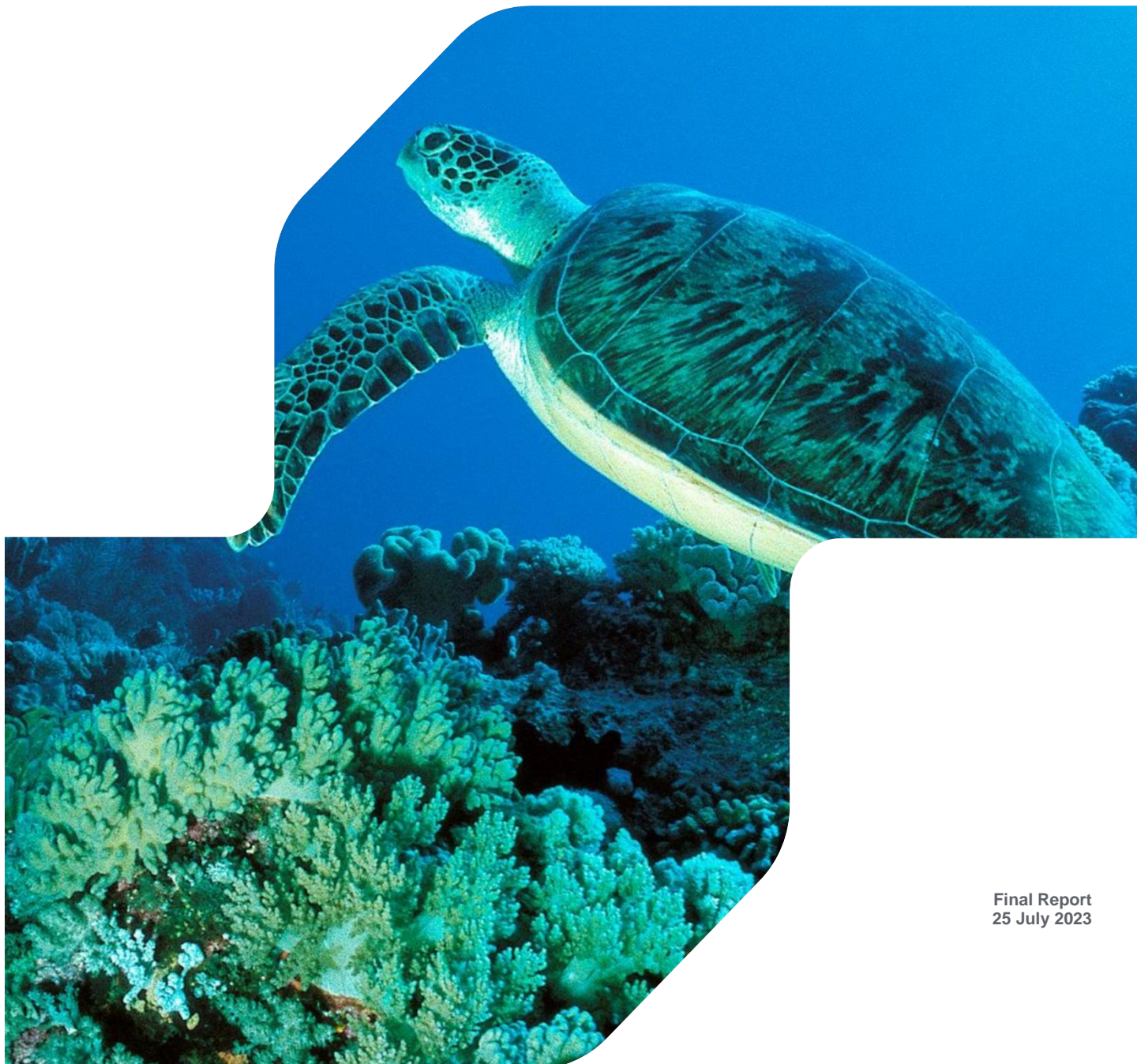


MURPHY OIL OCS-G 16987 WALKER RIDGE BLOCK 425 PROTECTED SPECIES OBSERVER REPORT

Prepared for: Murphy Oil



Final Report
25 July 2023

Contents

LIST OF ACRONYMS	4
1 EXECUTIVE SUMMARY	5
2 INTRODUCTION	6
2.1 BOEM Reporting Requirements	6
3 PROGRAM OVERVIEW	9
3.1 Vessel Summary	9
3.2 Equipment Specifications	9
3.2.1 Sound source equipment	9
4 MONITORING AND MITIGATION PROGRAM	11
4.1 Monitoring: PSOs and PAM Operators	11
4.2 Visual Monitoring: Protocols and Methods	11
4.2.1 Daylight Visual	12
4.3 Monitoring: Passive Acoustic Monitoring Protocols and Methods	13
4.3.1 Passive Acoustic Monitoring Parameters and Deployment	13
4.4 Monitoring: Data Collection	14
4.4.1 Data Collection Requirements & Methods	15
4.5 Mitigation Methodology	15
4.6 PSO Briefing	16
4.7 Reporting	16
4.7.1 Injured or Dead Protected Species	16
4.7.2 Non-functioning PAM System During Source Activity	16
4.7.3 Final Report	16
5 DATA RECORDS AND ANALYSIS METHODS	17
5.1 Operation Activity	17
5.2 Monitoring Effort	17
5.2.1 Summary of Environmental Conditions	17
5.3 Visual Sightings of Protected Species	18
5.3.1 Closest point of approach	18
5.4 Acoustic Detections	18
5.5 Correlated Visual and Acoustic Detections	19
5.6 Mitigation Measures Implemented	19
6 RESULTS	20
6.1 Operations Summary	20
6.2 Monitoring Effort	20
6.2.1 PAM Outages	21
6.3 Environmental Conditions	21
6.4 Visual Sightings	22
6.5 Acoustic Detections	22
6.6 Summary of Mitigation Measures Implemented	22
6.7 Protected Species Incident Reporting	22

Tables

Table 1: BOEM and NMFS Biological Opinion reporting requirements and location within this technical report	7
Table 2: General VSP survey parameters	9
Table 3: Vessel specifications	9
Table 4: Summary of key survey events by vessel on the VSP Survey.	9
Table 5: Seismic source specifications for the VSP	10
Table 6: Visual monitoring methodology during VSP	12
Table 7: Beaufort sea state scale	17
Table 8: Summary of seismic source operations aboard the <i>D/S Noble Stanley LaFosse</i>	20
Table 9: Summary of monitoring effort, visual and acoustic, by source activity status.....	20
Table 10: Summary of visibility during visual monitoring effort.....	21
Table 11: Summary of Beaufort sea state during visual monitoring during the survey	21
Table 12: Summary of swell height during visual monitoring during the survey	21

Figures

Figure 1: Electrical processing Unit and hydrophone array cable	14
Figure 2: Diagram of hydrophone connector cable.....	14

Appendices

APPENDIX A : NMFS BIOLOGICAL OPINION AND NMFS LETTER OF AUTHORIZATION
APPENDIX B : ENVIRONMENTAL MONITORING PLAN
APPENDIX C : SURVEY DRILLSHIP PHOTOS
APPENDIX D : PSOS AND PAM OPERATORS
APPENDIX E : VESSEL SPECIFIC PAM DEPLOYMENT PROCEDURES
APPENDIX F : EXCEL DATA SHEETS OF MONITORING EFFORT, SOURCE OPERATIONS AND DETECTIONS OF PROTECTED SPECIES DURING THE PROGRAM
APPENDIX G : REQUIRED ATTENDEES AT PSO BRIEFING
APPENDIX H : PAM CALIBRATION CERTIFICATION
APPENDIX I : LEAD PSO DATA CERTIFICATION

List of Acronyms

BO	Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the GOM
BOEM	Bureau for Ocean Energy Management
BZ	Buffer Zone
CPA	Closest Point of Approach
dB	Decibel
dB re 1 μ Pa (rms)	Decibel related to 1 micropascal (root mean square)
D/S	Drillship
DSLRL	Digital Single Lens Reflex
EPU	Electronic Processing Unit
EZ	Exclusion Zone
GOM	Gulf of Mexico
HF	High Frequency
Hz	Hertz
ID	Sighting Identity
in ³	Cubic inches
kHz	Kilohertz
km	Kilometer
LF	Low Frequency
m	Meters
min	Minute/s
MMPA	Marine Mammal Protection Act
NM	Nautical Miles
NMFS	National Marine Fisheries Service
PAM	Passive Acoustic Monitoring
psi	Pounds per Square Inch
PSO	Protected Species Observer
RPS	PSO Provider
s	Second/s
VSP	Vertical Seismic Profile

1 EXECUTIVE SUMMARY

This report covers the protected species mitigation measures and monitoring efforts during a Vertical Seismic Profile (VSP) survey conducted on board the drillship (D/S) *Noble Stanley LaFosse* on 03 July 2023. This is the first and final report for the Murphy Oil *D/S Noble Stanley LaFosse* VSP, which was conducted by Baker Hughes in Walker Ridge protraction area, Block 425, US Gulf of Mexico (GOM), under OCS-G 16987 and LOA issued 14 June 2023.

During this VSP survey, three Protected Species Observers (PSOs) and four Passive Acoustic Monitoring (PAM) Operators, all provided by RPS, were onboard the drillship *D/S Noble Stanley LaFosse* to undertake visual and acoustic monitoring in accordance with the Biological Opinion (BO) on the Federally Regulated Oil and Gas Program Activities in the GOM issued by the National Marine Fisheries Service (NMFS) on 13 March 2020.

During acquisition of the VSP, the seismic source on the *D/S Noble Stanley LaFosse* was active for a total of 08 hours 22 minutes. This included six ramp-ups with a total duration of 02 hours 02 minutes, 01 hour 43 minutes of source testing, 03 hours and 24 minutes of acquisition at full source volume, and 01 hour 13 minutes of full volume non-production while positioning tool at acquisition stations.

Visual observations were conducted for a total of 29 hours 35 minutes and acoustic PSOs conducted PAM monitoring for a total of 19 hours. All source activity was accompanied by visual and acoustic monitoring during the day and by acoustic monitoring during the night.

There were neither visual nor acoustic detections of protected species during the survey.

There were no mitigation actions required during the survey.

2 INTRODUCTION

The *D/S Noble Stanley LaFosse* VSP survey was conducted by Baker Hughes on behalf of Murphy Oil under Ancillary Activity Plan for OCS-G 16987 and LOA issued 14 June 2023. NMFS and Bureau for Ocean Energy Management (BOEM) have advised that sound-producing survey equipment operating in the hearing range of marine species has the potential to cause acoustic harassment, in particular to marine mammals. Protected species monitoring was conducted in accordance with BOEM and NMFS standards.

The survey company conducting operations was responsible for contracting PSOs through a provider to conduct monitoring and mitigation for protected species, including marine mammals, sea turtles, Gulf sturgeon, oceanic whitetip shark and giant manta rays during their activities. Monitoring and mitigation procedures that were implemented during the survey are described in Section 4 of this report.

2.1 BOEM Reporting Requirements

This report summarizes the information required by the BOEM permit OCS-G 16987 and LOA issued 14 June 2023 and the NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the GOM (BO) identified in Table 1.

Table 1: BOEM and NMFS Biological Opinion reporting requirements and location within this technical report

Required content	Source reference	Location addressed in technical report
BOEM		
<p>SEISMIC SURVEY OPERATION, MONITORING, AND REPORTING GUIDELINES: The applicant will follow the guidance provided under Appendix A. Seismic Survey Mitigation and Protected Species Observer Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on NOAA Fisheries internet website at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federallyregulated-oil-and-gas-program-gulf-mexico.</p>	BOEM OCS-G 34993	This Technical Report
<p>PSOs must use a standardized data collection form, whether hard copy or electronic. PSOs shall record detailed information about any implementation of mitigation requirements, including the distance of animals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up of the acoustic source. If required mitigation was not implemented, PSOs should record a description of the circumstances.</p>	NMFS BO Appendix A	Section 6.6
<p>The MMPA authorization (as applicable) and BOEM Permit/Plan holder shall submit a draft comprehensive report to BOEM/BSEE (protectedspecies@boem.gov and protectedspecies@bsee.gov) and NMFS (nmfs.psoreview@noaa.gov) on all activities and monitoring results within 90 days of the completion of the survey or expiration of the MMPA authorization (as applicable) or BOEM Permit/Plan, whichever comes sooner, or if an issued MMPA authorization is valid for greater than one year, the summary report must be submitted on an annual basis,. The report must describe all activities conducted and sightings of protected species near the activities, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all protected species sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). A final report must be submitted within 30 days following resolution of any comments on the draft report.</p>	NMFS BO Appendix A	This Technical Report
<p>The MMPA authorization (as applicable) and BOEM Permit/Plan holder must report sightings of any injured or dead aquatic protected species immediately, regardless of the cause of injury or death. For injured or dead non-marine mammal aquatic protected species, report incidents to the hotlines listed at https://www.fisheries.noaa.gov/report (phone numbers vary by state). For</p>	NMFS BO Appendix A	Section 6.6

Required content	Source reference	Location addressed in technical report
reporting dead or injured marine mammals, refer to the reporting requirements specified in the MMPA authorization (as applicable), associated with the activity being conducted.		
NMFS and BSEE must be notified via email (nmfs.psoreview@noaa.gov and protectedspecies@bsee.gov, respectively) as soon as practicable with the time and location of any operations conducted without an active PAM system. The notification will include the vessel name, the time and location (GIS position) in which the PAM system ceased function where seismic operations continued.	NMFS BO Appendix A	Section 6.2.1
NMFS LOA		
PSOs must use standardized electronic data forms. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of marine mammals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up or activation of the acoustic source. If required mitigation was not implemented, PSOs must record a description of the circumstances.	NMFS LOA, Section 5 (c)	Appendix F: Excel Data Sheets of Monitoring Effort, Source Operations, and Detections of Protected Species during the Survey
The draft report must be accompanied by a certification from the lead PSO as to the accuracy of the report, and the lead PSO may submit directly to NMFS a statement concerning implementation and effectiveness of the required mitigation and monitoring.	NMFS LOA, Section 6 (a) iv	Appendix J: Lead PSO Data Certification
A final report must be submitted within 30 days following resolution of any comments on the draft report.	NMFS LOA, Section 6 (a) v	This technical report
Reporting of injured or dead marine mammals: In the event that personnel involved in the survey activities discover an injured or dead marine mammal, the Holder must report the incident to the Office of Protected Resources (OPR), NMFS and to the Southeast Regional Stranding Network as soon as feasible.	NMFS LOA, Section 6 (c) i-ii	Section 6.7 Protected species incident reporting
In the event of a ship strike of a marine mammal by any vessel involved in the survey activities, the LOA-holder must report the incident to OPR, NMFS and to the Southeast Regional Stranding Network as soon as feasible.		

3 PROGRAM OVERVIEW

The survey area is located 384 km (207 NM) south of Louisiana, within the block of Green Canyon 564, US GOM. Water depths in the project area is 8,829 ft (2,691 m).

Table 2: General VSP survey parameters

Survey parameters	<i>D/S Noble Stanley LaFosse</i>
General location	Walker Ridge Block 425, Gulf of Mexico
Water depth (m)	2,691 m
Port location	Fourchon, LA

3.1 Vessel Summary

The VSP Survey was undertaken from the *D/S Noble Stanley LaFosse*. Specifications of the drillship are provided in Table 3 and a photo is included in Appendix C. A high-level overview of survey events for each vessel is outlined in Table 4.

Table 3: Vessel specifications

Vessel name	Scope of work	Length (m)	Width (m)	Dates on project
<i>D/S Noble Stanley LaFosse</i>	VSP Source vessel	228	42	01 July 2023 - 04 July 2022

Table 4: Summary of key survey events by vessel on the VSP Survey.

Event	Dates
PSO team mobilizes	01 July 2023
Project kick-off meetings	02 July 2023
Seismic array testing begins	03 July 2023
VSP acquisition begins	03 July 2023
Data acquisition complete	03 July 2023

3.2 Equipment Specifications

3.2.1 Sound source equipment

The VSP was acquired using one airgun array (Appendix C), consisting of six airguns, deployed 20 meters off the port side of the vessel at a depth of 15 meters. Each of the six airgun elements had a

volume of 225 cubic inches (in³) such that the total operating volume, or “full” volume, of the source array was 1,350 in³. The operating intensity was 15.5 bar meters at a target frequency of 40 Hz (Table 5).

Table 5: Seismic source specifications for the VSP

Source specification	<i>D/S Noble Stanley LaFosse VSP</i>
Total source volume (in ³)	1,350
Number of source arrays	1
Total number of source elements In full volume source	6
Source depth (m)	15
Source distance from vessel (m)	20
Source frequency (Hz)	40
Source intensity (dB re 1μPa or bar meters)	15.5 bar meters
Shot point interval (s)	30

4 MONITORING AND MITIGATION PROGRAM

This section describes the protected species monitoring and mitigation measures established to meet the requirements of the BOEM permit and the NMFS BO. Survey mitigation measures were designed to minimize potential impacts of the survey activities on marine mammals, sea turtles, and other protected species of interest.

