Letter of Authorization Application – Addendum to G&G Permit Application

Long Form – Assumes proprietary materials of BOEM G&G application are not provided to NMFS

Requested Period of Effectiveness:
Start : February 1st, 2025
Finish : December 31st, 2025

BOEM Permit No.:

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):

Proxy Selected & Justification: Coil

CGG is applying for an LOA to acquire a long offset sparse OBN survey.

Sparse OBN and Coil surveys aim to acquire full azimuth (FAZ) and long offset data for better imaging of deep sub-surface structures, while 3D NAZ surveys have limitations in imaging depth due to their narrow azimuth range and shorter offset distances. These differences in survey methodologies affect their suitability for various exploration and production scenarios in the oil and gas industry.

Breakdown of the key points:

1. **Sparse OBN Survey:**
    - Involves acquiring seismic data using ocean bottom nodes placed at relatively large intervals.
    - Utilizes multiple sources towed from different vessels to achieve full azimuth (FAZ) and long offset data.
    - Long offsets typically extend up to 30 km.
    - FAZ allows each receiver to collect data from a full range of azimuths (0° - 360°), providing a clearer image of deep sub-surface geological structures.
2. **Coil Survey:**
    - Utilizes a methodology similar to sparse OBN surveys but with shorter offsets.
    - Long offsets typically range from 18-20 km.
    - Like sparse OBN, Coil surveys aim to achieve FAZ data to improve imaging of deep geological structures.
3. **3D NAZ Survey:**
    - Involves narrow azimuth and short offset data acquisition.
    - Typically covers azimuths from 150° to 210° relative to the source.
    - Shorter offset distances, typically 8-10 km.
    - Limited azimuth range restricts the imaging capability of deep geological structures compared to FAZ surveys.

B. Survey Area and Operational Plan:

Question:	Response
Overall Duration of the Activity (days):	115 (total) including node deployment/retrieval and 65 days of sound source operation
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)	1,224 OCS blocks Map and perimeter shapefiles provided as separate attachments.
G&G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):	Central GoM in intermediate waters 1,000m -2,700m deep. The proposed survey area is in Zone 5 (59%), Zone 6 (35%), Zone 7 (6%)
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.)	65 days

C. Sound Sources:

- List all survey-related instruments that emit acoustic energy into the water column, including but not limited to airgun or airgun arrays, sub-bottom profilers, bubble pulsers, sparkers, side scan sonars, multi-beam sonars, single-beam echosounders, ultra-short baseline (USBL) position systems, pressure inverted echosounder (PIES), etc.
- For airgun arrays, please attach a diagram showing the layout (geometry) of the array and list of airgun sizes.

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)
Air Gun Array	Bolt	LLXT 1900	5,220/42	220 dB	235.7 dB	2-200Hz		1 pulse approximately every 10 seconds	8m	OBN (Seafloor)	65
PIES	Sonardyne	8302	NA	190-202 dB	NA	14-19kHz		Variable; Typically 0.0116		OBN (Seafloor)	85
Tuned Pulse Source (TPS)	Sercel	TPS	28,000ci x 2	~220 dB	~236 dB	0-128Hz	1 second	10-44 seconds	10 m	OBN (Seafloor)	65
Echosounder	SIMRAD	EZ600	NA	NA	NA	12-210Hz		1 per minute			

Note: the source will be primarily TPS with conventional airgun as an alternative – only one source will be utilized.

Acquisition Plan:

A single node laying vessel, and the two dual source vessels will mobilize to the survey area. The node laying vessel will begin deploying the required number of nodes for designed receiver offsets before the source vessels may begin activation. It is expected to take approximately 25 days to deploy enough nodes to meet the required offsets before source effort can begin.

Once a minimum number of nodes have been deployed, both dual source vessels will be in service at the same time, and for the full duration of acquisition. Note: both sources vessels will not activate simultaneously.
The node vessel will continue to deploy nodes until all are positioned at their approved pre-planned locations. This will be ongoing before sources have been completely acquired.

Once all available nodes have been deployed, and enough source points have been acquired, the node vessel will begin to recover the first nodes after the required offsets has been reached by the source vessels. Upon final completion of the source effort, the node vessel may require an additional 25 days to complete the recovery of the nodes.

