

January 15, 2024

Jolie Harrison, Division Chief
Permits and Conservation Division, Office of Protected Resources
1315 East-West Hight, F/PR1 Room 13805
Silver Springs, MD 20910
USA

RE: G&G Permit - LoA Application, Ancillary Activities

Zone 5- Gulf of Mexico- Mississippi Canyon area (Blocks 509, 629, 589)

Dear Ms. Harrison,

Please find the attached request for an incidental take authorization under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). This request is for the potential take of marine mammals while conducting any one for the following: Zero Offset, Offset, or Walkaway VSP, Salt Proximity Survey, and/or Checkshot after reaching total depth of any of our proposed wells operated by LLOG Exploration Company within the Zone 5. The requested activities, mentioned above, is to provide high confidence of seismic-to-well tie.

LLOG's activities are subject to the provisions of the MMPA and the regulations Governing Taking Marine Mammals Incidental to Geophysical Survey Activities in the Gulf of Mexico. LLOG is requesting issuance of a Letter of Authorization for the proposed activities.

- Purpose of the Activity:

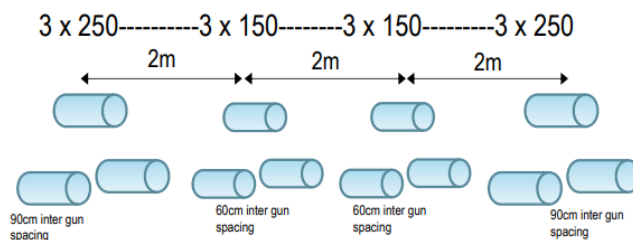
LLOG Exploration Offshore, L.L.C. is requesting approval for a Zero Offset, Offset, or Walkaway VSP, Salt Proximity Survey, and/or Checkshot in Gulf of Mexico in what NOAA recognizes as Zone 5.

- Description of the equipment to be used for this activity will satisfy the following: (size, output, towing depth of the acoustic source(s); length and number of streamer). Included with these descriptions will also be a diagram of the proposed acoustic arrays.

Schlumberger air gun source arrays will be deployed from cranes mounted on the deck of the either the Shelly Lab, Gibson Lab, or utilize the drillship rig crane. Wireline geophones will be positioned in the wellbore. The Schlumberger source will consist of either a 6-gun array (Hypercluster) or a 12-gun array (Dual Magnum). – In the GoM, Schlumberger has 2 airgun sources, Dual Magnum which features 12 guns (Total Volume 2,400cu.in at 2,000psi firing pressure), and HyperCluster which features 6 guns (Total Volume 1,500cu.in at 3,000psi firing pressure). Both sources provide similar energy output. (See Diagrams below)

Dual Magnum Air Gun Array

- 12 x G-Guns
- Peak to Peak output: 47 +/- 0.678 (4.7 +/- 0.0678 MPa, ~ 253 db re 1 muPa. at 1m.) (15' depth)*
- RMS Pressure in bar-m 3.3 (0.33 MPa, 230 db re 1 muPa. at 1m.) *
- SEL (Sound Exposure Level) 154.1 dB re 1muPa²-s (Mxx) (10Hz - 25 kHz) 148.1 at 500 M*
- Total Volume 2400 in₃ / Firing Pressure 2,000 PSI



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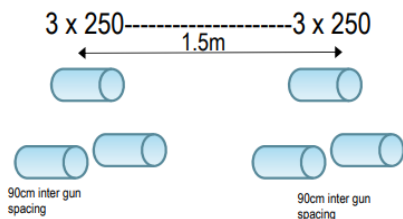
* Modeled output using Gundalf software (Marine mammal noise impact report (0-25,000 Hz))

Schlumberger LOG

Schlumberger-Private

Hypercluster Air Gun Array

- 6 x G-Guns
- Peak to Peak output: 36 +/- 0.734 (3.6 +/- 0.0734 MPa, ~ 251 db re 1 muPa. at 1m.) (15' depth)*
- RMS Pressure in bar-m : 3.05 (0.305 MPa, 230 db re 1 muPa. at 1m.) *
- SEL (Sound Exposure Level): 156.2 dB re 1muPa²-s (Mxx) (10Hz - 25 kHz) at 500 M*
- Total Volume 1500 in₃ / Firing Pressure 3,000 PSI



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* Modeled output using Gundalf software-Marine mammal noise impact report (0-25,000 Hz)

Schlumberger LOG

Schlumberger-Private

ZOVSP (Zero Offset VSP): no area covered (source remains in fixed position hanging from the rig).