The following monitoring protocols were implemented to meet these objectives, and each are described in detail in a sub-section below:

- Visual observations were conducted during the day to provide real-time sighting data, allowing for the implementation of mitigation procedures as necessary.
- A PAM system was operated continuously day and night to augment visual observations and provide additional marine mammal detection data.
- Protected species exclusion zones (EZ) (Section 4.5) were established around the seismic sound source where delays to initiation of the source and shutdowns of the active source were implemented when protected species were detected inside.

4.1 Monitoring: PSOs and PAM Operators

There were trained and experienced PSOs on board the drillship during VSP survey activities to conduct the monitoring for protected species, record and report detections, and request mitigation actions in accordance with the established regulatory requirements and monitoring plan.

The PSO Provider (RPS) was responsible for ensuring that each PSO deployed met the minimum requirements set forth by BOEM and by NMFS, who were required to review and approve each PSO prior to their deployment as an Observer. BOEM and NMFS PSO requirements include training in protected species identification and behavior in addition to field experience in protected species observation in the Atlantic Ocean or the GOM.

RPS was responsible for the provision of training certifications and CVs to be reviewed and approved prior to deployment on the vessel.

RPS was responsible for providing the PSOs with vessel-specific and survey contractor-specific training. Environmental Project Inductions specific to the VSP survey were provided by RPS, Baker Hughes, and Murphy Oil during project kick-off meetings, conducted prior to the start of survey operations and prior to scheduled crew changes.

All certified PSOs who were deployed during the VSP survey operations are listed in Appendix D.

4.2 Visual Monitoring: Protocols and Methods

A team of three PSOs was deployed on *D/S Noble Stanley LaFosse*. PSOs monitored prior to and during all seismic source operations conducted by the vessel. Visual monitoring was also conducted during all periods between source activities in order to collect additional protected species data. Two PSOs monitored at a time on a rotating watch schedule (watch periods not to exceed two hours without a minimum one-hour break, and a maximum watch duration of 12 hours within a 24-hour period).

Visual monitoring locations on the vessel were selected to maximize or in consideration of the following factors:

1. To afford PSOs a 360-degree viewpoint around the vessel and acoustic source, such that the monitoring zones around the sound source could be monitored,
2. Provide the highest vantage point possible so as to allow for monitoring out to the greatest distances around the vessel,
3. Provide shelter from inclement weather, as needed,
4. Provide real-time communication with vessel and seismic equipment operators.

PSOs conducted their visual monitoring by actively scanning with the naked eye out to the furthest observation points visible, methodically sweeping areas closer to the vessel, focusing on the EZs. PSOs conducted regular sweeps of the surrounding areas using magnification devices as described below. PSOs monitored for cues that might indicate the presence of protected species including but not limited to splashing, footprints, blows, and presence of other marine species (diving seabirds, fish feeding activity).

Table 6: Visual monitoring methodology during VSP

<i>D/S Noble Stanley LaFosse</i>	
Total number of PSOs or PSO/PAMs	7
Number of PSOs on watch - day	3
Visual monitoring equipment- Day	Handheld reticle binoculars Big Eye binoculars Digital SLR cameras
Visual monitoring conducted at night	No
Range estimation	With reticle binoculars, by relating to object at known distance
Primary monitoring location	Bridge wings (Nav deck)

Displays inside the bridge showed current information about the vessel (e.g., position, speed, heading, etc.), sea conditions (e.g., water depth, sea temperature, etc.), and weather (e.g., wind speed and direction, air temperature, etc.). Environmental conditions, along with vessel and acoustic source activity, were recorded at least once an hour, or every time there was a change of one or more of the variables.

4.2.1 Daylight Visual

The PSOs on board were equipped with 7x50 reticle binoculars, as well as Digital Single Lens Reflex (DSLR) cameras with 300mm zoom lenses to aid in visual monitoring watches conducted during the day.

Big eye binoculars (SW25X and 40XI of 25/62 x 100 magnification) were installed on each of the starboard and port bridge wing of the drillship.

PSO teams used field notebooks to record data while on watch and laptops were used to enter data on breaks between watches and at the end of each day.

Range estimates were made by comparison to object of known distance, as well as with reticle binoculars. Reticle binoculars were calibrated whenever possible to ensure accuracy of distance data.

4.3 Monitoring: Passive Acoustic Monitoring Protocols and Methods

PAM was used to augment visual monitoring efforts in the detection, identification, and locating of marine mammals. Acoustic monitoring was conducted continuously day and night during all source operations and to the maximum extent possible when no operations were being undertaken.

Acoustic monitoring was undertaken by trained PAM Operators each of whom had completed a BOEM accepted PSO training course and an RPS in-house PAM training course, which includes use of the PAM systems on board a vessel offshore. PAM monitoring shifts were no longer than four hours in duration followed by at least a two-hour break.

The PAM system was installed in a location which provided space for the system, allowed for quick communication with the visual PSOs and source operators, and provided access to the vessel's instrumentation screens. Information about the vessel (e.g., position, heading, and speed), water depth, source activity, and the PAM system (e.g., cable deployments/retrievals, changes to the system, background noise score) were recorded at least once an hour, or whenever any of the parameters changed.

Acoustic monitoring for marine mammals was conducted aurally, utilizing Sennheiser headphones, and visually with the PAMGuard software program. Low to mid-frequency delphinid whistles, clicks, and burst pulses, as well as sperm whale clicks and baleen whale vocalizations, could be visualized in PAMGuard's spectrogram modules. Odontocete clicks could also be visualized in low frequency (LF) and high frequency (HF) click detector modules. Settings adjustments to amplitude range, amplitude triggers, and spectral content filters, among others, could be made in PAMGuard's spectrogram. Click detector modules to maximize the distinction between cetacean vocalizations and ambient signal were used. The map module within PAMGuard could be utilized to attempt localizing the position and range of vocalizing marine mammals. Sound recordings could be made using the HF and LF sound recording modules when potential marine mammal vocalizations were detected, or when the operator noted unknown or unusual sound sources.

4.3.1 Passive Acoustic Monitoring Parameters and Deployment

A PAM system designed to detect most species of marine mammals was installed on the *D/S Noble Stanley LaFosse*. The systems were developed by Seiche Measurements and consisted of the following main components: a single hydrophone static cable, a National Instrument sound buffer, a laptop computer, and a suite of analysis software. A spare system was also present on board in the event the main system components became damaged or inoperable. Figure 1 shows the Electronic Processing Unit (EPU) and array cable.



Figure 1: Electrical processing Unit and hydrophone array cable

The hydrophone array cable contained one hydrophone element (Figure 2: Diagram of hydrophone connector cable).

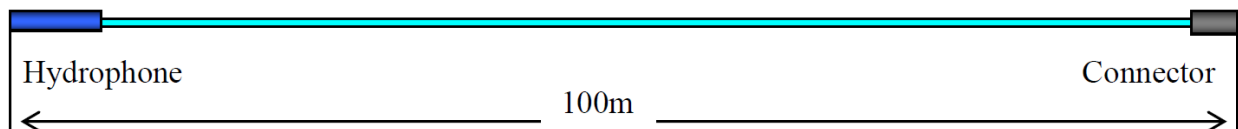


Figure 2: Diagram of hydrophone connector cable

The hydrophone array was deployed from the port aft main deck following vessel-specific deployment and retrieval procedures developed by the PAM Operator team in co-operation with relevant vessel crew. To deploy a PAM hydrophone array from *the D/S Noble Stanley LaFosse*, the PAM operator must secure a permit which is issued by the *D/S Noble Stanley LaFosse’s* tool-pusher and approved by the safety officer and Captain/OIM. Prior to deployment or retrieval of the hydrophone cable, all relevant personnel involved attended a toolbox meeting, covering the procedures approved, as well as Murphy Oil, Noble, and RPS safety requirements. The EPU was powered down prior to connection or disconnection and the hydrophone cable was disconnected to ensure the safety of the equipment.

The hydrophone array was deployed and retrieved by hand from the port aft main deck, a location that was 20 meters from the seismic array. The hydrophone cable was deployed over the handrail and secured in place such that the hydrophone element was ten meters below the lowest point of the ship’s hull.

The full hydrophone deployment procedure for vessel can be found in Appendix E

4.4 Monitoring: Data Collection

During or immediately after each sighting event, the PSOs recorded the detection details in a standardized detection datasheet provided to them by RPS. Excel data forms included tabs for project data, monitoring effort data, seismic data, and protected species detection data. RPS supplied a set of standardized variables for specific data fields that were to be implemented on the data form provided to their PSOs.

Each sighting event was linked to an entry on an effort datasheet where specific environmental conditions and vessel activity were logged.

Species identifications were made whenever the distance of the animal(s), length of the sighting, and visual observation conditions allowed. Whenever possible during detections, photographs were taken with DSLR cameras that had telephoto lenses. Marine mammal identification manuals were consulted, and photos were examined during observation breaks to confirm identifications.

Identification of marine mammals, sea turtles was made or confirmed using identification guides: Guide to Marine Mammals and Turtles of the U.S. Atlantic & Gulf of Mexico (Wynne, K. and Schwartz, M. 1999); Guide to marine mammals of the world (Pieter A Folkens and Randall R Reeves); Whales, Dolphins and Seals: A Field Guide to the Marine Mammals of the World (Shirihai, H. and Jarett, B. 2006). For the identification of other wildlife, the guide used was Peterson Field Guide to Birds of North America (Peterson R., 2008).

While acoustic monitoring does not allow assessment of group size with the same level of precision as by visual observation, the LF and HF click detector modules in PAMGuard allow PAM Operators to identify when multiple animals are vocalizing simultaneously or in very close succession. Click detectors present cetacean click trains on computer displays, spatially differentiated by relative bearings to the hydrophone array, so when multiple click trains occur simultaneously or in close succession, and the click trains come from different bearings, the PAM Operator knows the click trains originate from different animals. While this does not allow the PAM Operator to estimate a total group size, it does provide the PAM Operator an estimate for the minimum group size.

4.4.1 Data Collection Requirements & Methods

Data was collected to meet the requirements of BOEM, and the NMFS BO as summarized in Table 1 of this report.

PSOs and PAM Operators collected data in handwritten notepads or on portable / tablet devices during watches. During watch breaks and at the end of daylight hours, data was compiled in proprietary data forms on laptop computers and backed up on portable hard drives.

4.5 Mitigation Methodology

The following mitigation actions were required for visual and acoustic detections of protected species, including marine mammals and sea turtles:

- Establishment of Buffer Zone (BZ) around seismic array
 - 1500-meter BZ for all true whales
 - 1000-meter BZ for all other marine mammals and sea turtles
- Establishment of Exclusion Zone (EZ) around seismic array
 - 1500-meter EZ for all true whales
 - 500 meters for all other marine mammals
- Search periods of 30 minutes conducted visually and acoustically (daytime) or acoustically (all periods of reduced visibility, including night) prior to the initiation of the acoustic array from silence.
- If marine mammals or sea turtles were detected inside their respective BZ during the search period prior to the initiation of the source, delays to the initiation of the sound source were implemented until all animals had been observed exiting the BZ, or when the animals were not observed exiting, 15 minutes for small odontocetes and 30 minutes for all other marine mammals and sea turtles were implemented. All delays for acoustic-only detections were for 30 minutes.

- Shut down of the active source upon detection of marine mammals inside their respective EZ. Shut down was not required for dolphins of the genera *Steno*, *Tursiops*, *Stenella*, and *Lagenodelphis*. In the event of an acoustic detection of dolphins inside the EZ, unless a visual observer or PAM Operator could confirm that the animals detected were not of one of the four shutdown-exempted genera listed above, the detection was assumed to have been of one of those genera, and no shutdown was required.
- Once the sound source had been shut down for a protected species detection, operations would resume with ramp-up after either all animals were observed exiting the exclusion zone, or when they were not observed exiting, 30 minutes had passed.

4.6 PSO Briefing

A PSO Briefing, meeting the requirements of the BO, was conducted on the *D/S Noble Stanley LaFosse* on 02 July 2022, prior to commencement of this survey where the PSO-PAM team, survey crew, marine crew, client representatives, and the other members of the crew involved in survey operations attended. The purpose of this meeting was to discuss mitigation protocols, roles and responsibilities, the authority of PSO/PAM to call for delays and shutdowns, specific communication protocols and language to be used, as well as the requirement for clearance requests to be made to PSO/PAM before initiating the airguns from silent periods of any length. A list of attendees may be found in Appendix G.

4.7 Reporting

Reporting requirements of the BOEM permit and the NMFS BO were outlined in A Letter of Authorization from NMFS was applied to the survey and referenced in Table 1. Both agencies require that a final PSO survey report to be prepared detailing survey operations, monitoring effort, and detection of protected species.

4.7.1 Injured or Dead Protected Species

Any injured or dead marine mammal or sea turtle observed either by a PSO on watch or by a crew member was required be reported to BOEM and NMFS as described in Table 1. Reporting requirements included a phone notification to the NMFS Regional Stranding hotline as soon as practicably possible, made by either the Lead PSO or shore based PSO Provider, as communications permitted from the vessel.

The Lead PSO would also prepare a written report in accordance with NMFS standard reporting guidelines and using the template provided by BOEM in the lease, which would be submitted to Murphy Oil for submittal to the agencies.

4.7.2 Non-functioning PAM System During Source Activity

RPS has prepared reports for each PAM outage event during source activity to meet the GOM BO report requirements outlined in Table 1 of this report. PAM outage reports for the *D/S Noble Stanley LaFosse* were submitted to Murphy Oil, NMFS, and BOEM on the day of the event. During the survey, there were no PAM outages that required reporting to NMFS and BOEM.

4.7.3 Final Report

RPS has prepared this Technical Report to meet the BOEM lease reporting requirements outlined in Table 1 of this report. A Letter of Authorization from NMFS was applied for but at the time of issuance of the report, has not yet need issued.

5 DATA RECORDS AND ANALYSIS METHODS

5.1 Operation Activity

PSOs and PAM Operators collected the seismic source's operational status each day that they were deployed on the vessel.

5.2 Monitoring Effort

PSOs and PAM Operators recorded monitoring effort by entering start of watch and end of watch times into data sheets where the vessel position and environmental data was also documented for that duration.

Total monitoring effort was calculated by summing the durations of each watch period. The monitoring effort entry also indicated the source status for that monitoring period.

Visual monitoring while the acoustic source was off included monitoring conducted prior to the start of VSP operations and any other recorded silent periods (mitigation action, equipment downtime, or weather standby time).

5.2.1 Summary of Environmental Conditions

Each PSO monitoring effort data form included environmental conditions present during that watch period. Environmental variables were recorded every 30 to 60 minutes or when conditions changed.

Beaufort sea state was recorded for each monitoring period using the accepted scale (Table 7):

Table 7: Beaufort sea state scale

Beaufort number	Description	Wave height	Sea conditions
0	Calm	0 m	Sea like a mirror
1	Light air	0–0.3 m	Ripples with appearance of scales are formed, without foam crests
2	Light breeze	0.3–0.6 m	Small wavelets still short but more pronounced; crests have a glassy appearance but do not break
3	Gentle breeze	0.6–1.2 m	Large wavelets: crests begin to break; foam of glassy appearance; perhaps scattered white horses
4	Moderate breeze	1–2 m	Small waves becoming longer; fairly frequent white horses
5	Fresh breeze	2–3 m	Moderate waves taking a more pronounced long form; many white horses are formed; chance of some spray
6	Strong breeze	3–4 m	Large waves begin to form; the white foam crests are more extensive everywhere; probably some spray
7	High wind,	4–5.5 m	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind; spindrift begins to be seen
8	Gale	5.5–7.5 m	Moderately high waves of greater length; edges of crests break into spindrift; foam is blown in well-marked streaks along the direction of the wind
9	Severe gale	7–10 m	High waves; dense streaks of foam along the direction of the wind; sea begins to roll; spray affects visibility

10	Storm	9–12.5 m	Very high waves with long overhanging crests; resulting foam in great patches is blown in dense white streaks along the direction of the wind; on the whole the surface of the sea takes on a white appearance; rolling of the sea becomes heavy; visibility affected
11	Violent storm	11.5–16 m	Exceptionally high waves: small- and medium-sized ships might be for a long time lost to view behind the waves; sea is covered with long white patches of foam; everywhere the edges of the wave crests are blown into foam; visibility affected
12	Hurricane force	>14 m	The air is filled with foam and spray; sea is completely white with driving spray; visibility very seriously affected

The swell heights were categorized: less than 2 meters, 2 to 4 meters, and greater than 4 meters.

PSOs categorized visibility during visual monitoring effort in kilometers and/or meters as less than 500 meters, 500 meters to 1 kilometer, 1 to 2 kilometers, 2 to 5 kilometers and greater than 5 kilometers.

5.3 Visual Sightings of Protected Species

PSOs used standardized reporting forms provided by RPS to record all detections of marine mammals and sea turtles made during survey operations. These records were completed any time a sighting was made, regardless of distance, not just for detections where mitigation was implemented.

