Regia Marine Seismic Survey
Sound Source Verification Procedure

Appendix G6: REG-EP-047-G6

Rev 1

December 2025

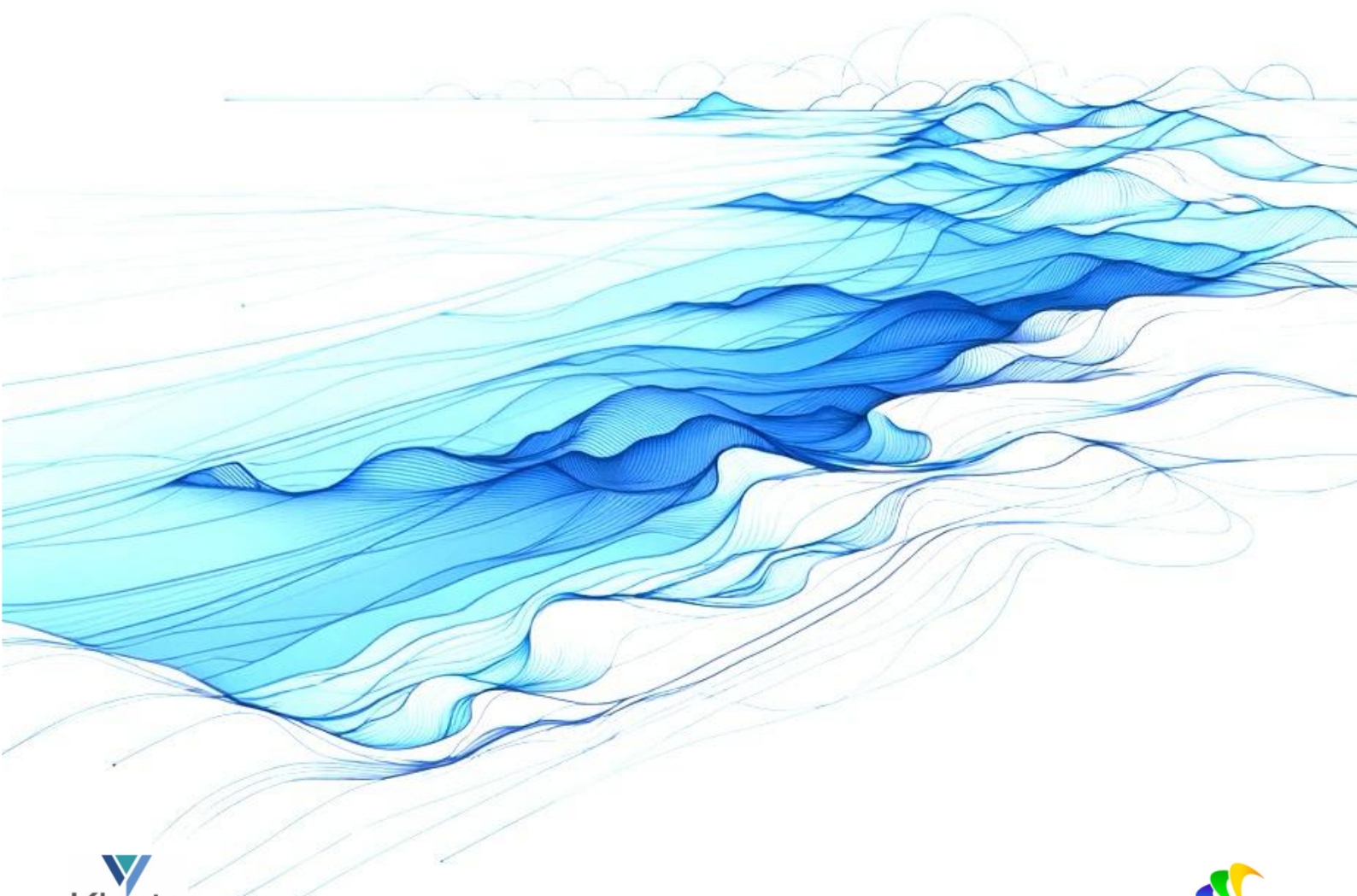


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1 Purpose

This procedure describes the sound logging system which CGG has designed with the primary objectives being to:

a) obtain an empirical baseline of in-water ambient sound profiles.
b) to monitor sound profiles emanating from the Regia MSS.
c) Meet the EPO: Underwater sound emissions from the Regia MSS are empirically measured and validated through the sound source verification procedure to ensure they remain within levels that do not cause injury or unacceptable disturbance to Southern Right Whale.

