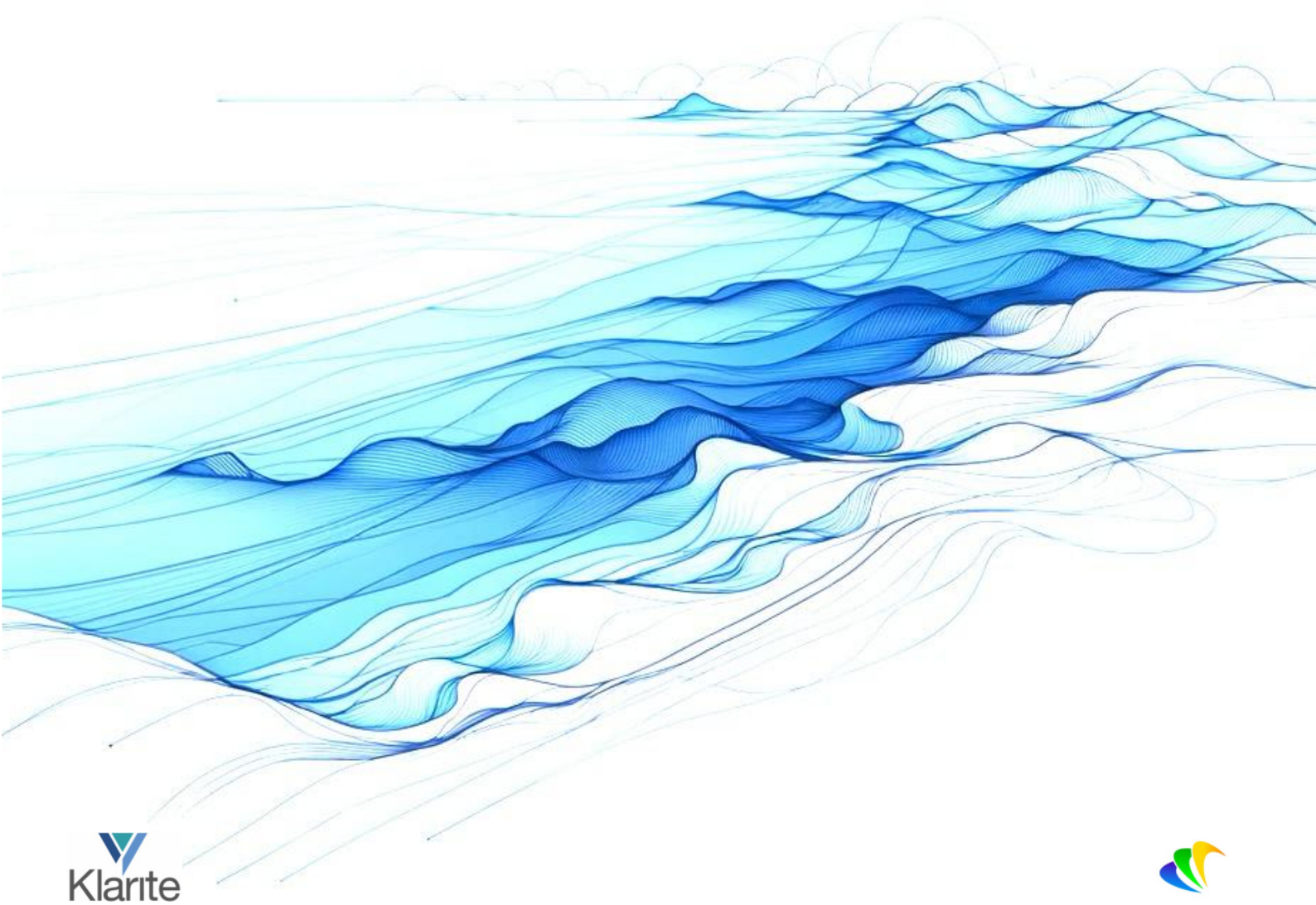
REGIA
Marine Seismic Survey

Impact Assessment
Underwater Sound: Invertebrates

Appendix E4: REG-EP-023-E4

Rev 4

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Klarite

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1 Introduction

Underwater Sound was identified through the Preliminary Environmental Impact and Risk Assessment (PEIRA) (Appendix B4) as an Aspect needing further assessment. Hence this document presents a detailed examination of Underwater **Sound**, as will typically be produced during the proposed Regia Marine Seismic Survey (**Regia MSS**), and its interaction with the environmental Receptor we are collectively calling **Invertebrates.**

This assessment is built on the information contained in the following four core studies, which should be read in the order they are listed:

1. PEIRA.
2. Seismic Sound Studies Report (Appendix B8).
3. Sound Emissions Modelling Reports (Appendix B7).

1.1 Purpose and Scope

The purpose of this document is to assess all acceptable sources of information to provide clear outcomes around levels-of-impact, and any associated mitigation and management measures that may be needed.

This assessment is the second stage of the environmental assessment. Its purpose is to rank the impact according to the criteria set out in the Environmental Assessment Process found in Appendix B3. The purpose of this stage of the assessment is to demonstrate that the impact can be managed to an acceptable level through the adoption of mitigation measures and the setting of an appropriate environmental performance outcome.

The measures adopted because of consultation and because of the assessment will be carried through to the ALARP assessment which occurs in stage three of the overall assessment process. Recommendations will be made if there is any further assessment required in the third stage of the assessment.

1.2 Consultation in Preparation of the EP

This document was initially published in draft form and uploaded to the Document Library of the Regia MSS Consultation Hub on 11 September 2023 as a stand-alone document, rather than as part of the much more substantial total EP document. This was done to maximise the ability of interested members of the public to read, interpret and respond within the mandated 30-day public comment period.

As such, public and Relevant persons were invited to comment on the document with an explicit request for feedback on:

- The accuracy of the described environment that may be affected.
- Any omissions of environmental values and sensitivities relevant to the environmental aspect.
- Any errors or omissions of scientific/peer reviewed literature that should be considered.
- Any errors or omissions of relevant legislation or documents of standing that should be considered.
- Any further mitigation or management measures that should be considered.

Up to 22 December 2023, there were no specific comments received on the content of the document.

1.3 Modifications Arising from Further Assessment

To ensure this environmental assessment remains contemporary, accurate, and reflects feedback from the regulator and relevant persons, this document will be updated from time-to-time. In particular, the CGG environmental assessment process requires consideration of whether further assessment was needed to verify, or dive deeper into a topic, to further improve the predictive quality

of the assessment. When this has occurred, reference to such changes will be communicated in the Recommendation section and identified at relevant points in the assessment.

2 Aspect – Underwater Sound

2.1 How the Aspect Occurs

The primary sound source will be impulsive underwater acoustic emissions coming from the seismic source releasing compressed air (seismic pulse) and creating a sound wave directed downwards towards the seabed.

Secondary sound sources will include continuous underwater acoustic emissions generated by the survey and support vessels and helicopters. Sounds from vessels are generated by thrusters, engines, and propellers. Underwater acoustic emissions from helicopters are generated via the engine and rotors. Underwater acoustic emissions from Ultra-Short BaseLine positioning beacons are generated within the streamer spread.

2.2 Extent and Duration of the Aspect

Impulsive Sound

Duration: 60 days

Extent: Active Source Area + 90m – 2.74 km m based on the furthest distance to modelled sound effect criteria. [Updated in response to Matter: F17]

Active seismic acquisition will occur for up to 60 days within the Active Source Area.

Continuous Sound

Duration: 90 days

Extent: Operational Area

The survey and support vessels will be active in the Operational Area for the duration of the survey undertaking support activities and acquisition.

3 Cause-Effect Pathway

The PEIRA (Appendix B4) identified a cause-effect pathway for impulsive (seismic) underwater sound for the following environmental components and their social, cultural, and economic features:

- Invertebrates
- People and communities

In addition, indirect impacts were identified to the following via relevant person consultation:

- Commercial Fishers

Potential environmental impacts to invertebrates identified from the PEIRA are:

- Change in fauna behaviour.
- Change in hearing capacity.
- Change in physical condition.

3.1.1 Exempted Areas

Invertebrates were identified as a value within the West Tasmanian Canyons Key Ecological Feature (KEF) which the initial Activity Planning Area overlapped. Hence, an assessment of impacts to invertebrates within this KEF was included in the initial draft of this document first published to the Document Library of the Regia MSS Consultation Hub on 11 September 2023. However, since then the Active Source Area has been further refined and is now ~20 km from the West Tasmanian Canyons KEF (Appendix B12 MAP-REG-EPM-004). Given that the furthest distance to the modelled sound effect criteria for invertebrates is between –90 m – 2.74 km from the Active Source Area, impacts are not predicted.

Invertebrates were also identified as a value within the Twelve Apostles Marine National Park which was adjacent to the previous Activity Planning Area. Since then, the Operational and Active Source Areas have been refined and now include a 5 km buffer from the Operational Area to the Twelve Apostles Marine National Park (Appendix B12 MAP-REG-EPM-047). The Active Source Area is ~20 km from the seaward boundary of the Twelve Apostles Marine National Park (Appendix B12 MAP-REG-EPM-047). Given that the furthest distance to the modelled sound effect criteria for invertebrates is between 90 m – 2.74 km from the Active Source Area, impacts to invertebrates are not predicted within the park.

There is no scientific information on the potential for continuous underwater sound impacts to invertebrates and no cause-effect pathway has been established. Thus, the impact assessment focuses on impacts from impulsive (seismic) underwater sound to invertebrates.

4 Description of the Existing Environment that may be Affected by the Activity

For a description of the baseline soundscape in the region relevant to the Regia MSS, refer to Section 1.1 of Appendix B8.

Marine invertebrates include:

- Crustaceans such as crabs and rock lobsters.
- Molluscs such as bivalves (abalone, clams, mussels, and scallops), gastropods (sea snails/trochus, sea slugs and nudibranchs) and cephalopods (squid and octopus).
- Hard and soft corals.

Marine invertebrates not only represent the largest proportion of marine biomass, but many species also have important socio-economic values (Sole et al. 2023).

Species are grouped according to their sound modelling characteristics as outlined in Section 5: Acceptable Levels of Impact

4.1 Invertebrates - General

Studies by the Museum of Victoria found that invertebrate diversity was high in southern Australian waters although the distribution of species was patchy, with little evidence of any distinct biogeographic regions (Wilson and Poore 1987). This is supported by studies in the region.

Studies for the Beach Otway Gas Development that is in the eastern part of the Regia Operational Area identified the following:

- A video survey of the seabed at selected sites along proposed offshore pipeline routes for the Otway Gas Development was undertaken during 2003 (Beach Energy 2022) and found:
  - Substrate in water depths between 82 and 66 m was predominantly low-profile limestone with an incomplete sand veneer that supported a low to medium density, sponge dominated filter feeding community. Fish and other motile organisms were uncommon.
  - In shallower depths between 30 and 63m the video surveys showed a rippled, sand or sand/pebble substrate with minor sponge dominated benthic communities. The epibenthic organisms were generally attached to outcropping or sub-outcropping limestone pavements. Only in waters shallower than ~ 20 m, was significant, high-profile reef and associated high density macroalgae dominated epibenthos encountered.
- A drop camera survey at the seabed for the next phase of the Otway Gas Development was undertaken from November 2019 to January 2020 in water depths from 70 to 104 m (Beach Energy 2022) and found:
  - Percent cover of epifauna ranged from 0 to 80% for all samples, averaging no more than 37%. Of the individual epibenthic organisms, Gastropoda sp. 2 (a cone shell) and crinoids (featherstars) were the most abundant.
  - The general impression of the seafloor was of an unmodified marine environment that supports a patchy complex of branching epibiota (i.e., bryozoans, gorgonian cnidarians and sponges) providing microhabitat for a range of macrofauna such as amphipods, isopods, polychaete worms and molluscs.
  - There was a low abundance and diversity of infauna living within the sediment which reflects the coarse nature of the substrate. This type of substrate is highly

mobile making it difficult for filter feeders and soft bodies invertebrates to survive and establish significant populations.

- Epibiota on the seabed in the area surveyed was representative of what is expected at depths around 70-100 m. The infauna was of relatively low abundance and diversity as expected for coarse sand substrates. No species or ecological communities listed as threatened under the *Environmental Protection and Biodiversity Conservation Act* 1999 (the EPBC Act) were observed.

Studies for the proposed pipeline for the Cooper Energy Casino, Henry, Netherby Development (Cooper Energy 2017) located in the eastern part of the Regia Operational Area, found that.

- in water depths from 20 – 60 m much of the seabed was sand or fine gravel. No epifauna were observed in these large tracts of sand and the biological component was likely to be primarily in-faunal or pelagic.
- Beyond 60 m water depth, the seabed was characterised by concreted outcroppings with very low relief and structural complexity separated by gullies of sand or fine gravel. Survey footage indicated that this broad flat area has a sparse cover of filter-feeding epifauna dominated by sponges and probably hydrozoans, bryozoans and algae.