Sighting identity (ID) or detection event numbers were assigned chronologically for all protected species observed. A new detection number was assigned for a new species sighting or when enough time had passed between observations of animals of the same species such that PSOs could not be certain that they were observing the same animals previously documented. A standard duration of time was to be applied between observations: 15 minutes for delphinid detections and 30 minutes for large whales. If there were multiple species in a single detection, the same sighting ID or detection event was used.

Protected species movement relative to the vessel, pace, and initial and subsequent behavior states were recorded for each protected species sighting where standardized categories for each were provided as controlled fields in the provided data form.

5.3.1 Closest point of approach

All PSOs recorded Closest Point of Approach (CPA), if the source was deployed at time of detection, and the source status at the CPA.

5.4 Acoustic Detections

PAM Operators used standardized reporting forms provided by RPS to record all acoustic detections of marine mammals. These records were completed any time an acoustic detection was made, not just for detections where mitigation was implemented.

Detection ID or detection event numbers were assigned chronologically for acoustic detections on a vessel throughout that vessel’s survey activity. A new detection number was assigned for a new species detection or when enough time had passed between detection cues of animals of the same species such that PAM Operators could not be certain that they were detecting the same animals as previously documented. A standard duration of time was to be applied between observations: 15 minutes for delphinid detections and 30 minutes for large whales.

The method/modules on which vocalizations were detected and the method used for distance estimation was recorded for every event where standardized categories for each were provided as controlled fields in the provided data form.

5.5 Correlated Visual and Acoustic Detections

Any visual and acoustic detection event of the same species/species group that overlapped in time (period of time between initial and final detection), was recorded as a correlated visual and acoustic detection. The time at first and last detection was recorded for each detection method and the method that initial detection was made was also recorded where PSO/PAM selected from controlled fields that included each detection method as well as whether the detection had been communicated to the other person on watch (PSO or PAM).

5.6 Mitigation Measures Implemented

Mitigation measures were implemented as previously described. The PSO team communicated and requested mitigation in real time to the seismic source operators. Communications were conducted over handheld radios or in person.

Implemented mitigation actions were recorded on PSO data sheets in the detection data form and in the operations activity logs.

For each mitigation action, the mitigation downtime associated with that action was calculated. Mitigation downtime was the duration of the break in source operations as required by the regulatory protocols: the duration of time that an animal was observed inside an EZ and any additional clearance time required before source could be activated. Mitigation downtime did not include any additional downtime that a survey operator needed in order to resume acquisition.

6 RESULTS

This section of the report details source operations, protected species monitoring effort, environmental conditions during monitoring effort and distribution, and detection data.

The monitoring effort, source operations and protected species detections for the project vessel are provided as an excel file as Appendix F.

6.1 Operations Summary

Survey operations began two days after the PSO-PAM and survey teams mobilized to the vessel via helicopter. A breakdown of source operations can be found in Table 8.

Table 8: Summary of seismic source operations aboard the *D/S Noble Stanley LaFosse*

Source status	Duration (hh.hh)
Testing at reduced source volume	00:00
Testing at full source volume	1.72
Ramp-up	02.03
Full volume while not acquiring production data	01.22
Full volume while acquiring production data	3.40
Total source activity	08.37

On 03 July 2023, after two failed attempts to calibrate the array during source testing, acquisition was delayed, and the source array was retrieved to the riser deck. An hour after retrieval, maintenance on deck, and redeployment, the array was properly calibrated, depth correction made after a correlation pass, and acquisition began with Station #1 at 14:30 UTC.

6.2 Monitoring Effort

Visual and acoustic monitoring effort for the VSP is summarized in Table 9.

Table 9: Summary of monitoring effort, visual and acoustic, by source activity status

Vessel	Source Active		Source Inactive		All Source Statuses	
	Duration (hh.hh)		Duration (hh.hh)		Duration (hh.hh)	
	Visual	PAM	Visual	PAM	Visual	PAM
<i>D/S Noble Stanley LaFosse</i>	6.52	8.37	23.06	10.63	29.58	19.00

6.2.1 PAM Outages

There were no PAM outages that met the requirements to be recorded and reported as described in the BO during this survey.

6.3 Environmental Conditions

Environmental conditions can have an impact on the probability of detecting protected species in a survey area, especially visibility, swell and Beaufort Sea state.

Most of the monitoring effort (98.04%) for the survey was undertaken in conditions where visibility extended to greater than five kilometers, this is summarized in Table 10.

Table 10: Summary of visibility during visual monitoring effort

Visibility	Duration (hh.hh)	% of Overall monitoring effort
Greater than 5 km	29.00	98.04%
2 to 5 km	00.00	00.00%
Less than 2 km	00.58	01.96%

Monitoring effort was conducted in Beaufort sea states ranging from Level 2 through Level 3, but the majority of the monitoring effort was accumulated at sea states Level 2, which is generally considered to be favorable conditions for monitoring for most marine mammal species. Visual observations at Level 2 Beaufort Sea states accounted for 86.71% of the total visual monitoring effort, as summarized in Table 11.

Table 11: Summary of Beaufort sea state during visual monitoring during the survey

Beaufort sea state	Duration (hh.hh)	% of Overall monitoring effort
B2	25.65	86.71%
B3	3.93	13.29%
B2 through B3	29.58	100.00%

Swell heights during visual observations were less than two meters for the entire monitoring effort as summarized in (Table 12).

Table 12: Summary of swell height during visual monitoring during the survey

Swell height	Duration (hh.hh)	% of overall monitoring effort
Less than 2 meters	29.58	100.00%
2 to 4 meters	00.00	00.00%
Greater than 4 meters	00.00	00.00%

6.4 Visual Sightings

There were no visual detections of protected species during the survey.

6.5 Acoustic Detections

There were no acoustic detections of marine mammal during the survey.

6.6 Summary of Mitigation Measures Implemented

There were no mitigation measures implemented during the survey.

6.7 Protected Species Incident Reporting

There were no observations of dead or injured protected species during the survey.

Appendix A: NMFS Biological Opinion and NMFS Letter of Authorization

Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols

This Appendix has been revised as of April 26, 2021, and replaces the original Appendix C (dated March 13, 2020). These protocols will be implemented by the Bureau of Ocean Energy Management (BOEM), the Bureau of Safety and Environmental Enforcement (BSEE), and provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361-1423h). The measures contained herein apply to all seismic surveys approved by BOEM and associated with the federally regulated oil and gas program in the Gulf of Mexico.

Background

Geophysical surveys, including the use of airguns and airgun arrays may have an impact on marine wildlife. Many marine species are protected under the Endangered Species Act (ESA) and all marine mammals (including manatees) are protected under the Marine Mammal Protection Act (MMPA). The following Gulf of Mexico species are listed under the ESA:

ESA-listed Species common to the Gulf of Mexico
Gulf of Mexico Bryde's Whale (<i>Balaenoptera edeni</i>)
Sperm Whale (<i>Physeter macrocephalus</i>)
Green Turtle (<i>Chelonia mydas</i>) – North Atlantic DPS and South Atlantic DPS
Hawksbill Turtle (<i>Eretmochelys imbricata</i>)
Kemp's Ridley Turtle (<i>Lepidochelys kempii</i>)
Leatherback Turtle (<i>Dermochelys coriacea</i>) - Northwest Atlantic DPS
Loggerhead Turtle (<i>Caretta caretta</i>) – Northwest Atlantic Ocean DPS
Gulf Sturgeon (<i>Acipenser oxyrinchus desotoi</i>)
Oceanic Whitetip Shark (<i>Carcharhinus longimanus</i>)
Giant Manta Ray (<i>Manta birostris</i>)
West Indian Manatee (<i>Trichechus manatus</i>)*

*Managed by the US Fish and Wildlife Service

Note that this list can change as other species are listed/delisted, and this protocol shall be applied to any ESA-listed protected species (and all marine mammals) that occur in the Gulf of Mexico, including rare and extralimital species.

BSEE and BOEM consult jointly with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) under Section 7 of the ESA to ensure that BOEM- or BSEE-authorized activities do not jeopardize the continued existence of ESA-listed species nor result in destruction or adverse modification of designated critical habitat. Incidental take of ESA-listed species is prohibited except as authorized pursuant to an Incidental Take Statement in the attached Biological Opinion. Incidental take of ESA-listed marine mammals cannot be exempted under the ESA unless also authorized under the MMPA. In this case, NMFS is

developing an incidental take regulation (ITR) to facilitate subsequent issuance of MMPA authorization (as applicable) to operators to authorize take incidental to seismic surveys. The proposed regulations would establish a framework for authorization of incidental take by Level A and Level B harassment through MMPA authorization (as applicable). Once an ITR and subsequent LOA is complete, the Biological Opinion and associated Incidental Take Statement may be amended to exempt take for Gulf of Mexico Bryde's whale and sperm whale, which are listed under the ESA. Following development of the ITRs, implementation could occur via issuance of MMPA authorization (as applicable and as Letters of Authorization [LOAs]) upon request from individual industry applicants planning specific seismic survey activities.

These protocols are the result of coordination between BOEM, BSEE, and NMFS and are based on: past and present mitigation measures; terms and conditions and reasonable and prudent measures identified in the attached Biological Opinion issued to the Bureaus; conditions, mitigation, monitoring, and reporting requirements identified in the MMPA ITR (50 CFR part 217 Subpart S); and NMFS' technical memorandum on standards for a protected species observer and data management program (Baker et al. 2013). BSEE is tasked as the lead agency for compiling lessee or operator reporting data required under current Biological Opinions applicable to both Bureaus. Therefore, while BOEM is issuing these protocols, all observer reports described herein must be submitted to BSEE as well as to NMFS where specified.

In order to protect ESA-listed species and marine mammals during seismic operations, seismic operators will be required to use protected species observers (PSOs) and follow specific seismic survey protocols when operating. These measures contained herein apply to all on-lease ancillary activity surveys conducted under 30 CFR Part 550 and all off-lease surveys conducted under 30 CFR Part 551, regardless of water depth. Operators must demonstrate your compliance with these requirements by submitting to BSEE and NMFS reports as detailed below.

Definitions

Terms used in these protocols have the following meanings:

1. Protected species means any species listed under the ESA and/or protected by the MMPA. The requirements discussed herein focus on marine mammals and sea turtles since these species are the most likely to be observed during seismic surveys. However, other ESA-listed species (e.g., giant manta rays) are also protected and observations of them should be reported as detailed below.
2. Airgun means a device that releases compressed air into the water column, creating an acoustical energy pulse with the purpose of penetrating the seafloor.
3. Deep penetration surveys are defined as surveys using airgun arrays with total volume greater than 1,500 in³. These surveys may in some cases collect return signals using sensors incorporated into ocean-bottom cables (OBC) or autonomous

ocean-bottom nodes (OBN) placed on the seafloor. These surveys are also referred to as high energy surveys.

4. Shallow penetration surveys are defined as surveys using airgun arrays with total volume equal to or less than 1,500 in³, single airguns, boomers, or equivalent sources. These surveys are also referred to as low energy surveys.
5. Ramp-up (sometimes referred to as "soft start") means the gradual and systematic increase of emitted sound levels from an airgun array. Ramp-up begins by first activating a single airgun of the smallest volume, followed by doubling the number of active elements in stages until the full complement of an array's airguns are active. Each stage should be approximately the same duration, and the total duration should not be less than approximately 20 minutes for deep penetration surveys.
6. Shutdown of an airgun array means the immediate de-activation of all individual airgun elements of the array.
7. Exclusion zone means the area to be monitored for possible shutdown in order to reduce or eliminate the potential for injury of protected species. Two exclusion zones are defined, depending on the species and context.
8. Buffer zone means an area beyond the exclusion zone to be monitored for the presence of protected species that may enter the exclusion zone. During pre-clearance monitoring (i.e., before ramp-up begins), the buffer zone also acts as an extension of the exclusion zone in that observations of marine mammals and sea turtles within the buffer zone would also prevent airgun operations from beginning (i.e. ramp-up). The buffer zone is not applicable for contexts that require an exclusion zone beyond 500 meters. The buffer zone encompasses the area at and below the sea surface from the edge of the 0– 500 meter exclusion zone, out to a radius of 1000 meters from the edges of the airgun array (500–1,000 meters) The buffer zone is not applicable when the exclusion zone is greater than 500 meters, *i.e.*, the observational focal zone is not increased beyond 1,500 meters.
9. Visual monitoring means the use of trained protected species observers (herein referred to as visual PSOs) to scan the ocean surface visually for the presence of protected species. These observers must have successfully completed a visual observer training program as described below. The area to be scanned visually includes primarily the exclusion zone, but also the buffer zone. Visual monitoring of the exclusion zones and adjacent waters is intended to establish and, when visual conditions allow, maintain zones around the sound source that are clear of marine mammals and sea turtles, thereby reducing or eliminating the potential for injury. Visual monitoring of the buffer zone is intended to (1) provide additional protection to marine mammals and sea turtles and awareness and potential protection of other visual protected species that may be in the area during pre-clearance, and (2) during airgun use, aid in establishing and maintaining the exclusion zone by alerting the visual observer and crew of marine mammals and sea turtles that are outside of, but may approach and enter, the exclusion zone.
10. Acoustic monitoring means the use of trained personnel (sometimes referred to as

passive acoustic monitoring (PAM) operators, herein referred to as acoustic PSOs) to operate PAM equipment to acoustically detect the presence of marine mammals. These observers must have successfully completed a passive acoustic observer training program as described below. Acoustic monitoring is intended to further support visual monitoring in maintaining an exclusion zone around the sound source that is clear of marine mammals, in part for the purpose of reducing or eliminating the potential for injury. In cases where visual monitoring is not effective (e.g., due to weather, nighttime), acoustic monitoring may be used to allow certain activities to occur, as further detailed below.

General Requirements

1. A copy of a MMPA incidental take authorization (as applicable) and BOEM-approved Permit/Plan must be in the possession of the vessel operator, other relevant personnel, the lead PSO (see description below), and any other relevant designees operating under the authority of the MMPA authorization (as applicable) and BOEM Permit/Plan.
2. The MMPA authorization holder (as applicable) and BOEM-approved Permit/Plan holder shall instruct relevant vessel personnel with regard to the authority of the protected species monitoring team (PSO team), and shall ensure that relevant vessel personnel and the PSO team participate in a joint onboard briefing (hereafter PSO briefing) led by the vessel operator and lead PSO to ensure that responsibilities, communication procedures, protected species monitoring protocols, operational procedures, and MMPA authorization (as applicable) and BOEM Permit/Plan requirements are clearly understood. This PSO briefing must be repeated when relevant new personnel join the survey operations before work commences.
3. The acoustic source must be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Unnecessary use of the acoustic source must be avoided. For surveys using airgun arrays as the acoustic source notified operational capacity (not including redundant backup airguns) must not be exceeded during the survey, except where unavoidable for source testing and calibration purposes. All occasions where activated source volume exceeds notified operational capacity must be communicated to the PSO(s) on duty and fully documented. The lead PSO must be granted access to relevant instrumentation documenting acoustic source power and/or operational volume.

Protected Species Observers (PSOs, Visual and Acoustic)

Qualifications

1. The MMPA authorization (as applicable) and BOEM-approved Permit/Plan holder must use independent, dedicated, trained visual and acoustic PSOs, meaning that the PSOs must be employed by a third-party observer provider, may have no tasks other than to conduct observational effort (visual or acoustic), collect data, and communicate

with and instruct relevant vessel crew with regard to the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards), and must have successfully completed an approved PSO training course appropriate for their designated task (visual or acoustic). Acoustic PSOs are required to complete specialized training for operating PAM systems and are encouraged to have familiarity with the vessel with which they will be working. PSOs can act as acoustic or visual observers (but not at the same time) as long as they demonstrate to NMFS (nmfs.psoreview@noaa.gov) that their training and experience are sufficient to perform necessary tasks. NMFS must review and approve PSO resumes accompanied by a relevant training course information packet that includes the name and qualifications (i.e., experience, training completed, or educational background) of the instructor(s), the course outline or syllabus, and course reference material as well as a document stating successful completion of the course. NMFS shall have one week to approve PSOs from the time that the necessary information is submitted by the BOEM-approved Permit/Plan holder, after which PSOs meeting the minimum requirements shall automatically be considered approved.