The collection of on-location ambient sound data (which has historically been very sparse and not location specific) will enable further calibration and testing of existing acoustic model predictions. It will also allow for more informed impact analyses where sound masking is an important consideration.

It provides assurance that the EPO for sound source verification (SSV) can be met by ensuring that:

- Ambient sound levels are measured and recorded at representative sites.
- Hydrophone and mooring configurations function as designed.
- The Regia MSS sound source meets predicted received-level characteristics.

As these activities are within and/or near to the designated Biologically Important Area (BIA) for Southern Right Whales they are being conducted in accordance with Regulation 27 of the Marine and Coastal (Prescribed Consents) Regulations 2025 (Vic), with written approval obtained from the Director of Safe Transport Victoria.

2 Scope

Applies to all sound source verification (SSV) related activities within the Regia MSS Environmental Planning Area. All operations are governed by the CGG Marine Assurance System.

The sound monitoring program contains three primary components.

- Deployment:
    - Recording of ambient sound will be undertaken at 7 locations (see Figure G6-1) three of which will be via tethered PAMS and four of which will be via bottom mounted hydrophones (see Figure G6- 1 below).
- Sound Source Testing:
    - Multiple comparison tests will be made between logging units to ensure they are all listening and recording in a comparable way.
    - To better quantify the influence of noise from mooring systems in masking incoming sounds there will be multiple comparison tests between moored PAM units and free-floating PAM units to try and isolate the components of the ambient noise signal that are from movement of the mooring system.
- Data recoding:
    - Recording will start before the MSS and run throughout the survey period. Once the survey starts PAM data will be accessed multiple times daily to inform our monitoring of impulsive sound coming from the MSS.
    - To quantify and monitor the acoustic noise signal coming from the MSS there will be a regular sampling program undertaken throughout the survey period. This will involve obtaining recordings at a series of distances from the Regia MSS with the maximum distance defined by no seismic signal present. These distances will be set at increasing 5km increments out to 20km from the survey vessel, i.e. at 5km, 10km, 15km and 20km.

