

EXECUTIVE SUMMARY

1. INTRODUCTION

OK Energy Limited is proposing to undertake an exploration programme in the Northern Cape Ultra-deep Licence Area (Licence Blocks 3013 and 3113) off the West Coast of South Africa (see Figure 1). In 2013, OK Energy lodged an application for an Exploration Right with the Petroleum Agency SA (PASA) in terms of Section 79 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002; MPRDA). PASA accepted the application (Ref. No. 12/3/274) on 12 December 2013.

The Northern Cape Ultra-deep Licence Area is located in the Orange Basin beyond the continental shelf in depths from roughly 2 500 m to beyond 3 000 m and is approximately 6 930 km² in extent. OK Energy is proposing to explore for oil and gas using various methodologies, which may include two-dimensional (2D) and 3D seismic surveys, boat-acquired gravity and magnetics, multi-beam bathymetry and seafloor sampling for geochemical analysis. It is anticipated that the proposed activities would take place either late in the 2013/2014 survey window period (December to May) or early in the 2014/2015 survey window period.

In terms of the MPRDA, an Exploration Right must be issued prior to the commencement of the proposed exploration activities. A requirement of obtaining an Exploration Right is that an Environmental Management Programme (EMP) must be compiled in terms of Section 39 of the MPRDA and submitted to PASA for consideration and for approval by the Minister of Mineral Resources or delegated authority.

OK Energy has contracted CCA Environmental (Pty) Ltd (CCA) to compile this EMP to meet the relevant requirements of the MPRDA and the Regulations thereto.

2. EMP APPROACH AND METHODOLOGY

2.1 OBJECTIVES

The objectives for the EMP process are:

- To provide a reasonable opportunity for Interested and Affected Parties (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.

2.2 PUBLIC PARTICIPATION PROCESS

The public participation process has involved an open, participatory approach and involvement of I&APs to ensure that all potential impacts are identified and that planning and decision-making takes place in an informed, transparent and accountable manner.

As part of compiling the EMP, a Background Information Document (BID) and Response Form were distributed for a 21-day comment period (17 January 2014 to 10 February 2014). An advertisement announcing the proposed project and the availability of the BID was placed in The Cape Times and Die Burger regional newspapers on Wednesday 17 January 2014. Eight written submissions were received during the comment period.

