	420	99	519
Atlantic spotted dolphin	604	< 0.01	604
Clymene dolphin	899	290	1188
False killer whale	221	106	327
Fraser's dolphin	101	47	148
Killer whale	6	11	17
Melon-headed whale	590	192	782
Pantropical spotted dolphin	4078	2876	6954
Pygmy killer whale	139	93	232
Risso's dolphin	264	48	312
Rough-toothed dolphin	319	110	429
Spinner dolphin	1093	67	1160
Striped dolphin	351	150	501
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	159	50	209

* Zone 5 estimates are from the Summer season calculations

Zone 5 Estimated Take:

Parameters	
Survey Type	*COIL*
Zone Number	*5*

Schedule	
Season	# days
Summer	0
Winter	16

Exposures by Metric	Summer	Winter	Total	Total take, including Level B Scaling (where appropriate) Summer	Winter	Total
Level A						
Low-Frequency Hearing Group						
Bryde's whale	< 0.01	0.16	0.16			
High-Frequency Hearing Group						
Kogia (dwarf, pygmy sperm whale)	< 0.01	8.42	8.42			
Level B						
Low-Frequency Hearing Group						
Bryde's whale	< 0.01	6.90	6.90	< 0.01	7.0637046	7.06
Mid-Frequency Functional Hearing Group						
Beaked whales (Cuvier/Blainville/Gervais	< 0.01	1,857.47	1,857.47	< 0.01	1857.47	1857.47
Bottlenose dolphin	< 0.01	1,513.29	1,513.29	< 0.01	1513.29	1513.29
Short-finned pilot whale	< 0.01	170.80	170.80	< 0.01	170.80	170.80
Sperm whale	< 0.01	417.04	417.04	< 0.01	417.04	417.04
Atlantic spotted dolphin	< 0.01	604.47	604.47	< 0.01	604.47	604.47
Clymene dolphin	< 0.01	898.71	898.71	< 0.01	898.71	898.71
False killer whale	< 0.01	221.08	221.08	< 0.01	221.08	221.08
Fraser's dolphin	< 0.01	100.92	100.92	< 0.01	100.92	100.92
Killer whale	< 0.01	5.95	5.95	< 0.01	5.95	5.95
Melon-headed whale	< 0.01	590.46	590.46	< 0.01	590.46	590.46
Pantropical spotted dolphin	< 0.01	4,078.25	4,078.25	< 0.01	4078.25	4078.25
Pygmy killer whale	< 0.01	138.96	138.96	< 0.01	138.96	138.96
Risso's dolphin	< 0.01	264.05	264.05	< 0.01	264.05	264.05
Rough-toothed dolphin	< 0.01	319.37	319.37	< 0.01	319.37	319.37
Spinner dolphin	< 0.01	1,092.78	1,092.78	< 0.01	1092.78	1092.78
Striped dolphin	< 0.01	351.01	351.01	< 0.01	351.01	351.01
High-Frequency Hearing Group						
Kogia (dwarf, pygmy sperm whale)	< 0.01	150.65	150.65	< 0.01	159.06	159.06

Level A Color Legend:	
	Level A SEL
	Level A Peak

*If no color highlight, both level A peak and SEL are <0.01

Zone 7 Estimated Take:

