10. CONCLUSIONS AND RECOMMENDATIONS

This chapter concludes on the key impact assessment findings and makes a recommendation and conclusion regarding the issuing of an Environmental Authorisation for the proposed project.

10.1 NORMAL OPERATIONS

10.1.1 Operation of Project Vessels: Emissions, Routine Discharges, Lighting and Noise

The majority of the impacts associated with the normal operation of the project vessels will occur in the vicinity of the area of interest, which is the offshore marine environment, more than 45 km offshore, removed from sensitive coastal receptors (e.g. key faunal breeding / feeding areas and bird or seal colonies). The area of interest, however, overlaps with the Port Elizabeth Corals MPA, portion of an EBSA and CBAs.

The dominant wind and current direction will ensure that any **air emissions and discharges** move mainly in a south-westerly direction away from the coast. These impacts will largely be regional (although generally localised at any one time), of short-term duration (up to five months) and of very low to low intensity, and are considered to range from **NEGLIGIBLE** to **VERY LOW** significance with mitigation. Key mitigation includes ensuring that the project vessels comply with MARPOL 73/78 standards.

De-ballasting of project vessels could lead to the introduction of exotic species and harmful aquatic pathogens to the marine ecosystem. The risk of impacts on marine biodiversity related to the introduction of alien species is, however, significantly reduced by adherence to the 2004 IMO guidelines governing discharge of ballast, which specifies minimum discharge distances from the nearest land. Considering the dynamic location of the survey area and compliance with the IMO guidelines for ballast water, the residual impact is considered to be of very low intensity in the short-term (due to invasive species not being able to establish) and of regional extent. Thus, the residual impact is of **NEGLIGIBLE** significance.

The **noise generated by the operation of the project vessels** falls within the hearing range of most fish and marine mammals, and would be audible for considerable ranges before attenuating to below threshold levels. However, underwater noise from vessels is not considered to be of sufficient amplitude to cause direct harm to marine life, even at close range. The impact related to vessel noise is considered to be of **VERY LOW** significance. No mitigation measures are proposed or deemed necessary.

Operational lighting used to illuminate the project vessels at night will increase ambient lighting in offshore areas, which may disturb and disorientate pelagic seabirds feeding in the area. Since the survey area is located within a busy traffic route along the Southeast Coast of South Africa, which experiences high vessel traffic, animals in the area should be accustomed to vessel traffic within a few days. The residual impact related to vessel lighting is considered to be of **VERY LOW** significance.

These impacts are not unique to the project vessels, but common to the numerous vessels that pass through South African coastal waters on a daily basis.

10.1.2 Helicopter Operations

Crew changes will most likely occur by support or survey vessel calling to port. However, if necessary for personnel transfer or in emergency situations, the helicopter may fly over or in close proximity to sensitive

coastal receptors, such as seal and seabird breeding colonies, which could be affected by a flight path between the survey area of interest and the airport. Although exposure during crew changes will be limited over the five-month survey duration and be of a temporary nature while the helicopter passes overhead, indiscriminate or direct low altitude flying over seabird and seal colonies or breeding cetaceans could impact fauna behaviour and breeding success. Specified flight paths that avoid these sensitive receptors will reduce the impact intensity on marine fauna, but maintain the **VERY LOW** significance.

10.1.3 Seismic Acquisition

Seismic noise could impact marine fauna in a number of different ways, including physiological injury (e.g. PTS and TTS), disturbance and / or behavioural changes, masking of environmental sounds and communication, and effects on predator-prey relationships. Any impact to fish and fish behaviour could, in turn, impact commercial and small-scale fisheries that operate in the area through the reduction in catch rates and/or an increase in fishing effort.

The maximum estimated zones of impact for PTS, TTS and behaviour for the various faunal groups are summarised in Table 10-1 below.

Table 10-1: Zones of Impact from Seismic Pulses for all Faunal Groups

Type of animal		Zones of impact – maximum horizontal distances from source to impact threshold levels				
		Immediate Impact from Single Pulses		Cumulative Impact from Multiple Pulses		Behaviour
		Injury (PTS) onset	TTS onset	Injury (PTS) onset	TTS onset	
Mammals	**Cetaceans**	480 m (VHF cetaceans)	850 m (VHF cetaceans)	800 m (LF cetaceans)	12 000 m (LF cetaceans)	4 400 m
	Seals	25 m	35 m	-	< 10 m	-
Type of animal		**Mortality & Mortal Injury**	**Recovery injury**	**Mortality & Mortal Injury**	**Recovery injury**	
Fish	**Fish (with swim bladder)**	240 m	240 m	20 m	50 m	5 000 m
Sea turtles		240 m	-	< 10 m	-	3 100 m

Notes:
- A dash indicates the threshold is not applicable.
- If the zone of impact for cumulative is smaller than that for the single pulse, then the marine species are likely to be more sensitive to pressure impact than energy impact.

Thus, animals would need to be in relatively close proximity to the operating seismic source to suffer physiological injury (< 480 m for PTS and 850 m for TTS for a single seismic pulse), and with most being highly mobile, it is assumed that they would avoid sound sources at distances well beyond those at which injury is likely to occur. The cumulative zones of impact would only apply where the animals may not move away from the area during surveying, e.g. from specific coastal areas used as calving sites (although inshore of the area of interest) or from mid-ocean focal sites (such as the Southwestern Indian Seamounts to the south of the area of interest). Although the cumulative zone of impact for the extends to 800 m for PTS and to 12 000 m for TTS, the area of interest does not overlap with potential coastal nursery areas for Southern Right whales nor any sensitive mid-ocean focal sites. Behavioural effects, with a zone of impact up to 4 400 m for cetaceans, are generally short-term with duration of the effect being less than or equal to the duration of exposure, although these vary between species and individuals, and are dependent on the properties of the received sound.

With the implementation of the recommended mitigation measures, the residual impact on **marine fauna** ranges from **LOW** (cetaceans, turtles (**MEDIUM** for hatchlings) and fish) to **VERY LOW** (diving seabirds, seals and plankton) to **NEGLIGIBLE** (invertebrates) significance. Key mitigation includes ensuring the seismic survey avoids the key cetacean migration period from June to November (inclusive) and key spring fish spawning periods (September to December (inclusive)); implementing a 60-minute pre-watch period and "soft-start" procedure; monitoring the faunal activity within the mitigation zone when the seismic source is active; and terminating seismic shooting, as specified.

The inshore area of the Reconnaissance Permit application area overlaps with the fishing grounds of five **fishing** sectors (% of national catch indicated in brackets), including demersal trawl (6.4%), midwater trawl (16.2%), demersal longline (6.7%), large pelagic longline (3.3%) and South Coast rock lobster (1.9%). The avoidance of December will help mitigate the potential impact on the demersal trawl, midwater trawl and demersal longline sectors. With the January commencement and implementation of the mitigation measures related to the temporary exclusion zone, which will ensure good communication and coordination with the fishing sectors, the residual impact on the demersal trawl, midwater trawl, demersal longline, large pelagic longline and South Coast rock lobster is assessed to be of **LOW** significance. Although fishing activities will be temporarily excluded from the safety zone around the survey vessel and its array, fishing could continue in adjacent areas. There is **no anticipated impact on the traditional linefish, small pelagic purse-seine, squid jig and small-scale sectors**, which is unlikely to range beyond 25 km from the coastline; thus, falling inshore of the area of interest.

Similarly, **commercial shipping** would be excluded from portions of the survey area at any one time and may require these vessels to adjust their course slightly (detour) to avoid the survey vessel and lines being shot. Although the survey area is located within a busy traffic route along the Southeast Coast, with the implementation of the mitigation measures, which includes the broadcasting of a navigational warning for the duration of the survey, residual impacts on commercial shipping is assessed to be of **LOW** significance.

Any impact on the marine ecosystem could in turn impact the **intangible cultural heritage** of people who have a close spiritual link to the sea. The sea is described as 'living' waters and is believed to play a critical role in spiritual and health management in indigenous groups specifically (First Peoples and Nguni). With appropriate and substantive public participation efforts and the possible implementation of ritual events the potential impact is assessed as being of **LOW** significance.

10.1.4 Interaction with the Local Economy

The seismic activities will result in limited **economic benefits** with respect to the recruitment and the use of local service providers or suppliers. The demand for such local services will largely be limited to crew accommodation, meals, basic goods, and refuelling, provided in the selected supply port, Gqeberha. In addition, the workforce required for the exploration activities is expected to be 100 persons in total. Although the majority of these positions will be filled by international experts employed by the seismic contractor, there will be indirect employment via the contracting of local service providers and suppliers. The maximisation of opportunities for locals will result in a residual impact of **NEGLIGIBLE (positive)** significance. Due to the limited nature of this work, it is important to actively manage community expectations related to local procurement, local content, and local employment opportunities.

10.2 UNPLANNED EVENTS

Unplanned events may conceivably occur as a result of accidents or abnormal operating conditions, including a vessel collision and faunal strikes, accidental spills from bunkering or a vessel accident, and lost equipment.

Oil or diesel spilled in the marine environment will have an immediate detrimental effect on water quality. Being highly toxic, marine diesel released during an operational spill (e.g. during bunkering, vessel or equipment damage) will negatively affect any marine fauna in which it comes into contact. In the unlikely event of a spill, the intensity of the impact would depend on whether the spill occurred in offshore waters where encounters with pelagic seabirds, turtles and marine mammals would be low due to their extensive distribution ranges, or whether the spill occurred closer to the shore where encounters with sensitive receptors will be higher. Due to the dominant winds and currents, a diesel slick in the survey area would be blown in a south-westerly direction and away from sensitive coastal receptors. A small diesel spill would remain at the surface for less than 5 days (short-term) with no chance of it reaching sensitive coastal habitats. A spill within the port limits during bunkering / loading could, however, be easily managed and contained, and is less likely to pose a risk to the nearshore environment. A spill outside the port near the coast (e.g. in the unlikely event of a vessel collision) could reach the shore and mariculture activities through wave action and tidal currents. As the intensity of a nearshore spill may be higher than an offshore spill, the residual impacts on marine ecology and nearshore fishing (mariculture and small-scale) are considered to be of **LOW** significance, while the residual impacts on commercial fishing (offshore) are considered to be of **VERY LOW** significance. Key project controls include implementing the Shipboard Oil Pollution Emergency Plan and Emergency Response Plan.

The potential impacts associated with **lost equipment** to the seabed may initially crush benthic fauna, whereafter it would provide a localised area of hard substrate in an area of otherwise unconsolidated sediments. This would be of short-term duration as any lost object will likely sink into the sediments and be buried over time. Since the proposed survey area of interest overlaps with demersal fishing grounds along the shelf break, snagging of demersal gear due to equipment that sinks to the seabed is considered possible. The loss of a streamer would also result in entanglement and collision hazards in the water column before they sink under their own weight. The residual impacts on marine fauna and commercial fishing are both considered to be of **VERY LOW** significance. Due to the cost of the equipment, gear will be recovered, where possible, thereby reducing the likelihood of these impacts.

Movement of vessels between the survey area and the supply port may result in limited interaction with recreational and fishing boats that could lead to **vessel collisions** and related damage to vessels and death / injuries to humans. To be prepared for a collision event, the project will implement an emergency response system. As standard practice, an Emergency Response Plan and Medical Evacuation Plan will be implemented. Assuming compliance with port control and laws of the sea when navigating in the vicinity of the supply port, it is unlikely that collisions would occur, and the potential residual impact is assessed to be of **NEGLIGIBLE** significance.

Faunal strikes with the project vessels or the towed array, although unlikely, may occur during vessel transit or surveying. The residual impact is considered to be of **LOW** significance with the use of 'turtle-friendly' tail buoys, ensuring that all equipment that has been used in other regions is thoroughly cleaned prior to and regularly during use (less likely to attract animals wanting to feed off organisms growing on the equipment) and reducing transit speed from 12 knots to 10 knots in the vicinity of sensitive marine fauna and within 25 km from the coast.

Any unplanned events that impact on the marine environment could in turn impact on the **intangible cultural heritage** of people, largely due to *perceived* impacts of an accidental spill. With the efficient implementation of emergency response plans and appropriate consultation, the residual impact is considered to be of **LOW** significance.

10.3 COMPARATIVE ASSESSMENT OF ALTERNATIVES

A summary of the project alternatives that have been considered in the BA is provided in

Table 10-2: Comparative Assessment of Alternatives

Alternatives	Conclusions
1. Site / location alternatives	
Survey area location	CGG would limit survey activities to 9 000 km^2 within the 12 750 km^2 Reconnaissance Permit area. No data acquisition would be undertaken inside the Port Elizabeth Corals MPA and related buffer zone. There would also be no survey activities within any other MPAs or within 45 km off the coast. The proposed survey area has considered key fishing areas and would avoid squid fishing areas and minimise overlap with key trawl fishing grounds.
Onshore base locations	Due to the location of the proposed survey, the onshore supply base would be located at the Port of Gqeberha as the closest port of sufficient size to service the supply vessels. The Basic Assessment considers the option of sourcing supplies from the Port of Gqeberha. Due to the temporary nature of the survey and limited supply requirements, there would be no difference in impact significance between Gqeberha and another South African port, e.g. Cape Town.
2. Timing / Scheduling Alternatives	
Timing of seismic survey	CGG proposes to undertake the survey within the 2023/2024 summer survey window period from December to May (inclusive), with the earliest commencement date in January 2024. The proposed survey period would avoid the key whale migration period (June to November) as well as key squid and commercial fish spawning periods (September to December). If any other periods were to be considered, it would encroach into sensitive spawning and migration periods.
4. Technology Alternatives	
Seismic technology	A feasible alternative for acquiring 3D data in the proposed survey area does not currently exist. CGG will define and enforce the use of the lowest practicable seismic source volume of production.

10.4 CUMULATIVE IMPACT

The assessments of impacts of seismic sounds provided in the scientific literature usually consider short-term responses at the level of individual animals only, as scientific understanding of how such short-term effects relate to adverse residual effects at the population level are limited. Data on behavioural reactions to seismic noise acquired over the short-term could, however, easily be misinterpreted as being less significant than the cumulative effects over the long-term. Despite the density of seismic survey coverage over the past years in the South African offshore and particularly along the southern coast, the number of Southern right and Humpback whales around the southern African coast have increased, and their lingering on West Coast feeding grounds long into the summer, suggest that those surveys conducted over the past decades have not negatively influenced the distribution patterns of these two migratory species at least. Information on the population trends of resident species of baleen and toothed whales is unfortunately lacking, and the potential effects of seismic surveys on such populations remains unknown. Consequently, suitable precautionary mitigation measures must be implemented during seismic data acquisition to ensure the least possible disturbance of marine fauna in an environment where the cumulative impact of increased background anthropogenic noise levels has been recognised as an ongoing and widespread issue of concern.

There is the possible chance of an increase in disturbance and disruption to fisheries active in the area should additional exploration activities be undertaken during the same survey window period. There is also the possibility of cumulative benefits being accrued to local service providers and suppliers if multiple exploration activities become active either in parallel or in close sequence to each other. The need for ongoing support from local service providers and suppliers over multiple projects may see possible cumulative benefits over a longer period of time, but may also raise strong expectations.

Thus, should other speculative or proprietary seismic survey campaigns be undertaken concurrently with CGG's proposed survey programme of the Southeast Coast (although unlikely to be undertaken in the same area during the same survey window due to impacts on operation and data acquisition), cumulative impacts may be likely and there would need to be alignment in planning of such concurrent operations in order to avoid cumulative impacts.

10.5 RECOMMENDATION

All residual impacts related to normal operations, are of **NEGLIGIBLE** to **LOW** significance with the implementation of the recommended mitigation measures. Based on the nature, duration (short-term) and extent (regional, although generally localised at any one time) of the proposed seismic survey and the findings of the specialist studies, SLR is of the opinion that there is no reason why the proposed project should not, with implementation of the project controls and proposed mitigation measures, receive a favourable decision and the issuing of an Environmental Authorisation.

In making a decision on this application, PASA and DMRE will, however, need to weigh up these potential impacts with the project's alignment with National strategic policy (specifically the "just" transition to net carbon zero) and the large amount of public opposition to the continued use of fossils fuels and the exploration for new hydrocarbons resources.