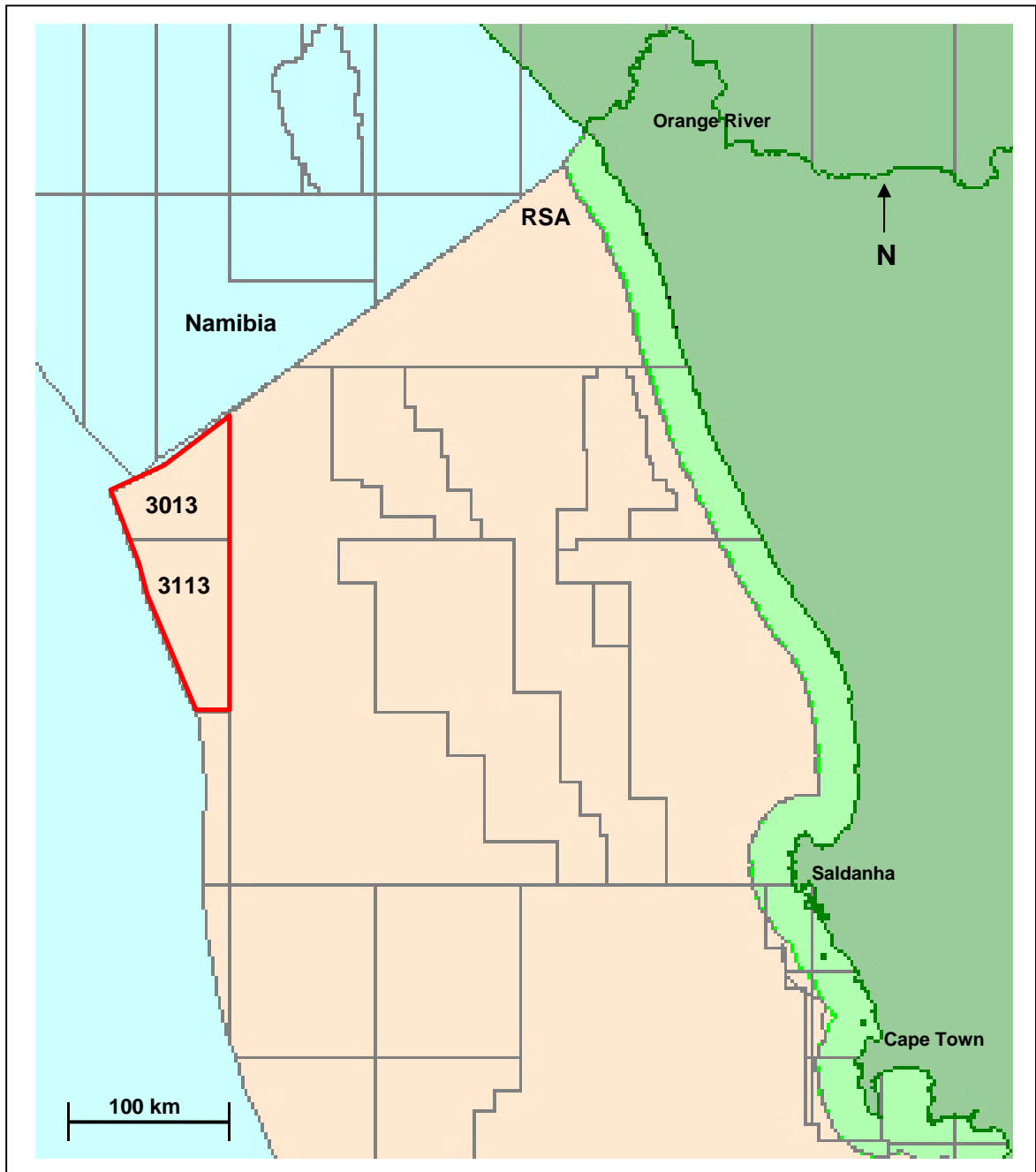


Figure 1: Location of the Northern Cape Ultra-deep Licence Area in the Orange Basin off the West Coast of South Africa.

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 and other relevant information were then integrated into the EMP.

3. PROJECT DESCRIPTION

3.1 GENERAL INFORMATION

3.1.1 Exploration Right Applicant

OK Energy is the applicant for the Exploration Right.

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3.1.2 Financial Provision

OK Energy 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. OK Energy will make provision for the requirements of the EMP 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 OK Energy's insurance.

3.1.3 Environmental Policy

OK Energy recognises its responsibility to take care of the environment throughout all its operations and is committed to complying with environmental laws and protecting the environment. They are committed to conducting operations in a manner that minimises negative impacts and promotes the maintenance and enforcement of environmental procedures.

3.1.4 Monitoring and EMP Performance Assessment

OK Energy would undertake appropriate monitoring and EMP Performance Assessments during the proposed exploration activities. OK Energy would track performance against objectives and targets specified in the EMP.

At the conclusion of the proposed exploration activities "close-out" reports (one per exploration activity, unless activities are conducted simultaneously) would be prepared, which would include a monitoring and performance assessment. These reports would outline the implementation of the EMP and highlight any problems and issues that arose during the exploration activities. Copies of these reports will be sent to PASA.

3.1.5 Plans and Procedures for Environmental Related Emergencies and Remediation

All offshore emergencies would be managed in terms of emergency plans prepared by the selected contractor/s.

3.1.6 Undertaking by the Applicant

OK Energy undertakes to comply with the specifications of the EMP and provisions of the MPRDA and Regulations thereto.

3.2 PROPOSED EXPLORATION PROGRAMME

As a minimum, the proposed exploration work programme would consist of the following:

- Acquisition of 500 km new 2D seismic infill data;
- Purchase of existing 800 km seismic data;
- Boat acquired full tensor gravity and magnetics; and
- Interpretation of data.

In addition, the contingent work programme would include the following:

- Acquisition of 1 000 km² 3D seismic data;
- Multi-beam bathymetry; and
- Seafloor sampling for geochemical analysis.