2. At least one visual and two acoustic PSOs (when required) aboard the vessel must have a minimum of 90 days at-sea experience working in those roles, respectively, with no more than 18 months elapsed since the conclusion of the at-sea experience. One visual PSO with such experience shall be designated as the lead for the entire protected species observation team. The lead shall coordinate duty schedules and roles for the PSO team and serve as primary point of contact for the vessel operator (the responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator). To the maximum extent practicable, the lead PSO shall devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.
 - a. PSOs must successfully complete relevant training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program. PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or

equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver shall be submitted by the BOEM-approved Permit/Plan holder to NMFS (nmfs.psoreview@noaa.gov) and must include written justification. Requests shall be granted or denied (with justification) by NMFS within one week of receipt of submitted information. Alternate experience that may be considered includes, but is not limited to: (1) secondary education and/or experience comparable to PSO duties; (2) previous work experience conducting academic, commercial, or government-sponsored protected species surveys; or (3) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

Equipment

The MMPA incidental take authorization (as applicable) and BOEM-approved Permit/Plan holder is required to:

1. Provide PSOs with bigeye binoculars (e.g., 25 x 150; 2.7 view angle; individual ocular focus; height control) of appropriate quality solely for PSO use. These shall be pedestal-mounted on the deck at the most appropriate vantage point that provides for optimal sea surface observation, PSO safety, and safe operation of the vessel.
2. Work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed protected species. Such equipment, at a minimum, shall include:
 - a. Each vessel requiring PAM will include a passive acoustic monitoring system that has been verified and tested by an experienced acoustic PSO that will be using it during the trip for which monitoring is required.
 - b. Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups)
 - c. Global Positioning Units (GPS) (plus backup)
 - d. Digital camera with a telephoto lens (the camera or lens should also have an image stabilization system) that is at least 300 mm or equivalent on a full-frame single lens reflex (SLR) (plus backup)
 - e. Radios for communication among vessel crew and PSOs (at least one per PSO, plus backups)
 - f. Any other tools necessary to adequately perform necessary PSO tasks.

Equipment specified in (a) through (g) above may be provided by an individual PSO, the third-party observer provider, or the MMPA authorization (as applicable) and BOEM-approved Permit/Plan holder but the latter is responsible for ensuring PSOs have the proper equipment required to perform the duties specified within these protocols.

Data Collection

PSOs must use standardized data collection forms. PSOs shall record detailed information about any implementation of mitigation requirements, including the distance of animals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up of the acoustic source. If required mitigation was not implemented, PSOs should record a description of the circumstances. At a minimum, the following information must be recorded:

1. BOEM Permit/Plan number;
2. Vessel names (source vessel and other vessels associated with survey), vessel size and type, maximum speed capability of vessel, port of origin, and call signs;
3. PSO names and affiliations;
4. Dates of departures and returns to port with port name;
5. Date and participants of PSO briefings (as discussed in General Requirements. 2);
6. Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort;
7. Vessel location (latitude/longitude) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;
8. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change;
9. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including BSS and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;
10. Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions changed (e.g., vessel traffic, equipment malfunctions);
11. Survey activity information, such as acoustic source power output while in operation, number and volume of airguns operating in the array, tow depth of the array, and any other notes of significance (i.e., pre-clearance, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, etc.); and
12. Upon visual observation of any protected species, the following information:
 - a. Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
 - b. PSO who sighted the animal;
 - c. Time of sighting;
 - d. Vessel location (coordinates) at time of sighting;
 - e. Water depth;
 - f. Direction of vessel's travel (compass direction);
 - g. Direction of animal's travel relative to the vessel;
 - h. Pace of the animal;

- i. Estimated distance to the animal and its heading relative to vessel at initial sighting;
 - j. Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
 - k. Estimated number of animals (high/low/best);
 - l. Estimated number of animals by cohort (adults, juveniles, group composition, etc.);
 - m. Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
 - n. Detailed behavior observations (e.g., number of blows/ breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior), including an assessment of behavioral responses to survey activity;
 - o. Animal's closest point of approach (CPA) and/or closest distance from any element of the acoustic source;
 - p. Platform activity at time of sighting (e.g., deploying, recovering, testing, shooting, data acquisition, other); and
 - q. Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp-up) and time and location of the action.
13. If a marine mammal is detected while using the PAM system, the following information should be recorded:
- a. An acoustic encounter identification number, and whether the detection was linked with a visual sighting;
 - b. Date and time when first and last heard;
 - c. Types and nature of sounds heard (e.g., clicks, whistles, creaks, burst pulses, continuous, sporadic, strength of signal);
 - d. Any additional information recorded such as water depth of the hydrophone array, bearing of the animal to the vessel (if determinable), species or taxonomic group (if determinable), spectrogram screenshot, and any other notable information.

Deep Penetration Seismic Survey Protocols

Visual Monitoring

1. During survey operations (e.g., any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of two visual PSOs must be on duty and conducting visual observations at all times during daylight hours (i.e., from 30 minutes prior to sunrise through 30 minutes following sunset).
2. Visual monitoring must begin no less than 30 minutes prior to ramp-up and must

continue until one hour after use of the acoustic source ceases or until 30 minutes past sunset.

3. Visual PSOs shall coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts, and shall conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.
4. PSOs shall establish and monitor applicable exclusion and buffer zones. These zones shall be based upon the radial distance from the edges of the airgun array (rather than being based on the center of the array or around the vessel itself). During use of the acoustic source (i.e., anytime the acoustic source is active, including ramp-up), occurrences of protected species within the buffer zone (but outside the exclusion zone) should be communicated to the operator to prepare for the potential shutdown for marine mammals (or voluntary pause for other non-marine mammal protected species [e.g., sea turtles] if being employed) of the acoustic source.
5. Visual PSOs shall immediately communicate all observations to the on duty acoustic PSO(s), including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination.
6. Any observations of protected species by crew members aboard any vessel associated with the survey shall be relayed to the PSO team.
7. During good conditions (e.g., daylight hours; Beaufort sea state (BSS) 3 or less), visual PSOs shall conduct observations when the acoustic source is not operating for comparison of sighting rates and behavior with and without use of the acoustic source and between acquisition periods, to the maximum extent practicable.
8. Visual PSOs may be on watch for a maximum of two consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours of observation per 24-hour period. Combined observational duties (visual and acoustic but not at same time) may not exceed 12 hours per 24-hour period for any individual PSO. NMFS may grant an exception for LOA applications that demonstrate such a “two hours on/one hour off” duty cycle is not practicable, in which case visual PSOs will be subject to a maximum of four consecutive hours on watch followed by a break of at least two hours between watches. Combined observational duties (visual and acoustic but not at the same time) must not exceed 12 hours per 24-hour period for any individual PSO

Acoustic Monitoring

1. Applicants must provide a PAM plan to NMFS according to the MMPA authorization including description of the hardware and software proposed for use prior to proceeding with any survey where PAM is required. The source vessel must use a towed PAM system at all times when operating in waters deeper than 100 m, which

must be monitored by at a minimum one on duty acoustic PSO beginning at least 30 minutes prior to ramp-up, at all times during use of the acoustic source, and until one hour after use of the acoustic source ceases. “PAM system” refers to calibrated hydrophone arrays with full system redundancy to detect, identify, and estimate distance and bearing to vocalizing cetaceans, coupled with appropriate software to aid monitoring and listening by a PAM operator skilled in bioacoustics analysis and computer system specifications capable of running appropriate software. The PAM system must have at least one calibrated hydrophone (per each deployed hydrophone type and/or set) sufficient for determining whether background noise levels on the towed PAM system are sufficiently low to meet performance expectations).

2. Acoustic PSOs shall immediately communicate all detections to visual PSOs, when visual PSOs are on duty, including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination.
3. Acoustic PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least two hours between watches and may conduct a maximum of 12 hours of observation per 24-hour period. Combined observational duties (acoustic and visual but not at same time) may not exceed 12 hours per 24-hour period for any individual PSO.
4. Survey activity may continue for 30 minutes when the PAM system malfunctions or is damaged, while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM system must be repaired to solve the problem, operations may continue for an additional two hours without acoustic monitoring during daylight hours only under the following conditions:
 - a. Sea state is less than or equal to BSS 4;
 - b. No marine mammals (excluding delphinids) detected solely by PAM in the applicable exclusion zone in the previous two hours;
 - c. NMFS and BSEE are notified via email (nmfs.psoreview@noaa.gov and protectedspecies@bsee.gov, respectively) as soon as practicable with the time and location in which operations began occurring without an active PAM system; and
 - d. Operations with an active acoustic source, but without an operating PAM system, do not exceed a cumulative total of four hours in any 24-hour period.

Pre-clearance and Ramp-up

The intent of pre-clearance observation (30 minutes) is to ensure no protected species are observed within the exclusion zones, and buffer zone if applicable (i.e., only when the exclusion zone is equal to 500 meters, see Definitions section for details on when the buffer

zone is not applicable), prior to the beginning of ramp-up. During pre-clearance is the only time observations of protected species in the buffer zone would prevent operations (i.e., the beginning of ramp-up). The intent of ramp-up is to warn protected species of pending seismic operations and to allow sufficient time for those animals to leave the immediate vicinity. A ramp-up procedure, involving a step-wise increase in the number of airguns firing and total array volume until all operational airguns are activated and the full volume is achieved, is required at all times as part of the activation of the acoustic source. All operators must adhere to the following pre-clearance and ramp-up requirements, which are applicable to both marine mammals and sea turtles:

1. The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up.
2. Ramp-ups shall be scheduled so as to minimize the time spent with the source activated prior to reaching the designated run-in.
3. A designated PSO must be notified again immediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed.
4. Ramp-up may not be initiated if any marine mammal or sea turtle is within the applicable exclusion or buffer zone. If a marine mammal or sea turtle is observed within the applicable exclusion zone or the buffer zone during the 30 minute pre-clearance period, ramp-up may not begin until the animal(s) has been observed exiting the zones or until an additional time period has elapsed with no further sightings (15 minutes for small odontocetes and 30 minutes for all other species including sea turtles).
5. Ramp-up shall begin by activating a single airgun of the smallest volume in the array and shall continue in stages by doubling the number of active elements at the commencement of each stage, with each stage of approximately the same duration. Duration shall not be less than 20 minutes. The operator must provide information to the PSO documenting that appropriate procedures were followed.
6. PSOs must monitor the exclusion and buffer zones during ramp-up, and ramp-up must cease and the source must be shut down upon observation of a marine mammal or sea turtle within the applicable exclusion zone. Once ramp-up has begun, observations of marine mammals and sea turtles within the buffer zone do not require shutdown, or voluntarily pause for other non-marine mammal protected species (e.g., sea turtles) if being employed, but such observation shall be communicated to the operator to prepare for the potential shutdown, or voluntarily pause if being employed.
7. Ramp-up may occur at times of poor visibility, including nighttime, if appropriate acoustic monitoring has occurred with no detections in the 30 minutes prior to beginning ramp-up. Acoustic source activation may only occur at times of poor

visibility where operational planning cannot reasonably avoid such circumstances.

8. If the acoustic source is shut down for brief periods (i.e., less than 30 minutes) for reasons other than implementation of prescribed mitigation (e.g., mechanical difficulty), it may be activated again without ramp-up if PSOs have maintained constant visual and/or acoustic observation and no visual detections of marine mammals or sea turtles have occurred within the applicable exclusion zone and no acoustic detections of marine mammals have occurred. For any longer shutdown, pre-clearance observation and ramp-up are required. For any shutdown at night or in periods of poor visibility (e.g., BSS 4 or greater), ramp-up is required, but if the shutdown period was brief and constant observation was maintained, pre-clearance watch of 30 min is not required.
9. Testing of the acoustic source involving all elements requires ramp-up. Testing limited to individual source elements or strings does not require ramp-up but does require pre-clearance observation period.

Shutdown

For non-marine mammal protected species (e.g., sea turtles), shutdowns are not required. However, the BOEM Permit or authorized Plan and MMPA authorization (as applicable) holder may employ a voluntary pause during which the visual PSO would request that the operator voluntarily pause the airgun array for six shots if a non-marine mammal protected species is observed within the exclusion zone (within 500 meters) during active airgun use, to let the animal float past the array while it is inactive. For marine mammals, all operators must adhere to the following shutdown requirements:

1. Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the acoustic source if a marine mammal is detected within the applicable exclusion zone.
2. The operator must establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the acoustic source to ensure that shutdown, and voluntary pause commands (optional for other protected species) are conveyed swiftly while allowing PSOs to maintain watch.
3. When both visual and acoustic PSOs are on duty, all detections must be immediately communicated to the remainder of the on-duty PSO team for potential verification of visual observations by the acoustic PSO or of acoustic detections by visual PSOs.
4. Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 500 meters from the edges of the airgun array (0-500 m) is defined. An extended 1,500-m exclusion zone must be applied upon detection (visual or acoustic) of a baleen whale, sperm whale, beaked whale or *Kogia* spp. within the zone.
5. When the airgun array is active (i.e., any time one or more airguns is active, including during ramp-up) and (1) a marine mammal appears within or enters the applicable exclusion zone and/or (2) a marine mammal (excluding delphinids) is detected acoustically and localized within the applicable exclusion zone, the acoustic source must be shut down. When shutdown is called for by a PSO, the acoustic source must be

immediately deactivated and any dispute resolved only following deactivation.

6. The shutdown requirement is waived for dolphins of the following genera:
Steno, *Tursiops*, *Stenella*, and *Lagenodelphis*.
 - a. If a small delphinid (individual of the Family Delphinidae, which includes the aforementioned dolphin genera), is acoustically detected and localized within the exclusion zone, no shutdown is required unless the acoustic PSO or a visual PSO confirms the individual to be of a genera other than those listed above, in which case a shutdown is required.
7. If there is uncertainty regarding identification (i.e., whether the observed marine mammal(s) belongs to one of the delphinid genera for which shutdown is waived or one of the species with a larger exclusion zone), visual PSOs may use best professional judgment in making the decision to call for a shutdown.
8. Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone (i.e., animal is not required to fully exit the buffer zone where applicable) or following a 30-minute clearance period with no further observation of the marine mammal(s).

Time-area closure

From January 1 through May 31, no use of airguns may occur shoreward of the 20-m isobaths and between 90-84° W

Shallow penetration protocols

1. The requirements defined for deep penetration surveys shall be followed, with the following exceptions:
 - a. PAM is not required for shallow penetration surveys.
 - b. Ramp-up for small airgun arrays must follow the procedure described above for large airgun arrays, but may occur over an abbreviated period of time. Ramp-up is not required for surveys using only a single airgun. For sub-bottom profilers, power should be increased as feasible to effect a ramp-up.
 - c. Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 100 meters from the edges of the airgun array (if used) or from the acoustic source (0-100 m) is defined. An extended 500-m exclusion zone must be applied upon detection (visual or acoustic) of a baleen whale, sperm whale, beaked whale or *Kogia* spp. within the zone.
 - d. The buffer zone encompasses the area at and below the sea surface from the edge of the 0-100 meter exclusion zone out to a radius of 200 meters from the edges of the airgun array (if used) or from the acoustic source (100-200 meters). The buffer zone is not applicable when the exclusion zone is greater than 100 meters.

Non-Airgun High-Resolution Geophysical (HRG) Protocol

Non-airgun HRG surveys are conducted in leases and along pipeline routes to evaluate the potential for geohazards, archaeological resources, and certain types of benthic communities. Non-airgun HRG sources include but are not limited to side-scan sonars, boomers, sparkers (in limited situations) and compressed high-intensity radiated pulse (CHIRP) sub bottom profilers (in limited situations), and single-beam or multibeam depth sounders.

Non-Airgun HRG Surveys with Frequencies ≥ 180 kHz

Acoustic sources do not require detailed analyses because the frequency is outside the general hearing range of marine mammals.

Non-Airgun HRG Surveys with Frequencies < 180 kHz

For all non-airgun HRG surveys in which one or more active acoustic sound sources are operating at < 180 kHz, the requirements defined for shallow penetration surveys shall be followed, with the following exceptions:

1. Pre-clearance watch is required for a period of 30 minutes and over a 200-m radius from the acoustic source.
2. When operating in waters deeper than 100-m, during survey operations (*e.g.*, any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of one trained and experienced independent PSO must be on duty and conducting visual observations at all times during daylight hours (*i.e.*, from 30 minutes prior to sunrise through 30 minutes following sunset).
3. When operating in waters shallower than 100-m, a minimum of one trained visual PSO, which may be a crew member, must be employed. PSOs employed during shallow-water HRG surveys are only required during the pre-clearance period.
4. PSOs are not required during survey operations in which the active acoustic source(s) are deployed on an autonomous underwater vehicle.
5. PAM is not required for HRG surveys. Shutdowns are not required for HRG surveys.

Entanglement and Entrainment Risk Reduction

Nodal Survey Requirements

To avoid the risk of entanglement, lessees and operators conducting surveys using ocean-bottom nodes or similar gear must:

1. Use negatively buoyant coated wire-core tether cable;
2. Ensure any cables/lines are designed to be rigid;

3. Retrieve all lines immediately following completion of the survey; and
4. Attach acoustic pingers directly to the coated tether cable; acoustic releases should not be used.

