

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 : May 1st, 2024

End date : May 1st, 2025

BOEM permit# : L23-035

A. Type of Survey:

Please indicate which type of survey will be used in the proposed 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>

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.

#Note that the survey area, as permitted, is very large. It is not the intention of WesternGeco to acquire data in all the permitted area. However, at this time, we cannot be more specific as to the exact location as we are seeking underwriting from various Clients. The intention is to acquire a subset of the permitted area to produce a data set of approximately 200 OCS blocks .

B. Survey Area and Operational Plan:

Question:	Response
Location: (Lease Block(s), Facility or Prospect Name, Lat/Lon, etc.)	Green Canyon and Walker Ridge Engagement-5
Overall Duration of the Activity (days):	100 days for both node and source activity
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)	~200 OCS blocks for the node area ~500 OCS blocks for the source area Source and node perimeter shape files attached (see #note above)
G&G ITR/PEIS Modeling Zone(s) in which the activity will occur (1-7):	Zones 5 & 7 The proposed survey area is split between zones 5 and 7 with 66.7% of the survey in zone 5 and 33.3% in zone 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.)	65 days, 43 in zone 5 and 22 in zone 7 The survey is planned to last from mid-May to mid-October. Hence, summer has been used for the modelling.
Water depth range	700 m to 3,000 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: Gundalf_repB_5240_10m_2518.pdf and Gundalf_repC_5240_10m_6610.pdf
- The Gemini enhanced frequency source (EFS) is also under consideration for this project. The source description and modelling can be found in the attached file: Gemini_Source_Modelling_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	10 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
Gemini Enhanced frequency source (EFS)	Sercel	Gemini	8000	220	243	0-128 Hz	100 msecs	8 seconds	10 m	OBN receivers on Seabed	65

Note: the source will be either the standard air gun array or the Gemini EFS – both sources will not be utilized.

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	43
Winter	0

Exposures by Metric			
	Summer	Winter	Total
Level A			
Low-Frequency Hearing Group			
Bryde's whale	0.39	< 0.01	0.39
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	22.62	< 0.01	22.62
Level B			
Low-Frequency Hearing Group			
Bryde's whale	18.51	< 0.01	18.51
Mid-Frequency Functional Hearing Group			
Beaked whales (Cuvier/Blainville/Gervais)	4,848.33	< 0.01	4,848.33
Bottlenose dolphin	3,823.10	< 0.01	3,823.10
Short-finned pilot whale	452.42	< 0.01	452.42
Sperm whale	1,131.02	< 0.01	1,131.02
Atlantic spotted dolphin	1,573.85	< 0.01	1,573.85
Clymene dolphin	2,293.34	< 0.01	2,293.34
False killer whale	576.33	< 0.01	576.33
Fraser's dolphin	267.33	< 0.01	267.33
Killer whale	15.37	< 0.01	15.37
Melon-headed whale	1,564.06	< 0.01	1,564.06
Pantropical spotted dolphin	10,406.94	< 0.01	10,406.94
Pygmy killer whale	362.26	< 0.01	362.26
Risso's dolphin	672.83	< 0.01	672.83
Rough-toothed dolphin	832.58	< 0.01	832.58
Spinner dolphin	2,788.57	< 0.01	2,788.57
Striped dolphin	895.72	< 0.01	895.72
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	385.49	< 0.01	385.49

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
3.8869913	< 0.01	3.89
489.68	< 0.01	489.68
1097.23	< 0.01	1097.23
133.46	< 0.01	133.46
478.42	< 0.01	478.42
451.70	< 0.01	451.70
658.19	< 0.01	658.19
170.02	< 0.01	170.02
76.72	< 0.01	76.72
4.53	< 0.01	4.53
461.40	< 0.01	461.40
2986.79	< 0.01	2986.79
106.87	< 0.01	106.87
198.49	< 0.01	198.49
238.95	< 0.01	238.95
800.32	< 0.01	800.32
257.07	< 0.01	257.07
146.36	< 0.01	146.36

Zone 7

Parameters	
Survey Type	COIL
Zone Number	7

Schedule	
Season	# days
Summer	22
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)	5.48	< 0.01	5.48
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)	954.51	< 0.01	954.51
Bottlenose dolphin	4.33	< 0.01	4.33
Short-finned pilot whale	22.49	< 0.01	22.49
Sperm whale	104.90	< 0.01	104.90
Atlantic spotted dolphin	< 0.01	< 0.01	< 0.01
Clymene dolphin	422.01	< 0.01	422.01
False killer whale	153.56	< 0.01	153.56
Fraser's dolphin	71.93	< 0.01	71.93
Killer whale	15.43	< 0.01	15.43
Melon-headed whale	283.75	< 0.01	283.75
Pantropical spotted dolphin	4,189.72	< 0.01	4,189.72
Pygmy killer whale	135.70	< 0.01	135.70
Risso's dolphin	70.10	< 0.01	70.10
Rough-toothed dolphin	163.96	< 0.01	163.96
Spinner dolphin	98.31	< 0.01	98.31
Striped dolphin	219.22	< 0.01	219.22
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	52.19	< 0.01	52.19

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
96.41	< 0.01	96.41
1.24	< 0.01	1.24
6.63	< 0.01	6.63
44.37	< 0.01	44.37
< 0.01	< 0.01	< 0.01
121.12	< 0.01	121.12
45.30	< 0.01	45.30
20.64	< 0.01	20.64
4.55	< 0.01	4.55
83.71	< 0.01	83.71
1202.45	< 0.01	1202.45
40.03	< 0.01	40.03
20.68	< 0.01	20.68
47.06	< 0.01	47.06
28.22	< 0.01	28.22
62.92	< 0.01	62.92
22.24	< 0.01	22.24

Zone 5 + 7 Combined

Zone	5	7	5+7
Season	Summer	Summer	Summer / Winter
# days	43	22	65
Survey Type	Coil	Coil	Coil

Level B			
Low-Frequency Hearing Group			
Bryde's whale	3.89	0.00	3.89
Mid-Frequency Functional Hearing Group			
Beaked whales (Cuvier/Blainville/Gervais)	489.68	96.41	586.09
Bottlenose dolphin	1,097.23	1.24	1,098.47
Short-finned pilot whale	133.46	6.63	140.10
Sperm whale	478.42	44.37	522.79
Atlantic spotted dolphin	451.70	0.00	451.70
Clymene dolphin	658.19	121.12	779.31
False killer whale	170.02	45.30	215.32
Fraser's dolphin	76.72	20.64	97.37
Killer whale	4.53	4.55	9.09
Melon-headed whale	461.40	83.71	545.10
Pantropical spotted dolphin	2,986.79	1,202.45	4,189.24
Pygmy killer whale	106.87	40.03	146.90
Risso's dolphin	198.49	20.68	219.16
Rough-toothed dolphin	238.95	47.06	286.01
Spinner dolphin	800.32	28.22	828.54
Striped dolphin	257.07	62.92	319.99
High-Frequency Hearing Group			
Kogia (dwarf, pygmy sperm whale)	146.36	22.24	168.60

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 >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]