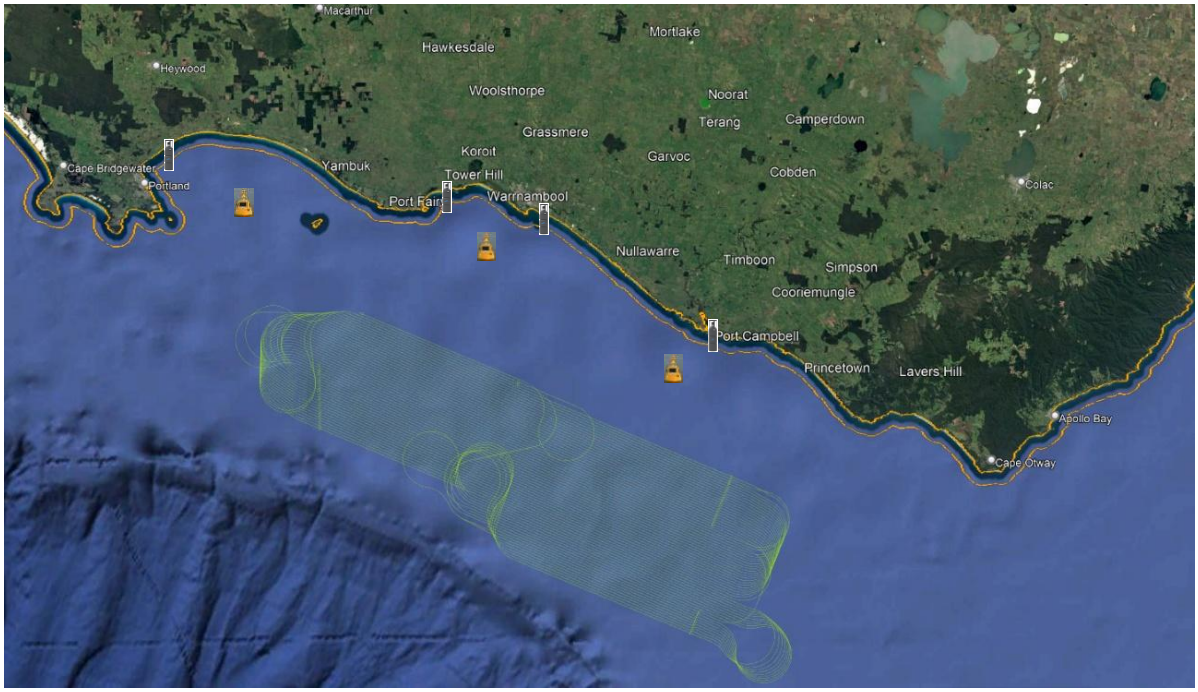


Figure G6- 1: Tentative locations of bottom mounted sound loggers (≤20m depth) and anchored PAM systems (40-50m depth).

3 Responsibilities

Roles and responsibilities for the Regia MSS apply and can be found in the Implementation Strategy (Appendix B3).

4 Equipment

Tethered SSV Buoys (©Sercel QuietSea)

- Three SSV buoys from Sercel with QuietSea technology, and real-time autonomous passive acoustic monitoring capability. These units have an integrated hydrophone, data logger, GPS, and telemetry (https://www.sercel.com/en/products/quietsea). Data will be retrieved at regular intervals through either a 4G connection or Satellite links.
- Buoys will be moored at pre-determined locations at Portland Bay (40-50 m depth), Logan's Beach (40-50 m depth), and Port Campbell (40-50 m depth). Precise GPS coordinates TBD (once actual deployment has occurred, but Figure G6-1 gives approximate locations).
- These systems will be deployed/recovered via a dedicated vessel with appropriate certified lifting gear, acoustic release systems, and mooring interface assemblies.

Bottom-Mounted SSV Loggers (© Ocean Instruments, SoundTrap)

- Four SoundTrap hydrophones from Ocean Instruments will be deployed at four locations (see Figure G6-1) where SRW mothers and calves are historically known to reside for extended periods. These loggers are for short term deployments of up to 3 months between battery changes.
- Data is recorded on 4 micro-SD cards and retrieved when the instrument is brought to the surface for battery renewal.
- The STD model (as opposed to High Frequency Model) used here has very low self-noise, ensuring clean recordings.
- A custom bracket has been developed which contains a clamping system. This enables the units to be retrieved by release of the clamping system, while the bracket remains attached to the bottom. Data is downloaded from the unit on the boat then the unit has its batteries replaced and is returned to the bracket and reclamped. Brackets will be permanently removed once sound logging is no longer needed.

5 Procedures

5.1 Deployment of loggers for ambient sound recording.

This section describes the sequence, controls, and responsibilities for deployment of the three tethered SSV buoys and the four bottom mounted hydrophones. These units will collect ambient sound measurements from the nearshore and midshelf regions which will be used for calculation of ambient baseline conditions prior to the Regia MSS acquisition phase. All units will continue collecting received sound measurements throughout the MSS acquisition period to help calibrate sound models. As the three SSV buoys have real-time access capability they will be used to monitor the far-field sound source from the MSS as it approaches the BIA.

5.1.1 Calibration of sound loggers

Prior to deployment all loggers will record data simultaneously with other recorders to ensure that sound measurements are comparable. This will be done by putting loggers close together while they simultaneously record for a minimum of 30 minutes.

5.1.2 Quantification of mooring-related self-noise (e.g. line strumming).

SSV buoys will produce their own sound signature through noise generated from the mooring, which will add confounding noise to the ambient sound recordings. Recording of ambient noise with a similar SSV buoy that is not moored will provide a means to calibrate the contribution that mooring noise makes to recordings. As an SSV is moored and starts recording a second SSV will be deployed, but not moored, to record from the same soundscape but at a distance far enough away to not have the signal contaminated by mooring noise. Recording will be for a minimum of 30 minutes. The mooring has also been designed to minimise noise effects as much as possible.