Reporting

1. The BOEM Permit/Plan holder shall submit interim reports (see Data Collection section for details) on the 1st of each month to BSEE (protectedspecies@bsee.gov) detailing all protected species observations with closest approach distance. The MMPA authorization (as applicable) and BOEM Permit/Plan holder shall submit a draft comprehensive report to BOEM/BSEE (protectedspecies@boem.gov and protectedspecies@bsee.gov) and NMFS (nmfs.psoreview@noaa.gov) on all activities and monitoring results within 90 days of the completion of the survey or expiration of the MMPA authorization (as applicable) or BOEM Permit/Plan, whichever comes sooner, or if an issued MMPA authorization is valid for greater than one year, the summary report must be submitted on an annual basis. The report must describe all activities conducted and sightings of protected species near the activities, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all protected species sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). For operations requiring the use of PAM, the report must include a validation document concerning the use of PAM, which should include necessary noise validation diagrams and demonstrate whether background noise levels on the PAM deployment limited achievement. The draft report shall also include geo-referenced time-stamped vessel track lines for all time periods during which airguns were operating. Track lines should include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off, or when they changed from full array to single gun or vice versa). GIS files shall be provided in ESRI shapefile format and include the UTC date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates shall be referenced to the WGS84 geographic coordinate system. In addition to the report, all raw observational data shall be made available to BOEM/BSEE and NMFS. The report must summarize the information submitted in interim monthly reports as well as additional data collected as described above in *Data Collection* and the MMPA authorization (as applicable). The draft report must be accompanied by a certification from the lead PSO as to the accuracy of the report, and the lead PSO may submit directly to BOEM/BSEE and NMFS a statement concerning implementation and effectiveness of the required mitigation and monitoring. A final report must be submitted within 30 days following resolution of any comments on the draft report.
2. Reporting injured or dead protected species:
The MMPA authorization (as applicable) and BOEM Permit/Plan holder must report

sightings of any injured or dead aquatic protected species immediately, regardless of the cause of injury or death. For reporting dead or injured marine mammals, refer to the reporting requirements specified in the MMPA authorization (as applicable), associated with the activity being conducted, and Appendix C

References

Baker, K., D. Epperson, G. Gitschlag, H. Goldstein, J. Lewandowski, K. Skrupky, B. Smith, and T. Turk. 2013. National standards for a protected species observer and data management program: A model using geological and geophysical surveys. Technical Memorandum NMFS-OPR-49, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration; Bureau of Ocean Energy Management, U.S. Department of the Interior; Bureau of Safety and Environmental Enforcement, U.S. Department of the Interior, Silver Spring, Maryland.

Appendix C. Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols

This Appendix has been revised as of April 26, 2021 and replaces the original Appendix C (dated March 13, 2020). These protocols will be implemented by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) through non-discretionary conditions of approval (COA) applied programmatically to BOEM/BSEE permitted activities (see Attachment 1 to the amended Incidental Take Statement), and provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361- 1423h). The measures contained herein apply to all seismic surveys approved by BOEM and associated with the federally regulated oil and gas program in the Gulf of Mexico.

Aquatic Protected Species Identification

Crew and supply vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark; hereafter collectively termed “other aquatic protected species”) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS). Vessel operators must comply with the below measures except under extraordinary circumstances when the **safety of the vessel or crew is in doubt or the safety of life at sea is in question.**

Vessel Strike Avoidance

1. Vessel operators and crews must maintain a vigilant watch for all aquatic protected species and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any protected species. A single aquatic protected species at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should always be exercised. A visual observer aboard the vessel must monitor a vessel strike avoidance zone (species-specific distances detailed below) around the vessel according to the parameters stated below, to ensure the potential for strike is minimized. Visual observers monitoring the vessel strike avoidance zone can be either third-party observers or crew members (e.g., captain), but crew members responsible for these duties must be provided sufficient training to distinguish aquatic protected species to broad taxonomic groups, as well as those specific species detailed further below.
2. Vessel speeds must also be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages (greater than three) of any marine mammal are observed near a vessel.

3. All vessels must maintain a minimum separation distance of 100 meters (m) from sperm whales, and 500 m from any baleen whale to specifically protect the Gulf of Mexico Bryde's whale.
4. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 meters from all "other aquatic protected species" including sea turtles, with an exception made for those animals that approach the vessel.
5. When aquatic protected species are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling).
6. Any BOEM/BSEE-authorized or -permitted activity occurring within the Eastern Planning Area will be subject to a step-down review with NMFS under the attached 2020 biological opinion on BOEM Oil and Gas Program Activities in the Gulf of Mexico.

The above requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of that restriction, is unable to comply.

Injured/Dead Protected Species Reporting

The measures below have been revised from the original measures (contained in the Appendices to the biological opinion dated March 13, 2020) in accordance with the revised proposed action (see Attachments 1 and 2 to the amended ITS).

At all times, vessel operators must report sightings of any injured or dead aquatic protected species immediately, regardless of whether the injury or death was caused by the operator's vessel. If the injury or death was caused by a collision with the operator's vessel, the operator must immediately report the incident to NMFS by email at nmfs.psoreview@noaa.gov and must also immediately report the incident to the appropriate NMFS contact below for 24 hour response. The operator must further notify BOEM and BSEE within 24 hours of the strike by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. The report must include the following information:

1. Time, date, and location (latitude/longitude) of the incident;
2. Species identification (if known) or description of the animal(s) involved;
3. Vessel's speed during and leading up to the incident;
4. Vessel's course/heading and what operations were being conducted (if applicable);
5. Status of all sound sources in use;

6. Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;
7. Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;
8. Estimated size and length of animal that was struck;
9. Description of the behavior of the marine mammal immediately preceding and following the strike;
10. If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;
11. Estimated fate of the animal (*e.g.*, dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and
12. To the extent practicable, photographs or video footage of the animal(s).

In the event that any of the following occur at any time, immediate reporting of the incident is required, after personnel and/or diver safety is ensured:

- Entanglement or entrapment of a protected species (*i.e.*, an animal is entangled in a line or cannot or does not leave a moon pool of its own volition).
- Injury of a protected species (*e.g.*, the animal appears injured or lethargic).
- Interaction or contact with equipment by a protected species.
- Any observation of a leatherback sea turtle within a moon pool (regardless of whether it appears injured, or an interaction with equipment or entanglement/entrapment is observed).

As soon as personnel and/or diver safety is ensured, any of the incidents listed above must be reported to NMFS by contacting the appropriate expert for 24-hr response. If an immediate response is not received, the operator must keep trying until contact is made. Any failed attempts should be documented. Contact information for reporting is as follows:

- Marine mammals: contact Southeast Region's Marine Mammal Stranding Hotline at 1-877-433-8299.
- Sea turtles: contact NMFS Veterinary Medical Officer at 352-283-3370. If no answer, contact (301) 301-3061. This includes the immediate reporting of any observation of a leatherback sea turtle within a moon pool.
- Other protected species (*e.g.*, giant manta ray, oceanic whitetip shark, or Gulf sturgeon): contact the ESA Section 7 biologist at 301-427-8413.

The report must include the following information:

1. Time, date, water depth and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
2. Name, type, and call sign of the vessel in which the event occurred;
3. Equipment being utilized at time of observation;
4. Species identification (if known) or description of the animal(s) involved;
5. Approximate size of animal;
6. Condition of the animal(s) during the event and any observed injury / behavior;
7. photographs or video footage of the animal(s), if able; and
8. General narrative and timeline describing events that took place.

After the appropriate contact(s) have been made for guidance/assistance as described above, the operator may call BSEE at 985-722-7902 (24 hours/day) for questions or additional guidance on recovery assistance needs (if still required) and continued monitoring requirements. The operator may also contact this number if a timely response from the appropriate contact(s) listed above were not received.



LETTER OF AUTHORIZATION

Murphy Exploration and Production Company and its designees are hereby authorized under section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(A)) to take marine mammals incidental to geophysical survey activities in the Gulf of Mexico, subject to the provisions of the MMPA and the Regulations Governing Taking Marine Mammals Incidental to Geophysical Survey Activities in the Gulf of Mexico (50 CFR Part 217, Subpart S) (Regulations).

1. This Letter of Authorization (LOA) is valid from the date of issuance through September 13, 2023.
2. This LOA authorizes take incidental to the specified geophysical survey activities (Zero Offset VSP survey in the Walker Ridge Block 425) described in the LOA request.
3. General Conditions
 - (a) A copy of this LOA must be in the possession of the Holder of the Authorization (Holder), vessel operator, other relevant personnel, the lead protected species observer (PSO), and any other relevant designees operating under the authority of the LOA.
 - (b) The species and/or stocks authorized for taking are listed in Table 1. Authorized take, by Level B harassment only, is limited to the species and numbers listed in Table 1.
 - (c) The taking by serious injury or death of any of the species listed in Table 1 or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA. Any taking exceeding the authorized amounts listed in Table 1 is prohibited and may result in the modification, suspension, or revocation of this IHA.
 - (d) The Holder must instruct relevant vessel personnel with regard to the authority of the protected species monitoring team (PSO team), and must ensure that relevant vessel personnel and PSO team participate in a joint onboard briefing, led by the vessel operator and lead PSO, prior to beginning work to ensure that responsibilities, communication procedures, protected species monitoring protocols, operational procedures, and LOA requirements are clearly understood. This briefing must be repeated when relevant new personnel join the survey operations before work involving those personnel commences.
 - (e) The acoustic source must be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Unnecessary use of the acoustic source must be avoided. Notified operational capacity (i.e., total array volume or



airgun size) (not including redundant backup airguns) must not be exceeded during the survey, except where unavoidable for source testing and calibration purposes. All occasions where activated source volume exceeds notified operational capacity must be communicated to the PSO(s) on duty and fully documented. The lead PSO must be granted access to relevant instrumentation documenting acoustic source power and/or operational volume.

(f) PSO requirements:

- i. LOA-holders must use independent, dedicated, qualified PSOs, meaning that the PSOs must be employed by a third-party observer provider, must have no tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards), and must be qualified pursuant to section 5(a) of this LOA.
- ii. The Holder must submit PSO resumes for NMFS review and approval prior to commencement of the survey. Resumes should include dates of training and any prior NMFS approval, as well as dates and description of last experience, and must be accompanied by information documenting successful completion of an acceptable training course. NMFS is allowed one week to approve PSOs from the time that the necessary information is received by NMFS, after which PSOs meeting the minimum requirements will automatically be considered approved.
- iii. At least one PSO aboard each acoustic source vessel must have a minimum of 90 days at-sea experience working in the role, with no more than eighteen months elapsed since the conclusion of the at-sea experience. One PSO with such experience must be designated as the lead for the entire PSO team. The lead must coordinate duty schedules and roles for the PSO team and serve as the primary point of contact for the vessel operator. (Note that the responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator.) To the maximum extent practicable, the lead PSO must devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.

4. Mitigation Requirements

(a) Visual monitoring requirements:

- i. During survey operations (i.e., any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of two PSOs must be on duty

and conducting visual observations at all times during daylight hours (i.e., from 30 minutes prior to sunrise through 30 minutes following sunset).

- ii. Visual monitoring must begin not less than 30 minutes prior to use of the acoustic source and must continue until one hour after use of the acoustic source ceases or until 30 minutes past sunset.
 - iii. PSOs must coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts, and must conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.
 - iv. Any observations of marine mammals by crew members aboard any vessel associated with the survey must be relayed to the PSO team.
 - v. During good conditions (e.g., daylight hours; Beaufort sea state (BSS) 3 or less), PSOs must conduct observations when the acoustic source is not operating for comparison of sighting rates and behavior with and without use of the acoustic source and between acquisition periods, to the maximum extent practicable.
 - vi. PSOs may be on watch for a maximum of two consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours of observation per 24-hour period. NMFS may grant an exception for LOA applicants that demonstrate such a “two hours on/one hour off” duty cycle is not practicable, in which case PSOs will be subject to a maximum of four consecutive hours on watch followed by a break of at least two hours between watches.
- (b) PSOs must establish and monitor applicable exclusion and buffer zones. During use of the acoustic source (i.e., anytime the acoustic source is active), occurrence of marine mammals within the relevant buffer zone (but outside the exclusion zone) should be communicated to the operator to prepare for the potential shutdown of the acoustic source.
- i. Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 100 meters from the sound source (0-100 m) is defined. For special circumstances (defined at 4(d)(iv) of this LOA), the exclusion zone encompasses an extended distance of 500 meters (0-500 m).
 - ii. During pre-start clearance monitoring, the buffer zone acts as an extension of the exclusion zone in that observations of marine mammals within the buffer zone would also preclude airgun operations from beginning. For all marine mammals (except where superseded by the extended 500-m

exclusion zone), the buffer zone encompasses the area at and below the sea surface from the edge of the 0-100 meter exclusion zone out to a radius of 200 meters from the sound source (100-200 m). The buffer zone is not applicable when the exclusion zone is greater than 100 meters, i.e., the observational focal zone is not increased beyond 500 meters.

- (c) A 30-minute pre-start clearance observation period must occur prior to activation of the sound source. The Holder must adhere to the following pre-start clearance requirements:
- i. The operator must notify a designated PSO of the planned activation of the sound source as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned activation.
 - ii. A designated PSO must be notified again immediately prior to activating the sound source and the operator must receive confirmation from the PSO to proceed.
 - iii. Activation must not occur if any marine mammal is within the applicable exclusion or buffer zone. If a marine mammal is observed within the exclusion zone or the buffer zone during the 30-minute pre-start clearance period, activation must not occur until the animal(s) has been observed exiting the zones or until an additional time period has elapsed with no further sightings (15 minutes for small delphinids and 30 minutes for all other species).
 - iv. Activation may occur at times of poor visibility, including nighttime. Acoustic source activation may only occur at night where operational planning cannot reasonably avoid such circumstances.
 - v. If the acoustic source is shut down for brief periods (i.e., less than 30 minutes) for reasons other than implementation of prescribed mitigation (e.g., mechanical difficulty), it may be activated again without pre-start clearance watch if PSOs have maintained constant visual observation and no detections of any marine mammal have occurred within the applicable exclusion zone. For any longer shutdown, pre-start clearance observation is required.
- (d) Shutdown requirements:
- i. Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the acoustic source pursuant to the requirements of this subpart.
 - ii. The operator must establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the acoustic source to

ensure that shutdown commands are conveyed swiftly while allowing PSOs to maintain watch.

- iii. When the airgun is active and a marine mammal appears within or enters the applicable exclusion zone, the acoustic source must be shut down. When shutdown is called for by a PSO, the acoustic source must be immediately deactivated and any dispute resolved only following deactivation.
 - iv. The extended 500-m exclusion zone must be applied upon detection of a baleen whale, sperm whale, beaked whale, or *Kogia* spp. within the zone.
 - v. Shutdown requirements are waived for dolphins of the following genera: *Tursiops*, *Stenella*, *Steno*, and *Lagenodelphis*. If a delphinid is visually detected within the exclusion zone, no shutdown is required unless the PSO confirms the individual to be of a genus other than those listed above, in which case a shutdown is required.
 - vi. If there is uncertainty regarding identification or localization, PSOs may use best professional judgment in making the decision to call for a shutdown.
 - vii. Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone or following a 30-minute clearance period with no further detection of the marine mammal(s).
- (e) *Vessel strike avoidance*. The Holder must adhere to the following requirements:
- i. Vessel operators and crews must maintain a vigilant watch for all marine mammals and must slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any marine mammal. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel, which shall be defined according to the parameters stated in this subsection. Visual observers monitoring the vessel strike avoidance zone may be third-party observers (i.e., PSOs) or crew members, but crew members responsible for these duties must be provided sufficient training to distinguish marine mammals from other phenomena and broadly to identify a marine mammal as a baleen whale, sperm whale, or other marine mammal;
 - ii. Vessel speeds must be reduced to 10 kn or less when mother/calf pairs, pods, or large assemblages of marine mammals are observed near a vessel;
 - iii. All vessels must maintain a minimum separation distance of 500 m from baleen whales;

- iv. All vessels must maintain a minimum separation distance of 100 m from sperm whales;
- v. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all other marine mammals, with an exception made for those animals that approach the vessel; and
- vi. When marine mammals are sighted while a vessel is underway, the vessel must take action as necessary to avoid violating the relevant separation distance, e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area. If marine mammals are sighted within the relevant separation distance, the vessel must reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear or any vessel that is navigationally constrained.
- vii. These requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply.