After the recovery of the nodes, the node vessel and source vessels will demobilize from the survey area.

D. Take Estimate:

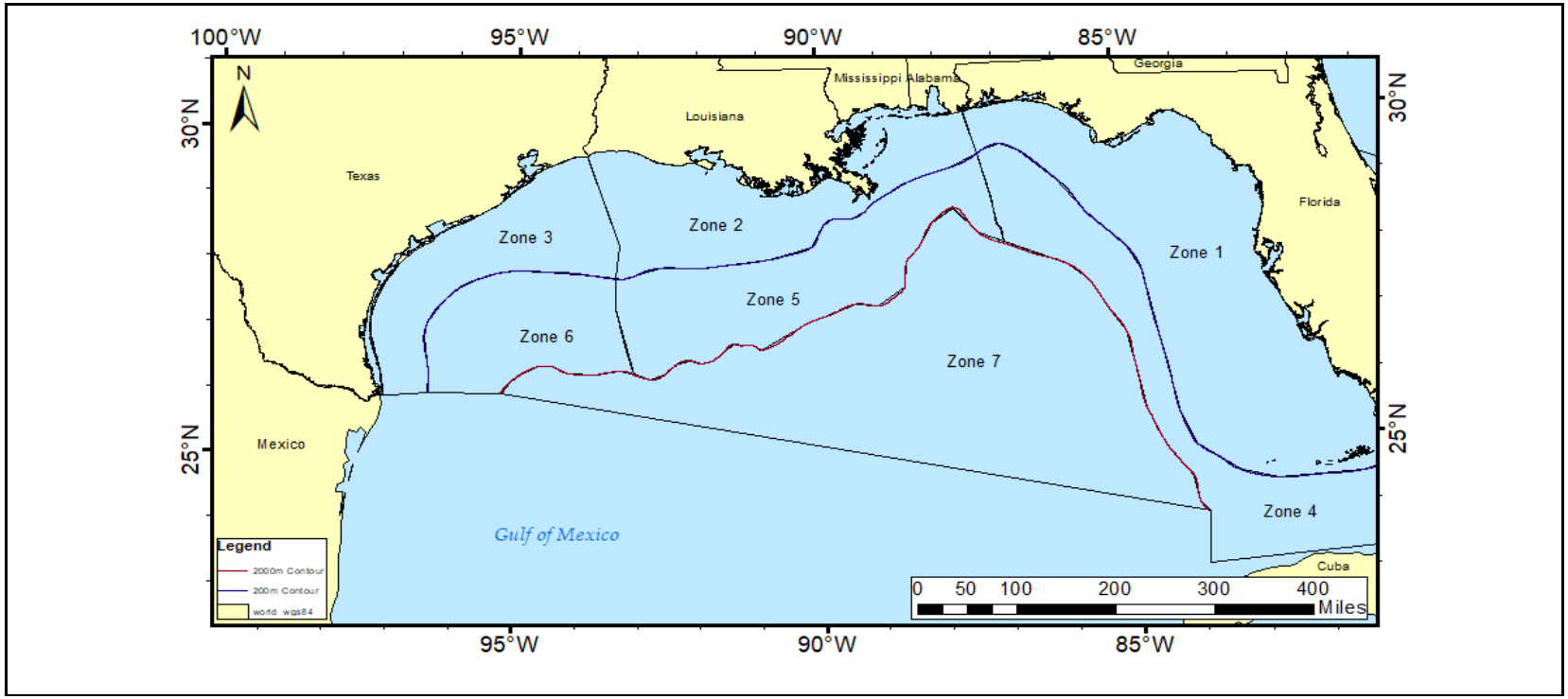
Instructions:

- Select the survey type and zone number (2-7, operations in Zone 1 are not covered by the incidental take regulations) from the drop down lists (click in the cell to see the dropdown arrow)

- Type in the number of days of acquisition per season in the "Schedule" section (Winter: December - March, Summer: April - November)

Report tables are automatically updated based on user selections.