5.1.3 Ambient background sound recording.

The initial role of the sound logging system is to obtain ambient noise recordings when seismic is not being undertaken. This baseline information will be used to quantify the characteristics of the sound field adjacent and near to the SRW BIA. Such data is needed to enable masking effects to be incorporated into analysis of sound signatures emanating from the seismic survey. This data will also be augmented with a pre-existing dataset of ambient noise captured by the IMOS program from 2012-2017. This data was collected from loggers located approximately 20km off Portland in ~130-150m water.

The three surface moored SSVs will collect and transmit data for near real-time analysis during the MSS. They are effectively functioning as sentinels which stand between the MSS and the SRW BIA. If sound levels are detected above pre-determined thresholds and are determined to have come from a seismic source, then the SSV system will send a notification to this effect which will initiate responses as needed.

5.1.4 Logistical Details

Mobilisation and Transit

1. Load all buoys and mooring hardware at port. Candidate ports are Portland Port or Port Fairy.
2. Transit to Cape Nelson (Site 1) by ~ 1 August 2026.

Site 1 – Cape Nelson

3. Connect Buoy 1 to pre-installed mooring and commence ambient recording.

4. Deploy Buoy 2 for capturing sound field without mooring noise - should remain ~ 500 m distant to Buoy 1 (to ensure no mooring noise is being captured) and let drift past Buoy 1; record free-field ambient data for minimum 30 minutes.
5. Recover Buoy 2 and log all times, positions, and instrument diagnostics.
6. Transit to Site 2.

Site 2 – Logan's Beach

7. Connect Buoy 2 to pre-installed mooring and commence ambient recording.
8. Deploy Buoy 3 as per Site 1 instructions and allow to drift past Buoy 2; record free-field ambient data for minimum of 30 minutes.
9. Recover Buoy 3 and log all times, positions, and instrument diagnostics.
10. Transit to Site 3.

Site 3 – Cape Otway

11. Connect Buoy to pre-installed mooring and commence ambient recording.
12. Return to port once all deployments are verified.

Data Handling

Confirm recording integrity; back-up metadata; transmit summary to CGG Environment Advisor promptly.

5.2 Monitoring of the Seismic Sound Field

This section describes t the method and sequence for monitoring of the seismic sound field while the survey is acquiring.

The objective is to:

- Measure received sound levels at 5 km, 10 km, 15 km (and if necessary 20km) from the seismic source zone to obtain a real-time understanding of the sound envelope that is accompanying the acquisition process. This process will be repeated multiple times as the survey moves over different depths and habitat types. This real time measurement will provide an early warning system for potential sound violations into the SRW BIA as the spatial extensions of the sound envelope will be known in advance of approaching the closest point to the BIA.
- This data will also be used to check alignment of real data with modelled predictions for the Regia MSS source configuration.
- Demonstrate that operational control measures for sound source ramp-up and shutdown are effective and compliant with CGG's environmental performance outcomes (EPOs) for underwater sound.

5.2.1 Logistical Details

First recordings will commence within the first week of the seismic acquisition. Subsequent timing of recordings will be decided based on changing depth and bathymetry conditions. We anticipate at least 3 recordings will be undertaken across the duration of the MSS.

Deployment for Drift Recording

While the Seismic vessel follows pre-ordained transects the support vessel will travel to a position approximately 5 km, 10 km, 15 km (and 20km if needed) from the seismic vessel along a rhumb line running from the seismic vessel and meeting the coast at a perpendicular angle. At each nominal distance a sound logger will be deployed to record for at least 30 minutes. Once a recording is completed the support vessel will move to the next distance along the rhumb line and repeat. A

deployment will consist of a sound logger attached to a buoy and tether and free floating independent of the support vessel and far enough away to minimise support vessel noise being recorded (see Figure G6-2). Distance travelled will be noted and sound files verified before moving to a new location.



Figure G6-2: Schematic indicating how drift recording at staged distances from the seismic vessel will proceed.

5.3 Determination of sound breaches in the BIA

CGG will implement a precautionary and pro-active underwater sound monitoring program during the Regia MSS. This program draws directly on current best practice for characterising and managing underwater noise impacts (e.g., Marotte et al. 2022[1]).

The objectives are to ensure that:

- underwater sound levels remain within natural and/or acceptable levels as defined by ambient sound recordings from the area.

[1] Marotte et al (2022), provide a detailed description of relevant approaches to quantifying underwater noise impacts to North Atlantic Right Whales, which are clearly an appropriate proxy for Southern Right Whales. Conclusions are based on the collective response of 24 experts in fields relevant to such a topic e.g. underwater noise, impacts of noise on marine mammals, marine mammal hearing, policy and management etc. Moreover, seismic airguns were identified as a major acoustic stressor and hence there are detailed guidelines relevant to this type of disturbance.

- any statistically/biologically meaningful departures from natural and/or acceptable levels are detected promptly.
- The likely source of any such departures is promptly identified to determine if the signals can be directly attributed to the seismic survey; and
- Where the cause- effect pathway is identified as linked to the MSS, timely management actions are implemented to mediate any potential for disturbances.

To establish baseline distributions of ambient (natural) underwater sound levels, prior to acquisition, CGG will:

- Download and analyse data collected by the IMOS Passive Acoustic Observatories buoy array operating off Portland between 2009 and 2017. Sound data from the months September, October and November will be assessed from multiple years to establish a mid-shelf baseline dataset for the period appropriate to the MSS.
- Collect, download and analyse ~8 months of ambient sound data collected from multiple loggers deployed in the nearshore environment (~20m depth) within the SRW reproduction BIA. These data will establish a nearshore baseline dataset for the MSS.

5.3.1 Warning System Methodology

Ambient baseline data will be used to determine whether any unacceptable sound levels from the seismic survey reach the BIA. Having empirically derived ambient noise data for the area will enable masking effects to be incorporated into calculations which is a more realistic approach than only using received sounds. Warning parameters will be set based on violations of the ambient sound scape and its interaction with any masking effects (see Figure G6-3 for further details).

The MSS survey is scheduled to start from the 16 September 2026. At this time the moored SSV buoys will have been recording ambient sound conditions for at least 4 weeks which will provide the baseline spectral probability plot against which any seismic related incursions can be detected.

Active seismic will start approximately 70 km from the coast at the most southerly lines (refer to MAP-REG-EPM-040). Drift recording of the sound profile will be undertaken at this time and sound data captured at 5km, 10km, 15km and 20km (if needed) will be analysed to ascertain the extent of horizontal, seismic attenuation. This process will be repeated at least 3 times as the survey comes progressively closer to the coast and BIA boundary. This will serve as an early warning system - independent of the tethered PAMS – to indicate whether inappropriate levels of seismic sound may penetrate the BIA.