4.2 Invertebrates – Commercial Species

Based on the review of commercial fisheries within the Regia MSS Operational Area (Appendix B6), a number of fisheries have been identified as having catch-effort for invertebrate species within the Operational Area (Table E4-1).

Table E4-1 - Commercial Invertebrate Fisheries with Catch-Effort within the Regia MSS Operational Area.

Jurisdiction	Fishery	Species	Note
Commonwealth	Southern Squid Jig Fishery	Gould's squid (*Nototodarus gouldi*	The Operational Area overlaps the Southern Squid Jig Fishery and Southern and Eastern Scalefish and Shark Fishery Commonwealth Trawl Sector Squid maximum fished area and where there has been fishing intensity during 2010 – 2020.
Victoria	Giant Crab Fishery	*Pseudocarcinus gigas*	The Operational Area overlaps the area actively fished by the Giant Crab Fishery.
Victoria	Octopus Fishery	Pale octopus (*Octopus pallidus*) Maori octopus (*Octopus maorum*) Gloomy octopus (*Octopus tetricus*)	The Operational Area overlaps the area where there has been one vessel with a maximum fishing day of one since the fishery commence in 2020. Currently octopus fishing in the Western Zone, which overlaps the Operational Area is via exploratory, temporary permits.
Victoria	Southern Rock Lobster Fishery	*Jasus edwardsii*	The Operational Area overlaps the area actively fished by the Rock Lobster Fishery.
Victoria	Abalone Fishery	Blacklip *(Haliotis rubra)* *Greenlip (Haliotis laevigata)*	Based on water depths, the Activity Planning Area does not overlap the fishery, while the Environmental Planning Area overlaps the Western and Central zones of the fishery.

4.2.1 Crustaceans

4.2.1.1 Giant Crab

Giant Crab (*Pseudocarcinus gigas)* occurs in southern Australian waters between central New South Wales to southern Western Australia, including Tasmania. Giant crabs inhabit the continental slope at approximately 200 m depth and are most abundant along the narrow band of the shelf edge (VFA 2023b).

The stock of Giant Crabs distributed along the Victorian coast is part of a larger, genetically homogenous population that is endemic to southern Australia and maintained through widespread larval dispersion (VFA 2010). There has been little Giant Crab fishing in the Eastern Zone so the stocks in that zone are considered to be close to their natural state.

Giant Crabs are slow moving carnivores that feed primarily on sedentary benthic species such as starfish and on carrion. Growth of Giant Crabs is relatively slow; females and males taking approximately seven years and four to five years, respectively, to reach the legal minimum length of 150 mm (VFA 2010). The inter-moult period is one of the longest of the crab species and can be up to fifteen years for mature females (VFA 2010).

Female Giant Crabs are highly fecund and their ability to store sperm gives them the ability to fertilise their eggs over several successive breeding seasons. Eggs are released during autumn and incubated by the female until the following spring when they are released in the shallower depths of the shoulder of the continental slope (VFA 2010).

While there is little scientific data on the population, stock status records show the species to be sustainable throughout Western Australia, South Australia and Victoria but depleted in the Tasmania region (FRDC 2020).

Harvesting of the species has been undertaken for decades, though total allowable catch has been decreasing in Victoria significantly since 2011 from 25 tonnes to 10 tonnes by 2020 (VFA 2023b). Aspects of the species' biology (e.g., long-lived, slow-growing) and life-history characteristics make the species vulnerable to overfishing. The Victorian fishery stock status is listed as 'sustainable' while the Tasmania stock status is listed as 'depleted' based on percentage of egg production relative to unfished level.

Both the Victorian and Tasmanian fisheries recognise the importance of the breeding season with closures in effect from 1 June to 15 November for females while they are breeding and in berry. The Victorian fishery also closes between 15 September to 15 November to protect males during moult, while Tasmania remains open all year round for males.

4.2.1.2 Southern Rock Lobster

The Southern Rock Lobster (*Jasus edwardsii*) is found on coastal reefs from the south-west coast of Western Australia to the south coast of New South Wales, including Tasmania and the New Zealand coastline. Southern Rock Lobsters have extensive larval dispersal and can be found to depths of 150 metres, with most of the catch coming from inshore waters less than 100 metres deep (VFA 2017).

As the species is distributed continuously across southern Australia, the population is considered a single biological stock (VFA 2023, Bruce et al. 2007, Ovenden et al. 1992). Bruce (2007) detailed that, with the exception of southwest Western Australia, all regions receive more pueruli from outside their own boundaries than from self-recruitment.

In Victoria, the abundance of Southern Rock Lobster decreases from west to east reflecting a decreasing area of suitable rocky reef habitat (VFA 2017). Most adult Southern Rock Lobster remain within the same region (moving less than 1 km), though some tagged Southern Rock Lobster have moved more than 80 km between inshore and offshore reefs (SRL 2023). In the Otway Bioregion, Southern Rock Lobster habitat occurs as patchy, discontinuous low-profile reef running parallel to the coast.

The life cycle of the Southern Rock Lobster is complex. After mating in April to July (SRL 2023), fertilised eggs (from 100,000 up to 1,000,000 per female) are carried under the tail of the female for approximately 4-6 months before being released, typically between September and November (VFA

2017). Larval release occurs across the southern continental shelf, which is a high-current area, facilitating dispersal.

Once released, Southern Rock Lobster larvae (phyllosoma) live in the plankton and undergo 11 developmental stages over a period of between 12 and 24 months (Hartmann et al. 2013; SRL 2023). This stage is spent far out to sea beyond the continental shelf where ocean currents can carry phyllosoma hundreds or even thousands of kilometres from where they were released by the female lobster.

At the end of this developmental phase, phyllosoma larvae moult and metamorphose into a puerulus larvae (a transparent miniature version of the adult), still living in the water column but not feeding (SRL 2023). Successful metamorphosis from the final stage phyllosoma to puerulus stage occurs offshore but close to the continental shelf (Curtin University 2009). The puerulus swim inshore at night to settle onto reef habitat in depths from 50 m to the intertidal zone (Booth et al. 1991) where they moult into pigmented juvenile lobsters (SRL 2023).

This settlement of puerulus is very important and is monitored using specifically designed collectors placed in many locations around southern Australia. Only a very small number of the eggs released actually reach the stage of settling as puerulus, and very few of these puerulus survive to become adults (SRL 2023). From the millions of larvae annually produced by each adult lobster, only two on average survive to become adult lobsters (SRL 2023a). By measuring the annual settlement of puerulus, fisheries scientists gain an indicator of future stock levels.

Bruce et al. (2007) reported data for state-maintained puerulus collector sites, which indicates that most puerulus settlement in Portland occurs June through September, tapering off in October.

Southern Rock Lobster grow by moulting or shedding their exoskeleton. The frequency of the moulting cycle declines with age from five per year for newly settled juveniles to once per year for mature adults (VFA 2017). Males grow faster and larger than females, reaching 160 mm in carapace length after ten years. Females generally reach 120 mm in the same period. Growth rates also vary spatially, with growth faster in the east than in the west (VFA 2017). It can take between three and ten years for Southern Rock Lobsters to reach commercial fishing size (SRL 2023).

Adult Southern Rock Lobster are carnivorous and feed mostly at night on a variety of bottom dwelling invertebrates such as molluscs, crustaceans, and echinoderms. The main predators of Southern Rock Lobster are octopus, sharks, and reef fish such as wrasse and ling (SRL 2023).

The latest stock status determination for the Southern Rock Lobster across South Australia, Tasmania, Victoria, and Western Australia details that it is sustainable (FRDC 2021). The 2021/22 Victorian Rock Lobster Fishery Stock Assessment Report (VFA 2023) details the that the egg production for the Western Zone, which the Operational Area overlaps, has been relatively consistent at 23-24% in the last seven years, in 2021/22 egg production was lower at 22.0% but still above the 20% limit reference point. Overall, the stock indicators in the Western Zone continue to show improvement.

The Victorian and Tasmanian Southern Rock Lobster Fisheries close between 1 June and 15 November to protect females in berry (with eggs attached) during the spawning period and between 15 September and 15 November to protect males during the moulting period when soft shells increase their vulnerability (VFA 2023a).

4.2.2 Cephalopods

4.2.2.1 Gould's Squid

The following is from AFMA (2023):

Gould's squid (*Nototodarus gouldi*) is a commercially important species that inhabits temperate and subtropical waters of Australia and New Zealand. They can be found in estuaries and pelagic environments to depths of 825 m but are most abundant over the continental shelf at depths of 50-200 m. Larvae and juveniles are often found in shallow coastal waters. Gould's squid aggregate near the seabed during the day and move into the water column at night to feed.

Gould's squid reach reproductive maturity at an age of 6-9 months. They spawn throughout the year, with 2-3 peaks in spawning activity. Females mate before they are fully mature, with sperm bundles ('spermatophores') from the male being stored in buccal pouches around the mouth. It is not known how long spermatophores are retained before fertilisation occurs. Eggs are fertilised as they pass the buccal pouch and are released in a free-floating jelly-like mass. Each egg mass can contain several thousand eggs, although reproduction is highly variable depending on environmental conditions. Hatching occurs 1-2 months after fertilisation. Gould's squid die shortly after spawning.

Gould's squid feed on crustaceans, fish and cephalopods at night and are in turn prey for birds, large fish, sharks, and marine mammals (O'Sullivan and Cullen 1983).

The species is commercially fished using jigging by the Southern Squid Jig Fishery and is incidental catch for the Southern and Eastern Scalefish and Shark Fishery – Commonwealth Trawl Sector. Fishing mortality and biomass are classed as not overfished.

4.2.2.2 Octopus

The Pale Octopus is a benthic species with no pelagic stage in its development. It has a depth range of 7–275 m and is found from the Great Australian Bight around Tasmania to southern New South Wales (Leporati et al. 2008a, 2008b). It has a single reproductive episode where the females stay with their eggs until they hatch, shortly after which they die. Leporati et al. (2008a, 2008b) details that Pale Octopus have a maximum life span of ~18 months and that peak-spawning season is around late summer and early autumn.

The Gloomy Octopus is unlikely to be present in the Operational Area as it is found throughout Subtropical eastern Australia and northern New Zealand (Australian Museum 2023).

Maori Octopus is the largest octopod in Australasia and can exceed an arm span of 3 m and mass of 10 kg (Lalas 2008). They live in the benthic zone in soft-sediment and rubble habitats from depths of 0-549 m and will sometimes forage in nearby hard-reef habitats but are less common at the fringes between reefal and soft sediment habitats (Animalia 2023).

Currently, only exploratory fishing for octopus is occurring in the western zone that overlaps the Operational Area with Pale Octopus classified as an undefined stock (FRDC 2020a).

4.2.3 Molluscs

4.2.3.1 Abalone (Blacklip and Greenlip)

The Abalone Fishery is one of Victoria's most valuable commercial fisheries. Almost all of the catch is exported to international markets, predominately in Asia. Abalone are caught along the majority of the Victorian coastline and the fishery is primarily based on targeting blacklip abalone (*Haliotis rubra*) although Greenlip abalone are also targeted (*Haliotis laevegata*). Blacklip abalone stocks within the contemporary fishing grounds are fully fished while Greenlip abalone stocks have limited abundance in the Western and Central Zones. Historical catch of greenlip in WZ has been small, with 41.6 t reported landed from 1965-2005, including 37.6 t from 1969-1980 and only 850 kg from 1981-2005. In recent years, greenlip catch has remained low (i.e. <2.0t per year) compared to previous years, and 0 t was landed in the fishing period to December 2022 (Peeters et al 2023).

Blacklip Abalone stocks in Victoria are in relatively poor condition having suffered greatly from disease and overfishing. The pelagic larval duration of abalone is short at ~10 days, nevertheless genetics studies have found that abalone stocks along Victorias south coast are well connected, with high levels of gene flow within and between reef patches. Larval supply and recruitment success may therefore not depend predominantly on local reef sources. The marine physical environment of the south coast is highly variable, driven by converging ocean currents, strong environmental gradients, habitat discontinuities and varying degrees of exposure to wave energy (Miller et al 2016).

Regia MSS will be operating at depths greater than 50m. While almost all diver-harvested abalone will come from depths <30m the majority will come from depths <20m, hence there is approximately 15-20km distance between the 20m and 50m depth contours adjacent to where the proposed Regia MSS will approach the coast.

4.3 People and Communities

4.3.1 Social and economic features

During consultation, as presented in Annex 2, objections and claims were raised regarding concerns of impacts on the local economy and environment, including commercial species and marine life in general. Species that may be affected are described above in sections 4.1 and 4.2.