Zone Map:



CGG is requesting approval for February 1, 2025 through December 31, 2025

Calculation has been generated:

1) 65 days of sound activation in Summer in Zones 5, 6 and 7.
2) The planned 3D OBN survey will involve up to two source vessels sailing along closely spaced survey lines that are 400 m apart.
3) The source line lengths range from 37 km to 103 km within an overall survey area of 9,041 km2.
4) The vessels will sail along nearby lines in a typical “racetrack” pattern with the second vessel staggered behind the first vessel.
5) At a survey speed of approximately 5.0 knots (9.3 km/hr), the survey area will be covered in approximately 65 days.
6) This results in an average of 144 km2 surveyed per day. Therefore, the Coil Survey Type was selected.

User Selections

Parameters	
Survey Type	*COIL*
Zone Number	*5*
Array	*5110cuin*

# of Days per Month					
jan	0	may	0	sep	0
feb	0	jun	0	oct	0
mar	31	jul	0	nov	0
apr	7	aug	0	dec	0

Exposures by Metric

F.H.G	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total (No Level B Scaling)	Total (Including Level B Scaling)
Level A															
LF	Rice's whale	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**< 0.01**	
HF	Kogia spp.[a]	< 0.01	< 0.01	4.13	0.79	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**4.92**	
Level B															
LF	Rice's whale	< 0.01	< 0.01	0.64	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**0.75**	**0.14**
MF	Atlantic spotted dolphin	< 0.01	< 0.01	205.18	47.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**252.41**	**72.44**
	Bottlenose dolphin	< 0.01	< 0.01	721.47	149.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**870.54**	**249.85**
	Clymene dolphin	< 0.01	< 0.01	339.28	50.23	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**389.52**	**111.79**
	Beaked whales[b]	< 0.01	< 0.01	664.47	115.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**779.63**	**78.74**
	Fraser's dolphin[d]	< 0.01	< 0.01	263.04	59.77	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**322.82**	**92.65**
	Blackfish[c]	< 0.01	< 0.01	1,034.43	189.47	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**1,223.90**	**361.05**
	Pantropical spotted dolphin	< 0.01	< 0.01	2,883.32	533.28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**3,416.60**	**980.56**
	Risso's dolphin	< 0.01	< 0.01	104.47	24.37	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**128.83**	**38.01**
	Rough-toothed dolphin[d]	< 0.01	< 0.01	722.57	162.91	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**885.47**	**254.13**
	Short-finned pilot whale	< 0.01	< 0.01	149.95	34.42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**184.37**	**54.39**
	Sperm whale	< 0.01	< 0.01	127.85	31.39	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**159.24**	**67.36**
	Spinner dolphin	< 0.01	< 0.01	89.69	20.73	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**110.42**	**31.69**
	Striped dolphin	< 0.01	< 0.01	917.76	147.67	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**1,065.43**	**305.78**
HF	Kogia spp.[a]	< 0.01	< 0.01	79.51	14.76	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**94.27**	**30.26**

Level A Colour Legend

	Level A SEL > Level A Peak
	Level A Peak > Level A SEL

User Selections

Parameters	
Survey Type	*COIL*
Zone Number	*6*
Array	*5110cuin*

# of Days per Month					
jan	0	may	0	sep	0
feb	0	jun	0	oct	0
mar	0	jul	0	nov	0
apr	23	aug	0	dec	0

Exposures by Metric

F.H.G	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total (No Level B Scaling)	Level A Colour Legend / Total (Including Level B Scaling)
Level A															Level A SEL > Level A Peak
LF	Rice's whale	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**< 0.01**	Level A Peak > Level A SEL
HF	Kogia spp.[a]	< 0.01	< 0.01	< 0.01	2.97	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**2.97**	**Total (Including Level B Scaling)**
Level B															
LF	Rice's whale	< 0.01	< 0.01	< 0.01	0.09	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**0.09**	**0.02**
MF	Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01	1,111.93	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**1,111.93**	**319.12**
	Bottlenose dolphin	< 0.01	< 0.01	< 0.01	498.35	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**498.35**	**143.03**
	Clymene dolphin	< 0.01	< 0.01	< 0.01	672.85	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**672.85**	**193.11**
	Beaked whales[b]	< 0.01	< 0.01	< 0.01	38.43	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**38.43**	**3.88**
	Fraser's dolphin[d]	< 0.01	< 0.01	< 0.01	189.98	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**189.98**	**54.52**
	Blackfish[c]	< 0.01	< 0.01	< 0.01	1,065.50	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**1,065.50**	**314.32**
	Pantropical spotted dolphin	< 0.01	< 0.01	< 0.01	1,438.37	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**1,438.37**	**412.81**
	Risso's dolphin	< 0.01	< 0.01	< 0.01	55.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**55.11**	**16.26**
	Rough-toothed dolphin[d]	< 0.01	< 0.01	< 0.01	471.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**471.06**	**135.19**
	Short-finned pilot whale	< 0.01	< 0.01	< 0.01	285.82	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**285.82**	**84.32**
	Sperm whale	< 0.01	< 0.01	< 0.01	104.49	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**104.49**	**44.20**
	Spinner dolphin	< 0.01	< 0.01	< 0.01	1.77	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**1.77**	**0.51**
	Striped dolphin	< 0.01	< 0.01	< 0.01	303.53	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**303.53**	**87.11**
HF	Kogia spp.[a]	< 0.01	< 0.01	< 0.01	50.80	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**50.80**	**16.31**