Parameters	
Survey Type	*COIL*
Zone Number	*7*

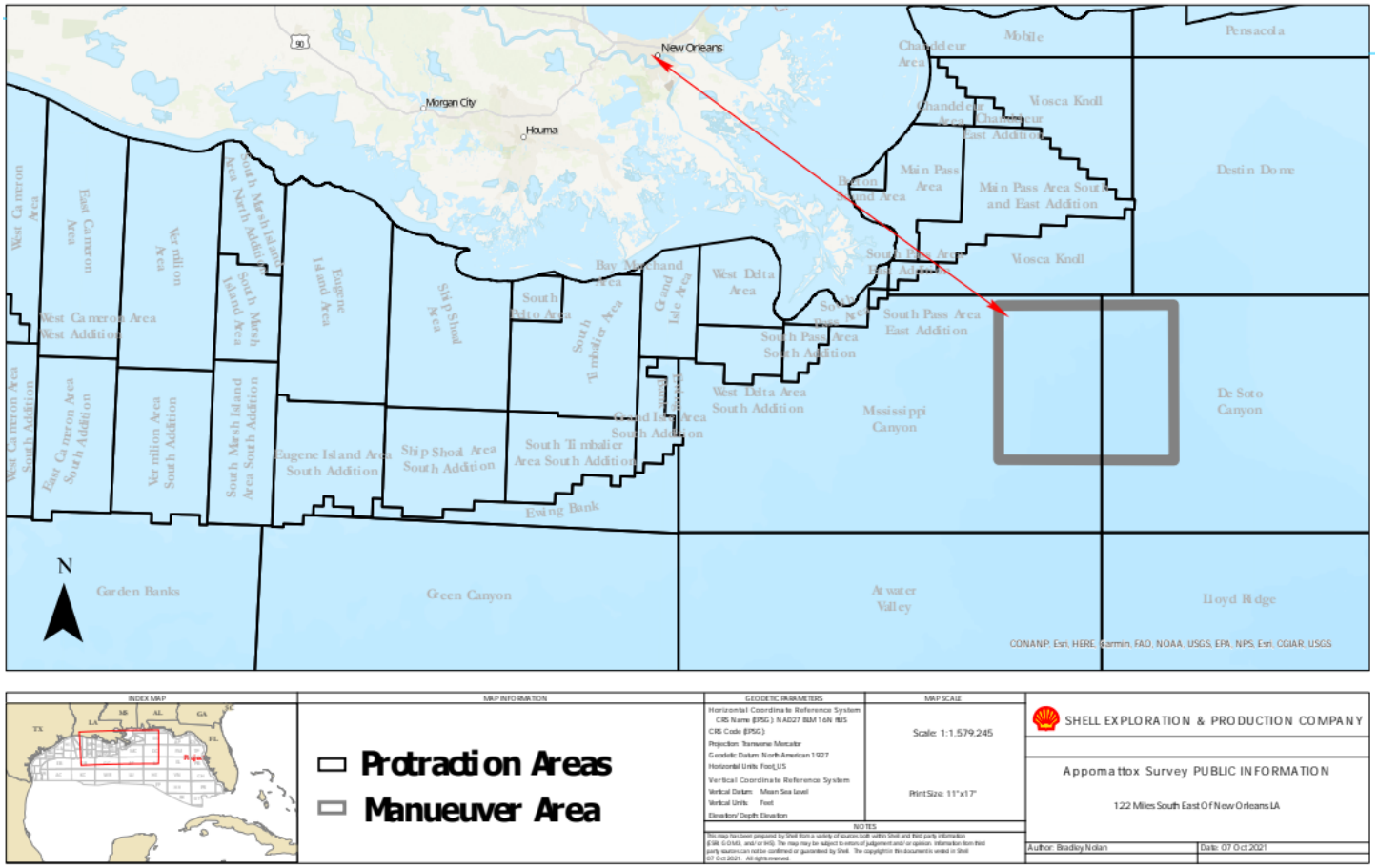
Schedule	
Season	# days
Summer	0
Winter	44

Exposures by Metric	Summer	Winter	Total	Total take, including Level B Scaling (where appropriate)		
				Summer	Winter	Total
Level A						
Low-Frequency Hearing Group						
Bryde's whale	< 0.01	< 0.01	< 0.01			
High-Frequency Hearing Group						
Kogia (dwarf, pygmy sperm whale)	< 0.01	10.97	10.97			
Level B						
Low-Frequency Hearing Group						
Bryde's whale	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mid-Frequency Functional Hearing Group						
Beaked whales (Cuvier/Blainville/Gervais	< 0.01	2,057.62	2,057.62	< 0.01	207.82	207.82
Bottlenose dolphin	< 0.01	10.15	10.15	< 0.01	2.91	2.91
Short-finned pilot whale	< 0.01	51.56	51.56	< 0.01	15.21	15.21
Sperm whale	< 0.01	233.03	233.03	< 0.01	98.57	98.57
Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Clymene dolphin	< 0.01	1,009.36	1,009.36	< 0.01	289.69	289.69
False killer whale	< 0.01	358.15	358.15	< 0.01	105.66	105.66
Fraser's dolphin	< 0.01	164.90	164.90	< 0.01	47.33	47.33
Killer whale	< 0.01	36.14	36.14	< 0.01	10.66	10.66
Melon-headed whale	< 0.01	650.50	650.50	< 0.01	191.90	191.90
Pantropical spotted dolphin	< 0.01	10,020.90	10,020.90	< 0.01	2876.00	2876.00
Pygmy killer whale	< 0.01	316.49	316.49	< 0.01	93.36	93.36
Risso's dolphin	< 0.01	162.73	162.73	< 0.01	48.00	48.00
Rough-toothed dolphin	< 0.01	382.41	382.41	< 0.01	109.75	109.75
Spinner dolphin	< 0.01	235.14	235.14	< 0.01	67.49	67.49
Striped dolphin	< 0.01	524.34	524.34	< 0.01	150.48	150.48
High-Frequency Hearing Group						
Kogia (dwarf, pygmy sperm whale)	< 0.01	120.18	120.18	< 0.01	49.55	49.55

Level A Color Legend:	
	Level A SEL
	Level A Peak

*If no color highlight, both level A peak and SEL are <0.01

E. MITIGATION AND MONITORING EFFORTS:

Question:	Response:
Please indicate which set of monitoring and mitigation measures from the ITR apply to the planned activity:	All monitoring and mitigation measures in the ITRs applicable to Airgun Surveys with a total volume >1,500 in^3 (Deep Penetration) will be followed. Additionally, to avoid potential taking of killer whales, the airgun array will be shutdown if killer whales are observed at any distance from the array while it is in operation.
Confirm that you will apply this set of monitoring and mitigation measures during the activity:	Yes

F. MAP OF SURVEY AREA AND TRANSIT ROUTE: