

EXECUTIVE SUMMARY

1. INTRODUCTION

In July 2012 Petroleum Geo-Services (PGS) lodged an application for a Reconnaissance Permit in terms of Section 74 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA) for the undertaking of a speculative two-dimensional (2D) seismic survey in a number of petroleum licence blocks off the South and East coasts of South Africa (see Figure 1). An Environmental Management Plan (EMP) was compiled in terms of Section 39 of the MPRDA for a proposed 12 000 km seismic survey covering a portion of the Reconnaissance Permit area (which is 450 000 km² in total) between St Francis Bay (25°E) and Port Edward (31°S) (see Figure 1). This EMP was submitted to the Petroleum Agency of South Africa (PASA) in October 2012 for consideration and for approval by the Minister of Mineral Resources. On 11 February 2013 PASA notified PGS that their Reconnaissance Permit had been granted and would be issued subject to the submission of, *inter alia*, their financial provision in a format that is acceptable to PASA.

PGS is now proposing to extend the initial 2D seismic survey by an additional 7 000 km. The proposed expanded survey area, which falls within the original Reconnaissance Permit area, is situated a substantial distance offshore roughly between Cape Agulhas and Cape St. Francis¹ in water depths ranging from 200 m to over 4 000 m (see Figure 2). Although survey commencement would ultimately depend on a permit award date, it is anticipated that the survey would be undertaken during the summer of 2013/2014 and would take in the order of six months to complete.

In terms of Section 102 of the MPRDA, PGS is required to compile an EMP Addendum focusing on the proposed seismic survey extension and submit it to PASA for consideration and for approval by the Minister of Mineral Resources. Furthermore, Interested and/or Affected Parties (I&APs) must be notified and consulted in this regard.

PGS appointed CCA Environmental (Pty) Ltd (CCA) to compile this EMP Addendum for the proposed seismic survey extension to meet the relevant requirements of the MPRDA and the Regulations thereto.

2. EMP ADDENDUM APPROACH AND METHODOLOGY

2.1 OBJECTIVES

The objectives for the EMP Addendum process are:

- To provide a reasonable opportunity for I&APs to be consulted on the proposed project;
- To ensure that all potential key environmental issues and impacts that could result from the proposed project are identified;
- To identify feasible alternatives to the implementation of the proposed project;
- To assess potential impacts related to the proposed project;
- To present appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits; and
- Through the above, to ensure informed, transparent and accountable decision-making by the relevant authorities.

¹ From Cape Agulhas and Cape St. Francis, the block is approximately 180 km and 90 km offshore, respectively.