5. Monitoring Requirements

(a) PSO qualifications:

- i. PSOs must successfully complete relevant, acceptable training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program.
- ii. PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver must be submitted to NMFS and shall include written justification. Requests will be granted or denied (with justification) by NMFS within one week of receipt of submitted information. Alternate experience that may be considered includes, but is not limited to:
 - (A) secondary education and/or experience comparable to PSO duties;
 - (B) previous work experience conducting academic, commercial, or government-sponsored marine mammal surveys; or

- (C) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.
- (b) *Equipment.* The Holder is required to:
 - i. Work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed marine mammals. (Equipment specified in A. through G. below may be provided by an individual PSO, the third-party observer provider, or the LOA-holder, but the LOA-holder is responsible for ensuring PSOs have the proper equipment required to perform the duties specified herein.) Such equipment, at a minimum, must include:
 - (A) Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups);
 - (B) Global Positioning Unit (GPS) (plus backup);
 - (C) Digital camera with a telephoto lens (the camera or lens should also have an image stabilization system) that is at least 300 mm or equivalent on a full-frame single lens reflex (SLR) (plus backup);
 - (D) Compass (plus backup);
 - (E) Radios for communication among vessel crew and PSOs (at least one per PSO, plus backups); and
 - (F) Any other tools necessary to adequately perform necessary PSO tasks.
- (c) *Data collection.* PSOs must use standardized electronic data forms. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of marine mammals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent activation of the acoustic source. If required mitigation was not implemented, PSOs must record a description of the circumstances. At a minimum, the following information should be recorded:
 - i. Vessel names (source vessel and other vessels associated with survey), vessel size and type, maximum speed capability of vessel, port of origin, and call signs;

- ii. PSO names and affiliations;
- iii. Dates of departures and returns to port with port name;
- iv. Dates of and participants in PSO briefings;
- v. Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort;
- vi. Vessel location (latitude/longitude) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;
- vii. Vessel location at 30-second intervals (if software capability allows) or 5-minute intervals (if location must be manually recorded);
- viii. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change;
- ix. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;
- x. Vessel location when environmental conditions change significantly;
- xi. Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions change (e.g., vessel traffic, equipment malfunctions);
- xii. Survey activity information, such as acoustic source power output while in operation, number and volume of airguns operating in an array, tow depth of an acoustic source, and any other notes of significance (i.e., pre-start clearance, shutdown, testing, shooting, end of operations, streamers, etc.); and
- xiii. Upon visual observation of a marine mammal, the following information:
 - (A) Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
 - (B) PSO who sighted the animal and PSO location (including height above water) at time of sighting;
 - (C) Time of sighting;
 - (D) Vessel coordinates at time of sighting;

- (E) Water depth;
- (F) Direction of vessel's travel (compass direction);
- (G) Speed of the vessel(s) from which the observation was made;
- (H) Direction of animal's travel relative to the vessel;
- (I) Pace of the animal;
- (J) Estimated distance to the animal (and method of estimating distance) and its heading relative to vessel at initial sighting;
- (K) Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
- (L) Estimated number of animals (high/low/best);
- (M) Estimated number of animals by cohort (adults, juveniles, group composition, etc.);
- (N) Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
- (O) Detailed behavior observations (e.g., number of blows/breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior), including an assessment of behavioral responses to survey activity;
- (P) Animal's closest point of approach (CPA) and/or closest distance from any element of the acoustic source;
- (Q) Platform activity at time of sighting (e.g., deploying, recovering, testing, shooting, data acquisition, other); and
- (R) Description of any actions implemented in response to the sighting (e.g., delays, shutdown) and time and location of the action.

6. Reporting Requirements

- (a) Annual reporting:

- i. The Holder must submit a summary report to NMFS on all activities and monitoring results within 90 days of the completion of the survey or expiration of the LOA, whichever comes sooner, and must include all information described above under section 5(c) of this LOA. If an issued LOA is valid for greater than one year, the summary report must be submitted on an annual basis.
 - ii. The report must describe activities conducted and sightings of marine mammals, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all marine mammal sightings (dates, times, locations, activities, associated survey activities, and information regarding locations where the acoustic source was used). In addition to the report, all raw observational data must be made available to NMFS.
 - iii. The Holder must provide geo-referenced time-stamped vessel tracklines for all time periods in which airguns (full array or single) were operating. Tracklines must include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off). GIS files must be provided in ESRI shapefile format and include the UTC date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates must be referenced to the WGS84 geographic coordinate system.
 - iv. The draft report must be accompanied by a certification from the lead PSO as to the accuracy of the report, and the lead PSO may submit directly to NMFS a statement concerning implementation and effectiveness of the required mitigation and monitoring.
 - v. A final report must be submitted within 30 days following resolution of any comments on the draft report.
- (b) *Comprehensive reporting.* The Holder must contribute to the compilation and analysis of data for inclusion in an annual synthesis report addressing all data collected and reported through annual reporting in each calendar year. The synthesis period shall include all annual reports deemed to be final by NMFS in a given one-year reporting period. The report must be submitted to NMFS within 90 days following the end of a given one-year reporting period.
- (c) Reporting of injured or dead marine mammals:
- i. In the event that personnel involved in the survey activities discover an injured or dead marine mammal, the Holder must report the incident to the Office of Protected Resources (OPR), NMFS and to the Southeast

Regional Stranding Network as soon as feasible. The report must include the following information:

- (A) Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- (B) Species identification (if known) or description of the animal(s) involved;
- (C) Condition of the animal(s) (including carcass condition if the animal is dead);
- (D) Observed behaviors of the animal(s), if alive;
- (E) If available, photographs or video footage of the animal(s); and
- (F) General circumstances under which the animal was discovered.

ii. In the event of a ship strike of a marine mammal by any vessel involved in the survey activities, the LOA-holder must report the incident to OPR, NMFS and to the Southeast Regional Stranding Network as soon as feasible. The report must include the following information:

- (A) Time, date, and location (latitude/longitude) of the incident;
- (B) Species identification (if known) or description of the animal(s) involved;
- (C) Vessel's speed during and leading up to the incident;
- (D) Vessel's course/heading and what operations were being conducted (if applicable);
- (E) Status of all sound sources in use;
- (F) Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;
- (G) Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;
- (H) Estimated size and length of animal that was struck;
- (I) Description of the behavior of the marine mammal immediately preceding and following the strike;

- (J) If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;
- (K) Estimated fate of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and
- (L) To the extent practicable, photographs or video footage of the animal(s).

7. Actions to Minimize Additional Harm to Live-Stranded (or Milling) Marine Mammals

- (a) In the event of a live stranding (or near-shore atypical milling) event within 50 km of the survey operations, where the NMFS stranding network is engaged in herding or other interventions to return animals to the water, the Director of OPR, NMFS (or designee) will advise the Holder of the need to implement shutdown procedures for all active acoustic sources operating within 50 km of the stranding. Shutdown procedures for live stranding or milling marine mammals include the following:
 - i. If at any time, the marine mammal(s) die or are euthanized, or if herding/intervention efforts are stopped, the Director of OPR, NMFS (or designee) will advise the LOA-holder that the shutdown around the animals' location is no longer needed.
 - ii. Otherwise, shutdown procedures will remain in effect until the Director of OPR, NMFS (or designee) determines and advises the LOA-holder that all live animals involved have left the area (either of their own volition or following an intervention).
 - iii. If further observations of the marine mammals indicate the potential for re-stranding, additional coordination with the LOA-holder will be required to determine what measures are necessary to minimize that likelihood (e.g., extending the shutdown or moving operations farther away) and to implement those measures as appropriate.
- (b) If NMFS determines that the circumstances of any marine mammal stranding found in the vicinity of the activity suggest investigation of the association with survey activities is warranted, and an investigation into the stranding is being pursued, NMFS will submit a written request to the LOA-holder indicating that the following initial available information must be provided as soon as possible, but no later than 7 business days after the request for information. In the event that the investigation is still inconclusive, the investigation of the association of the survey activities is still warranted, and the investigation is still being pursued, NMFS may provide additional information requests, in writing, regarding the

nature and location of survey operations prior to the time period above.

- i. Status of all sound source use in the 48 hours preceding the estimated time of stranding and within 50 km of the discovery/notification of the stranding by NMFS; and
 - ii. If available, description of the behavior of any marine mammal(s) observed preceding (i.e., within 48 hours and 50 km) and immediately after the discovery of the stranding.
8. This Authorization may be modified, suspended or revoked if the Holder fails to abide by the conditions prescribed herein (including, but not limited to, failure to comply with monitoring or reporting requirements), or if NMFS determines: (1) the authorized taking is likely to have or is having more than a negligible impact on the species or stocks of affected marine mammals, or (2) the prescribed measures are likely not or are not effecting the least practicable adverse impact on the affected species or stocks and their habitat.

Kimberly Damon-Randall
Director,
Office of Protected Resources,
National Marine Fisheries Service.

Table 1. Authorized Incidental Take.

Common name	Scientific name	Level A harassment	Level B harassment
Sperm whale	<i>Physeter macrocephalus</i>	0	10
Pygmy/Dwarf sperm whale	<i>Kogia</i> spp.	0	5
Beaked whales	<i>Ziphius cavirostris/ Mesoplodon</i> spp.	0	87
Rough-toothed dolphin	<i>Steno bredanensis</i>	0	15
Clymene dolphin	<i>Stenella clymene</i>	0	38
Pantropical spotted dolphin	<i>Stenella attenuata</i>	0	381
Spinner dolphin	<i>Stenella longirostris</i>	0	9
Striped dolphin	<i>Stenella coeruleoalba</i>	0	20
Fraser's dolphin	<i>Lagenodelphis hosei</i>	0	7
Risso's dolphin	<i>Grampus griseus</i>	0	6
Melon-headed whale	<i>Peponocephala electra</i>	0	26
Pygmy killer whale	<i>Feresa attenuata</i>	0	12
False killer whale	<i>Pseudorca crassidens</i>	0	14
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	0	2

Appendix B: Environmental Monitoring Plan

Murphy Oil ZERO OFFSET VSP SURVEY

Environmental Management Plan: Marine Mammal and Sea Turtle
Monitoring, Mitigation, and Reporting



16 June 2023

rpsgroup.com

Murphy Oil ZERO OFFSET VSP SURVEY

Environmental Management Plan: Marine Mammal and Sea Turtle Monitoring, Mitigation, and Reporting

With reference to the Biological Opinion (BO) issued by the National Marine Fisheries Service on March 13, 2020 and amended on April 24, 2021.

Approval for issue

Stephanie Milne



02/28/23

Contents

1	INTRODUCTION	3
1.1	Applicable Regulatory Documents and Permits.....	3
2	MARINE PROTECTED SPECIES	3
3	PROTECTED SPECIES OBSERVERS AND PASSIVE ACOUSTIC MONITORING OPERATORS.....	3
3.1	Staffing Plan.....	3
3.2	Roles and Responsibilities	3
3.3	PSO and PAM Operator Requirements	4
4	MONITORING EQUIPMENT.....	4
4.1	Visual Monitoring Equipment	4
4.2	Acoustic Monitoring Equipment.....	4
4.2.1	PAM System	4
4.2.2	PAM JSA and PAM deployment and retrieval procedure.....	5
4.2.3	Distance estimation of acoustic detections.....	5
5	VISUAL AND ACOUSTIC MONITORING PROCEDURES.....	5
5.1	Visual Monitoring Watches.....	5
5.2	PAM Watches.....	6
5.2.1	Procedures for PAM System Malfunction.....	6
6	PROJECT BRIEFING	7
7	MITIGATION PROCEDURES: STRIKE AVOIDANCE.....	7
8	MITIGATION PROCEDURES: SOUND SOURCES.....	7
8.1	Sound Source Exclusion Zones and Buffer Zones	7
8.2	Delays to Initiation of the Seismic Source.....	8
8.3	Ramp-Up Procedure and Testing	8
8.4	Protected Species Shutdown Procedures	9
8.5	Short Breaks in Source Operations.....	9
8.5.1	Daylight Operations	9
8.5.2	Night-time.....	10
8.6	Non-acquisition and Non-Testing Source Activity.....	10
9	REPORTING	10
9.1	Incident Reporting	10
9.1.1	Potential Non-Compliance Incidents.....	10
9.1.2	Reporting A Non-functioning PAM System During Seismic Operations.....	10
9.1.3	Injured or Dead Protected Species Reporting	11
9.2	Daily Progress, Interim and Final Reporting	11
9.2.1	Interim Reports	11
9.2.2	Final Report	11

Appendices

APPENDIX A REGULATORY REFERENCE DOCUMENTS

APPENDIX B PAM EQUIPMENT SPECIFICATIONS

1 INTRODUCTION

Murphy Oil Corporation (Murphy Oil) has contracted RPS to provide the protected species monitoring assets required to meet the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), and the Bureau of Ocean Energy Management (BOEM) monitoring and mitigation requirements during a Borehole Vertical Seismic Profiling (VSP) survey within the Gulf of Mexico. The details of the survey activities are provided in the survey plan application.

To minimize the potential impacts of seismic operations on certain protected species, including marine mammals and sea turtles, the Bureau of Ocean Energy Management (BOEM), the National Marine Fisheries Service (NMFS), and the Bureau of Safety and Environmental Enforcement (BSEE), have outlined monitoring, mitigation, and reporting procedures that survey operators and permit holders are expected to implement during their seismic survey operations.

1.1 Applicable Regulatory Documents and Permits

Protected species monitoring, mitigation and reporting procedures that are applicable to the VSP survey are contained in the following regulatory documents:

1. The Biological Opinion (BO) issued by the NMFS on March 13, 2020, and amended on April 24, 2021, where Protected Species Observer (PSO) procedures are outlined in detail in Appendix A
2. The Letter of Authorization (LOA) issued by NMFS on 14 June 2023, valid through 13 September 2023.

This document, the Environmental Management Plan (EMP), prepared by RPS on behalf of Murphy Oil, describes how monitoring, mitigation, and reporting measures for protected species will be executed during the VSP program to maintain compliance with the regulatory requirements in the 2020 Gulf of Mexico BO and its appendices.

2 MARINE PROTECTED SPECIES

Marine protected species or protected species refers to any marine species for which dedicated monitoring and mitigation procedures will be implemented, including:

- All marine mammals
- All sea turtles

3 PROTECTED SPECIES OBSERVERS AND PASSIVE ACOUSTIC MONITORING OPERATORS

3.1 Staffing Plan

A team of three PSOs and four Passive Acoustic Monitoring (PAM) Operators, supplied by RPS, will be onboard the drillship *Noble Stanley LaFosse* to undertake day-time visual watches and both day and nighttime acoustic watches, implement mitigations, and conduct data collection and reporting in accordance with the BO.

3.2 Roles and Responsibilities

Lead PSO / PAM Tech / Onboard Team Lead

- Coordinate and oversee PAM and PSO Operations and ensure compliance with monitoring requirements
- Oversee all deployments and retrievals of the hydrophone cable

- Maintain and troubleshoot the PAM system hardware and software
- Visually monitor, detect, and identify protected species, as well as determine distance from source.
- Acoustically monitor, detect, and identify protected species, as well as determine distance from source, as needed during remote PAM downtime.
- Record and report protected species sightings, survey activities, and environmental conditions, per regulations
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the survey
- Communicate with the crew to implement mitigation actions as required by environmental protocols
- Participate in daily operation meeting with crew when appropriate

PSO

- Visually monitor, detect, and identify protected species
- Record and report according to survey plan
- Monitor and advise on sound source and vessel operations for compliance with the environmental requirements for the survey plan
- Communicate with the crew to implement mitigation actions as required by environmental protocols
- Participate in daily operation meeting with crew when appropriate

3.3 PSO and PAM Operator Requirements

All PSOs and PAM Operators will have completed a protected species observer training program as described in the BO.

PAM Operators will have completed a PAM training course as described in the BO.

PSOs' and PAM Operators' CVs will be submitted to NMFS for approval prior to deployment on the project.

PSOs and PAM Operators will have completed HUET / Sea Survival training with CA-EBS.

PSOs and PAM Operators have completed the BSEE Marine Debris training.

PSO and PAM Operators have completed an Offshore Safety Awareness training.

PSO and PAM operators will be equipped with Personnel Protective Equipment (PPE), including hard hat, lace up steel-toe boots, fire-retardant coveralls, work gloves, and safety glasses.

4 MONITORING EQUIPMENT

4.1 Visual Monitoring Equipment

The PSO on duty will monitor for marine protected species using the naked eye, hand-held reticle binoculars and bigeye binoculars as described in BO.

Digital camera equipment, including zoom lens that is at least 300 mm or the equivalent on a full frame camera, will be used to record sightings and verify species identification.

4.2 Acoustic Monitoring Equipment

4.2.1 PAM System

Two complete PAM systems will be deployed on the *Noble Tom LaFosse*. Only one PAM system will be active, and the hydrophone cable will be deployed from a location that does not hinder operations and provides optimal acoustic coverage. A rig and survey specific deployment and retrieval procedure will be developed between the Lead PAM Operator and vessel crew. A "Permit to Work" will be secured, and a risk

assessment, as implemented by ship management (e.g., Task-Based Risk Assessment (TBRA), Job Safety Analysis (JSA), etc.) will be completed prior to hydrophone deployment.

The Seiche-designed PAM system consists of a 100-meter hydrophone array cable, electronic processing unit (EPU), headphones, and laptop running PAMGuard Beta 64 will be used in PAM monitoring. The vertically deployed array cable, shown in Apx B Figure 2, contains a single hydrophone element with a frequency response of 20 Hz through 150 kHz, a wide band channel sensitivity of -166dB re1V/ μ Pa, and a low frequency channel sensitivity of -157dB re1V/ μ Pa.

The PAM system has been designed to monitor for most cetacean species found in the Gulf of Mexico, covering a broad range of frequencies up to 200kHz. The predominant vessel noise (dynamic position thrusters and other active machinery on the ship) can be filtered out by raising the minimum frequency threshold at which PAMGuard displays vocalizations to 2 kHz, if/as necessary. Some thruster and machinery noise will still dominate the lower frequencies, but the species of concern should all be detectable above the noise as their dominant frequencies are around the 8 to 20 kHz ranges.

Mid- and high-frequency marine mammal vocalizations are processed by the PAM laptop's internal sound card. Mid-frequency vocalizations include sperm whale click trains and codas, and delphinid whistles in the frequency range of approximately 2 kHz to 24 kHz. Kogia species, beaked whales, and delphinid echolocation clicks that are emitted at very high frequencies in excess of 80kHz are processed by a specialized sound card in the buffer unit, an external National Instruments sound card, capable of sampling audio at 500kHz. PAM equipment specifications are provided in Appendix B.