User Selections

Parameters	
Survey Type	*COIL*
Zone Number	*7*
Array	*5110cuin*

# of Days per Month					
jan	0	may	4	sep	0
feb	0	jun	0	oct	0
mar	0	jul	0	nov	0
apr	0	aug	0	dec	0

Exposures by Metric

F.H.G	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total (No Level B Scaling)	Total (Including Level B Scaling)
Level A															
LF	Rice's whale	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**< 0.01**	
HF	Kogia spp.[a]	< 0.01	< 0.01	< 0.01	< 0.01	0.84	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**0.84**	
Level B															
LF	Rice's whale	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**< 0.01**	**< 0.01**
MF	Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**< 0.01**	**< 0.01**
	Bottlenose dolphin	< 0.01	< 0.01	< 0.01	< 0.01	0.40	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**0.40**	**0.40**
	Clymene dolphin	< 0.01	< 0.01	< 0.01	< 0.01	9.49	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**9.49**	**9.49**
	Beaked whales[b]	< 0.01	< 0.01	< 0.01	< 0.01	5.61	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**5.61**	**5.61**
	Fraser's dolphin[d]	< 0.01	< 0.01	< 0.01	< 0.01	22.28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**22.28**	**22.28**
	Blackfish[c]	< 0.01	< 0.01	< 0.01	< 0.01	67.48	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**67.48**	**67.48**
	Pantropical spotted dolphin	< 0.01	< 0.01	< 0.01	< 0.01	424.82	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**424.82**	**424.82**
	Risso's dolphin	< 0.01	< 0.01	< 0.01	< 0.01	4.58	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**4.58**	**4.58**
	Rough-toothed dolphin[d]	< 0.01	< 0.01	< 0.01	< 0.01	46.61	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**46.61**	**46.61**
	Short-finned pilot whale	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**< 0.01**	**< 0.01**
	Sperm whale	< 0.01	< 0.01	< 0.01	< 0.01	14.23	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**14.23**	**14.23**
	Spinner dolphin	< 0.01	< 0.01	< 0.01	< 0.01	7.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**7.17**	**7.17**
	Striped dolphin	< 0.01	< 0.01	< 0.01	< 0.01	39.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**39.07**	**39.07**
HF	Kogia spp.[a]	< 0.01	< 0.01	< 0.01	< 0.01	9.83	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**9.83**	**9.83**