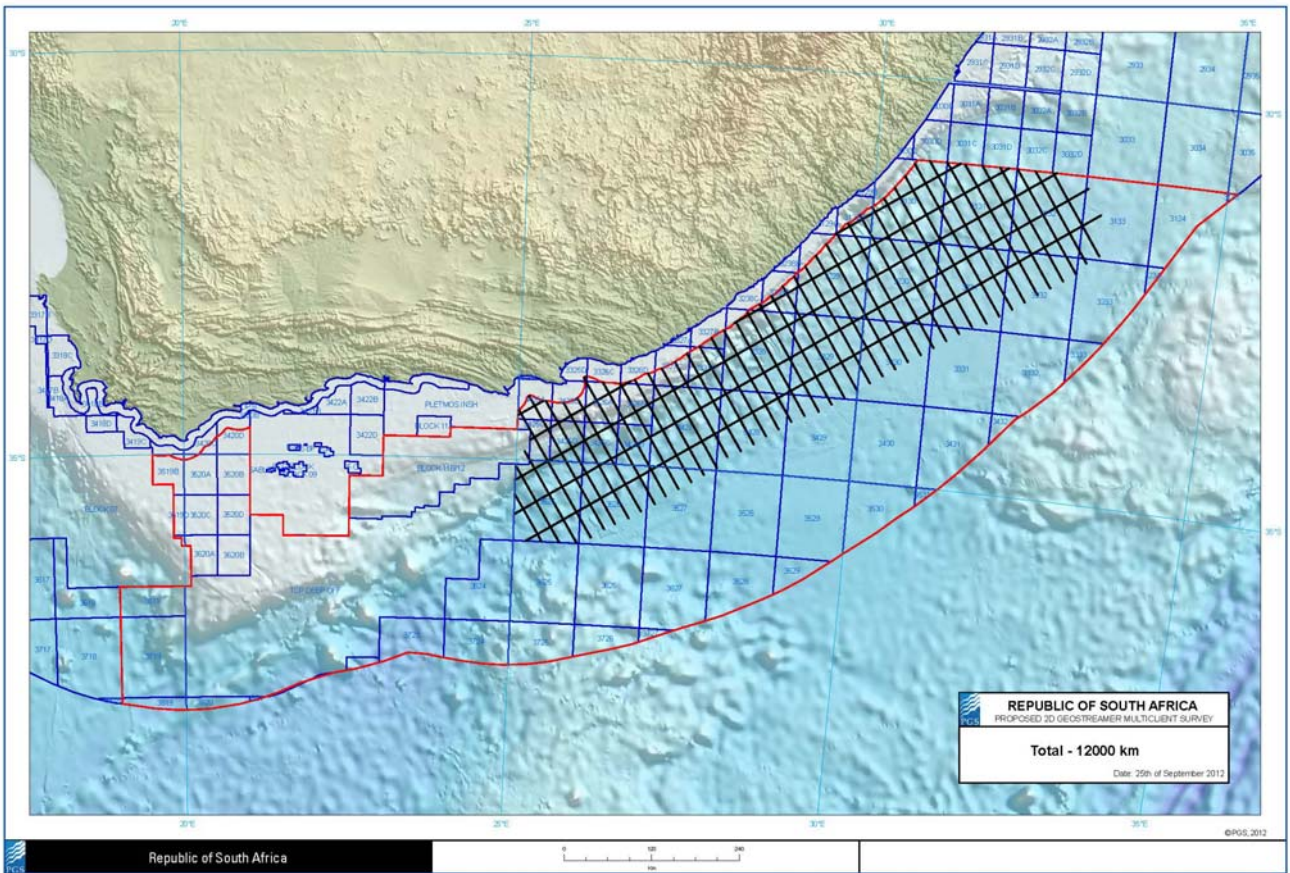


Figure 1: Location of the initial speculative 2D seismic survey over a portion of the proposed Reconnaissance Permit area.

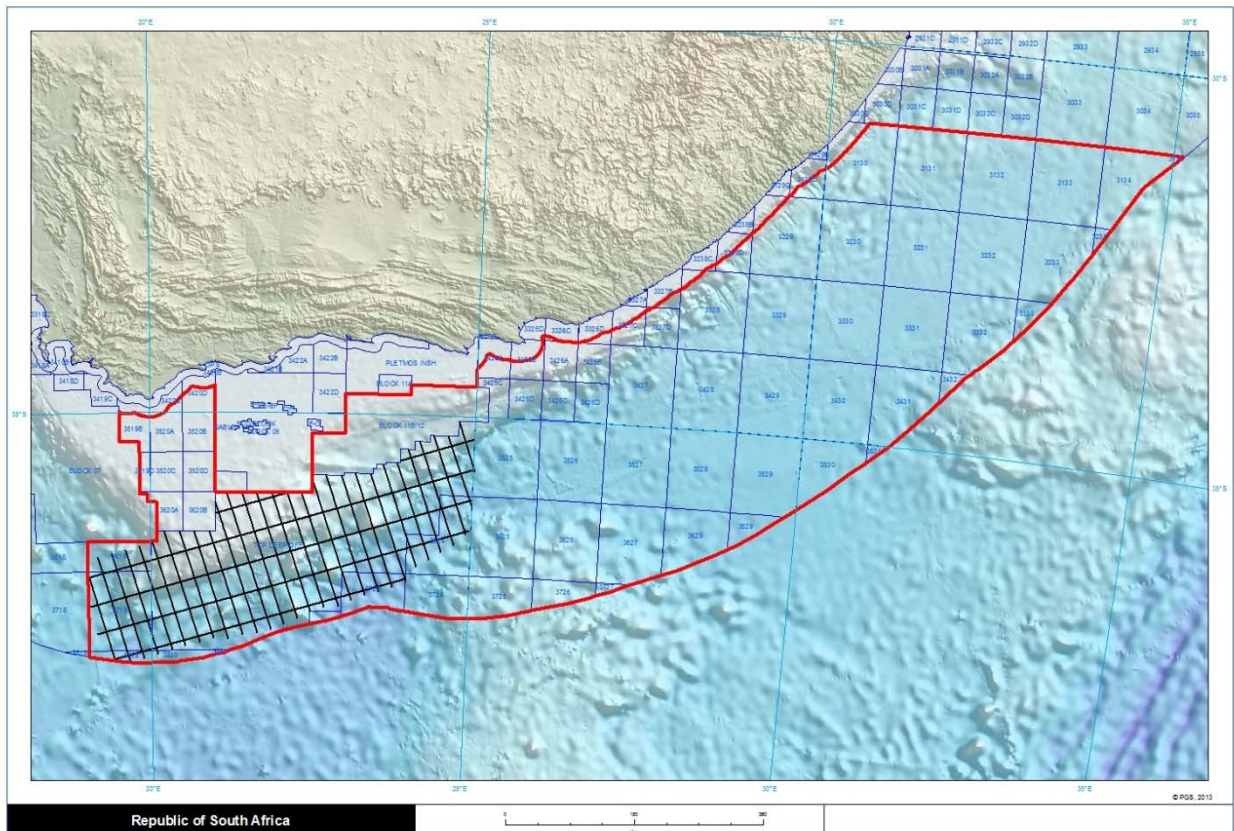


Figure 2: Location of the expanded speculative 2D seismic survey off the South Coast of South Africa.

2.2 PUBLIC PARTICIPATION PROCESS

The public participation process involved an open, participatory approach to ensure that I&APs were notified of the proposed project and given a reasonable opportunity to register on the project database and provide comments. Steps undertaken in the public participation process are summarised below.