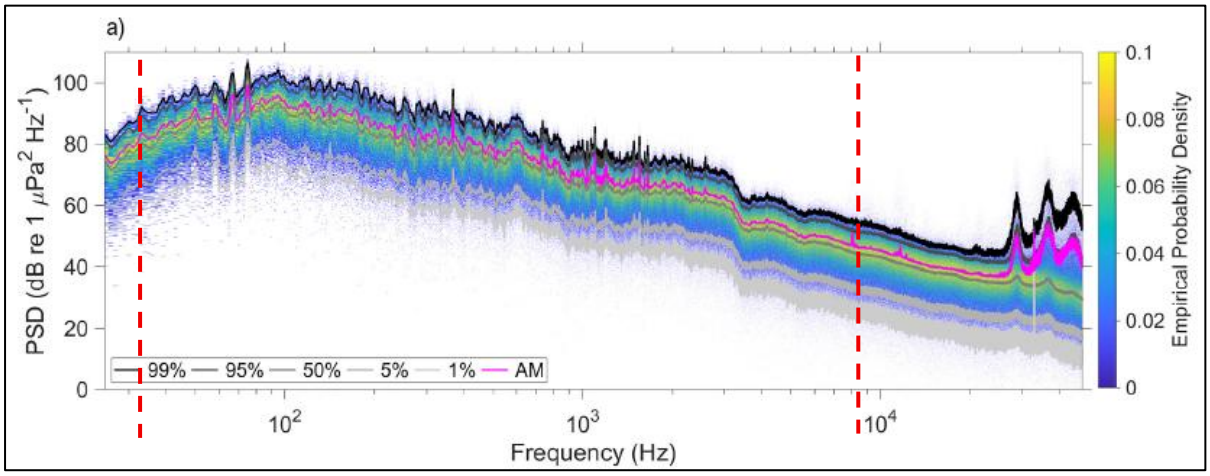


Figure G6-3: Example of a Spectral Probability Plot (SPP) with percentiles and the arithmetic mean (AM) represented.

This is from a 20-minute recording off Scotland in 2018 (van Geel et al 2022). These plots will be generated and updated multiple times each day from data uploaded from the moored PAMS. Warnings will be programmed into the PAM software to provide notice of any anomalous sound signals as defined by the running SPP. For the Regia MSS the calculations will be filtered to the frequency band between 7Hz and 36kHz (NOAA Technical Guidance 2024) – as indicated by the dashed red lines.

Having established the baseline ambient sound profile and then actively monitoring the seismic attenuation signal as the survey progresses, we then set the parameters on which an anomalous signal will be defined. We will be using sampling protocols as recommended by Marotte et al (2022)[2] and Southall et al (2023) for monitoring of behavioural changes and masking in baleen whales.

Specifically, a probability distribution of third-octave sound levels across the relevant weighted bands and established using a 0.1- second sound assessment window will be used. To capture short-term behavioural response thresholds for impulsive noise, the peak sound pressure level (PK) and the sound exposure level (SEL) from the individual impulses are calculated. The values will be averaged over a 3-min interval for checking against the set thresholds (Southall et al 2023). The target thresholds have been pre-determined with the lowest threshold set at an ultra-conservative 120 dB as calculated across the frequency band most applicable to hearing in LF cetaceans (see Figure G6-3).

If a significant breach is confirmed by the system, then the adaptive management protocols will be activated as described in Appendix G2- Fauna Management Plan.

[2] Marotte, Emmaline, Andrew J. Wright, Heather Breeze, et al. (2022). "Recommended Metrics for Quantifying Underwater Noise Impacts on North Atlantic Right Whales." Marine Pollution Bulletin 175: 113361. https://doi.org/10.1016/j.marpolbul.2022.113361.

Southall, Brandon L., Dominic Tollit, Jennifer Amaral, Christopher W. Clark, and William T. Ellison. (2023). "Managing Human Activity and Marine Mammals: A Biologically Based, Relativistic Risk Assessment Framework." Frontiers in Marine Science 10. https://doi.org/10.3389/fmars.2023.1090132.

6 Environmental and Safety Controls

- Comply with MARPOL Annex V – no discharge or disposal of materials overboard.
- Suspend activities if sea-state > 4 m or operating at night.
- If any whale is detected in relevant SDZs during soft start procedures, the acoustic source will be shut down, and another soft start cannot commence until all pre-acquisition criteria have been met again.
- Lost-gear notification to AMSA within 2 hours.
- Maintain 500 m separation between vessels during all manoeuvres.
- Adhere to CGG HSE-OMS stop-work authority and toolbox briefings before each phase.

7 Data Management and Reporting

- Verify logger clock synchronisation and sample rates.
- Store duplicate copies of datasets on encrypted drives and upload to Regia server as soon as possible.
- Submit SSV Validation Report summarising:
    - measured vs modelled received levels;
    - hydrophone calibration records; and
    - compliance statement against relevant EPOs (Underwater Sound, Section 1.8 of Appendix G1).

8 Deliverables

Deliverable	Responsible Party	Timing
Daily Operations Logs	Field Team Leader	During operations
Acoustic Datasets (5, 10, 15 km)	Acoustic Team	Within 48 hours of test
Ambient Baseline Data	Acoustic Team	Ongoing
SSV Validation Report	CGG Technical Ops Manager	45 business days after the conclusion of the survey.

9 Document Control

Version	Date of Revision	Author/Reviewer	Summary of Changes
0.1	1 December 2025	AH, MS, CT, RS, EO	Document Created