

## **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 date : April 1<sup>st</sup>, 2023

End date : April 1<sup>st</sup>, 2024

Permit application: L23-002

### **A. Type of Survey:**

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

Proxy used : Coil

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

The Coil proxy option has been used in the Exposure Estimation Tool because it most closely resembles sparse OBN. Both Coil and sparse OBN use efficient acquisition methodology to

acquire Full Azimuth (FAZ) and long offset data to enable better imaging of the sub-surface geological structures in both production/development and exploration settings. Both acquisition methods use multiple sources, towed from different vessels to achieve the Full Azimuth and Long Offset data set. Long offsets being 30 Km for sparse OBN and 18-20 Km for Coil. Full Azimuth (FAZ) means each receiver collects data from a full range of azimuths, i.e. 0° - 360°, thereby “illuminating” the sub-surface geological structures from different directions and therefore providing a clearer image of potential drilling prospects. In contrast, 3D NAZ is narrow azimuth and short offset, typically 8-10 Km, with a source towed by a single vessel, the same vessel that tows the receiver array. Narrow Azimuth means each receiver collects data from a limited range of azimuths, i.e. 150° - 210° relative to the source and therefore there is a limitation on this technology’s ability to image the deep geological structures.

**B. Survey Area and Operational Plan:**

<b>Question:</b>	<b>Response</b>
<b>Location:</b> (Lease Block(s), Facility or Prospect Name, Lat/Lon, etc.)	<b>Green Canyon, Garden Banks and Walker Ridge</b> Engagement-4
<b>Overall Duration of the Activity (days):</b>	85 days
<b>Areal extent of the survey area:</b> (in OCS lease blocks or km <sup>2</sup> ) (Attach GIS file(s) of survey lines and/or survey area perimeter)	202 OCS blocks for the node area 616 OCS blocks for the source area Source and node perimeter shape files attached
<b>G&amp;G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):</b>	Zone 5 & 2 Approximately 88% of the survey will be acquired in zone 5 with the remainder in zone 2.
<b>Number of days during the overall activity period on which the sound source(s) listed in Section C will operate:</b> (If the activity will occur in more than one Modeling Zone, provide the number of operating days within each modeling zone.)	65 days Summer has been used for modelling purposes as it is planned to acquire the survey fully in the summer months.
<b>Water depth range</b>	55 m to 2,000 m

**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. See attached source description file: 5370\_12m\_array\_report.pdf

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	Bolt	Long Life	5240 cu. in.	234	259	0-128 Hz	100 msecs	8 seconds	12 m	OBN receivers on Seabed	65
Pressure Inverted Echo Sounder	Sonardyne	8036	NA	188-200 dB	190-200 dB	14-19 KHz	NA	1 pulse every 15 seconds	Placed on seabed	Placed on seabed	85
Single beam echosounder One per vessel	Simrad	EA600	NA			38 KHz					85
USBL system	Kongsberg	HiPAP 501	NA			21-31 KHz					85

**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]

**Zone 5**

Parameters	
Survey Type	COIL
Zone Number	5

Schedule	
Season	# days
Summer	57
Winter	0

Exposures by Metric			
	Summer	Winter	Total
<b>Level A</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	0.52	< 0.01	0.52
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	29.98	< 0.01	29.98
<b>Level B</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	24.54	< 0.01	24.54
<b>Mid-Frequency Functional Hearing Group</b>			
Beaked whales (Cuvier/Blainville/Gervais)	6,426.86	< 0.01	6,426.86
Bottlenose dolphin	5,067.83	< 0.01	5,067.83
Short-finned pilot whale	599.72	< 0.01	599.72
Sperm whale	1,499.25	< 0.01	1,499.25
Atlantic spotted dolphin	2,086.27	< 0.01	2,086.27
Clymene dolphin	3,040.01	< 0.01	3,040.01
False killer whale	763.97	< 0.01	763.97
Fraser's dolphin	354.37	< 0.01	354.37
Killer whale	20.38	< 0.01	20.38
Melon-headed whale	2,073.29	< 0.01	2,073.29
Pantropical spotted dolphin	13,795.24	< 0.01	13,795.24
Pygmy killer whale	480.20	< 0.01	480.20
Risso's dolphin	891.90	< 0.01	891.90
Rough-toothed dolphin	1,103.66	< 0.01	1,103.66
Spinner dolphin	3,696.48	< 0.01	3,696.48
Striped dolphin	1,187.35	< 0.01	1,187.35
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	510.99	< 0.01	510.99

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
5.1525234	< 0.01	5.15
649.11	< 0.01	649.11
1454.47	< 0.01	1454.47
176.92	< 0.01	176.92
634.18	< 0.01	634.18
598.76	< 0.01	598.76
872.48	< 0.01	872.48
225.37	< 0.01	225.37
101.70	< 0.01	101.70
6.01	< 0.01	6.01
611.62	< 0.01	611.62
3959.24	< 0.01	3959.24
141.66	< 0.01	141.66
263.11	< 0.01	263.11
316.75	< 0.01	316.75
1060.89	< 0.01	1060.89
340.77	< 0.01	340.77
194.01	< 0.01	194.01

## Zone 2

Parameters	
Survey Type	COIL
Zone Number	2

Schedule	
Season	# days
Summer	8
Winter	0

Exposures by Metric			
	Summer	Winter	Total
<b>Level A</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	< 0.01	< 0.01	< 0.01
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	< 0.01	< 0.01	< 0.01
<b>Level B</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	< 0.01	< 0.01	< 0.01
<b>Mid-Frequency Functional Hearing Group</b>			
Beaked whales (Cuvier/Blainville/Gervais)	< 0.01	< 0.01	< 0.01
Bottlenose dolphin	7,305.69	< 0.01	7,305.69
Short-finned pilot whale	< 0.01	< 0.01	< 0.01
Sperm whale	< 0.01	< 0.01	< 0.01
Atlantic spotted dolphin	1,147.61	< 0.01	1,147.61
Clymene dolphin	< 0.01	< 0.01	< 0.01
False killer whale	5.51	< 0.01	5.51
Fraser's dolphin	1.87	< 0.01	1.87
Killer whale	0.03	< 0.01	0.03
Melon-headed whale	0.02	< 0.01	0.02
Pantropical spotted dolphin	0.32	< 0.01	0.32
Pygmy killer whale	0.02	< 0.01	0.02
Risso's dolphin	0.15	< 0.01	0.15
Rough-toothed dolphin	75.73	< 0.01	75.73
Spinner dolphin	< 0.01	< 0.01	< 0.01
Striped dolphin	< 0.01	< 0.01	< 0.01
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	< 0.01	< 0.01	< 0.01

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
< 0.01	< 0.01	< 0.01
7305.69	< 0.01	7305.69
< 0.01	< 0.01	< 0.01
< 0.01	< 0.01	< 0.01
1147.61	< 0.01	1147.61
< 0.01	< 0.01	< 0.01
5.51	< 0.01	5.51
1.87	< 0.01	1.87
0.03	< 0.01	0.03
0.02	< 0.01	0.02
0.32	< 0.01	0.32
0.02	< 0.01	0.02
0.15	< 0.01	0.15
75.73	< 0.01	75.73
< 0.01	< 0.01	< 0.01
< 0.01	< 0.01	< 0.01
< 0.01	< 0.01	< 0.01

**Zone 2 + 5**

Zone	2	5	2+5
Season	Summer	Summer	Summer
# days	8	57	65
Survey Type	Coil	Coil	Coil

<b>Level B</b>			
<b>Low-Frequency Hearing Group</b>			
Bryde's whale	0.00	27.98	27.98
<b>Mid-Frequency Functional Hearing Group</b>			
Beaked whales (Cuvier/Blainville/Gervais)	0.00	6,426.86	6,426.86
Bottlenose dolphin	7,305.69	5,067.83	12,373.52
Short-finned pilot whale	0.00	599.72	599.72
Sperm whale	0.00	1,499.25	1,499.25
Atlantic spotted dolphin	1,147.61	2,086.27	3,233.88
Clymene dolphin	0.00	3,040.01	3,040.01
False killer whale	5.51	763.97	769.49
Fraser's dolphin	1.87	354.37	356.24
Killer whale	0.03	20.38	20.41
Melon-headed whale	0.02	2,073.29	2,073.31
Pantropical spotted dolphin	0.32	13,795.24	13,795.57
Pygmy killer whale	0.02	480.20	480.22
Risso's dolphin	0.15	891.90	892.05
Rough-toothed dolphin	75.73	1,103.66	1,179.38
Spinner dolphin	0.00	3,696.48	3,696.48
Striped dolphin	0.00	1,187.35	1,187.35
<b>High-Frequency Hearing Group</b>			
Kogia (dwarf, pygmy sperm whale)	0.00	510.99	510.99

## E. Mitigation and Monitoring Efforts:

Question:	Response:
<p>Please indicate which set of monitoring and mitigation measures from the ITR's apply to the planned activity:</p>	<p>All monitoring and mitigation measures in the ITRs applicable to Airgun Surveys with a total volume &gt;1500 cu in will be followed. See attached file "Mitigation Measures.pdf" for a list of applicable monitoring and mitigation measures. Additionally, to avoid potential taking of killer whales, the airgun array will be shut down if killer whales are observed at any distance from the array while in operation.</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 3D OBN survey.</p>

## F. Map of Survey Area and Transit Route

[Insert map here or attach as a separate file]