1. A preliminary I&AP database was compiled of authorities (local and regional), Non-Governmental Organisations, Community-based Organisations and other key stakeholders (including the fishing industry, overlapping and neighbouring users with delineated boundaries in the oil/gas and mining industries). This database was compiled using databases of previous studies in the area and responses to the newspaper advertisements;
2. A notification letter / email and Background Information Document (BID) were distributed for a 24-day registration and comment period from 12 April 2013 to 6 May 2013 (which made provision for the public holidays on 27 April 2013 and 1 May 2013). The purpose of the BID was to convey information on the proposed project to I&APs and allowed them the opportunity to comment on the proposed project. To simplify the commenting process, a Response Form was included with the BID; and
3. Advertisements announcing the proposed project and the availability of the BID were placed in four regional newspapers, including:
 - Cape Times (Western Cape), Die Burger (Western Cape) and Die Burger (Eastern Cape) on 16 April 2013; and
 - The Herald (Eastern Cape) on 17 April 2013.
4. PGS has been in discussions with Total Exploration and Production South Africa (Total), who has a Technical Co-operation Permit (TCP) and an application for an Exploration Right for an area within the proposed survey area.

Comments received have been collated and responded to in an Issues and Responses Trail, which is appended to the EMP Addendum.

2.3 SPECIALIST STUDIES AND REPORT COMPILATION

Two specialist studies were undertaken to address the key issues that required further investigation, namely the impact on fishing and marine fauna. The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed project. These impacts were then assessed according to pre-defined rating scales.

The specialist information and other relevant information were then integrated into this EMP Addendum. Many of the issues associated with seismic surveys are generic in nature and have been assessed based on previous seismic survey programmes off the coast of South Africa and the Generic EMPr prepared for seismic surveys in South Africa. Recommendations proposed are based on specialist input and are in line with the Generic EMPr and the general principles of the Joint Nature Conservation Committee (JNCC) seismic guidelines. Information was incorporated into the EMP Addendum in order to ensure compliance with Section 39 and Regulation 52 of the MPRDA.

The EMP Addendum aims to present all information in a clear and understandable format and suitable for easy interpretation by authorities, I&APs and other key stakeholders (e.g. operator and contractors).

2.4 WAY FORWARD

The EMP Addendum is submitted to PASA for consideration and for approval by the Minister of Mineral Resources in terms of the MPRDA. The EMP Addendum has also been distributed for a 30-day review and comment period and any comments received will be forwarded directly to PASA for consideration.

3. PROJECT DESCRIPTION

3.1 GENERAL INFORMATION

3.1.1 Reconnaissance Permit Applicant

PGS as the applicant for the Reconnaissance Permit will also be the operator for the proposed project.

Address: Petroleum Geo-Services
No. 4, The Heights
Brooklands,
Weybridge
Surrey KT13 0NY
United Kingdom

Project Manager: Mr John Sheehan (Project Manager - Africa, Middle East, CIS)

Telephone: +44 (0) 1932 376 000

Facsimile: +44 (0) 1932 376 111

Cell: +44 (0) 7825 844 425

E-mail: john.sheehan@pgs.com

3.1.2 Existing permit and right holders (and applicants)

The Reconnaissance Permit area includes a number of license blocks off the South and East coasts of South Africa (refer to Figures 1 and 2). Total is the only operator with a TCP and an application for an Exploration Right within the proposed survey area. As mentioned earlier, PGS has been in discussions with Total with regard to their proposed survey.

3.1.3 Financial Provision

PGS will comply with the requirements for financial provision as specified in Section 41 of the MPRDA and Sections 52 and 53 of the MPRDA Regulations. PGS will make provision for the requirements of the EMP Addendum such as monitoring and reporting as part of the normal budgeting process. Environmental management actions required as a result of an incident or accident would be covered by PGS's insurance.

3.2 SEISMIC SURVEY

Seismic surveys are carried out during marine oil and gas exploration in order to investigate subsea geological formations. During seismic surveys high-level, low frequency sounds are directed towards the seabed from near-surface sound sources towed by a seismic vessel. Signals reflected from geological interfaces below the seafloor are recorded by multiple receivers (or hydrophones) towed in a single or multiple streamer. Analyses of the returned signals allow for interpretation of subsea geological formations.

For this investigation PGS is proposing to undertake a speculative 2D seismic survey. The proposed seismic survey would be approximately 7 000 km in length comprising a number of low density spaced survey lines covering a large area off the South Coast (see Figure 2). Although survey commencement would ultimately depend on a permit award date, it is anticipated that the survey would be undertaken during the summer of 2013/2014 and would take in the order of six months to complete.

PGS would undertake the 2D seismic survey themselves. It is anticipated that either the *MV Nordic Explorer* or the *MV Sanco Spirit* would be used for the proposed seismic survey. The specific vessel details (seismic and chase) will be compiled into an Environmental Notification that will be submitted to PASA for information purposes prior to survey commencement.

The seismic vessel would travel along transects of a prescribed grid that is carefully chosen to cross any known or suspected geological structure in the area. During surveying vessels travel at a speed of four to six knots.

The anticipated airgun and hydrophone array would consist of one airgun array containing 12 active guns with operating pressures of 4 000 cubic inches. The airgun sound source would be situated about 100 m behind the vessel at approximately 6 m below the surface. The single hydrophone steamer would be approximately 10 000 m long. Streamers would be towed at a depth of 25 m and would not be visible, except for the tail-buoy at the far end of the cables.

Under the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS, 1972, Part A, Rule 10), a seismic survey vessel that is engaged in surveying is defined as a "vessel restricted in its ability to manoeuvre" which requires that power-driven and sailing vessels give way to a vessel restricted in her ability to manoeuvre. Vessels engaged in fishing shall, so far as possible, keep out of the way of the seismic survey operation. Furthermore, under the Marine Traffic Act, 1981 (No. 2 of 1981), a seismic survey vessel and its array of airguns and hydrophones fall under the definition of an "offshore installation" and as such it is protected by a 500 m safety zone. It is an offence for an unauthorised vessel to enter the safety zone.

A support vessel would be commissioned as a "chase" boat. This vessel would be equipped with appropriate radar and communications to patrol the area during the seismic survey to ensure that other vessels adhere to the safe operational limits. The chase boat would assist in alerting other vessels (e.g. fishing, transport, etc.) about the proposed survey and the lack of manoeuvrability of the survey vessel. The chase boat will also be required to perform logistics support to the survey vessel. Helicopters may be utilised for crew / supply transfers between the seismic and support vessels and the mainland.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 PHYSICAL OCEANOGRAPHY

The oceanography off the South Coast is almost totally dominated by the warm Agulhas Current. Currents over the inner and mid-shelf (to depths of 160 m) are weak and variable, with velocities along the eastern half of the South Coast ranging from 25 to 75 cm/sec midshelf and 10 to 40 cm/sec nearshore. Eastward flow may occur close inshore, being particularly strong off Port Elizabeth. Bottom water shows a persistent westward movement, although short-term current reversals may occur. The surface waters of the Agulhas Current may be over 25° C in summer and 21° C in winter and have lower salinities than the Equatorial Indian Ocean and South Indian Ocean Central water masses found below.

On the South Coast, the majority of waves arrive from the south-west quadrant, dominating wave patterns during winter and spring. During summer, easterly wind-generated 'seas' occur. Tides are typically semi-diurnal along the South Coast with an average tidal range of between 0.5 m during neap tides and 1.5 to 2 m during springs. Wind-driven upwelling occurs in the nearshore along the South Coast, especially when easterly winds blow during summer. Such upwelling usually begins at the prominent capes and progresses westwards.

4.2 BIOLOGICAL OCEANOGRAPHY

South Africa is divided into nine bioregions, four of which occur in the proposed survey area (namely Atlantic Offshore, South-western Cape, Agulhas and Indo-Pacific Offshore).

The nutrient-poor characteristics of the Agulhas Current water are reflected in comparatively low primary productivity in the proposed survey area. The Agulhas Bank (particularly the western portion) is an important spawning area for a variety of pelagic species, including anchovy, pilchard and horse mackerel.

Squid and the South Coast rock lobster are two commercially important invertebrate species. Squid forms dense spawning aggregations (at depths ranging from 20 to 130 m) in sheltered bays along the eastern half of the South Coast, especially between Plettenberg Bay and Algoa Bay. These aggregations of adults reach a peak in November and December. The South Coast rock lobster occurs on rocky substrate in depths of 90 to 170 m.

The ichthyofauna on the South Coast is diverse, comprising a mixture of temperate and tropical species. As a transition zone between the Agulhas and Benguela current systems, the South Coast ichthyofauna includes many species occurring also along the West and/or East coasts. The seabed of the Agulhas Bank substrate is also diverse comprising areas of sand, mud and coral thereby contributing to increased benthic fauna and fish species. Small pelagic shoaling species occurring along the South Coast include anchovy, pilchard, round herring, chub mackerel and horse. Large migratory pelagic species that occur in offshore waters and beyond the shelf break include dorado, sailfish and black, blue and striped marlin, frigate tuna, skipjack, longfin tuna/albacore, bigeye tuna, yellowfin tuna, southern bluefin tuna and bluefin tuna. There is a high diversity of teleosts (bony fish) and chondrichthyans (cartilaginous fish) associated with the inshore and shelf waters of the South Coast, many of which are endemic to the Southern African coastline and form an important component of the demersal trawl and long-line fisheries. The Cape hake is distributed widely on the Agulhas Bank, while the deep-water hake is found further offshore in deeper water. Apart from the hakes, numerous other by-catch species are landed by the South Coast demersal trawling fishery including panga, kob, gurnard, monkfish, John Dory and angel fish.

Three species of turtle occur along the South Coast, namely the leatherback (Critically Endangered), and occasionally the loggerhead (Endangered) and the green (Endangered) turtle. Both the leatherback and the loggerhead turtle nest on the beaches of the northern KwaZulu-Natal coastline between October and February, extending into March. The southern extremity of the nesting area is thus located over 1 000 km to the north of the proposed seismic area. Hatchlings are born from late January through into March when the Agulhas Current is warmest. Once hatchlings enter the sea, they move southward in the Agulhas Current and are thought to remain in the southern Indian Ocean gyre for the first five years of their lives.

Overall, 60 species of seabirds are known, or thought likely to occur, along the South Coast. Thirteen species breed within the South Coast region. These include Cape gannets (Algoa Bay islands), African penguins (Algoa Bay islands), Cape cormorants (a small population at Algoa Bay islands and mainland sites), white-breasted cormorant, Roseate tern (Bird and St Croix Islands), Damara tern (inshore between Cape Agulhas and Cape Infanta), Swift tern (Stag Island) and kelp gulls. African penguin colonies along the South Coast occur at Dyer Island, Cape Recife and on the Algoa Bay islands (St Croix Island, Jaheel Island, Bird Island, Seal Island, Stag Island and Brenton Rocks).

The cetacean fauna of the South Coast comprises between 35 and 38 species of whales and dolphins known (historic sightings or strandings) or likely (habitat projections based on known species parameters) to occur here. The distribution of whales and dolphins on the South Coast can largely be split into those associated with the continental shelf and those that occur in deep, oceanic waters. Species from both environments may, however, be found associated with the shelf (200 - 1 000 m), making this a species-rich

area for cetaceans. Cetacean density on the continental shelf is usually higher than in pelagic waters as species associated with the pelagic environment tend to be wide-ranging across 1 000's of kilometres. The most common species within the proposed survey area (in terms of likely encounter rate not total population sizes) are likely to be the common bottlenose and short-beaked dolphins, long- and short-finned pilot whales, southern right whale and humpback whale. Southern right whales migrate to the southern Africa subcontinent to breed and calve, where they tend to have an extremely coastal distribution mainly in sheltered bays (90% <2 km from shore). Winter concentrations have been recorded all along the South and East coasts of South Africa as far north as Maputo Bay, with the most significant concentration currently on the South Coast between Cape Town and Port Elizabeth. They typically arrive in coastal waters off the South Coast between June and November each year, although animals may be sighted as early as April and as late as January. The majority of humpback whales on the South and East coasts of South Africa are migrating past the southern African continent. The main winter concentration areas for humpback whales on the East Coast include Mozambique, Madagascar, Kenya and Tanzania. Humpbacks have a bimodal distribution off the East Coast, most reaching southern African waters around April, continuing through to September/October when the southern migration begins and continues through to December. The calving season for humpback whales extends from July to October, peaking in early August. Off Cape Vidal whale abundances peak around June/July on their northward migration, although some have been observed still moving north as late as October. Southward moving animals on their return migration were first seen in July, peaking in August and continuing to late October.

The Cape fur seal is the only seal species that has breeding colonies along the South Coast, namely at Seal Island in Mossel Bay, on the northern shore of the Robberg Peninsula in Plettenberg Bay and at Black Rocks (Bird Island group) in Algoa Bay.

4.3 HUMAN UTILISATION

There are five commercial fisheries active in the vicinity of the proposed survey area, including demersal trawl, small pelagic purse-seine, demersal long-line (hake- and shark-directed), pelagic long-line (tuna- and shark-directed), traditional line fish, south coast rock lobster, squid jig and mid-water trawl.

A large number of vessels navigate along the South Coast on their way around the southern African subcontinent. The majority of this vessel traffic, including commercial and fishing vessels, remains relatively close inshore and is, therefore, expected to pass inshore of the proposed survey area.

Total Exploration and Production South Africa (Total) is the only operator with a permit or right within the proposed survey area. Total has a Technical Co-operation Permit and an application for an Exploration Right for an area referred to as Outeniqua South Area. There are currently no oil and gas production activities taking place within the proposed seismic survey area.

Diamond Fields International Ltd has submitted an application to the Department of Mineral Resources (DMR) to prospect for marine phosphates in the Outeniqua West Licence Area, a portion of which overlaps with the proposed survey area.

Numerous conservation areas and marine protected areas (MPAs) exist along the South Coast, although none fall within the proposed survey area. The South African National Biodiversity Institute (SANBI) has initiated a process to identify potential benthic priority areas for spatial management in the offshore environment that require protection. The Southwest Indian Seamounts and Browns Bank which are located within the proposed survey area have been identified as priority areas for seabed protection.

5. IMPACT ASSESSMENT CONCLUSIONS

A summary of the assessment of potential environmental impacts associated with the proposed seismic survey is provided in Table 1.

In summary, the majority of the impacts associated with seismic surveys would be of short-term duration and limited to the immediate survey area. As a result, the majority of the impacts associated with seismic surveys are considered to be of **INSIGNIFICANT** to **LOW** significance after mitigation.

The two key issues identified in this study relate to:

- The potential impact on marine mammals (physiological injury and behavioural avoidance) as a result of seismic noise; and
- The potential impact on the fishing industry (vessel interaction, disruption to fishing operations and reduced catch) due to the presence of the survey vessel with its associated safety zone, potential fish avoidance of the survey area and changes in feeding behaviour.

Although most of the impacts on cetaceans are assessed to have **VERY LOW** to **LOW** significance with mitigation, the impact could be of much higher significance due to the limited understanding of how short-term effects of seismic surveys relate to longer term impacts. For example, if a sound source displaces a species from an important breeding area for a prolonged period, impacts at the population level could be more significant. In order to mitigate the potential impact on cetaceans it is recommended that the proposed seismic survey programme be planned to avoid their key cetacean migration and breeding period from the beginning of June to the end of November. Various other measures are recommended to further mitigate the potential impact on cetaceans, including 30-minute pre-watch period (visually and using Passive Acoustic Monitoring (PAM) technology), “soft-start” procedure, temporary termination of survey, etc.

The potential impact on the fishing industry ranges from **INSIGNIFICANT** (traditional line fish and squid jig) to **VERY LOW** (demersal trawl, hake demersal long-line, mid-water trawl and South Coast rock lobster) to **MEDIUM** (large pelagic long-line) significance with and without mitigation. However, if fish avoid the survey area and / or change their feeding behaviour it could have a more significant impact on the fishing industry. Research has, however, shown that behavioural effects 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. Similarly, if there was any interaction between the seismic survey vessel and a fishery the significance of the impact could be higher. Thus it is important that PGS engage timeously with the fishing industry prior to and during the survey. Regular communication with fishing vessels in the vicinity during surveying would minimise the potential disruption to fishing operations and risk of gear entanglements. There is no envisaged impact on the hake shark-directed long-line.

Table 1: Summary of the significance of potential impacts of the proposed 2D speculative seismic survey off the South Coast of South Africa.

Potential impact	Significance	
	Without mitigation	With mitigation
<i>Normal seismic / support vessels and helicopter operation:</i>		
Emissions to the atmosphere	VL	VL
Deck drainage into the sea	VL	VL
Machinery space drainage into the sea	VL	VL
Sewage effluent into the sea	VL	VL
Galley waste disposal into the sea	VL	VL
Solid waste disposal into the sea	Insignificant	INSIGNIFICANT

Potential impact		Significance	
		Without mitigation	With mitigation
Noise from seismic and support vessel operation		VL	VL
Noise from helicopter operation		L-M	VL
Impact of seismic noise on marine fauna:			
Plankton		VL	VL
Invertebrates	Physiological injury	VL	VL
	Behavioural avoidance	VL	VL
Fish	Physiological injury	L	VL
	Behavioural avoidance	L	VL
	Spawning and reproductive success	L	VL
	Masking sound and communication	VL	VL
	Indirect impacts	VL	VL
Non-diving seabirds	Physiological injury	Insignificant	INSIGNIFICANT
	Behavioural avoidance	Insignificant	INSIGNIFICANT
Diving seabirds	Physiological injury	L	VL
	Behavioural avoidance	L	VL
	Indirect impacts	VL	VL
Turtles	Physiological injury	L	VL
	Behavioural avoidance	L	VL
	Reproductive success	L	VL
	Masking sound and communication	Insignificant	INSIGNIFICANT
	Indirect impacts	VL	VL
Seals	Physiological injury	VL	VL
	Behavioural avoidance	VL	VL
	Masking sound and communication	VL	VL
	Indirect impacts	VL	VL
Mysticetes Cetaceans	Physiological injury	M	L
	Behavioural avoidance	L-M	VL-L
	Masking sound and communication	VL	VL
	Indirect impacts	VL	VL
Odontocetes Cetaceans	Physiological injury	M	L
	Behavioural avoidance	VL-L	VL
	Masking sound and communication	L	VL
	Indirect impacts	VL	VL
Impact on other users of the sea:			
Fishing industry	Demersal trawl	VL	VL
	Demersal long-line (hake)	VL	VL
	Demersal long-line (shark)	No impact	
	Large pelagic long-line (tuna)	M	M
	Traditional line-fish	Insignificant	INSIGNIFICANT
	South Coast rock lobster	VL	VL
	Squid jig	Insignificant	INSIGNIFICANT
	Mid-water trawl	VL	VL
	Fisheries research	L	L

Potential impact		Significance	
		Without mitigation	With mitigation
Marine transport routes		L	VL
Marine prospecting, mining, exploration and production	Prospecting and mining	VL	VL
	Exploration and production	VL	VL
H=High M=Medium L=Low VL=Very low		All impacts are negative	

6. RECOMMENDATIONS²

6.1 COMPLIANCE WITH ACTION PLAN, PROCEDURES AND MARPOL STANDARDS

All phases of the proposed project (including pre-establishment phase, establishment phase, operational phase, and decommissioning and closure phase) must comply with the Action Plan and Procedures presented in Chapter 7 of the EMP Addendum. In addition, the seismic and support vessels must ensure compliance with the MARPOL 73/78 standards.

6.2 SURVEY TIMING AND SCHEDULING

The seismic survey should be undertaken outside of the key cetacean migration and breeding period from the beginning of June to the end of November.

6.3 SEISMIC SURVEY PROCEDURES

6.3.1 PAM technology

All survey vessels must be fitted with PAM technology, which detects animals through their vocalisations. PAM technology must be used during the 30-minute pre-watch period and when surveying at night or during adverse weather conditions and thick fog.

In order to avoid unnecessary delays to the survey programme, it is recommended that a spare PAM cable and sensor are kept onboard should there be any technical problems with the system. However, if there is a technical problem with PAM during surveying, visual watches must be maintained by the Marine Mammal Observer (MMO) during the day and night-vision/infra-red binoculars must be used at night while PAM is being repaired.

6.3.2 “Soft-start” procedures and airgun firing

All initiations of seismic surveys must be carried out as “soft-starts” for a minimum of 20 minutes. This requires that the sound source be ramped from low to full power rather than initiated at full power, thus allowing a flight response by marine fauna to outside the zone of injury or avoidance. Where possible, “soft-starts” should be planned so that they commence within daylight hours.

“Soft-start” procedures must only commence once it has been confirmed (visually and using PAM technology) that there are no seabirds (diving), seals, turtles or cetaceans activity within 500 m of the

² It is important to note that recommendations in this EMP Addendum have been modified slightly from those presented in the initial EMP. If any conflict arises, the recommendations in this EMP Addendum shall apply.

vessel³. For cetaceans, the period of confirmation should be for at least 30 minutes prior to the commencement of the “soft-start” procedures, so that deep or long diving species can be detected. However, in the case of seals, which are often attracted to survey vessels, the normal “soft-start” procedures should be allowed to commence, if after a period of 30 minutes seals are still within 500 m of the airguns.

“Soft-start” procedures must also be implemented after breaks in airgun firing (for whatever reason) of longer than 20 minutes. Breaks of shorter than 20 minutes should be followed by a “soft-start” of similar duration.

The use of the lowest practicable airgun volume, as defined by the operator, should be defined and enforced.

During surveying, airgun firing should be terminated when:

- obvious negative changes to turtle, seal and cetacean behaviour is observed;
- turtles or cetaceans are observed within 500 m of the operating airgun and appear to be approaching the firing airgun; or
- there is mass mortality of fish or mortality / injuries to seabirds, turtles or cetaceans as a direct result of the survey.

The survey should be terminated until such time the MMO confirms that:

- Turtles or cetaceans have moved to a point that is more than 500 m from the source;
- Despite continuous observation, 30 minutes has elapsed since the last sighting of the turtles or cetaceans within 500 m of the source; and
- Risks to seabirds, turtles, seals or cetaceans have been significantly reduced.

A log of all termination decisions must be kept (for inclusion in both daily and “close-out” reports).

6.3.3 Line changes

During night time line changes, especially when turning in the vicinity of Brown’s Bank and the Southwest Indian Seamounts, low level warning airgun discharges should be fired at regular intervals in order to keep animals away from the survey operation while the vessel is repositioned.

6.3.4 Independent Observer or MMO and PAM Operator

An independent onboard MMO and PAM operator must be appointed for the duration of the seismic survey. The MMO and PAM operator must have experience in seabird, turtle and marine mammal identification and observation techniques. The duties of the MMO would be to:

Marine fauna:

- Observe and record responses of marine fauna to the seismic survey, including seabird, turtle, seal and cetacean incidence and behaviour and any mortality of marine fauna as a result of the survey. Data captured should include species identification, position (latitude/longitude), distance from the vessel, swimming speed and direction (if applicable) and any obvious changes in behaviour (e.g. startle responses or changes in surfacing/diving frequencies, breathing patterns) as a result of the survey activities;
- Record airgun activities, including sound levels, “soft-start” procedures and pre-firing regimes;

³ Note: once it has been confirmed that there is no seabird (diving), seal, turtle or cetacean activity within 500 m of the vessel and soft-start procedures have commenced, monitoring must continue visually during the day and using PAM technology at night. In order to confirm that there is no diving seabird activity at night, night-vision/infra-red binoculars must be used.

- Request the temporary termination of a seismic survey, as appropriate. It is important that Observers or MMOs have a full understanding of the financial implications of terminating firing, and that such decisions are made confidently and expediently;

Other:

- Record meteorological conditions;
- Monitor compliance with international marine pollution regulations (MARPOL 73/78 standards); and
- Prepare daily reports of all observations. These reports should be forwarded to the key stakeholders.

The duties of the PAM operator would be to:

- Confirm that there is no marine mammal activity within 500 m of the vessel prior to commencing with the “soft-start” procedures;
- Record species identification, position (latitude/longitude) and distance from the vessel, where possible;
- Record airgun activities, including sound levels, “soft-start” procedures and pre-firing regimes; and
- Request the temporary termination of the seismic survey, as appropriate.

All data recorded by the MMO and PAM operator should form part of the survey “close-out” report.

6.4 HELICOPTER OPERATIONS

Mitigation relating to helicopter operations includes:

- Flight paths must be pre-planned to ensure that no flying occurs over bird and seabird colonies, coastal reserves or marine islands. Important areas in the vicinity of the proposed survey area include: Algoa Bay islands (St Croix Island, Jaheel Island, Bird Island, Black Rocks, Seal Island, Stag Island and Brenton Rocks), Dyer Island, Cape Recife, Seal Island (Mossel Bay) and Robberg Peninsula (Plettenberg Bay);
- Extensive coastal flights (parallel to the coast within 1 nautical mile of the shore) should be avoided. There is a restriction of coastal flights (parallel to the coast within 1 nautical mile of the shore) on the South Coast between the months of June and November to avoid Southern Right whale breeding areas;
- Aircraft may not approach to within 300 m of whales without a permit in terms of the Marine Living Resources Act, 1998;
- The operator must comply with the Seabirds and Seals Protection Act, 1973, which prohibits the wilful disturbance of seals on the coast or on offshore islands;
- The contractor should comply fully with aviation and authority guidelines and rules; and
- All pilots must be briefed on ecological risks associated with flying at a low level parallel to the coast.

6.5 OTHER MITIGATION MEASURES

Other mitigation measures that should also be implemented during the survey in order to ensure that any potential impacts are minimised include the following:

Permit / exemption requirements

- An exemption is required from DEA to approach or remain within 300 m of whales;

Equipment

- ‘Turtle-friendly’ tail buoys should be used by the survey contractor or existing tail buoys should be fitted with either exclusion or deflector ‘turtle guards’;

Vessel safety

- The survey vessels must be certified for seaworthiness through an appropriate internationally recognised marine certification programme (e.g. Lloyds Register, Det Norske Veritas). The certification, as well as existing safety standards, requires that safety precautions would be taken to minimise the possibility of an offshore accident;
- Collision prevention equipment should include radar, multi-frequency radio, foghorns, etc. Additional precautions include:
 - > A support / chase vessel with Fisheries Liaison Officer (FLO) familiar with the fisheries expected in the area;
 - > The existence of an internationally agreed 500 m safety zone around the survey vessels;
 - > Cautionary notices to mariners; and
 - > Access to current weather service information.
- The vessels are required to fly standard flags, lights (three all-round lights in a vertical line, with the highest and lowest lights being red and the middle light being white) or shapes (three shapes in a vertical line, with the highest and lowest lights being balls and the middle light being a diamond) to indicate that they are engaged in towing surveys and are restricted in manoeuvrability, and must be fully illuminated during twilight and night;
- Report any emergency situation to the South African Maritime Safety Authority (SAMSA);

Vessel lighting

- Lighting on board survey vessels should be reduced to the minimum safety levels to minimise stranding of pelagic seabirds on the survey vessels at night. All stranded seabirds must be retrieved and released during daylight hours;

Emissions, discharges into the sea and solid waste

- Ensure adequate maintenance of diesel motors and generators to minimise the volume of soot and unburned diesel released to the atmosphere;
- Ensure adequate maintenance of all hydraulic systems and frequent inspection of hydraulic hoses;
- Undertake training and awareness of crew members of the need for thorough cleaning up of any spillages immediately after they occur, as this would minimise the volume of contaminants washing off decks;
- Use of low toxicity, biodegradable detergents during deck cleaning to further minimise the potential impact of deck drainage on the marine environment;
- Collect deck drainage in oily water catchment systems;
- Discharge effluent (e.g. sewage and galley waste as per MARPOL requirements) into the sea as far as possible from the coast;
- Initiate an onboard waste minimisation system;
- Ensure onboard solid waste storage is secure;
- Ensure that contractors co-operate with the relevant local authority to ensure that solid and hazardous waste disposal is carried out in accordance with the appropriate laws and ordinances;

Communication with key stakeholders

- Prior to survey commencement, PGS should consult with the managers⁴ of the Department of Agriculture, Forestry and Fisheries (DAFF) research survey programmes to discuss their respective survey and survey programmes and the possibility of altering the exploration programme in order to minimise or avoid disruptions to both parties;
- Prior to survey commencement the following key stakeholders should be consulted and informed of the proposed survey activity (including navigational co-ordinates of the survey area, timing and duration of proposed activities) and the likely implications thereof:

⁴ Deon Durholtz (DeonD@nda.agric.za) and Janet Coetzee (JanetC@nda.agric.za).

- > Fishing industry / associations: South African Deepsea Trawling Industry Association, South East Coast Inshore Fishery Association, Small Hake Quota Holders Association, South African Tuna Longline Association, Hake Longline Association, South Coast Rock Lobster Association and Blue Continent Products; and
- > Other: DAFF, Port Captains, SAMSA, South African Navy Hydrographic office and other prospecting / exploration right holders.
- PGS must request, in writing, the South African Navy Hydrographic office to release Radio Navigation Warnings and Notices to Mariners throughout the seismic survey period. The Notice to Mariners should give notice of (1) the co-ordinates of the proposed survey areas, (2) an indication of the proposed survey timeframes and day-to-day location of the survey vessel, and (3) an indication of the 500 m safety zones and the proposed safe operational limits of the survey vessel. These notices should be distributed timeously to fishing companies and directly onto vessels where possible;
- An independent onboard FLO that is familiar with fisheries operational in the area must be appointed for the duration of the survey. The duties of the FLO would be to:
 - > Identify fishing vessels active in the area and associated fishing gear;
 - > Advise on actions to be taken in the event of encountering fishing gear;
 - > Provide back-up onboard facilitation with the fishing industry and other users of the sea. This would include communication with fishing and shipping / sailing vessels in the area in order to reduce the risk of interaction between the proposed survey and other existing or proposed activities; and
 - > Daily electronic reporting on vessel activity and recording of any communication and/or interaction should also be undertaken in order to keep key stakeholders informed of survey activity and progress.
- Ongoing notification is to be undertaken throughout the duration of survey / sampling activities with the submission of daily reports (via email) indicating the vessel's location to key stakeholders;
- Any dispute arising with other prospecting / exploration right holders should be referred to DMR or PASA for resolution; and
- Marine mammal incidence data and data arising from the survey should be made available, if requested, to the Marine Mammal Institute, Department of Environmental Affairs: Branch Oceans and Coasts, DAFF and PASA.