4.3.2 Cultural features

Several invertebrate species including torbos, pipis, abalone, limpets, mussels, elephant snails, crayfish/lobster, crabs and squid are identified as culturally significant to the Gunditjmara People as both a resource and in harvesting as a cultural practice (GMTOAC, 2023). Barnabeel (oyster), murrabal (mussel), bam bam (crayfish), abalone and pipi are also culturally important resources to the Wadawurrung People (WTOAC, 2020). Invertebrate species are an important traditional, social and economic resource for the Eastern Maar People. Abalone, cockles and crayfish are collected as tucker along the coast (EMAC, 2015). Invertebrate species may also hold totemic values and kinship. (Appendix F3, Section 3.16.1).

5 Relevant Legislative Requirements

CGG has considered all the relevant legislative requirements, conservation management and recovery plans for all invertebrate species that may be affected. No measures were identified from this process.

6 Defining Acceptable Levels of Impact

To define acceptable levels of impacts to invertebrates the species identified have been grouped according to similarity of impact pathways:

- Crustaceans - Southern Rock Lobster and Giant Crab
- Bivalves (Molluscs)
- Cephalopods
- Coral

Invertebrates do not sense sound pressure but rather particle motion, the other major component of sound waves. Particle motion is a more difficult component to measure, and this has meant most available research on seismic impacts to invertebrates characterises received sound levels in terms of the sound pressure only. Sound exposure levels can nevertheless be used as a reasonable proxy of particle motion at distances >250m from the source but at lesser distances there is too much signal saturation (McCauley et al. 2021).

The sound effect criteria adopted for the assessment of sound impacts to invertebrate groups are based on studies identified and cited in the Seismic Sound Studies Report and Sound Modelling Reports (Appendices B7 and B8 respectively). They have been used to define the acceptable levels of impact.

CGG defined acceptable levels of impact and risk as part of its decision-making processes and published them as part of its consultation efforts, inviting relevant persons to comment on their appropriateness. During the preparation of the EP, it became clear that assessment specific statements would be necessary to create a stronger link between the defined acceptable level and the predictions of impacts and risks.

As such, shows the general acceptable level statements which cover the whole of the activity (which are consistent across all environmental impacts and risks), and the corresponding assessment specific defined acceptable levels established for this assessment. This sets the foundation for relevant and targeted demonstration later in this assessment.[1]

Table E4-2 - Defined acceptable levels of impact from underwater sound effects to invertebrates

Category	Defined Acceptable Levels (General)	Defined Acceptable Levels (Specific)	Rationale
Principles of ESD	The petroleum activity results in temporary / reversible, small scale, and/or low intensity environmental damage.	**Commercial Fishing** Fish and aquaculture stocks continue to be assessed as the same stock status they held prior to commencement of the activity. **Crustaceans** Exposure of individual invertebrates to sound levels exceeding 202 dB PK-PK may occur but is acceptable provided that the affected species or functional groups have sufficient abundance, distribution, or	**Commercial Fishing** Whilst this level is not related to a specific sound exposure level, this is a suitable proxy for effects on the commercial species under consideration. **Crustaceans** Payne et al (2008) and Day et al (2016a) Crustaceans are the most studied group in terms of the range of metrics investigated, including catch rates and physical, behavioural, and physiological effects (Carroll et al. 2017). Particle motion rather than sound pressure is the likely mechanism of impacts
	The impact and risk assessment process are based on sufficient information to understand if: Serious/irreversible environmental damage is predicted; or The application of the precautionary principle is applied in the presence of scientific uncertainty.		

[1] Note: The acceptable levels related to demonstrating ALARP and the adoption of specific measures to ensure the effectiveness of control measures can be found in Appendix F2 and B3 respectively. As they are criteria integral to the acceptance of the Environment Plan, and they a documented elsewhere, these criteria are not discussed further in this assessment.

Category	Defined Acceptable Levels (General)	Defined Acceptable Levels (Specific)	Rationale
	Environmental management of the activity must not be inconsistent with EPBC Act Management Plans and Recovery Plans.	reproductive capacity to maintain population viability and ecological function. .**Molluscs** Sound exposure to molluscs must be below PK-PK sound levels of 212 dB re 1 μ Pa a. **Cephalopods** Sound exposure to cephalopods must be below temporary threshold shifts at thresholds in exceedance of 162 dB SEL. **Corals** Sound exposure to corals and sponges are below 226 dB PK.	for invertebrates however this has not been rarely studied so PK-PK sound pressure is used here, based on work by Payne et al. (2008) who identified no effects on righting time in lobster at 202 dB re 1 μ Pa (PK-PK), and Day et al. (2016a) who found effects at 209 dB re 1 μ Pa (PK-PK). **Molluscs** Day et al (2017). A threshold of PK-PK 212 dB for molluscs is based on sub-lethal effects to scallops and oysters exposed at these levels from Day et al (2017). **Cephalopods** Fewtrell and McCauley (2012). A threshold of 162 dB SEL per-pulse for squid is used, based on the "inking and startle" response from Fewtrell and McCauley (2012). This is the most conservative measure available from the literature. **Corals** Heyward et al. (2018). A threshold of 226 dB PK received levels is used, based on no impacts to coral were identified at this level by (Heyward et al. 2018).
Biological	Impacts and risks to biological features will be temporary / reversible, small scale, and/or low intensity environmental damage at population levels.		
Ecological	Impacts and risks to ecological features will be temporary / reversible, small scale, and/or low intensity damage to the overall health, diversity, or functioning of the ecosystem.		
Economic	Affected persons will not be worse off because of the activity.	Industries, livelihoods, and ecosystem services remain viable, with no sustained financial or operational consequences resulting from changes in species behaviour, abundance, or access to resources.	For species and sensitivities with social, cultural and/or economic values, if the potential ecological impact or risk is deemed acceptable, it is likely that the corresponding impact on social, cultural and/or economic values will also be considered acceptable, as the physical presence and health of these species are key for maintaining their social, economic and cultural roles. Therefore, ongoing assessment for social, cultural and economic values will be on a receptor level.
Cultural	Impacts and risks to cultural features including cultural values, traditions, or practices, will be temporary / reversible, small scale, and/or low intensity.	Culturally important species, places, and practices can continue without disruption to their role, accessibility, or long-term viability.	
Social	Measures have been adopted based on the consultation process to address relevant objections and claims of relevant persons.	People and communities can continue engaging with the natural environment, recreational activities, and heritage values without experiencing long-term or irreversible disruption.	
	The views of public have been considered in the impact and risk assessment.		

Category	Defined Acceptable Levels (General)	Defined Acceptable Levels (Specific)	Rationale
Company	Environmental impacts and risks are consistent with the CGG impact and risk assessment process such that for an impact or risk the effect/ consequence rating is medium or below.	As per the general levels.	CGG is a company familiar with managing the effects of seismic sound on the marine environment, and its global operational history supports the reliability of its internal assessment process. The use of CGG's impact and risk matrix, when consistently applied, has not resulted in unacceptable environmental outcomes, which indicates the process produces conservative and realistic assessment outcomes.

7 Consultation Input

CGG carried out the consultations required by the regulations to:

- Improve the predictive quality of this assessment by seeking relevant person input into the preparation of the EP.
- To verify the description of the environment that CGG produced as part of its environmental assessment process through information provided to CGG by relevant persons.
- Receive objections or claims about the adverse effects of the activity on a relevant person's functions, interests, or activities.

The information received from relevant persons can be found in each relevant person consultation report. It has been considered in the preparation of this assessment.

Objections or claims about the adverse of the effects of the activity can also be found in each relevant person's consultation report. They have been assessed for merit and CGG has written a statement of its response to each objection or claim. Any objection or claim relevant to this assessment and subsequently considered in its preparation can be found in Annex 2.

7.1 Elimination

Elimination involves removing the source of an impact or risk entirely through changes to the activity design. In the context of underwater sound, elimination involves removing the source of underwater sound or preventing its generation in the first place. Four main options were considered and subsequently adopted:

No vessel movements within 5 km of the Twelve Apostles Marine Park

This activity limitation was adopted through the consultation process with Marine Parks Victoria. It is protective of cultural values of the marine park and Southern Rock Lobsters which are also a key value.

No vessel movements within 700 m of fishing blocks G12, G13, H13, and H14

During consultation concerns were raised by a fisher regarding the use of a smaller vessel which the fisher launches from a pier in Port Cambell. This restricts the fisher to access deeper waters and limits the fisher to fishing blocks G12, G13, H13 and H14 exclusively (see MAP -REG-EPM-037_A in Appendix 12).

To ensure this fisher was not worse off as a result of the activity, CGG implemented an activity limitation where the Regia MSS would not operate within 700m of Southern Rock Lobster Fishing Blocks G12, G13, H13, and H14. This activity limitation is based on the underwater sound modelling results where 700m is the no effect distance for invertebrates including Southern Rock Lobster, which is the target species fishers in these blocks.

No discharge of the sound source within the West Tasmania Canyons KEF

This measure eliminates potential noise impacts in a KEF characterised by complex bathymetry and high productivity, which may be important for key behaviours for invertebrates. It has been applied by CGG to protect the ecological integrity and invertebrate biodiversity associated with this KEF, which is recognised for its national environmental significance.

No seismic acquisition within 17 km of Deen Maar / Lady Percy Julia Island

This limitation reduced the overlap with most fishing effort in the region and is protective for mobile or short ranging fish species that are more likely to be present in water depth < 50 m. The shallow depths are also where most lobster will settle when ready to do so. This measure was adopted to avoid disturbance to coastal and nearshore invertebrate communities and to prevent elevated acoustic energy in shallow, sensitive environments. This was confirmed during consultation with commercial fishers who agreed that the data was correct and most fishing activities occurred in shallower waters close to ports (Event ID 4107, Feedback ID 1277).

8 Minimisation of Impacts Through Activity Design

As part of planning and design of the activity, several activity limitations were considered in accordance with the hierarchy of controls and through the consultation process (see Annex 2). These limitations were evaluated to determine whether the source of impact could be eliminated or substituted through changes in the timing, technology, or design of the activity. As described in Appendix F3, section 3.16.2, due to the interconnection between the tangible and intangible cultural values, all activity limitations are relevant to safeguarding social, economic, and cultural features and values, ensuring protection across all areas

8.1 Substitution

Where elimination is not viable, substitution involves altering the timing, location, or sequencing of the activity to reduce the likelihood or consequence of the impact. One main option was considered and subsequently adopted:

Sound will not be emitted above the stated capacity

By selecting a sound source and operational settings that remain within a defined maximum acoustic output, the activity substitutes more harmful, higher energy alternatives for lower-intensity ones. This measure was adopted to ensure predicted effects on fish remain within modelled thresholds, avoiding excessive acoustic exposure that could disrupt behaviour or physiology.

9 Predicted Levels of Impact

To arrive at the predicted levels of impact of underwater sound on invertebrates at this stage in the process requires the reader to have assimilated all prior relevant information that has been assessed on invertebrates. The EP documentation is coded alphabetically to guide the reader through what is a natural process of temporal accumulation and review of evidence. The following documentation forms the evidence lineage for predictions on invertebrates as described here.

- B6 – Commercial Fisheries Review – all commercial fisheries and their targeted species, associated with the Commonwealth and/or the states of Victoria, Tasmania and South Australia were identified and mapped to indicate fishing effort relative to the proposed Regia MSS.
- B7 – Sound Modelling Reports –SLR) performed a numerical modelling study of underwater sound levels associated with the planned Regia Marine Seismic Survey (MSS) to assist in understanding the potential acoustic impacts on key regional receptors including benthic invertebrates, marine mammals, fish, turtles, plankton and recreational divers and swimmers. Acoustic thresholds derived from this document are used to guide assessments of impacts.
- B8 – Seismic Studies Report – This report provides a detailed assessment of the scientific literature related to sound (and specifically seismic) effects on invertebrates and other fauna. This literature is the key evidence base from which impact levels are derived.

Therefore, all species identified through B6 have been assessed through the framework provided by B7 and B8. Because of commonalities among species in their sensitivity to seismic it is not always necessary to describe effects to each species individually but rather as groups defined by their sensitivity to different frequency levels of sound and shared life-history behaviours.

9.1 Change in fauna behaviour, hearing capacity, and physical condition

As detailed from the underwater sound and studies relevant to seismic surveys, provided in the Seismic Sound Studies Report (Appendix B8), mortality and injury to invertebrates are not predicted based on the received sounds levels to these species.

No impacts to corals are predicted as the threshold in the underwater sound modelling was not reached.

9.1.1 Crustacean - Giant Crab

Giant Crab are likely to be present in the deeper waters (>200 m) of the Operational Area which overlaps areas where Giant Crab are caught by the Victorian Giant Crab Fishery. The Operational Area does not overlap the Tasmanian Giant Crab Fishery.

The extent of the area of impact is predicted to be 232m-397m.