OVSP (Offset VSP): no area covered (source remains in fixed position deployed from a supply vessel on an offset position).

WAVSP (Walkaway VSP): no area covered (source moves along a line or series of lines towed by a supply vessel). Modeling will dictate the length of such line(s), but as an approx. a WAVSP line length is up to 3 times the total depth of the well (TVD) centered around the well head.

3D VSP: this is the only survey that involves covering an area (source moves along a spiral or line swaths towed by a supply vessel or using a marine shooting vessel). Modeling will dictate the area of such grid, but as an approx. a 3D VSP grid at surface is up to 3 times the total depth of the well (TVD) centered around the well head.

Checkshot: no area covered (source remains in fixed position hanging from the rig).

The difference between Checkshot and ZOVSP is the spatial interval used for the receivers. Checkshots is typically sparse data (300-500ft receiver interval) and/or horizons of interest, whereas ZOVSP typically receivers are spaced out every 50ft. This distinction allows different products to be obtained from the two geometries.

Salt-Proximity VSP: consists typically of the combination of both ZOVSP plus a fixed OVSP (could be more). Sources are deployed as explained before for each survey. Acquisition is typically done near simultaneously (with the tool in one depth setting, acquire the ZOVSP source, followed by the OVSP source until completing the desired interval). The downhole tool must be oriented (requires 3-C tool), in which case the downhole tools are typically rigid (stiff interconnects) and a gyro is required to orient the tool in each depth setting

- There will only be one source vessel (You can acquire with more than one vessel (SimSrc acquisition technique).
- The source(s) will be placed approximately 15 feet below sea surface.
- The duration of the proposed activity will be from 1-5 days.
- Proposed starting date and duration of the activity:

The earliest start date will be March 1, 2024- The latest start date is December 31, 2027. Any one of the surveys listed above, will take approximately 1-5 days.

- A certification signed by an authorized company official attesting that LLOG will conduct the ancillary activity in accordance with the performance standards in 30 CFR 550.202(a), (b), (d) and (e) and any applicable protective measures listed in Appendix F of BOEM NTL 2009-G34 and BOEM NTL 2016-G02: – Letter Attached.
- Name, title, and telephone number of LLOG’s contact person:

Sean O’Brien, Geologist
985-801-4300

Jaime Mata, (Contractor) Geo Hazard Coordinator
281-752-1100

In support of this request, please review the attached Letter of Authorization Application.

If you have any questions, please contact Sean O’Brien at 985-801-4300 or by email @ sean.obrien@llog.com

Best Regards, Sean O’Brien

Ancillary Activity G&G Information and LoA Application Template

Contact Person:	
Name:	Sean O'Brien
Title:	Geologist
Telephone Number:	985-801-4300

A. Type of Survey

Please indicate which type of survey will be conducted during the planned activity
<p><input checked="" type="checkbox"/> Deep Penetration Seismic (greater than 1,500 in³ total airgun array volume)</p> <ul style="list-style-type: none"> • 2D Seismic-towed Streamer • 2D Seismic-Sea-floor Cable or Nodes • 3D Seismic-towed Streamer • 3D Seismic-Sea-floor Cable or Nodes • NAZ • WAZ • 4D (Time Lapse) • Vertical Cable • Borehole Seismic (VSP) <p><input type="checkbox"/> Shallow Penetration Seismic (less than 1,500 in³ total airgun array volume)</p> <ul style="list-style-type: none"> • Surface Vessel • Surface Vessel and AUV/ROV • Borehole Seismic (VSP) <p><input type="checkbox"/> HRG Surveys (no airguns used)</p> <ul style="list-style-type: none"> • Surface vessel • AUV/ROV • Both <p><input type="checkbox"/> Other <u>Describe (if Other):</u></p>

B. Date, Location, and Operations Information:

Question:	Response:
Purpose of the Activity:	Zero-Offset, Offset, Walkaway VSP, Salt Proximity and/or Checkshot
Proposed Start Date:	March 1, 2024
Proposed End Date:	December 31, 2027
Overall Duration of the Activity (days):	1-5 Days
Lease Number(s):	OCS-G 36250, 36134, 35979
OCS Area(s):	Mississippi Canyon
OCS Lease Block(s):	(OCS-G 36250 MC 509), (OCS-G 36134 MC 629), (OCS-G 35979 MC 589)
Range of water depths (ft or m):	3000-6500 ft
Average water depth (ft or m):	4800 ft
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)	One OCS block 9 mi ² (23.3 km ²)
G&G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):	Zone 5
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.)	1-5 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	Manufacturer	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 (12 x G-Guns)	SLB	Dual Magnum	2400 cu. in.	154.1 dB re 1μPa ² -s (Mxx) (10Hz - 25 kHz) 148.1 at 500 M*	47 +/- 0.678 (4.7 +/- 0.0678 MPa, ~ 253 db re 1 μPa. at 1m.) (15' depth)*	10Hz - 25 kHz	1 sec	20 sec	15 ft (5m)	12 ft (3.75 m)	1 - 3
<u>OR</u>											
Air Gun Array (6 x G-Guns)	SLB	Hypercluster	1500 cu. in.	156.2 dB re 1μPa ² -s (Mxx) (10Hz - 25 kHz) at 500 M*	36 +/- 0.734 (3.6 +/- 0.0734 MPa, ~ 251 db re 1 μPa. at 1m.) (15' depth)*	10Hz - 25 kHz	1 sec	20 sec	15 ft (5m)	12 ft (3.75 m)	1 - 3

* Modeled output using Gundalf software

D. Take Estimate:

[Insert the “Summary for NOAA” table here after completing all required inputs on the “Applicant Data Entry” spreadsheet in the Take Calculator Excel file or alternative tool developed with/by NMFS]

LLOG Could not find a 6- or 12-gun array in the “Survey Type” option. We went with the suggested option “Coil” to satisfy this application.

Parameters	
Survey Type	Single Airgun
Zone Number	5

Schedule	
Season	# days
Summer	5
Winter	0

Exposures by Metric			
	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)	0.04	< 0.01	0.04
Level B			
Low-Frequency Hearing Group			
Bryde's whale	< 0.01	< 0.01	< 0.01
Mid-Frequency Functional Hearing Group			
Beaked whales (Cuvier/Blainville/Gervais)	65.77	< 0.01	65.77
Bottlenose dolphin	8.02	< 0.01	8.02
Short-finned pilot whale	0.80	< 0.01	0.80
Sperm whale	3.86	< 0.01	3.86
Atlantic spotted dolphin	2.74	< 0.01	2.74
Clymene dolphin	3.76	< 0.01	3.76
False killer whale	0.76	< 0.01	0.76
Fraser's dolphin	0.47	< 0.01	0.47
Killer whale	0.03	< 0.01	0.03
Melon-headed whale	2.76	< 0.01	2.76
Pantropical spotted dolphin	17.05	< 0.01	17.05
Pygmy killer whale	0.48	< 0.01	0.48
Risso's dolphin	1.07	< 0.01	1.07
Rough-toothed dolphin	1.10	< 0.01	1.10
Spinner dolphin	4.57	< 0.01	4.57
Striped dolphin	1.47	< 0.01	1.47
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	0.80	< 0.01	0.80

Level A Color Legend:	
	Level A SEL
	Level A Peak

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

Total take, including Level B Scaling (where appropriate)		
Summer	Winter	Total
< 0.01	< 0.01	< 0.01
65.77	< 0.01	65.77
8.02	< 0.01	8.02
0.80	< 0.01	0.80
3.86	< 0.01	3.86
2.74	< 0.01	2.74
3.76	< 0.01	3.76
0.76	< 0.01	0.76
0.47	< 0.01	0.47
0.03	< 0.01	0.03
2.76	< 0.01	2.76
17.05	< 0.01	17.05
0.48	< 0.01	0.48
1.07	< 0.01	1.07
1.10	< 0.01	1.10
4.57	< 0.01	4.57
1.47	< 0.01	1.47
0.84	< 0.01	0.84

E. Monitoring and Mitigation Plans:

Question:	Response:
<p>Please indicate which set of monitoring and mitigation measures from the ITR apply to the planned activity:</p>	<p>All monitoring and mitigation measures in the ITRs applicable to Airgun surveys with a total volume >1,500 cubic inches will be followed.</p> <p>Appendix F of BOEM NTL No. 2009-G34</p> <p>Appendices A, B, and C to NMFS 2020 BiOp for the GoMex Oil and Gas Program</p>
<p>Confirm that you will apply this set of monitoring and mitigation measures during the activity:</p>	<p>Yes, we will apply these measures during the VSP survey.</p>

F. Attach Certification

Attach a certification signed by an authorized company official attesting that you will conduct your ancillary activity in accordance with the performance standards in 30 CFR 550.202(a), (b), (d), and (e) and any applicable protection measures listed in Appendix F of BOEM NTL No. 2009-G34 Reissued: June 19, 2020.

Certification attached.

G. Map of Survey Area and Transit Route