3.2.1 Seismic survey information

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 streamers. Analyses of the returned signals allow for interpretation of subsea geological formations.

For this investigation OK Energy is proposing to undertake both 2D and 3D seismic surveys. The proposed 2D seismic survey would be approximately 500 km in length comprising a number of low density spaced survey lines covering the entire licence area (6 930 km²). It is anticipated that the proposed survey would either commence late in the 2013/2014 survey window period or early in the 2014/2015 survey window period and would take approximately two weeks to complete. As part of the contingent work programme the acquisition of 1 000 km² 3D data within the licence area is also proposed. The 3D survey would take approximately four weeks to complete. The planned survey period has not yet been determined.

The seismic surveys would involve a towed airgun array, which provides the seismic source energy for the profiling process, and a seismic wave detector system, usually known as a hydrophone streamer. The anticipated airgun and hydrophone array would be dependent on whether a 3D or 2D seismic survey is undertaken. The sound source or airgun array (two for 3D and one for 2D) would be situated some 100 m behind the vessel at a depth of 5 to 7 m below the surface. 3D surveys use multiple streamers (up to 12 streamers spaced 100 m apart), whereas a 2D survey typically involves a single streamer. The array can be up to 10 000 m long. A surface tail-buoy with radar reflectors would be connected to the end of the streamer/s. During surveying the vessels would travel at a speed of 4 to 6 knots.

Under the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS, 1972, Part A, Rule 10), survey vessels that are engaged in surveying or towing operations are 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 vessel (including seismic arrays) used for the purpose of exploration or exploitation of the seabed 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. In addition to a statutory 500 m safety zone, a seismic contractor would request a safe operational limit (that is greater than the 500 m safety zone) that it would like other vessels to stay beyond.

A support vessel would be commissioned as a "chase" boat for the duration of the survey. 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. THE AFFECTED ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

The Northern Cape Ultra-deep Licence area is located in the Orange Basin off the West Coast of South Africa, more than 300 km offshore on the southern side of the border with Namibia. The licence area lies within the southern zone of the Benguela Current region and is characterised by the cool Benguela upwelling system.

Wind and weather patterns along the West Coast are primarily due to the South Atlantic high-pressure cell and the eastward movement of mid-latitude cyclones, south of the subcontinent. The majority of swells are generated by mid-latitude cyclones and originate from the south-west. Wave height decreases with both distance north along the West Coast and with distance offshore. Tides along the West Coast are subject to a simple semi-diurnal tidal regime.

The continental shelf along the West Coast is generally both wide and deep, although large variations in both depth and width occur. The shelf maintains a general north-north-west trend north of Cape Point, being narrowest in the south between Cape Columbine and Cape Point (40 km), widening to the north of Cape Columbine to its widest off the Orange River (180 km).

The most important current is the Benguela current, which constitutes a broad, shallow and slow north-west flow along the West Coast between the cool coastal upwelled waters and warmer Central Atlantic surface waters further offshore. The current is driven by the moderate to strong south to south-east winds which are characteristic of the region and is most prevalent at the surface, although it does follow the major seafloor topographic features. Current velocities in continental shelf areas generally range between 10–30 cm/s.

The Benguela region is one of the world's major coastal upwelling systems. Upwelling is characterised by pulsed input of cold, nutrient-rich water into the euphotic zone, and in the Benguela region results from the wind-driven offshore movement of surface waters. The surface waters are replaced by cold nutrient-rich water that upwells from depth. Once upwelled, this water warms and stabilises, and moves offshore where a thermocline usually develops. Nutrient-rich upwelled water enhances primary production, and the West Coast region consequently supports substantial pelagic fisheries.

4.2 BIOLOGICAL OCEANOGRAPHY

Biogeographically, the licence area falls within the Atlantic Offshore bioregion which extends beyond the shelf break off the West Coast of South Africa. Communities within marine habitats are largely ubiquitous throughout the southern African West Coast region, being particular only to substrate type or depth zone. These biological communities consist of many hundreds of species, often displaying considerable temporal

and spatial variability (even at small scales). The near- and offshore marine ecosystems comprise a limited range of habitats, namely unconsolidated seabed sediments and the water column.

Species diversity, abundance and biomass of benthic invertebrate macrofauna increases from the shore to 80 m depth. Further offshore to 120 m depth, the midshelf is a particularly rich benthic habitat, which acts as an important source of food for carnivores, such as cephalopods, mantis shrimp and demersal fish species. Outside of this rich zone biomass declines.

A geological feature of note within the vicinity of the licence area is Tripp Seamount, situated about 250 km offshore at about 29°40' S (approximately 80 km north-east of the licence area). The effect of such a seabed feature on the surrounding water masses can include the upwelling of relatively cool, nutrient-rich water into nutrient-poor surface water thereby resulting in higher productivity, which can in turn strongly influence the distribution of organisms on and around seamounts. Evidence of enrichment of bottom-associated communities and high abundances of demersal fishes has been regularly reported over such seabed features. Consequently, seamounts are usually highly unique and are usually, but not always, identified as Vulnerable Marine Ecosystems.

As many as 110 species of bony and cartilaginous fish have been identified in the demersal communities on the continental shelf of the West Coast, but information from beyond the shelf break is sparse. Changes in fish communities occur with increasing depth, with the most substantial change in species composition occurring in the shelf break region between 300 m and 400 m depth. The shelf community (<380 m) is dominated by Cape hake. Small pelagic fish species, including the sardine/pilchard, anchovy, chub mackerel, horse mackerel and round herring, typically occur in mixed shoals of various sizes within the 200 m contour. Large pelagic species, including tunas, billfish and pelagic sharks, migrate throughout the southern oceans, between surface and deep waters (>300 m) and have a highly seasonal abundance in the Benguela.

Three species of turtles, the green, leatherback and loggerhead, are found along the West Coast. However, only the Leatherback turtle (Critically Endangered) is likely to be encountered within the licence area, but their abundance is expected to be low.

A total of 49 species of pelagic seabirds occur within the southern Benguela area, of which 14 are resident species. Most of the resident species feed on fish (with the exception of the gulls, which scavenge, and feed on molluscs and crustaceans). The far offshore location of the licence area places it outside of the foraging range of most pelagic species that have breeding populations along the West Coast.

The marine mammals occurring off the West Coast include seals and cetaceans (whales and dolphins). The cetacean fauna of the West Coast comprises 28 species. The distribution of whales and dolphins on the West 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. Cetaceans comprised two basic taxonomic groups: the mysticetes (filter-feeding baleen whales) and the odontocetes (toothed predatory whales and dolphins).

Mysticete (baleen) cetaceans occurring in the proposed survey area include the southern right, humpback, blue, fin, sei, minke, dwarf minke and two populations of Bryde's whale. Most of these species occur in pelagic waters, with only occasional visits into shelf waters. All of these species show some degree of migration either to, or through, the proposed survey area when *en route* between higher-latitude feeding grounds (Antarctic or Subantarctic) and lower-latitude breeding grounds. Depending on the ultimate location of these feeding and breeding grounds, seasonality off South Africa can be either unimodal (usually in June-August, e.g. minke and blue whales) or bimodal (usually May-July and October-November, e.g. fin whales), reflecting a northward and southward migration through the area. As whales follow geographic or

oceanographic features, the northward and southward migrations may take place at different distances from the coast, thereby influencing the seasonality of occurrence at different locations.

There is almost no data available on the abundance, distribution or seasonality of the smaller odontocetes (including the beaked whales and dolphins) known to occur in oceanic waters off the shelf of the West Coast. Beaked whales are all considered to be true deep water species usually being seen in waters in excess of 1 000 – 2 000 m depth.

4.3 HUMAN UTILISATION

The only commercial fishery active in the proposed exploration area is the large pelagic long-line sector.

The majority of shipping traffic is located on the outer edge of the continental shelf with traffic inshore of the continental shelf along the South-West Coast largely comprising fishing vessels, especially between Kleinsee and Oranjemund.

Exploration for oil and gas is currently undertaken in a number of licence blocks off the West Coast. There is no current development or production from the South African West Coast offshore.