4.2.2 PAM JSA and PAM deployment and retrieval procedure

A job safety analysis (JSA) will be completed prior to hydrophone deployment. The Lead PSO/PAM Operator will develop, in cooperation with the vessel crew, a vessel-specific deployment and retrieval procedure that considers both the minimization of entanglement risks with other equipment while maximizing the acoustic range of the system.

4.2.3 Distance estimation of acoustic detections

Experienced PAM Operators can make a distance estimation assisted by the noise or detection score system developed by Gannier et al. (2002). Gannier et al. monitored sperm whales in the Mediterranean both visually and acoustically. A scale was developed based upon the strength or intensity of the sperm whale clicks at various distances that were then measured when the sperm whales surfaced and were visually observed. Although the scale is subjective, and sounds produced in marine environments will vary according to local conditions, the scale provides a measure for approximating distances when using a single, linear hydrophone array.

5 VISUAL AND ACOUSTIC MONITORING PROCEDURES

NOTE: Visual and Acoustic monitoring must be consistent, diligent, and free of distractions for the duration of the watch.

5.1 Visual Monitoring Watches

There will be **at least two PSOs on visual watch** during:

- All seismic source activity in daylight hours, including testing
- During search periods prior to activating the seismic source
- **For the duration of any day when there is planned acoustic source activity, whether or not the source is deployed**

When the above conditions are not met, such as days when no source activity is planned, there will still be at least one PSO on watch at all times, whenever the monitoring conditions are defined as "good", (good conditions are defined in the BO as Beaufort sea state of 3 or less).

Visual monitoring will begin 30 minutes before sunrise and continue until 30 minutes after sunset.

The following guidelines will apply to these watch periods:

- No additional duties may be assigned to the PSO during his/her visual observation watch
- No PSO will be allowed more than **two consecutive hours on watch** before being allocated a one-hour break from visual monitoring
- No PSO will be assigned a combined watch schedule of more than 12 hours in a 24-hour period

The PSOs will stand watch in a suitable location that will not interfere with the navigation or operations of the ***Noble Stanley LaFosse*** and that affords an optimal view of the sea surface. PSOs will maintain 360° coverage surrounding the ***Noble Stanley LaFosse*** and the seismic source.

If a protected species is observed, the PSO should first take care of any necessary mitigation actions, or if no mitigation actions are required, they will note and monitor the position (including latitude/longitude of the vessel and relative bearing and estimated range to the animal) until the animal dives or moves out of visual range of the observer.

5.2 PAM Watches

The Lead PAM Operator on the source vessel will have duties that include any technical onboard tasks with the PAM system, scheduling for the whole team, and reporting.

- **PAM monitoring will begin no less than 30 minutes prior to any source activity and continue for one hour after source activity has ended.**

During acoustic monitoring watches, the following guidelines shall be followed:

- No additional duties may be assigned to the PAM Operator during their acoustic monitoring watch
- No PAM Operator will be allowed more than **four consecutive hours of acoustic monitoring** before they will be allocated a break of two hours
- No person on watch as a PSO or PAM Operator will be assigned a combined watch schedule of more than 12 hours in a 24-hour period

5.2.1 Procedures for PAM System Malfunction

If a PAM system is not functional for the purposes of mitigation monitoring, whether because of malfunction with the cables, electronics, monitoring software or another issue, the PAM Operator is permitted **30 mins to diagnose the issue** without the need to shut down the source array.

During daylight when PSOs are also on watch, IF the problem is diagnosed in the first 30 minutes of PAM downtime, an additional 2 hours is permitted to conduct repairs while seismic operations continue **if all the following conditions are met:**

1. The sea state at the time of the malfunction is B4 or less.

AND

2. There were no acoustic-ONLY detections of marine mammals other than delphinids inside the applicable EZ in the 2 hours preceding the malfunction.

NOTE: The above permission to continue operations applies to an active acoustic source on the production shot point interval BUT does not include activations of the source from silence. PAM is required to clear from silence for both ramp up after long silences and returns to full volume after short silences. If the source is silenced, it may not resume shooting until the PAM system is brought online and a 30-minute clearance search is conducted.

Operations conducted without ongoing acoustic monitoring **may not exceed a total of 4 hours in a 24-hour period.**

NMFS and BSEE must be notified as soon as is practicable of any PAM system malfunctions. Reporting procedures are outlined in the Reporting section of this EMP.

6 PROJECT BRIEFING

The PSO/PAM team and any *Noble Stanley LaFosse* crew who have involvement in the seismic operations shall participate in a project briefing that includes communication procedures, monitoring requirements and operating protocols.

The briefing should be repeated every time relevant new personnel join the crew before operations begins.

7 MITIGATION PROCEDURES: STRIKE AVOIDANCE

The BO contains strike avoidance procedures that apply to protected species in the Gulf of Mexico, but they are not relevant to this exploration activity, as it will take place from a stationary drillship, physically attached to the ocean floor.

8 MITIGATION PROCEDURES: SOUND SOURCES

8.1 Sound Source Exclusion Zones and Buffer Zones

Two types of zones will be established around the seismic sources, both radii that extend from the outer edge of the VSP.

Buffer Zones (BZ): Applicable during the pre-clearance search periods conducted prior to initiating the sound source from silence, where detections of a protected species inside it's applicable BZ during the search will result in a delay to activating the source.

- **1500 meters:** All true whale species (Rice's (Bryde's) whales, sperm whales, Kogia species and all beaked whales)
- **1000 meters:** All other marine mammals and sea turtles

Exclusion Zones (EZ): Applicable once the source has been activated, where detections of a protected species inside it's applicable EZ will result in a shutdown of the sound source.

- **1500 meters:** All true whale species (Rice's (Bryde's) whales, sperm whales, Kogia species and all beaked whales)
- **500 meters:** All other marine mammals and sea turtles?

To activate the sound source, a minimum of a 30-minute search period must be conducted.

During the daytime, the search will be conducted visually by the PSOs and acoustically by the PAM Operator.

During nighttime, the search will be conducted acoustically by the PAM Operator.

PSO and PAM on watch should be notified of the intent to turn on the source from silence, either to conduct a ramp-up or for testing, at least 60 minutes prior to the planned start.

8.2 Delays to Initiation of the Seismic Source

If any marine mammal or sea turtle was detected inside its respective Buffer Zone during the 30-minute search period, initiation of the seismic source must be delayed until:

- All marine protected species that were observed inside the relevant BZ have been confirmed by the visual observer to have exited the relevant BZ
- 15 minutes from last detection for small odontocetes if not observed exiting the BZ
- 30 minutes from last detection for all other protected species, including sea turtles, if not observed exiting the BZ
- 30 minutes from last detection for acoustic-only detections

NOTE: Both the 30-minute pre-clearance search period and the mandatory delay for animals not seen exiting the BZ must be completed before source initiation, but the pre-clearance search and delays can be implemented concurrently (they overlap). For a delay period that ends **BEFORE** the clearance search period is completed, the BZ will be cleared when the clearance search is completed. For a delay period that ends **AFTER** the standard clearance search period is completed, the source can be turned on when the delay period is completed.

8.3 Ramp-Up Procedure and Testing

The intent of ramp-up is to warn marine mammals and sea turtles of pending seismic operations and to allow sufficient time for those animals to leave the immediate vicinity.

For all acoustic source activity, including source testing involving more than one airgun element, ramp-up procedures must be conducted to allow marine mammals and sea turtles to depart the exclusion zone before surveying begins.

Ramp-up is not required for testing of single elements but requires completion of the pre-clearance search.

Ramp-up should be planned in an effort to minimize time that the source is active while being brought into position at the next acquisition level.

Acoustic source activation may only occur at times of poor visibility (including night) where operational planning cannot reasonably avoid such circumstances.

Ramp-up procedures are as follows:

- The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up in order to allow the PSOs time to monitor the BZ for 30 minutes prior to the initiation of ramp-up (pre-clearance).
- Visually and acoustically (day) or acoustically (night) monitor the BZ and adjacent waters for the absence of marine mammals and sea turtles for at least 30 minutes before initiating ramp-up procedures.
- If no protected species are visually and/or acoustically detected inside their respective BZs, ramp-up procedures may begin. If animals are detected, refer to Section 7.4 for procedures to clear the BZs prior to start of source operations
- Seismic personnel confirm with PSOs on watch (daytime) and/or PAM Operator (day and night) that the BZs are clear of protected species.
- Ramp-up begins by activating a single airgun of the smallest volume in the array.
- Continue ramp-up in stages by doubling the number of active elements at the commencement of each stage, with each stage of approximately the same duration.
- Total duration of the ramp-up should not be less than 20 minutes.

8.4 Protected Species Shutdown Procedures

If any **marine mammal** is detected visually or acoustically within its EZ, an immediate shutdown of the seismic source is required.

The shutdown requirement is waived under the following circumstances:

1. Shutdown is not required for dolphins of the following genera: *Steno*, *Tursiops*, *Stenella*, and *Lagenodelphis*.
2. Shut down is not required for acoustic detections of delphinids inside the EZ unless the PSO or PAM Operator can confirm that the dolphin(s) present are from a different genus than those listed above.

If there is uncertainty regarding identification (i.e., whether the observed marine mammal(s) belongs to one of the delphinid genera for which shutdown is waived or one of the species with a larger exclusion zone), visual PSOs should use best professional judgment in making the decision to call for a shutdown.

The vessel operator must comply immediately with any shutdown request made by a PSO and/or PAM Operator. Any discussion can occur only after the shutdown has been implemented.

Subsequent restart of seismic source may only occur following clearance of the EZ of all marine protected species under the following conditions:

- When all marine mammals have been confirmed by the visual observer to have been seen exiting the relevant EZ (not BZ)
OR
- When a marine mammal was not observed exiting the EZ, an additional 30 minutes has elapsed following the last detection inside the EZ.

NOTE: All resumptions of source activity following a protected species shutdown must begin with a ramp-up.

8.5 Short Breaks in Source Operations

8.5.1 Daylight Operations

In recognition of occasional short periods of silence for a variety of reasons, other than for mitigation, the seismic source may be silenced for periods of time not exceeding 30 minutes in duration and may be restarted at the same volume for operations without a ramp-up if:

1. Visual and acoustic monitoring (daytime) and acoustic monitoring (nighttime and other reduced visibility) is continued diligently through the silent period

AND

2. No marine protected species are visually observed in their respective EZ during the silent period, and no acoustic detections made **at any distance**

NOTE: Procedures for returning to full volume without ramp-up after silent periods also apply to returning to full volume from reduced volume.

For example, if two of three strings were silenced from full volume for the purpose of testing single strings, and testing was completed in less than 30 minutes, the array could return to full volume without a ramp-up provided that the conditions described above were met.

However, if the source were operating at that reduced volume for more than 30 minutes, **a ramp up would be required to return to full volume.**

8.5.2 Night-time

In recognition of occasional short periods of silence for a variety of reasons other than for mitigation, the seismic source may be silenced for periods of time not exceeding **10 minutes in duration** and may be restarted at the same volume for operations without a ramp-up if:

1. Acoustic monitoring (nighttime) is continued diligently through the silent period

AND

2. No acoustic detections have been made **at any distance**

NOTE: Procedures for returning to full volume without ramp-up after silent periods also apply to returning to full volume from reduced volume.

8.6 Non-acquisition and Non-Testing Source Activity

The acoustic source should be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Unnecessary use of the acoustic source shall be avoided.

9 REPORTING

9.1 Incident Reporting

9.1.1 Potential Non-Compliance Incidents

The Lead PSO or Lead PAM Operator verbally informs the Murphy Oil Party Manager of any potential compliance related issues immediately. The Lead PSO/PAM Operator also informs the RPS Project Manager (PM) immediately of all potential non-compliance events.

If the issue can be resolved between the Lead PSO/PAM Operator, Murphy Oil Representative and Party Manager, the lead PSO/PAM Operator will document in writing the compliance issue and the agreed-upon practices for minimizing future non-compliance incidents of the same nature. The Party Manager and QC Representative will review and approve, and the statement is submitted to the following distribution list:

RPS PM: Matt Harris (Matt.Harris@rpsgroup.com)

Thomas Wichman (TomWichman@murphyoilcorp.com)

The representatives listed above will distribute any pertinent information resulting from the incident to their respective crews as deemed necessary and appropriate.

If the issue cannot be resolved at the vessel level, Murphy Oil and RPS will discuss and determine the appropriate future actions to be taken. When a common position is reached, notification of the agreed procedures will be distributed by Murphy Oil to vessel crew and by RPS to the PSOs and PAM Operators.

If an agreement cannot be reached at the office level, a Murphy Oil representative will contact BOEM/NMFS/BSEE for clarification. Results from the clarification will be distributed by Murphy Oil.

9.1.2 Reporting A Non-functioning PAM System During Seismic Operations

The PAM Operator on duty will notify the RPS PM, who will collect details and notify NMFS and BSEE via email (nmfs.psoreview@noaa.gov and protectedspecies@bsee.gov, respectively) as soon as is practicable.

The notification will include the vessel name, the time and location (GIS position) in which the PAM system ceased to function and where seismic operations continued.

The PAM Operator will also notify by email:

- The vessel Party Chief
- The Murphy Oil Representative

9.1.3 Injured or Dead Protected Species Reporting

1. The PSO on watch will report the sightings of a dead and/or injured marine species to the Lead PSO, the RPS project manager, onboard company man, and the onboard wellsite geologist as soon as is practicable after the sighting.
2. The RPS PM will report the sighting to the appropriate stranding hotline. This will occur as soon as practicably possible but no more than 24 hours of the detection. The RPS PM will continue until contact is made.
3. A written report will be prepared including any photos taken of the animal and sent to RPS as soon as possible.
4. The RPS office will submit the written report to the following distribution list within 12 hours of the detection for review:
 - On-board:**
 - Wellsite Geologist
 - Company Man
 - On-shore:**
 - Tom Wichman

RPS will provide the written report, once the draft has been reviewed and approved per above, to NOAA, NMFS, and BOEM with Murphy Oil in copy.

NOTE: Unless otherwise directed by BOEM, NOAA Fisheries, or NOAA, the dead or injured marine mammal or sea turtle SHOULD NOT be touched! Dead and injured marine mammals and sea turtles are still protected by the ESA and the MMPA and touching the animals in any manner is considered harassment and is punishable by law.

Reporting requirements are specific by species group. There is a stranding hotline contact for marine mammals, sea turtles and other protected species (e.g., giant manta ray, oceanic whitetip shark, or Gulf sturgeon). These notifications will be made by the RPS PM to the appropriate source based on the species incident.

9.2 Daily Progress, Interim and Final Reporting

9.2.1 Interim Reports

RPS will submit interim reports in the format of an excel spreadsheet for each vessel containing the required information listed in the BO.

RPS will submit interim reports (a dataset in a format approved by NMFS and BSEE) on the 1st of each month to BSEE (protectedspecies@bsee.gov).

9.2.2 Final Report

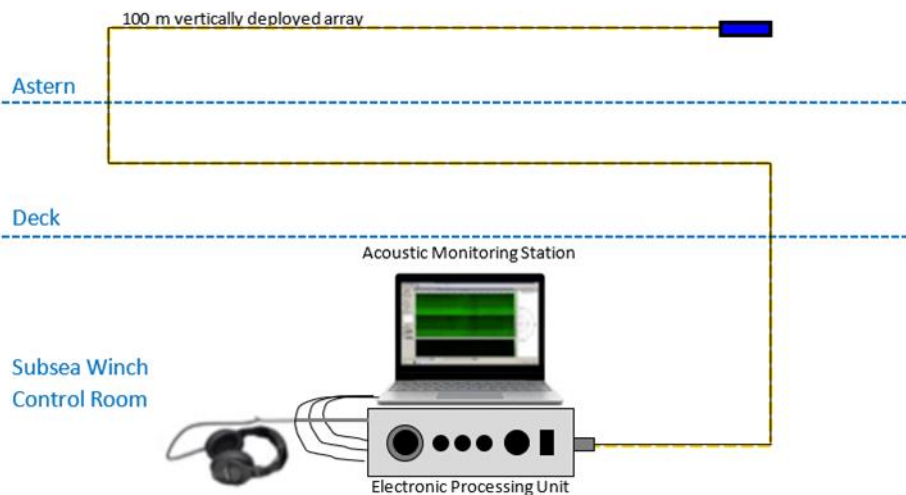
RPS will develop a final report summarizing the survey activities and all PAM / PSO observations. The report will contain all the data required to meet the requirements of the BO.

The RPS PM will provide the draft final report to the Murphy Oil Project Manager within 30 days of project completion.