The predicted effect level to this species is assessed as minor. While some level of impact is possible any potential effects are not considered significant or at a level to affect the population given the following:

- Available scientific literature has demonstrated no direct mortality of crabs from exposure to seismic sounds (Morris et al. 2017, Christian et al. 2003, Christian et al. 2004, DFO 2004).
- Sub-lethal effects, relating to impairment of reflexes, damage to the statocysts and reduction in numbers of haemocytes are documented in rock lobsters at received levels of 209 dB re 1 µPa (PK-PK) (Day et al. 2016a) and could also occur in Giant Crab. Based on the distances from the seismic source that these levels would be reached it is possible that some individual Giant Crabs will incur a reduction in fitness. However, there is no evidence to support large-scale fitness reductions or consequential changes to population health.
- A range of studies have exposed female crabs bearing eggs to seismic sound, with no reports of acute or chronic mortality in the adult lobsters and no mortality of embryos

(Christian et al. 2003, DFO 2004, Pearson et. al 1994). Day et al. (2016a, 2016b) also reported that exposures equivalent to approximately 205 dB re 1 µPa (PK) did not impact the condition or development of eggs carried by female lobsters, or the size or morphology of the larvae once hatched. Therefore, potential exposure of berried females to the seismic source is unlikely to result in any mortalities to adult females in addition to natural or fishing mortalities and, therefore, no reduction in the adult spawning biomass.

- No change to development rate in exposed fertilised crab eggs/embryos is predicted compared with unexposed eggs/embryos based on Payne et al. 2008, Christian et al 2003, DFO 2004 and Pearson et al. 1994. Therefore, impacts at a population level due to reduced recruitment would be unlikely as impacts to larvae and eggs were not observed.
- At received noise levels of 209 – 212 dB re 1 µPa (PK-PK) impacts to rock lobster embryonic development were not observed, with hatched larvae found to be unaffected in terms of egg development, the number of hatch larvae, larval dry mass and energy content and larval competency (Day et al. 2016a), thus recruitment should be unaffected. Though a different species, these results align with the outcomes of studies into the effects of seismic on fertilised crab eggs/embryos (Payne et al. (2008), Christian et al (2003), DFO (2004) and Pearson et al. (1994)).
- The stock of Giant Crabs distributed along the Victorian coast is part of a larger, genetically homogenous population that is endemic to southern Australia and maintained through widespread larval dispersion (VFA 2010).

The uncertainty level for impact to Giant Crab from seismic sound is assessed as medium based on:

- There are no published sound effect criteria for acoustic impacts from seismic exposure to crustaceans.
- In the absence of a published sound effect criteria for acoustic impacts from seismic exposure to crustaceans no effects on righting time in lobster at 202 dB re 1 µPa (PK-PK) from Payne et al. (2008) was applied in this assessment as a precautionary threshold to determine potential impacts.
- There are limited published studies on the effects of seismic on Giant Crab, none of which are specific to the species in the Otway region.
- An absence of long-term monitoring data of the effects of seismic exposure on Giant Crab in the presence of frequent seismic surveys, and other anthropogenic sound generating activities, in the region.

The predicted level of impact based on the effect (minor) and uncertainty (medium) is assessed as medium. For Giant Crab the predicted level of impact is clearly below the defined acceptable levels of impact as detailed in Section 10. The mitigation and management measures detailed in Section 9.2 provide sufficient confidence in the predicted effect levels.

9.1.2 Crustacean - Southern Rock Lobster

The Operational Area overlaps where Southern Rock Lobster are likely to be present in waters up to 150 m, and the nearshore waters where the majority of catch for the Victorian Rock Lobster Fishery occurs. The Operational Area does not overlap the Tasmanian Rock Lobster Fishery.

The extent of impact to Southern Rock Lobsters is predicted to be within 232m-397m from the seismic source.The extent of impact to larvae is predicted to be within 740 m from the seismic source (see Appendix E2 Underwater Sound – Plankton) for on how this distance has been determined.

The duration of the predicted physical and physiological impacts to individuals:

- May be permanent in some adults directly below the sound source.
- May be recoverable in puerulus and is permanent in juvenile life-stages.

The duration of the predicted impacts to the SRL population are uncertain due to potential increased vulnerability to predators and increased intermoult period arising from the possible impacts to individuals. However, given fishery recruitment is largely unimpeded by the Regia MSS, the duration of population level impact is expected to be limited to juveniles in the current cohort.

The predicted effect level to this species is assessed as minor as impacts are predicted to have some effect on Southern Rock Lobster, but the effect is not considered significant or at a level to affect the population given the following:

- Scientific literature has demonstrated no direct mortality of lobsters including eggs, puerulus, juvenile, and adults, proximate to a seismic source (Day et al. 2016a, Payne et al. 2008, Day et al. 2021). The Day et al (2016 and 2021) assessments are considered conservative given the water depths in the Operational Area and the protection afforded by typical habitat features such as holes, crevices, or rocky dens within structurally complex reef habitats in nearshore area where most Southern Rock Lobsters would be present. Scientific studies have detected impacts in shallower water depths, and as scientific literature identifies, behavioural and physiological responses in crustaceans are likely to be related to particle motion effects, located close to the operating array, rather than pressure effects (Carroll et al. 2017).
- Southern Rock Lobster population is sustainably fished meaning that the population is not vulnerable to mortal effects to large portions of the adult populations.
- A single seismic survey has a negligible impact on larval supply by comparisons with the size of the larval populations (McCauley et al. 2000) and recruitment into or out of the area is unlikely to be impaired.
- Pueruli are likely to use a range of orientation cues to locate suitable settlement areas (Hinojosa et al. 2016), reducing the potential impact of increased ambient sound on the ability to locate suitable settlement areas.
- The impact assessment has evaluated impacts from underwater sound on Southern Rock Lobster stocks, including at key life stages based on contemporary scientific literature.
- Conservative thresholds have been adopted and given the small spatial overlap with likely Southern Rock Lobster habitat, the potential for impact at the population level is negligible, localised, and recoverable.
- The Southern Rock Lobster population is highly recoverable shown by the overlaps with the Victorian Rock Lobster Fishing Area which have removed their full quota or close to their quota since quotas were introduced, which was a combined Total Allowable Commercial Catch (TACC) of 286 tonnes of the adult population in 2019/20.
- The Southern Rock Lobster population is resilient to mortal effects because the population is a connected, broadly distributed stock across the whole of southern Australia in water depths from 0 m to 400 m.
- The predicted physical and physiological effects to individuals are unlikely to affect the current population, or future populations, because of the high resilience of the species to more severe impacts.
- Despite the uncertainty in the duration of population level effects, the extent of impacts is ecologically insignificant in comparison to any of the analysed areas.
- This assessment is considered highly conservative given that:
  - Puerulus larvae settle onto reef habitat in shallow waters (50 m to the intertidal zone) not present within the operational area; and
  - Juveniles are normally found in isolated holes and crevices, with larger juveniles and sub-adults residing in large aggregations inside rocky dens within structurally complex reef habitats and are not typically exposed at the seafloor.

The uncertainty level for impact to Southern Rock Lobster from seismic sound is assessed as medium based on:

- There are no published sound effect criteria for acoustic impacts from seismic exposure to crustaceans.
- In the absence of a published sound effect criteria for acoustic impacts from seismic exposure to crustaceans no effects on righting time in lobster at 202 dB re 1 µPa (PK-PK) from Payne

et al. (2008) was applied in this assessment as a precautionary threshold to determine potential impacts.
- There are limited published studies on the effects of seismic on Southern Rock Lobster, none of which are specific to the species in the Otway region.
- An absence of long-term monitoring data of the effects of seismic exposure on Southern Rock Lobster in the presence of frequent seismic surveys, and other anthropogenic sound generating activities, in the region.

The predicted level of impact based on the effect (minor) and uncertainty (medium) is assessed as medium. For Southern Rock Lobster the predicted level of impact is clearly below the defined acceptable levels of impact as detailed in Section 10. The mitigation and management measures detailed in Section 9.2 provide sufficient confidence in the predicted effect levels.

9.1.3 Molluscs

Molluscs may be present within the Operational Area although no commercial fishing for molluscs such as scallops or abalone was identified within the Operational Area. However, based on consultation with Abalone Fishers a separate assessment on abalone has been added to Appendix F3. The predicted levels of impact as reported for Molluscs as a group are nevertheless the same for Abalone specifically.

As detailed in CGG defined acceptable levels of impact and risk as part of its decision-making processes and published them as part of its consultation efforts, inviting relevant persons to comment on their appropriateness. During the preparation of the EP, it became clear that assessment specific statements would be necessary to create a stronger link between the defined acceptable level and the predictions of impacts and risks.

As such, shows the general acceptable level statements which cover the whole of the activity (which are consistent across all environmental impacts and risks), and the corresponding assessment specific defined acceptable levels established for this assessment. This sets the foundation for relevant and targeted demonstration later in this assessment. The maximum modelled distance to sound effect criteria for molluscs is expected within 90m from the sound source at water depths of 67.4m.

The predicted effect level to this species is assessed as negligible as impacts to molluscs are predicted to have little or no effect on the environment or the affected species, populations, or ecosystems based on:

- The Abalone fishery usually operates in less than 50m water depth, therefore, CGG has implemented an operational constraint where the seismic source will not be operated in water depths less than 50 m, thus impacts to abalone and other molluscs in these water depths are not predicted.

The uncertainty level for impact to molluscs from seismic sound is assessed as medium based on:

- There are no published sound effect criteria for acoustic impacts from seismic exposure to molluscs.
- There are several published studies on the effects of seismic on molluscs, none of which are specific to the species in the Otway region.
- An absence of long-term monitoring data of the effects of seismic on molluscs in the presence of frequent seismic surveys, and other anthropogenic sound generating activities, in the region.

The predicted level of impact based on the effect (negligible) and uncertainty (medium) is assessed as medium. For molluscs the predicted level of impact is clearly below the defined acceptable levels of impact as detailed in Section 10. The mitigation and management measures detailed in Section 9.2 provide sufficient confidence in the predicted effect levels.

9.1.4 Cephalopods - Octopus and Squid

The extent of the area of impact is predicted to be a maximum of 2.74 km from the sound source during survey acquisition (CGG defined acceptable levels of impact and risk as part of its decision-making processes and published them as part of its consultation efforts, inviting relevant persons to comment on their appropriateness. During the preparation of the EP, it became clear that assessment specific statements would be necessary to create a stronger link between the defined acceptable level and the predictions of impacts and risks.

As such, shows the general acceptable level statements which cover the whole of the activity (which are consistent across all environmental impacts and risks), and the corresponding assessment specific defined acceptable levels established for this assessment. This sets the foundation for relevant and targeted demonstration later in this assessment.) which would result in a startle response.

The predicted effect level to this species is assessed as negligible as impacts to octopus and squid are predicted to have little or no effect on the environment or the affected species, their populations, or the broader ecosystem. The impact will be localised and temporary, and octopus and squid have the capacity to recover from the impact without significant harm based on:

- Verified impacts remain limited to behavioural startle responses and potentially inking (Fewtrell & McCauley (2102)
- Fewtrell and McCauley (2012) detailed that caged squid exposed to an air gun signal displayed a significant decrease in alarm responses in the second exposure to the air gun noise when compared with the first, supporting general habituation to the sound.
- Mortality and harm to adult octopus and/or hatchlings exposed to seismic was not detected during a targeted study by Day et al. (2023) to octopus.
- While individual octopus and squid may be injured if they are in very close proximity to a seismic source at full power, the use of soft starts will moderate this interaction. This is in addition to the lack of mortality found by Day et al. 2023 in caged individuals. [Paragraph updated in response to Matter I05].

The uncertainty level for impact to octopus and squid from seismic sound is assessed as medium based on:

- There are no published sound effect criteria for acoustic impacts from seismic exposure to octopus and squid.
- In the absence of a published sound effect criteria for acoustic impacts from seismic exposure to octopus and squid, the inking and startle response received level of 162 dB re 1 µPa from Fewtrell and McCauley (2012) was used which provides a conservative assessment as the study was undertaken on caged squid which could not move away from the air gun.
- There are no published sound effect criteria for acoustic impacts from seismic exposure to cephalopods.

The predicted level of impact based on the effect (negligible) and uncertainty (medium) is assessed as low thus good industry practice (including legislation and standards) has been applied and therefore these impacts are of an acceptable level without further reduction measures being required.

9.2 Measures Adopted to Manage Environment Impacts

The following measures have been adopted to ensure that the impacts associated with elevated levels of underwater sound from the survey and support vessels on invertebrates will be of an acceptable level.

These measures have been taken through to the ALARP assessment in the next stage of the CGG assessment process. This assessment can be found in Appendix F2.

Measure	Measure Type	Details and Justification
Ramp up of sound source to full power over 30 minutes.	Practice	Mobile marine fauna (including demersal and pelagic fish, octopus, squid, diving birds, penguins, and turtles) are expected to move away from the source before it is at full power, providing them a level of protection. However, once the source passes, animals will be free to move back into the habitat that they departed from. [Paragraph updated in response to Matter I04, I05, E08].

10 Demonstration impacts will be of an acceptable level

10.1 Principles of ESD

Temporary, Reversible, Small Scale and Natural variation

Site-specific modelling predicts that impulsive sound levels capable of eliciting behavioural or physiological changes in marine invertebrates are confined to a limited spatial extent. Impacts to invertebrates will be predominantly behavioural or sub-lethal, including startle responses such as inking in cephalopods. Except for lobsters, these effects are short-lived and reversible and occur in populations that are naturally resilient to both environmental and fishing-related mortalities. For cephalopods, the predicted distance for behavioural startle response extends up to 2.74 km from the source. For molluscs, the effect distance is 90 m, and since the minimum water depth of the Regia MSS is 50 m, no impacts to molluscs are expected.

Predicted distances for recoverable injury to commercially and culturally significant species are 397 m for Southern Rock Lobster, and up to 397 m for Giant Crab depending on water depth. Modelled distances do not intersect any sensitive benthic habitats or invertebrate spawning areas. Importantly, the scientific literature has demonstrated no direct mortality of lobsters or crabs including eggs, puerulus, juvenile, and adults, proximate to a seismic source (Day et al. 2016a, Payne et al. 2008, Day et al. 2021). Therefore, any mortality or physiological stress that may occur is not expected to exceed natural or fishing-related mortality rates. Effects to invertebrates, where they occur, are considered minor, temporary, and immeasurably small at the population level (Payne et al. 2008, Christian et al 2003, DFO 2004 and Pearson et al. 1994). No impacts to corals are predicted, as the seismic sound thresholds for effect are not exceeded at water depths greater than 50 m. Overall, the predicted impact is low intensity, reversible, and spatially limited.

Based on sufficient information

The assessment utilised site-specific acoustic modelling, a review of peer-reviewed literature (including McCauley et al. 2017 and Day et al. 2016), and available guidance on invertebrate sensitivity to impulsive sound. While invertebrate hearing mechanisms differ from vertebrates and data is limited for some taxa, sufficient evidence exists to characterise likely exposure effects. The most sensitive group identified was cephalopods, and the assessment applied conservative thresholds derived from controlled laboratory studies. No evidence of permanent population-level harm was identified. As a result, the precautionary principle was not triggered.

Activity not inconsistent with EPBC Act

Invertebrates are not currently the subject of specific recovery plans under the EPBC Act. Nonetheless, the assessment reviewed relevant conservation advice for listed marine species and benthic environments, confirming no inconsistency between the activity and the objectives of the Act. No listed invertebrate species or key ecological communities occur within the modelled impact area. Mitigation and environmental management measures adopted for the activity, including soft-start procedures and adherence to spatial boundaries, align with best practice and maintain consistency with EPBC principles.

10.2 Biological and Ecological Categories

Marine invertebrates may display behavioural responses to impulsive sound, particularly within tens of metres of the source. However, the rapid dissipation of sound energy, limited duration of exposure, and lack of evidence of mortality or lasting physiological damage support the conclusion that any biological impacts will be minor. Species with low mobility are likely shielded by substrate, and more mobile taxa can avoid or quickly recover from exposure. No population-level effects are predicted.

The spatial and temporal scale of potential disturbance from seismic sound is too limited to disrupt ecological functions. The affected footprint, which has the potential to cause recoverable injury, but not mortality, moves continuously with the vessel and does not intersect with unique or sensitive habitats. Furthermore, the footprint of the survey area is extremely small in the context of a spatially

very large population that has a high level of connectivity (VFA 2010, VFA 2023, Bruce et al. 2007, Ovenden et al. 1992). Therefore, there is no anticipated cascade effect on trophic relationships, and ecosystem diversity and function will remain intact. Recovery is expected without intervention.

10.3 Economic, Cultural and Social Categories

Several invertebrate species including turbos, pipis, abalone, limpets, mussels, elephant snails, oyster, cockles, crayfish/lobster, crabs and squid were identified through the cultural heritage review, consultation and desktop research as species with social, cultural and/or economic significance that may be impacted by underwater sound. Concerns raised via consultation focused on possible sublethal effects, larval sensitivity, and cumulative exposure alongside fishing pressure. Stakeholders requested additional evidence that recoverable injury would not affect catch rates or access to culturally or economically significant species. In response, CGG integrated updated modelling that confirmed the distance to recoverable injury thresholds for southern rock lobster and giant crab are well within the spatial footprint of the survey and do not overlap with fishing grounds or culturally significant areas.

The assessment confirmed that no spawning areas, traditional harvest sites, or sensitive habitats would be affected, and that effects would be limited to temporary behavioural responses or minor, reversible physiological effects. As these values are closely tied to the physical presence and health of the species, the corresponding social, cultural and economic impacts are likewise considered acceptable. CGG also updated the impact characterisation to better reflect input from relevant persons and added further literature to address uncertainty about indirect ecological consequences. These actions demonstrate that the views of affected persons were seriously considered and incorporated into the environmental assessment. Therefore, industries, livelihoods, and ecosystem services remain viable, with no sustained financial or operational impacts; culturally significant species, places, and practices continue without disruption; and people and communities maintain ongoing access to the natural environment, recreational activities, and heritage values without long-term or irreversible effects and no person or group is expected to be materially worse off due to the activity.

10.4 Discussion on Consistency with Company Processes

The impact assessment used the ranking system outlined in Appendix B3. For invertebrates, the overall predicted level of effect was assessed as minor, with uncertainty rated as medium due to limited field validation studies. This reflects the application of conservative thresholds and recognition of remaining scientific uncertainty, while confirming that the impact remains within acceptable company limits. All mitigation measures are in place and effective in managing the impact pathway. The conclusion of the assessment of seismic sound to invertebrates is summarised below.

Invertebrates	Predicted Level of Effect	Uncertainty	Predicted Level of Impact
Giant Crab	Minor	Medium	Medium
Molluscs	Negligible	Medium	Medium
Southern Rock Lobster	Minor	Medium	Medium
Octopus and Squid	Negligible	Medium	Low

11 Environmental Performance Outcomes

Environmental Performance Outcomes (EPOs) are measurable and activity-specific outcomes that describe the environmental performance the titleholder must achieve to ensure impacts and risks are managed to acceptable levels. EPOs are critical to the structure of an Environment Plan because they form the clear link between the defined acceptable level of impact and the predicted level of environmental consequence. Each EPO must be measurable, achievable, and within the control of the titleholder to implement, providing a transparent and enforceable statement against which performance can be assessed.

Table E4-3 - Environmental Performance Outcomes and Justifications

Defined Acceptable Level (From Table E4-2)	Environmental Performance Outcome	Rationale
Fish and aquaculture stocks continue to be assessed as the same stock status they held prior to commencement of the activity.	No change in the assessed stock status of commercial and aquaculture species during and following the activity.	This EPO is supported through alignment with fisheries science reporting and stock assessments, allowing external verification of biomass trends. It provides a clear threshold for biological consequence and supports cumulative impact management.
Exposure of individual invertebrates to sound levels exceeding 202 dB PK-PK may occur, but is acceptable provided that the affected species or functional groups have sufficient abundance, distribution, or reproductive capacity to maintain population viability and ecological function.		
Sound exposure to molluscs must be below PK-PK sound levels of 212 dB re 1 μ Pa a.		
Sound exposure to cephalopods must be below temporary threshold shifts at thresholds in exceedance of 162 dB SEL.		
Sound exposure to corals and sponges are below 226 dB PK.		
Industries, livelihoods, and ecosystem services remain viable, with no sustained financial or operational consequences resulting from changes in species behaviour, abundance, or access to resources.	**Social, cultural, and economic features are protected, sustaining their value for people and communities.**	
Culturally important species, places, and practices can continue without disruption to their role, accessibility, or long-term viability.		

Defined Acceptable Level (From Table E4-2)	Environmental Performance Outcome	Rationale
People and communities can continue engaging with the natural environment, recreational activities, and heritage values without experiencing long-term or irreversible disruption.		
Environmental impacts and risks are consistent with the CGG impact and risk assessment process such that for an impact or risk the effect/ consequence rating is medium or below.	**The activity is conducted such that environmental impacts and risks remain within the range assessed as medium or lower, with mitigation measures in place and functioning as intended.**	This EPO enables ongoing assessment of effectiveness through internal reviews and operational audits. It provides a clear link between the risk assessment process and implementation strategy, supporting regulatory compliance and continuous improvement without requiring environmental outcome monitoring.

12 Recommendations

For most species/taxa/groups of invertebrates reviewed, this document provides the final assessment of impacts. However, despite an extensive review of the relevant literature around the effects of seismic on invertebrates, there has been a high level of concern voiced throughout consultation with relevant persons, around the importance of commercially targeted species. High levels of engagement on an aspect are a trigger for CGG to undertake additional assessment. In this case looking at the effects of the activity on certain commercial fish species. This additional assessment is detailed in Appendix F3 – Further Assessment of Key Values and Sensitivities under Section

- 3.5 Southern Rock Lobster
- 3.6 Giant Crab
- 3.8 Goulds Squid
- 3.9 Pale Octopus
- 3.10 Blacklip Abalone
- 3.14 Spawning Patterns

It is important to note that F3 is a response to further information requests and/or clarification and not a reflection of any prior assessment being insufficiently thorough. It is a recognition that more explanation and detail was sometimes necessary to better inform all groups involved in the consultation process, including the regulatory authority.

Hence F3 does not provide further assessment on all aspects and values identified through the EP process only those that were identified as

- Having some residual uncertainty about whether impacts or risks were of an acceptable level; and/or
- Contained environmental values and sensitivities (species) of key importance due to their protection status or commercial value; and/or
- Consultation with relevant persons revealed a particular value or sensitivity required further attention and material to support the consultation.

13 Document Control

Date	Revision	Update
20 July 2023	A	Draft prepared for initial comment
30 August 2023	B	Update based on comments and relevant person feedback
11 Sept 2023	0	Approved for release on Regia MSS website
20 Dec 2023	1	EP submission to NOPSEMA
23 October 2024	2	Updated following NOPSEMA assessment
16 April 2025	3	Updated following NOPSEMA OMR 1 Letter
6 December 2025	4	Updated following NOPSEMA OMR 2 Letter

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Annex 1

Public Comment

The following consultation feedback was received since the beginning of the public comment period starting 25 January 2024. Table E4-4 shows how this feedback has been incorporated into the environmental assessments.

Table E4-4 - Public comment input

Matter	Matter ID	Changes made arising from public comment
Matter: Flawed argument regarding animals moving away	I04	CGG has considered these claims and has updated the EP Impact Assessments (Appendices E, and F where relevant) to clarify that, while some displacement is expected from mobile taxa during the Regia MSS, the survey will not preclude animals from the Operational Area in its entirety. Instead, animals are expected to temporarily move away from the active acoustic source, but once the source passes, animals will be free to move back into the habitat that they departed from.
Matter: Impacts to dive-based fisheries	F17	CGG has considered this claim and, based on the updated secondary sound modelling, has updated EP Appendix E8 (Impact Assessment – Underwater Sound: Surfers, Divers and Swimmers), Appendix A2 (Description of the Activity) and the following Activity limitation: the sound source will not be discharged at full power from areas which have been predicted to result in an exceedance of the human health safety criterion for recreational divers, surfers and swimmers along the coastline. CGG has also made updates to modelling in Appendices (E1, E2, E3, E4, E5, E6, E7, F1 F3, G1 and G2).

Annex 2

Objections and Claims Raised from Consultation

During the consultation process relevant persons were invited to raise objections and claims about the adverse effects of the activity. An assessment of merit of each objection or claim has been made by CGG which can be found in the consultation report using the Feedback ID number shown in Table E4-5. If an objection or claim had merit and was relevant to this assessment it has been included in the table below.

Table E4-5 - Objections and Claims raised from consultation.

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
4022	Attendees voiced concerns about how seismic activities could impact the sustainability and fish-ability of the immediate and nearby areas.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1529
4226	The email expresses concern about the adverse effects of blasting the Southern Ocean and its creatures, particularly mentioning the geologically sensitive Bonney upwelling.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2940
4230	The feedback asserts that seismic testing is harmful to oceans and marine life, highlighting detrimental effects on the ecosystem.	We acknowledge that the Regia MSS will have some short-term, localised and recoverable effects on some parts of the environment. We will try demonstrating to our independent regulator that these impacts are of an acceptable level and not as detrimental as you claim. We welcome any evidence you can share so that we can consider it fully prior to our submission.	2080
4356	Concerns about the harm and damage to the marine ecosystem.	Titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the marine environment within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2831
4357	The stakeholder raised an objection to seismic surveys as they negatively affect the fishing industry, local economy and environment.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of commercial fish species and sensitive species within the area of operation. The MSS will also not impact the local economy. Mitigation plans are in place to reduce any impacts to as low as practicable.	424
4030	CGG's email on September 14 indicated that the project's timing has changed to two separate 3-month windows: April-June and	We acknowledge this concern and agree that acoustic propagation modelling is the foundation of subsequent analysis. We will complete	3384

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
	September-November. AMCS is concerned that the December sound speed profile may not accurately reflect the physical conditions during these new survey periods. Since acoustic propagation modeling is critical for subsequent analyses and for setting thresholds for mitigation measures required for NOPSEMA approval, AMCS requests an explanation of how the December sound speed profile differs from those in April-June and September-November.	another modelling report prior to submission to cover the changed timeframes of the proposed survey.	
4033	Claim that seismic testing is proven to damage and kill marine life.	The titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1024
4047	Concern about spawning activity of the Giant Crab, rather than the impact of the fishing overlap given exclusion of surveying at +200m water depths.	Titleholder acknowledged this concern and carried out an additional impact assessment for Giant crab and spawning species has been included in F3. There is expected to be no measurable effect on giant crab populations as a result of the survey.	4076
4050	Concern about the destruction of smaller sea life and the wounding of larger marine animals due to seismic blasting.	Regia EP has conducted thorough assessments of the literature for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS is required to define acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures are outlined in the EP.	1669
4051	Concern about the detrimental impacts on marine animals.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1452

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
4053	Concern about the impact on marine creatures due to noise pollution from seismic surveys.	The titleholder acknowledged the feedback, noting that potential impacts from underwater sound to relevant receptors, including plankton, fish, invertebrates, birds, turtles, and marine mammals, are assessed in the Environmental Plan (EP) and can be found in E2, E3, E4, E5, E6, and E7. Measures to minimise adverse impacts on biological receptors are outlined in the EP also and can be found in G2.	3237
4054	Concern about the impact on marine species, specifically molluscs, due to the seismic survey.	Titleholder acknowledged this concern and noted that a thorough assessment of the potential impacts to marine invertebrates, including molluscs, from underwater sound is assessed in E4 of the EP.	2089
4059	Concern about the potential impact on the Abalone industry and the need for compensation if marine species are killed off.	Titleholder acknowledged this concern and noted that potential impacts to commercial fisheries from physical presence is assessed in E1 of the EP, and potential impacts to marine invertebrates from underwater sound is assessed in E4 of the EP. Advised that control measures to reduce impacts to commercial fishers as a result of loss of catch are outlined in the EP and include Adjustment Protocol stipulates an adjustment process will be implemented if a commercial fisher has a financial loss due to the Regia MSS. The adjustment process will be developed in consultation with the fishery associations that represent the commercial fishers that fish within the Operational Area.	2089
4062	Concern expressed regarding the timing of juvenile marine species' settlement, which is critical for their survival.	The titleholder noted the settlement is almost exclusively in inshore waters and the 50 m exclusion would protect querulous. Timing wise the likely settlement time is 9-12 months after spawning. As spawning occurs in Sept/Oct/Nov the settlement is likely in July/Augur/Sept.	3228
4064	Concern raised by the stakeholder regarding the potential damage/kill of marine life due to seismic testing.	Titleholder responded to individual advising that CGG would not propose an activity that would lead to unacceptable impacts to marine life and advised that environmental impact assessments for each aspect of the proposed activity that has the potential to impact marine life were currently being prepared and that they would be based on scientific literature and published shortly for consultation and feedback.	1024
4067	Concern regarding the repeated seismic blasting in the area, which may have effects on marine life. Stakeholder is questioning the impact of multiple blasts and the potential for further exploration by	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in	879

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
	other companies, particularly regarding the sale of seismic data.	place to reduce any impacts to as low as practicable. Cumulative impacts are also assessed as negligible.	
4068	Concerned about the harm being inflicted on oceans by unnecessary gas exploration.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1656
4069	Concerned about the harm being inflicted on oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1673
4073	Concerns about impacts both reputational and physical to the region if the activity is allowed.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1244
4074	Concerns about implications for the population of Rock Lobsters in the area going forward.	This claim has been thoroughly assessed in E1 and E5, and F3 for southern rock lobsters. The known effects to individual lobsters are not predicted to have any measurable effect on population levels or dynamics.	2773
4075	Concerns about marine life and ecosystems.	The effects of underwater sound have been extensively assessed based on the latest scientific literature. CGG has committed to a variety of protective measures for various marine fauna (see G1)	2117
4076	Concerns about potential disturbance to the marine environment, including marine parks and areas of Biological Importance.	The titleholder acknowledged this concern and noted that potential impacts to the marine environment including marine parks and biologically important areas as a result of the Regia MSS is assessed in E1 to E9 and F3 of the EP. There will be no activities with Australian Marine Parks. All areas of biologic importance have been identified and assessment in the respective impact and risk assessments.	2278

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
4077	Concerns about potential harm to zooplankton, whales, dolphins, sharks, seals, the Bonney Upwelling, rock lobster fishery and other local fishing industries.	Titleholder has undertaken a comprehensive assessment of all available scientific literature to develop an appropriate EP. All potential risks have been identified with appropriate mitigation methods applied where necessary. There are no identified levels of harm that would endanger the population stability of any taxa.	722
4078	Concerns about seismic testing and drilling rigs impacting marine life and fishing activities.	Titleholder has undertaken a comprehensive assessment of all available scientific literature to develop an appropriate EP. All potential risks have been identified with appropriate mitigation methods applied where necessary. There are no identified levels of harm that would endanger the population stability of any taxa.	917
4080	Concerns about the impact of seismic testing on various marine species.	Titleholder has undertaken a comprehensive assessment of all available scientific literature to develop an appropriate EP. All potential risks have been identified with appropriate mitigation methods applied where necessary. There are no identified levels of harm that would endanger the population stability of any taxa.	2179
4081	Concerns about the impact on whale habitat, endangered marine life, and commercial fisheries	Titleholder acknowledged this concern and noted that potential impacts to whales and relevant endangered marine species is assessed in the EP Chapters on underwater sound and light (E2-E7, and E9). Any interactions with seismic are mitigated and managed through spatial boundaries and a comprehensive fauna management plan. Advised that control measures to reduce impacts to commercial fishers as a result of displacement are outlined in the EP and include Adjustment Protocol stipulates an adjustment process will be implemented if a commercial fisher has a financial loss due to the Regia MSS. The adjustment process will be developed in consultation with the fishery associations that represent the commercial fishers that fish within the Operational Area.	4551
4083	Concerns about why more seismic needed and what time of the year was the survey going to be done to minimise impacts to fishing for sharks, lobsters, squid	Titleholder acknowledged this concern and each of the species within this claim has been subject to extensive assessment in E1, E3, E4 and F3 with various measure adopted to limit the sound exposure to the lowest level possible to meet geophysical objectives and to protect marine fauna (see G1).	740
4085	Concerns of damage to the marine environment by seismic blasting and gas extraction	All available scientific evidence is used to inform the environmental assessment on seismic impacts. There are no impacts identified that will affect the population stability of any taxa.	825

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
4088	Condemns seismic testing, asserting that it is deadly to marine life and unacceptable for ocean ecosystems. Call for a total ban, citing the large number of marine animals harmed by the practice. Argument that the destruction of marine ecosystems and the fishing industry is unjustifiable and express frustration, telling the parties responsible to stop.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	422
4093	Doubted the effectiveness of mitigation measures and believed the reports/information provided were absent of action /intention.	The mitigations applied by CGG are industry standard and comply with government policy. They have been proven to be as effective as reasonably practical for a number of years. The measures adopted to protect species from the aspects of the activity are found in the respective impact and risk assessments.	2830
4096	Environmental Risk: Concerns about the environmental impact of seismic testing on marine life and the clash between business interests and environmental protection.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals, in relation to underwater sound and artificial light as aspects of the activity. Other marine users have also been considered in another impact assessment that considers physical presence as an aspect of the activity. The Regia MSS is required to define acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan. Measures to minimise adverse impacts on relevant biological receptors in the region and	2766

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		relevant mitigation measures are outlined in the EP.	
4102	Expresses opposition due to proximity to local fishing industries. Emphasises concern about potential risks this testing poses.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Adjustment protocol in place for fishers to seek compensation if impacted by MSS.	428
4118	Impact on marine animals, which are the livelihood of the community.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	2274
4123	Insufficient information about potential damage from seismic testing.	The titleholder is confident that sufficient relevant and available information has been used to inform this this EP and to complete a comprehensive assessment of relevant aspects of the activity. Information used based around sound, peer reviewed scientific literature.	4190
4130	Lasting and unrecoverable damage mentioned.	The titleholder acknowledged the feedback, noting that risks and impacts are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	4808
4132	Lobsters - Stakeholder claimed that seismic air guns damage rock lobster mechanosensory organs and impair righting reflex - impacts of anthropogenic aquatic noise on marine invertebrates being poorly understood. Cited a study of the impact of seismic surveys on the righting reflex and statocyst morphology of the palinurid rock lobster, Jasus edwardsii, using field-based exposure to air gun signals which showed impaired righting and significant damage to the sensory hairs of the statocyst which persisted up to 365 days post-exposure and did not improve following moulting. These results indicate that exposure to air gun signals caused morphological damage to the statocyst of rock lobsters, which can in turn impair complex reflexes. Stakeholder also	Scientific literature has demonstrated no direct mortality of lobsters including eggs, puerulus, juvenile, and adults, proximate to the seismic source (Day et al. 2016a, Payne et al. 2008, Day et al. 2021). The Day et al (2016 and 2021) assessments are considered conservative given the water depths in the Activity Planning Area and the protection afforded by typical habitat features such as holes, crevices, or rocky dens within structurally complex reef habitats in nearshore area where the majority of Southern Rock Lobsters would be present. Scientific studies have detected impacts in shallower water depths, and as scientific literature identifies, behavioural and physiological responses in crustaceans are likely to be related to particle motion effects, located close to the operating array, rather than pressure effects (Carroll et al. 2017). Our full Southern Rock Lobster	2886

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
	referenced study stating seismic surveys leave lobsters flat on their backs and unable to avoid predators, because of damaged statocysts, an organ similar to the human inner ear. It left the lobsters with an impaired ability to right themselves when flipped over.... "We didn't detect any sign of recovery, even one year after. LINK provided.	draft impact assessment is available here on page 13 and 14, for your review.	
4133	Mass destruction of marine populations through the blasting process.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	2274
4136	Mention of considerable damage to marine life outweighing the benefits of mapping seafloors for gas drilling.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1389
4145	Opposes seismic exploration claiming it is dangerous to all marine life. Cannot ensure zero risk.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	427
4146	Opposes seismic testing, claiming it will have catastrophic effects on marine life due to high decibel blasting sounds. States activities can harm various marine species and may cause whales to beach themselves from the pain, making	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low	537

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
	them unacceptable in a whale sanctuary area.	as practicable. Regia EP has found seismic impacts to cetaceans can be mitigated and managed through appropriate timing of the survey and a comprehensive fauna management plan	
4153	Presents a historical account of their catch rates over 24 years, indicating that seismic surveys in the past led to a significant decrease in their catch from 10-15 tons per trip to just 5-6 tons per trip for over two years. They now report a catch rate of 10-14 tons per 7 days, suggesting lingering concerns about how current seismic activities may similarly affect their fishing operations.	Titleholder acknowledged this concern and noted that potential impacts to molluscs the Regia MSS is assessed in E1, E4 and F3 of the EP. Advised that control measures to reduce impacts to commercial fishers as a result of loss of catch are outlined in the EP and include Adjustment Protocol stipulates an adjustment process will be implemented if a commercial fisher has a financial loss due to the Regia MSS. The adjustment process will be developed in consultation with the fishery associations that represent the commercial fishers that fish within the Operational Area.	5190
4154	Questions a previous statement that indicated there would be no mortal effects from seismic activities.	The titleholder acknowledged the feedback, noting that impacts and risks to the marine environment are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on the marine environment are outlined in the EP in G1.	2088
4155	Raised concerns about sound levels from the survey and associated effects on marine mammals and other species.	Acknowledged concerns and outlined the predicted effects of sound levels of different species of marine mammals including difference between high and low frequency cetaceans, sound propagation and modelling, and different effect level thresholds. Also outlined the whale management and mitigation measures in place for Southern Right Whales and Blue Whales including timing of the activity, vessel-based monitoring (MMO's and PAM Operators), detection technology trails, and citizen science program access. Also outlined the effects on zooplankton and the case for acceptability of these	3697
4158	Reference to the destruction and degradation of the marine environment observed during diving trips.	The titleholder acknowledged the feedback, noting that impacts and risks to the marine environment are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on the marine environment are outlined in the EP in G1.	2830
4173	Seismic blasting has adverse effects on the marine environment, with critical gaps in understanding the effects on individual species and	The titleholder responded with an explanation of the information sources used to inform the Regia MSS impact and risk assessments, and explained how these information sources and	4091