The majority of diamond mining concessions worked at present are those closer inshore. The licence area is located well offshore of the diamond mining concession areas. A number of prospecting areas for glauconite and phosphorite / phosphate are located off the West Coast, but none overlap with the licence area.

A number of Marine Protected Areas (MPAs) are located along the West Coast. There are no reserves or MPAs in close proximity to the licence area.

5. IMPACT ASSESSMENT CONCLUSIONS

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

The majority of the impacts associated with the various exploration activities would be of short-term duration and limited to the immediate survey area. As a result, the majority of the impacts are considered to be of **VERY LOW 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 various survey vessels, 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 feeding or 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 key cetacean migration and breeding periods (the key period stretches from the beginning of June to the end of November). Various other measures are recommended to further mitigate the potential impact on marine fauna, including a 30-minute pre-watch

period (visually and using PAM technology), a 20-minute “soft-start” procedure, temporary termination of survey, etc. It is also recommended that PAM be used 24-hours a day for the duration of the survey since the proposed survey would be undertaken in water depths beyond 3 000 m where sperm whales are likely to be encountered.

Due to the far offshore location of the survey area, the only fishing sector likely to be affected would be the large pelagic long-line sector. Due to the limited fishing effort taking place in the survey area, the impact is assessed to be of **VERY LOW** 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 survey vessels and a fishery the significance of the impact could be higher. Thus it is important that OK Energy 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.

Table 6.1: Summary of the significance of potential impacts of the proposed exploration programme in the Orange Basin off the West Coast of South Africa.

Potential impact		Significance	
		Without mitigation	With mitigation
Normal seismic / support vessels and helicopter operation:			
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
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	M	L
	Spawning and reproductive success	VL	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
	Masking sound and communication	Insignificant	INSIGNIFICANT
	Indirect impacts	VL	VL
Seals	All impacts	Insignificant	INSIGNIFICANT

Potential impact		Significance	
		Without mitigation	With mitigation
Mysticete Cetaceans	Physiological injury	M	L
	Behavioural avoidance	M	L
	Masking sound and communication	VL	VL
	Indirect impacts	VL	VL
Odontocete Cetaceans	Physiological injury	L	VL
	Behavioural avoidance	VL-L	VL
	Masking sound and communication	M	L
	Indirect impacts	VL	VL
Impact of multi-beam noise on marine fauna:		VL	VL
Impact of seafloor sampling on benthic biota:		Insignificant	INSIGNIFICANT
Impact on other users of the sea:			
Fishing industry	Large pelagic long-line fishery	VL	VL
Marine transport routes		VL	VL
Marine prospecting and mining		Insignificant	INSIGNIFICANT
Exploration and production		L	VL
H=High M=Medium L=Low VL=Very low N/A=Not applicable All impacts are negative			

6. RECOMMENDATIONS

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. In addition, all vessels must ensure compliance with the MARPOL 73/78 standards.

6.2 RECOMMENDATIONS SPECIFIC TO SEISMIC SURVEY PROCEDURES

6.2.1 Survey timing, scheduling and equipment

The exploration activities should be undertaken outside of the key cetacean migration and breeding periods (the key period stretches from the beginning of June to the end of November).

'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'.

6.2.2 PAM technology

All survey vessels must be fitted with PAM technology, which detects cetaceans 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. It is also recommended that PAM be used 24-hours a day for the duration of the survey since the proposed survey would be undertaken in water depths beyond 3 000 m where sperm whales are likely to be encountered. The PAM hydrophone streamer should ideally be towed behind the airgun array to minimise the interference of vessel noise, and be fitted with two hydrophones to allow directional detection of cetaceans.

In order to avoid unnecessary delays to the survey programme, it is recommended that a spare PAM cable and sensor are kept on-board 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 MMO during the day and night-vision/infra-red binoculars must be used at night while PAM is being repaired.

6.2.3 “Soft-start” procedure 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 during the day and using only PAM technology at night or during periods of poor visibility) that there are no seabirds (diving), turtles or marine mammal activity within 500 m of the vessel. 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.

All breaks in airgun firing of longer than 20 minutes must be followed by a 30-minute pre-shoot watch and a “soft-start” procedure of at least 20 minutes prior to the survey operation continuing. Breaks of shorter than 20 minutes should be followed by a visual assessment for marine mammals within the 500 m mitigation zone (not a 30-minute pre-shoot watch) and a “soft-start” of similar duration.