Appendix B: PAM Equipment Specifications

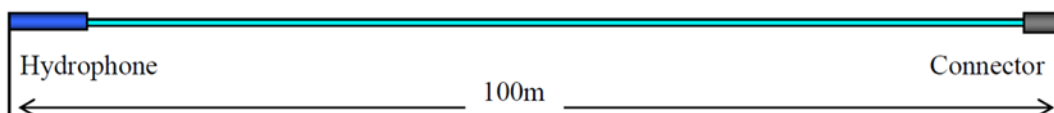
B.1 Passive Acoustic Monitoring (PAM) Parameters

A PAM system designed to detect most species of marine mammals was installed on the Drill Ship *Noble Stanley LaFosse*. The system was developed by Seiche Measurements Limited and consisted of the following main components: a 100 m hydrophone cable, electronic processing unit (EPU), headphones, and a laptop running PAMGuard64. A complete, spare PAM system was also onboard in case of technical malfunctions. Figure 1 is a simplified depiction of the PAM system installed on the *Noble Stanley LaFosse* during the survey.



Apx B Figure 1: Simplified pathway of data through the PAM system onboard the D/S

The vertically deployed array cable, shown in Apx B Figure 2, contained a single hydrophone element with a frequency response of 20 Hz through 150 kHz, a wide band channel sensitivity of $-166\text{dB re}1\text{V}/\mu\text{Pa}$, and a low-frequency channel sensitivity of $-157\text{dB re}1\text{V}/\mu\text{Pa}$.



Apx B Figure 2: Hydrophone array detail

The EPU served as an interface between the hydrophone cable and the laptop. The raw audio signal from the hydrophone element is transmitted through the buffer unit to two sound cards for processing and analysis. The lower range of frequencies, from 5-24 kHz, were captured with the laptop's internal sound card at a sampling rate of 48 kHz. The higher frequency ranges, up to 250 kHz, were captured on a National Instruments data acquisition sound card at a sampling rate of 500 kHz within the EPU. The analogue signal is converted into a digital signal and fed via the USB socket to the laptop for display.

The PAM operator conducted acoustic monitoring at a local monitoring station inside the subsea winch control room (Apx B Figure 3).



Apx B Figure 3: Passive Acoustic Monitoring station

Appendix C: Survey Drillship Photos



Figure 1. Seismic Acquisition Vessel D/S Deepwater Invictus

Appendix D: PSOs and PAM Operators

Approved RPS PSO Name

Leo De la Rosa

Laura Galvan

Tiffany Ramdoo

Alejandra Ramos

Sandra Pina

Elizabeth Breton

Travis lay

Appendix E: Vessel Specific PAM Deployment Procedures

Murphy Baker Hughes Noble Stanley Lafosse VSP PAM deployment

Hydrophone Cable Deployment

1.1 PAM station location

On this project, we performed a static deployment of a Seiche single-channel PAM array. A total length of 25 meters of hydrophone cable was deployed manually from the designated area assigned by the OIM/Master. This location was on the 'U' deck on the portside beam of the vessel. The specific area was assigned to avoid any risk of entanglement with the multiple vessel's DPS thrusters. To reinforce the safety of the equipment, a safety line was attached to the hydrophone cable. The hydrophone was deployed to a 10 m depth beneath the hull of the rig (Fig.1). The rest of the hydrophone cable remained coiled in the wooden spool on the deck.

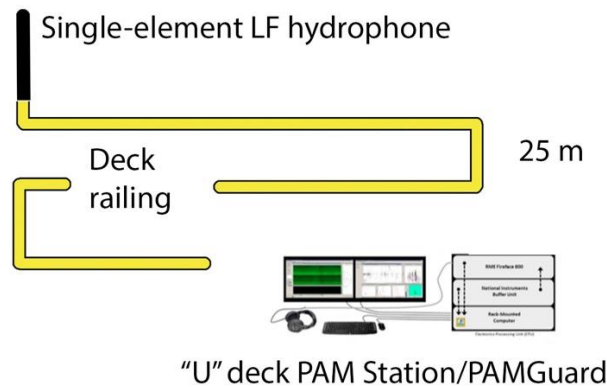


Figure 1. Noble Stanley Lafosse PAM deployment schematic.

1.2 Safety and Compliance

The use of photography or video is highly restricted for the section of the rig where the PAM station was set up. There are no photos of the set up available.

An electrical engineer for NOBLE inspected the PAM kit and supplied the team with a step-down transformer to provide the proper 220 V power for the PAM system. A work safety permit was extended by NOBLE to allow the use of an electric installation on the designated deck. A JSA for PAM deployment was also completed and submitted to NOBLE in order to obtain the work permit.

1.3 PAM Configuration

The hydrophone cable was connected to the NI buffer box. The output of the buffer box was then run into PAMGuard using a USB connection. The LF output was run into a Beringher audio interface which was then connected into the PAM station computer. Finally, a pair of

AudioTechnica headphones were used to monitor the sound source by the PAM operator. The headphones received sound from the NI buffer box headphone output.

1.4 PAMGuard configuration

PAM operators used PAMGuard Beta version 1.15.04 to monitor for protected species. A configuration file for vertical deployments of a single LF hydrophone was used.

Appendix F: Excel Data Sheets of Monitoring Effort, Source Operations and Detections of Protected Species During the Program

Appendix G: Required Attendees at PSO Briefing

Required Attendees at PSO Briefing

Name	<i>Position</i>	Affiliation
Leo De la Rosa	Lead Acoustic PSO	RPS
Alejandra Ramos	Acoustic PSO	RPS
Laura Galvan	Acoustic PSO	RPS
Tiffany Ramdoo	Acoustic PSO	RPS
Sandra Pina	Lead PSO	RPS
Travis Lay	PSO	RPS
Elizabeth Breton	PSO	RPS
Mike Sonier	Seismic Operator	Baker

Appendix I: PAM Calibration Certification

V-PAM System Sensitivity

Seiche 1-ch V-PAM **SM.4328**



Contents

Contents.....	2
Document Control.....	3
SM.4328 System Frequency Response.....	4
Calibration Values for PAM Software	5
Pamguard Array Manager.....	5
Pamguard Sound Acquisition.....	5
NI USB-6251	5
UCA-222	5
Calibration Methods	6
Recording Chain Components.....	6
Hydrophone at Low Frequency.....	6
Hydrophone at High Frequency.....	7

Document Control

Project Reference	Internal		
Client	RPS (USA)	Client Reference	
		Revision	Date
Prime Author(s)	Chris Pierpoint	1.0	02 March 2022
Reviewed by			
Update			
Reviewed by			
Update			
Reviewed by			
Update			

Disclaimer

Whilst every reasonable skill, care and diligence has been exercised to ensure the accuracy of the information contained in this Report, neither Seiche Ltd nor its parent or associate companies past present or future warrants its accuracy or will, regardless of its or their negligence, assume liability for any foreseeable or unforeseeable use made thereof, which liability is hereby excluded. Consequently, such use is at the recipient's own risk on the basis that any use by the recipient constitutes agreement to the terms of this disclaimer. The recipient is obliged to inform any subsequent recipient of such terms.

Copyright notice

The contents of this report are © Seiche Ltd.

Permission is given to reproduce this report in whole or in part provided (i) that the copyright of Seiche Ltd and (ii) the source is acknowledged. All other rights are reserved. Any other use requires the prior written permission of Seiche Ltd. These Terms and Conditions shall be governed by and construed in accordance with the laws of England and Wales. Disputes arising here from shall be exclusively subject to the jurisdiction of the courts of England and Wales.

SM.4328 System Frequency Response

This PAM system has been calibrated so that realistic sound level and signal amplitudes values may be displayed in PAM software. The system frequency response of the system when using this hydrophone cable is shown below, and calibration settings are provided for use in Pamguard.

Table 1 provides -3 dB and -6 dB points of the system response curves for the single hydrophone. These points delimit the ‘flat’ portion of the response curve. The hydrophone signal is acquired by two devices: a) a Behringer UCA-222 sound card, at a sampling rate of 48 kHz; and b) a National Instruments USB-6251 high-speed DAQ at a sampling rate of 500 kHz. The frequency response curves are shown in Fig. 1.

Table 1 Frequency points for -3 dB and -6 dB system sensitivity.

Hydrophone	UCA-222, -3 dB	UCA-222, -6 dB	USB-6251, -3 dB	USB-6251, -6 dB
H1	16-24,000* Hz	10-24,000* Hz	16-200,000 Hz	10-250,000*

[*The -response curve was flat to the Nyquist frequency.]

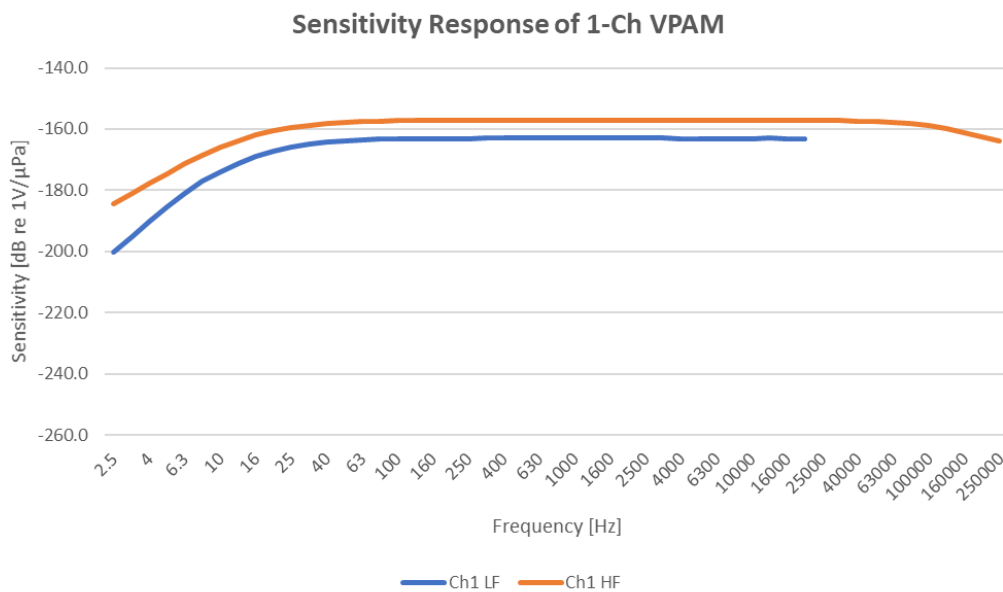


Fig. 1 System frequency response curves showing channel sensitivity for representative hydrophones of the H1-H2, H3-H4 and H5-H6 groups.



Calibration Values for PAM Software

Pamguard Array Manager

H1 (Ch0) Sensitivity = -197.0 dB re: 1 V/uPa, Preamplifier Gain = +40.0 dB

Pamguard Sound Acquisition

NI USB-6251

Terminal Configuration Differential
Input Voltage Range 4 V (set as +/- 2 V per channel)
Additional System Gain 0 dB
Channels SW Ch0 / HW Ch1
Sample Rate up to 500 kHz
Sample Size 16 bit

UCA-222

Input Voltage Range (p-p) 2 V (i.e., +/- 1 V)
Additional System Gain -6.0 dB
Channels SW Ch0 / HW Ch0
Sample Rate 48 kHz
Sample Size 16 bit*

[*On more recent VPAM systems the Behringer UCA-222 is replaced by a Behringer U-Phoria UMC202HD sound card, which samples the signal at 24-bit sample size (bit depth).]

Calibration Methods

Recording Chain Components

At Seiche Ltd., we measure the gain response of the individual electronic components of our PAM systems as a quality control process, immediately after purchase or manufacture. The same procedure, with slight differences, is followed when measuring the frequency response of preamplifiers, buffer boards, and data-acquisition units (DAQs).

The National Instruments DAQ NI-6251 is at the heart of the calibration approach. Currently, we use two in-house software applications (coded in MATLAB and LabView) to automate the measurement process. Both applications work in a similar way, producing a sequence of short tone bursts of increasing frequency, which are sent to the input of the Device Under Test (DUT) via the NI-6251, and are simultaneously recorded by the NI-6251 from the output of the DUT. The output tones from the DUT's are 'gated' and band-filtered to minimise the effect of contaminating noise. Gain is then calculated as the ratio between the root-mean-squared (RMS) voltage of the band-filtered output and the input at each measured frequency. The frequency response is presented in decibels, as $20 \times \log_{10}$ voltage gain.

A Faraday cage is used for the calibration of small components, such as preamplifiers and buffer boards, to reduce the contamination from electromagnetic interference. For larger devices, such as DAQ units, band-filtering techniques are most effective.

Hydrophone at Low Frequency

The low frequency sensitivity of all piezo-electric ceramics is measured before these are 'potted' onto a hydrophone cable using Robnor Resinlab EL225D/Bk. For this purpose, we use a relative *pressure-field* calibration method with a reference transducer, as described in section 10.4.1 of the BSI standard BS EN IEC 60565-2:2019 "Underwater Acoustics – Hydrophones – Calibration of Hydrophones. Part 2: Procedures for low frequency pressure calibration".

The ceramic is housed in an air-tight copper enclosure sealed at the bottom by a loudspeaker. The enclosure comprises two output terminals, connected internally to the ceramic, and an opening for the attachment of a reference microphone. The loudspeaker is driven with a constant low-frequency tone produced by a TTI TG5012A signal generator. A preamplifier is connected to the output terminals

of the ceramic to adapt the impedance between the ceramic and the measuring device. The microphone is connected to a WB1372 DeltaTron power supply to polarise the capsule and condition the signal. The outputs from the ceramic and preamplifier, and the reference microphone and power supply, are connected to an Agilent MSO-X 3024A digital oscilloscope. The RMS voltages from the three outputs are then measured and added into a spreadsheet tool for automatically calculating the sensitivity (in dB re: 1 μ Pa) for the corresponding frequencies. The spreadsheet uses the sensitivity of the reference microphone and the gain of the ceramic's preamplifier to calculate the final sensitivity of the ceramic.

Only six frequencies, from 10 Hz to 200 Hz, are routinely calibrated. Higher frequencies cannot be accurately measured with this method, since the *pressure field* assumption is no longer valid for frequencies comparable or lower than, the largest dimension of the cavity of the enclosure, resulting in an in-homogenous pressure field. Nonetheless, the low-frequency sensitivity of the ceramic remains practically constant at frequencies lower than the mechanical resonance of the ceramic, which is of the order of 50 kHz for our spherical ceramics.

The sensitivity response of 'potted' hydrophones at low frequencies is calculated as the combination of the nominal sensitivity of the ceramic (averaged over 5 measurements from 20 Hz to 200 Hz) and the gain response of the selected preamplifier. The sensitivity response calculated in this way holds relatively high accuracy up to 10 kHz. For frequencies above 10 kHz, a high-frequency calibration approach is required.

Hydrophone at High Frequency

When required, the high frequency sensitivity of 'potted' hydrophones is measured using a relative *free-field* method with reference hydrophone, as described in section 10.4.1 of the BSI standard BS EN IEC 60565-1:2020 "Underwater Acoustics – Hydrophones – Calibration of Hydrophones. Part 1: Procedures for free-field calibration of hydrophones".

The hydrophone under test (HUT) is placed in a *pool* or large water tank at a fixed position, depth and orientation. A *projector* or emitting hydrophone is placed at a fixed distance from the HUD. A National Instruments NI-6251 DAQ is used to simultaneously generate and measure a sequence of short tone bursts. The signal sequence is sent to a 50 dB power amplifier, with flat response below the megahertz range, to drive the projector. The voltage from the HUT is measured by the NI-6251. The process is repeated by replacing the HUT with a reference hydrophone of known sensitivity. The individual tones

in the sequences measured by the reference hydrophone and HUT are 'gated' and band-filtered before calculating their RMS voltage.

The measurement from the reference hydrophone is used to provide an accurate estimate of the pressure at the HUD for different frequencies. The pressure at the receiver and the measured voltage from the HUT are combined to obtain the sensitivity of the HUT, in dB re: 1V/ μ Pa.

The burst duration, emission period and measurement repeatability are key for the success of this type of calibration. The burst duration must be short enough to ensure that individual tone bursts are not affected by reflections from boundaries in the finite-sized tank, and can then be isolated; the emission period must be long enough to ensure that the reverberant energy from a previous emission is totally dissipated; and test conditions (hydrophone locations, water temperature, cables, etc.) are carefully controlled to ensure repeatability in the results. All free-field measurements are carried out with strict control measurements to guarantee maximum accuracy within the limitations of the calibration approach (see BS EN IEC 60565-1:2020).

Appendix J: Lead PSO Data Certification



I, Leonardo De la Rosa, am familiar with the protocols outlined in Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols, implemented by the Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE), which provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361- 1423h).

I hereby certify that, to the best of my knowledge, the data collected by the Protected Species Observer (PSOs) offshore and the information that was provided to RPS by the PSO team for our vessel to compile this report is accurate.

Name: Leonardo De la Rosa

Position: Lead Protected Species Observer

Oct 1, 2023

Date: _____

Signed  _____
855EF96C35A64C7...

I, Matthew Harris, am familiar with the protocols outlined in Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols, implemented by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE), which provide guidelines to operators in complying with the Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and Marine Mammal Protection Act (MMPA; 16 U.S.C. §§1361- 1423h).


I hereby certify that, to the best of my knowledge, the information provided in this report that was compiled by the RPS Project Support Manager is accurate.

Name: Matthew Harris

Position: RPS Environmental Project Manager

Oct 1, 2023

Date: _____

Signed  _____
643247A61DE743E