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
	the marine environment as a whole.	resulting measures are specific to the potential impact. The titleholder also made reference to documents relevant to this claim within the environment plan (Event ID 4092).	
4175	Seismic blasting is harmful and disruptive to marine life of many species.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	3343
4176	Seismic blasting negatively affects not only whales but also crucial marine life, including fish, crustaceans, and zooplankton, all of which play vital roles in the marine ecosystem.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	2074
4177	Seismic blasting would have a significant negative effect on marine creatures and ecosystems.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	3343
4179	Seismic sounds have far-reaching effects on the marine environment, causing damage and suffering to species.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts to marine life are outlined in the EP in G1.	3237
4180	Seismic testing and gas exploration/drilling pose undeniable risks to marine fauna, flora, ecosystems, local fishing, and tourism industries.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2118
4186	Stakeholder expressed concern about the destruction and depletion of the ocean due to the activity.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies,	2963

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		government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	
4187	Stakeholder expressed concern about the potentially devastating impact of seismic testing on ocean marine life.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts to marine life are outlined in the EP in G1.	3209
4189	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1653
4190	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1655
4191	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to	1659

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	
4192	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1661
4193	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1662
4194	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1663
4195	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-	1665

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	
4196	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1667
4197	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1670
4198	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1672

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4199	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2586
4200	Stakeholder noted that dolphins use clicks and whistles as a complex form of communication, with observations of bottlenose dolphins using distinctive whistles for individuals within their pod, similar to how humans use names. Claimed that blasts from seismic testing could cause temporary and permanent hearing loss in dolphins and whales, citing instance near Peru, where some 900 long-beaked common dolphins and black porpoises washed up dead along a stretch of beach, shown to have had fractures in their ear bones and signs of bleeding from their middle ears. - LINK provided.	A Preliminary Environmental Impact and Risk Assessment is undertaken during an impact assessment process (our PEIRA is available here). The PEIRA is compiled to identify environmental values and sensitivities, to provide an evaluation of the environmental impacts and risks associated with the project. The PEIRA is then used to inform the environmental assessment documents, and as above, the environmental impact and risk treatments, which are being uploaded in the document library. The draft Environmental Impact Assessments are in the document library now, for review and feedback. For transparency we are uploading the entire documents, however if there is a concern you would like a summary or specific information on, please let us know. Further information on marine mammal treatments is covered below in response to concern 6.	2886
4202	Stakeholder objects to the proposed blasting activity due to its detrimental effects on marine ecosystems.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2255
4211	Stakeholder stated they were extremely concerned about the risks, damage and destruction caused by exploration activities in the marine environment.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are	1049

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		established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan.	
4217	Strong objection to the proposal for 3D seismic blast in the Otway Basin due to harm to oceans and unacceptable environmental impact or risk.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1656
4218	Strong opposition to seismic testing in the ocean due to its effects on both wildlife and the fishing industry. Individual firmly disapproves of the practice.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan.	425
4226	The email expresses concern about the adverse effects of blasting the Southern Ocean and its creatures, particularly mentioning the geologically sensitive Bonney upwelling.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2940
4230	The feedback asserts that seismic testing is harmful to oceans and marine life, highlighting detrimental effects on the ecosystem.	We acknowledge that the Regia MSS will have some short-term, localised and recoverable effects on some parts of the environment. We will try demonstrating to our independent regulator that these impacts are of an acceptable level and not as detrimental as you claim. We welcome any	2080

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		evidence you can share so that we can consider it fully prior to our submission.	
4232	The feedback expresses frustration over repeated seismic blasts in the same area, emphasising the significant environmental impacts associated with these activities. It calls for accountability from NOPSEMA to prevent future occurrences, highlighting the ongoing threat to the environment.	The Regia MSS is targeting areas that have not been surveyed before though we acknowledge there may be some overlap with previous surveys. We have to show that the environmental impacts are short-term, localised, or recoverable and that they are controllable with appropriate measures in place.	2104
4235	The feedback questions if a strong environmental record includes the severe impacts of seismic activity on fishing industries, like the scallop industry near King Island, which has suffered losses reportedly without compensation.	Seismic survey effects on molluscs, including scallops are well understood and not mortal in our circumstance. There are many environmental pressures that cause fluctuations in fish populations, not just sound. We have a track record of successful co-existence with the fishing industry and of paying reasonable evidence-based claims for compensation - which we will do for the Regia survey.	2083
4239	The feedback raises concerns about the impact of seismic activities on the Abalone industry, suggesting that the industry may be negatively affected by the proposed exploration and seismic testing. This indicates a broader concern for the sustainability of marine life and the economic implications for local fisheries.	It would be unacceptable to have mortal effects on any marine species from our or any marine seismic survey. We do not predict mortal effects to molluscs (including scallops, abalone, oysters, clams, mussels, limpets, squids, octopus and cuttlefish etc.). Our full assessment of predict impacts on molluscs will be made publicly available as soon as it's completed.	2093
4246	The fishing industries in Port Fairy and King Island have reported significant impacts without financial compensation.	Through our extensive research we have not found any evidence of causation between seismic survey and mortal effects on molluscs. In fact, the evidence we have found (which we will publish in full) suggests seismic and fishing can happily co-exist. Please provide references, evidence, or testimonials for your claims so that we can take them into consideration in the proper process (Event ID 2084).	2084
4253	The possible effects to marine life and ecosystems are my primary concern	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2117

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4259	The proposed works will harm and damage the climate and ocean life.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2256
4260	The protection of wildlife in the Otway Basin is directly affected by drilling and seismic surveying.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan.	1901
4265	The seismic process is going to affect local marine life, ecosystems, and the climate in the community.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to defined acceptable levels and as low as reasonably practicable.	1259
4267	The Stakeholder also objected to the project on the basis that it would impact every marine creature and sea bird.	Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan. Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2064

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4268	The stakeholder argues that it is impossible to ensure zero risk from seismic activities, emphasising that only zero risk is acceptable. This position reflects a strong concern regarding the potential negative impacts of seismic exploration on the marine environment.	The legislative framework in Australia permits some impact from offshore petroleum if it is managed and of an acceptable level. We believe that responsible development of gas is essential for maintaining the current quality of life we all enjoy and ensuring we pass that quality of life on to future generations. Gas is part of the Labour governments energy transition plan.	2107
4270	The stakeholder asserts seismic surveying has been proven to be harmful and disruptive to marine life of many species.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	3343
4271	The stakeholder asserts that seismic blasts will have a direct negative impact on marine life, specifically mentioning that an “exclusion zone” will not effectively prevent the effects of the blasts from travelling through the ocean.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable. The titleholder is aware of the environmental, cultural, and spiritual importance of Deen Maar and will talk with local traditional owners to learn more about Deen Maar and understand how to protect and preserve the values of this site.	2108
4272	The stakeholder asserts that the survey will have a harmful effect on millions of sea creatures.	It would be unacceptable to have long-term or permanent/unrecoverable impacts, fortunately, impacts from marine seismic surveys are short-term, temporary, and recoverable. (Event ID: 3419)	3343
4274	The stakeholder claims that seismic exploration poses a significant danger to marine life in general. This claim suggests a strong opposition to the practice due to its perceived harmful effects on the marine ecosystem as a whole.	The titleholder publicly responded to this interactive map comment explaining that legislative framework in Australia permits some impact from offshore petroleum if it is managed and of an acceptable level. We believe that responsible development of gas is essential for maintaining the current quality of life we all enjoy and ensuring we pass that quality of life on to future generations. Gas is part of the Labour governments energy transition plan.	2107
4276	The stakeholder does not accept the blasting activity as beneficial or more important than existing marine life and structures.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are	2255

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		considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	
4278	The stakeholder expresses an active interest in the wellbeing of the coastline and its flora and fauna, indicating a general concern for environmental conservation.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	1325
4285	The stakeholder noted their concern as a resident of Port Fairy: noise (land and sea), impact on marine life, potential impacts on the environment and the future potential if gas is found.	We are also concerned about the welfare of marine fauna. We have undertaken an impact assessment process that includes whale, seals, pelagic and shorebirds. As part of this assessment, we must show that impacts to these species will be of an acceptable level. We have determined that it is acceptable to have temporary behavioural changes, such as moving away from the survey vessel, and no injury or long-term impacts. Our Preliminary Environmental Impact and Risk Assessment document has been published on the project website and is available here. We are also publishing environmental impact, risk and mitigation documents as they are completed, in the document library. We are publishing the entire documents in order to remain transparent, but I have also attached a summary document.	1747
4287	The stakeholder objected to the activities due to sound levels/acoustic trauma experienced by sea creatures	The scientific literature supports that marine fauna may potentially be displaced due to a seismic survey but that these impacts are typically short term with no impact to ecosystem function. Large scale studies undertaken in Australia that you may be interested in are: Australian Institute of Marine Science. North West Shoals to Shore Marine Noise Monitoring and Impacts https://www.aims.gov.au/research-topics/monitoring-and-discovery/north-west-shoals-shore Behavioural Response of Australian Humpback whales to Seismic Surveys https://www.brahss.org.au/ Assessing the impact of marine seismic surveys on southeast Australian scallop and lobster fisheries https://www.frdc.com.au/project/2012-	2389

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		008 Marine Seismic Survey Impacts on Fish and Invertebrates: Final Report for Gippsland Marine Environmental Monitoring Study https://ecat.ga.gov.au/geonetwork/srv/api/records/2292f4a7-ba2e-3533-e053-12a3070aaf2c Maxima 3D Marine Seismic Survey at Scott Reef https://www.sciencedirect.com/science/article/abs/pii/S0025326X13006528 https://www.sciencedirect.com/science/article/abs/pii/S0025326X18300687 Regarding Marine Fauna Observer's (MFOs), companies that contract MFOs such as Blue Planet Marine and RPS Group provide training for MFOs. As part of contracting MFOs we will ensure that the persons provided meet the requirement of the Australian Government EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales, that requires MFOs to be trained and experienced in whale identification and behaviour, distance estimation, and be capable of making accurate identifications and observations of whales in Australian waters. The Regia MSS Implementation Strategy, which will form part of the environment plan to be submitted to NOPSEMA, details the competency requirements for MFOs and ongoing awareness (page 23 and 24). The Regia MSS Implementation Strategy is available on the Regia MSS Website Document Library see https://klarite.mysocialpinpoint.com.au/regiamss/document-library As detailed in the Regia MSS Implementation Strategy, which will form part of the environment plan to be submitted to NOPSEMA, CGG will only use appropriately experienced MFOs as determined by a review of their CVs (page 23). The Regia MSS Implementation Strategy also details how CGG will monitor the performance of the control measures during the activity (page 25). For example: Audits and Inspections Post acceptance of the EP, conformance will be monitored on an at least quarterly basis by the Client Site Representative, or delegate, via audits and inspections, as well as through the	

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		commitments under the Management of Risk, Management of Change, and Management of Knowledge parts of this Implementation Strategy. During the activity, conformance will be monitored on an at least fortnightly basis by the Client Site Representative, or delegate, via audits and inspections during the activity. Conformance auditing or inspection while the EP is in-force will be based on the Conformance Register and will target the following: • Conformance with regulatory requirements detailed in the accepted EP. • Management strategies and procedures to ensure EPOs and EPSs are being implemented, monitored, measured, and evaluated. • Emissions and discharges are being monitored, measured, and documented As stated in the previous email, matters of national energy policy are not within the purview of CGG or the Regia MSS. We will however register claims related to the ongoing need for gas and provide those to NOPSEMA. Please find attached a brochure from NOPSEMA that describes this and may be of use to you.	
4288	The stakeholder objected to the project on the basis that it would impact the Stakeholder personally and every person in the community who love the ocean. Stakeholder noted that they do not support the activity and find it distressing to even think about the damage that could be caused for thousands of creatures and the future of herself, other people of Port Fairy and the greater community.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan.	2064
4292	The stakeholder raised concern about the sound level from the survey and its effect on marine mammals and other species.	Outlined the predicted effects of sound levels of different species of marine mammals including difference between high and low frequency cetaceans, sound propagation and modelling, and different effect level thresholds. Outlined the whale management and mitigation measures in place for Southern Right Whales and Blue Whales including timing of the activity, vessel-based monitoring (MMO's and PAM Operators), detection	3697