Level A Colour Legend

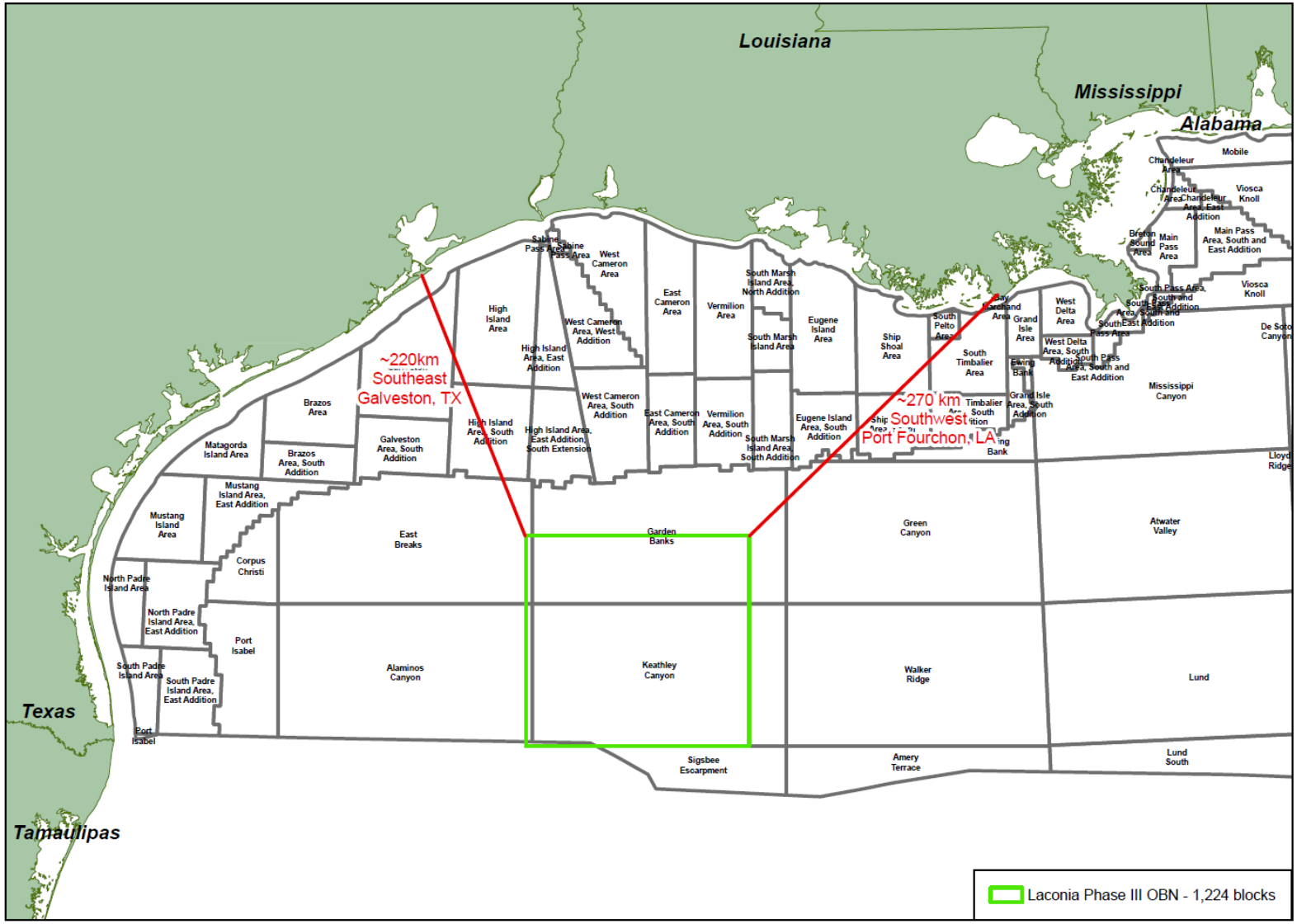
	Level A SEL > Level A Peak
	Level A Peak > Level A SEL

E. Mitigation and Monitoring Efforts:

Question:	Response:
Please indicate which set of monitoring and mitigation measures from the ITR's apply to the planned activity:	All monitoring and mitigation measures in the ITRs applicable to Airgun Surveys with a total volume >1,500 cu in will be followed. See attached list for summary of applicable monitoring and mitigation measures. BOEM NTL 2016-G02 revised 6/19/2020 Appendices A, B, and C to NMFS 2020 BiOp for the GoMex Oil and Gas Program
Confirm that you will apply this set of monitoring and mitigation measures during the activity:	Yes, we will apply these measures during the 3D OBN survey.

Map of Survey Area and Transit Route

Viridien Laconia Ph 3 OBN



Additional Notes:

There will be use of 2 source vessels with a minimum 2,000m separation. The source vessels will not fire simultaneously.

Water depths in the area range from 1,000m to over 2,700m with most of the activities taking place in waters greater than 1,100m.

The requested dates for the LOA are February 1, 2025 through December 31, 2025.