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		technology trails, and citizen science program access. Outlined the effects on zooplankton and the case for acceptability of these impacts noting the movement of the survey timing to avoid the upwelling period. (event ID 3697)	
4293	The stakeholder raised concerns about the lack of evidence of the effects of seismic on abalone.	Noted the distances for effects are likely from particle motion, which is very short range from the sound source.	948
4301	The stakeholder stated that the proposed activity is environmentally unsound irrespective of the assessment process and predicted environmental risk.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1747
4306	The stakeholder was concerned about potential negative impacts of gas exploration and development on Country, the marine and coastal environment, the local economy, Traditional Owners, and local communities.	The titleholder acknowledged the feedback, noting that all relevant impacts are assessed in the Environmental Plan (EP) and can be found in E1-E9. Measures to minimise adverse impacts on functions, interests and activities on relevant receptors are also adopted and can be found in G1.	3152
4309	The stakeholder was concerned about the impact on marine life sensibilities and populations.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	2273
4313	The statement challenges that seismic blasting will harm shellfish like scallops, citing research by Ryan Day et al. (2017) that demonstrates physiological harm and altered behaviour in scallops due to exposure to seismic air gun signals.	We understand that there are impacts of seismic surveys. The findings of the paper have been used to define the distance at which some effects may occur. Our current understanding is that the effects are initially sub-lethal, that increased mortality was observed post exposure, and that increased mortality was within natural variation. Our draft assessments will be published soon (Event ID 2078).	2078
4315	The statement suggests that the significant harm caused by seismic activity to marine life and commercial fisheries, along with the existing natural gas supplies	We believe impacts from our activity can be managed to below acceptable levels. Further development of the offshore area would be subject to multiple future approvals. The visual	2076

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	and climate change issues, renders the industrialisation of Port Fairy's coastline unacceptable. It emphasises community disapproval of allowing major oil companies to profit at the expense of the local environment and tourism.	impact from this survey would be temporary and similar to the shipping/fishing activity that already occurs in the region (Event ID 2076).	
4319	There are concerns regarding the potential impacts of seismic surveys on penguins, diving birds, and other marine fauna. Stakeholders are particularly worried about how the noise and disturbance from these surveys could affect the breeding and foraging behaviours of these species.	This effects of sound on birds were initially assessed in E4 and further assessments for penguins can be found in F3. Birds can also be affected by artificial light, which has been assessed in E9. The conclusion is that the measures adopted to protect foraging birds will mean that impacts are of an acceptable level.	2006
4322	There is measurable damage done to one species which will be an example of potential damage to others in the vicinity of King Island and surrounds	While the claim was noted the REGIA EP has conducted an extensive assessment of the literature and found no evidence of measurable damage to populations of invertebrates or fish in the vicinity of King Island and surrounds. The seismic acquisition area is also located ~100km from nearest King Island landfall.	2773
4323	There will be potential permanent damage to marine life due to sonic testing and drilling.	Titleholder responded and listed various information needs related to the activity, environmental assessment process, environmental aspects, predicted levels of environmental impact and risk, environmental management, consultation processes, and regulations or regulatory processes. Links to the project website and document library was provided.	1046
4329	This feedback highlights the uncertainty regarding the long-term impacts of seismic blasting on abalone populations, particularly emphasising that the effects may not be immediately observable and could depend on the juvenile stages at the time of blasting.	We have recently installed an exclusion zone down to the 40m bathymetry contour primarily as a result of discussions with abalone fishers who dive down to 30m. This will help protect early life-cycle stages of abalone. Further, seismic surveys have occurred in this region for many years and the two industries (fishing and petroleum) have successfully coexisted over time (Event ID 2095).	2095
4343	Questions possibility of compensation for the abalone industry if their stocks are depleted as a result of seismic testing, drawing a parallel to the scallop industry near King Island that was adversely affected. It highlights concerns regarding accountability and the financial implications for local fisheries in the event of ecological harm.	The titleholder acknowledged this concern and noted that potential impacts to the abalone industry. It would be unacceptable to have mortal effects on any marine species from our or any marine seismic survey. We do not predict mortal effects to molluscs (including scallops, abalone, oysters, clams, mussels, limpets, squids, octopus and cuttlefish etc.). Our full assessment of predict impacts on molluscs can be found in E1 Section 8, E4 Section 8 and F3 Section 4.	2093

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
4354	Uncertainty about the full extent of damage to the marine ecosystem.	Titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the marine environment within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2831
4358	The stakeholder was concerned about the impacts on flora and fauna being damaged and killed away from the coastline.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any flora or fauna within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2821
4362	Concerns about the lack of environmental reviews of seismic surveys at necessary scales to assess, mitigate and monitor impacts.	The titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The titleholder responded providing links to large scale studies on seismic undertaken in Australian waters and offered to provide individual with impact assessments when they became available.	1389
4363	Stakeholder noted opposition to the harmful effects on marine life and the pristine coast.	The titleholder provided information on identifying potential impacts and risks and putting mitigations in place such as, conducting survey during time of year marine mammals are less likely to be in area, reducing sound source to lowest setting and reducing number of times activated, implementing marine mammal and fish monitoring programs, exclusion zones, following strict NOPSEMA guidelines. Provided link to PEIRA and document library on website.	786
4364	Concern about the future of ocean health for children and sea life, including whale children.	Titleholder responded in Event ID: 1416, describing CGG's commitment to safeguarding marine mammals, the assessment process, regulations and measures currently in place. The stakeholder was provided with consultation information and invited to engage.	1410
4365	Concerns about the lack of definitive clarification on how seismic testing affects the marine environment and the clash between economic interests and environmental risks.	The titleholder acknowledged the feedback, noting that they have undertaken a thorough analysis and assessment of all relevant literature to inform the impact assessments conducted to assess potential impacts from underwater sound to relevant receptors, including plankton, fish, invertebrates, birds, turtles, and marine mammals in the Environmental Plan (EP). These findings can be found in E2, E3, E4, E5, E6, and E7 under Section 8: Predicted Levels of Impact. Additional assessments of key receptors were also completed to demonstrate that environmental impacts and risks	2383

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		arising from the activity will be of an acceptable level (F3). Titleholder also conducted an assessment to investigate potential impacts to other marine users from physical presence resulting from the activity (E1).	
4419	Concern about the potential impacts of seismic surveys on the planktonic phyllosoma stage of Southern Rock Lobster.	Event ID 6820 - The Regia team responded that the information already provided on Southern Rock Lobster shows the scales of connectivity and dispersal that are intrinsic to the stock of Southern Rock Lobster. They show how any impacts to individual rock lobster larvae within the intended area of seismic will be immeasurably small relative to the mortality that is operating across the regional distribution of this species. Such a well-connected, genetically homogenous stock is, by definition, highly resilient to localised disturbances. Evidence of impacts to individual larval lobsters is not evidence of impacts to the stock of southern rock lobsters. This conclusion is based on published papers presented in the previous document and an understanding of life-history dynamics in marine invertebrates.	6411
4420	Research indicating potential impacts of seismic activity to “pruning” of egg clutches by female Pale Octopus.	Event ID 6820 - The Regia team responded that the point raised repeats some of the key findings from Day et al 2023. They stated that they had discussed this in the information previously provided, along with the other implications which indicated that there was no evidence for significant long-term damaging effects or impairment. The Regia team said that it was conflating an effect at the individual level with population-level effects.	6411
4421	Reports on the impacts of a commercial seismic survey off the coast of Victoria on the Pale Octopus indicating a sub-lethal neurotoxic effect capable of altering behaviour and locomotor abilities.	Event ID 6820 - The Regia team responded that the point raised repeats some of the key findings from Day et al 2023. They stated that they had discussed this in the information previously provided, along with the other implications which indicated that there was no evidence for significant long-term damaging effects or impairment. The Regia team said that it was conflating an effect at the individual level with population-level effects. The study showed there were effects to individual octopus, however it also showed great variation in the scale of effects and a lack of evidence to support significant harm. Scale of effects is crucial to understanding outcomes. There are many disturbances acting on marine invertebrates and they span a scale from insignificant to very impactful. Climate changes and commercial	6411

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		fishing are at the very impactful level with potentially large changes to populations. Current science indicates that population changes are not going to result from a stand-alone seismic survey, irrespective of whether individual octopi are affected.	
4422	Uncertainty about whether Giant Crab are sensitive to seismic air gun exposure and if so, to what degree. The relevant person was also concerned about the lack of data on safe threshold distances for exposure.	Event ID 6820 - The Regia team responded that Appendix F3, Section 3.6 (provided a link), provides a specific assessment of the sensitivities of Giant Crab stocks and likely impacts from the proposed Regia MSS. This assessment addresses the questions posed here using all the available science. They recommended this section be read or re-read however they provided relevant excerpts to illustrate the assessment that has been done. Multiple studies have looked at seismic effects on crustacean larvae amongst other taxa, and results have been mixed, with any mortality limited to very close proximity to the source. Adult crab species that have been tested have shown very little response to seismic pulses (Appendix E4 and references therein). They stated that there was no evidence to support an expectation of significant and measurable cumulative impacts to P. gigas because of the MSS. Large scale environmental drivers driven by a changing climate, and fishing effort, will continue to be the major influences on the population health of giant crab. The Regia team reiterated that fishing effort is the major anthropogenic driver of changes to crab populations, and it is this driver interacting with a changing climate that will drive population changes in the future.	6411
4433	Seismic impacts can linger longer than the few hours suggested, the insistence on peer-reviewed work to prove this is opportunistic and suits OMICC's agenda.	Event 6724 - OMICC announces that the latest version of the OMICC Otway Adjustment Protocol has been published, along with a video briefing for fishers, which can be accessed through a provided link. In the briefing, OMICC confirms that, following the relevant persons feedback, a "claim period" and a "lodgement period" have been incorporated into the definitions of the protocol. The claim period is set to 30 days after the end of any activity, while the lodgement period extends up to 6 months after the end date of any activity. OMICC further informs the relevant person that the OMICC Founders reviewed the request for claims up to 6	6749

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		months after an activity. However, the decision was made to adopt a 30-day claim period, as this duration resulted in a positive compensation outcome for fishers affected by the Gippsland survey in 2019.	
4436	The relevant person stated that it was evident what had impacted rock lobsters in the early 2000s.	Event ID 6595 - Titleholder responded to relevant person outlining approach to assessment of fisheries and SRL, including assessment of mitigation in place.	6594
4437	Relevant person was concerned about impacts of seismic to rock lobsters.	Event ID 6595 - The titleholder responded that they had undertaken a thorough assessment of potential impacts on SRL, including a further assessment on the effectiveness of the mitigations in place.	6592
4438	Relevant person was concerned about the impacts of seismic surveys on lobster populations.	Event ID 6875 - The Regia team responded in-meeting and explained that there is an impact of the seismic activity on lobster associated with their righting reflex. Discussed that they needed to look at what the resource tolerates. Discussed research boat in Tasmania and directed relevant person to recent research paper "Boom, Shake the Room."	6875
4439	Concerned about impacts to squid, octopus and scallops.	Event ID 6875 - The Regia team responded in-meeting with a discussion about the assessment work undertaken on impacts to squid, octopus and scallops.	6875
4441	Concerned about the impacts of seismic activities on crab populations.	Event ID 6876 - The Regia team responded in-meeting that seismic can cause a physiological reaction in crab - delayed righting. Discussed that they will only go to 200m.	6876
4443	Concerned that the Regia team said there will be zero effect and that every historical seismic activity has had a worse effect.	Event ID 6876 - The Regia team responded in-meeting that they did not say there would be zero effect. Offered to analyse fishing data provided by commercial fishers and reproduce long-term catchability analysis. An analysis is also included in Appendix F3, section 3.5.3	6876
4444	Concerned that there are no studies about the effect of seismic after adult malting.	Event ID 6786 - The Regia team responded in-meeting and discussed UTAS study which looked into effects of seismic during different stages of juvenile development. Explained that the sample size was very small. Study showed that there is a repairing period. Asked relevant person about malting seasons.	6876
4447	Asserted that non-productive catch areas are a result of seismic activity.	Event ID 6876 - The Regia team responded in-meeting that they could re-run their long-term catchability analysis with data provided by commercial fishers. Stated that they	6876

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		could reduce block size and make it granular.	
4448	Concerned that seismic was hurting the industry and catch rates would be higher but for seismic testing.	Event ID 6876 - The Regia team responded in-meeting and went through their box plot analysis. Explained that the data used was landed catch data each month from 2016 - 2023. Also went through CPUE data set and stated that the analysis showed although landed catch was lower, CPUE was still in range in 2020. Explained the Regia team are looking at recruitment of the fishery. Explained that the fishers take 30% of the fishery. Stated there was evidence there was no stock level effect.	6876
4417	The relevant person was concerned that about the proposed seismic activity effecting the behaviours of certain species.	Event ID 6880 - The Regia team responded in-meeting that the first half of the EP is associated with assessment work undertaken prior to commencing the activity. First and foremost, because there are so many different species, they explained that they had grouped species together from a physiological perspective. Secondly, the Regia team explained that their focus is on the mega-fauna and species which have protection under the EPBC act.	6880
4450	Claimed that the Regia team should avoid September activity window due to female crays carrying eggs.	The effects on berried female Southern Rock Lobsters (SRL) and subsequent recruitment are considered minimal due to the species' high fecundity, variable recruitment patterns, and likely larval input from distant sources. These minor effects are outweighed by the benefits of avoiding impacts to more sensitive species, like blue whales, and avoiding surveys during summer when biodiversity peaks. Additionally, because SRL settle continuously from June to September, there is a high degree of certainty that major stock damage from a September start will not occur.	6876