Airgun use should be prohibited outside of the licence area.

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, seals or cetaceans as a direct result of the survey.

The survey should remain terminated until such time the time 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).

6.2.4 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 and cetacean incidence and behaviour and any mortality of marine fauna as a result of the seismic 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;
- Request the temporary termination of the seismic survey, as appropriate. It is important that the MMOs’ decisions to terminate firing are made confidently and expeditiously;

Other:

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

6.2.5 Onboard FLO

An independent onboard FLO that is familiar with fisheries operational in the area must be appointed for the duration of the seismic 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 on-board 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
- Provide daily electronic reporting on vessel activity and recording of any communication and/or interaction should be undertaken in order to keep key stakeholders informed of survey activity and progress.

6.2.6 Record of positioning data

A record should be kept of the hourly positioning of the survey vessel for the duration of the seismic survey. Positioning data should be provided to the Namibian government task force for use in their current research into the potential impact of seismic survey activities on migration routes of albacore tuna along the southwest coast of Africa.

6.3 RECOMMENDATIONS SPECIFIC TO THE MULTI-BEAM BATHYMETRY SURVEY

6.3.1 Survey timing

The multi-beam bathymetry survey should, as far as possible, be planned to avoid cetacean migration periods which stretch from the beginning of June to the end of November.

6.3.2 Multi-beam survey procedures

- An onboard Independent Observer(s) must be appointed for the duration of the multi-beam survey to act as the and MMO. The duties of the MMO are detailed in Section 6.2.4.
- Surveying must only commence once it has been confirmed by the MMO (visually during the day) that there is no large cetacean activity within 500 m of the vessel for a 15-minute period.
- If the source level is greater than 210 dB re 1 μ Pa at 1 m the following is recommended:
 - > Where equipment allows, a “soft-start” procedure shall be implemented for a period of 20 minutes. Where this is not possible, the equipment should be turned on and off over a 20 minute period to act as a warning signal and allow cetaceans to move away from the sound source;
 - > “Soft-starts” should, as far as possible, be planned to commence within daylight hours;
 - > “Soft-start” procedures must only commence once it has been confirmed by the MMO (visually during the day) that there is no large cetacean activity within 500 m of the vessel for a 15-minute period.
 - > “Soft-start” procedures must also be implemented after breaks in surveying (for whatever reason) of longer than 20 minutes. Breaks of shorter than 20 minutes should be followed by a “soft-start” of similar duration; and
 - > Should surveying in the sensitive cetacean period be unavoidable, PAM technology must be implemented 24 hours a day from beginning of June to end of November. If there is a technical problem with PAM during surveying, visual watches must be maintained by the MMO during the day and night-vision/infra-red binoculars must be used at night while PAM is being repaired. A PAM operator must be appointed during this period. The duties of the PAM operator are detailed in Section 6.2.4.
- Surveying should be terminated temporarily if cetaceans show obvious negative behavioural changes within 500 m of the survey vessel or equipment; and
- The survey should be terminated until such time the MMO confirms that cetaceans have moved to a point that is more than 500 m from the source or despite continuous observation, 15 minutes has elapsed since the last sighting of the cetaceans within 500 m of the source.

6.4 SEAFLOOR SAMPLING PROGRAMME

- Sampling sites must avoid existing submarine telecommunications cables within the proposed exploration area.

6.5 HELICOPTER OPERATIONS

Mitigation relating to helicopter operations includes:

- Flight paths must be pre-planned to ensure that no flying occurs over seal and seabird colonies, coastal reserves or marine islands;
- Extensive coastal flights (parallel to the coast within 1 nautical mile of the shore) should be avoided;
- Aircraft may not approach to within 300 m of whales without a permit or exemption in terms of the Marine Living Resources Act, 1998;

- 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.

6.6 OTHER MITIGATION MEASURES COMMON TO ALL EXPLORATION ACTIVITIES

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 requirement

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

Vessel safety

- The survey vessel 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 FLO familiar with the fisheries expected in the area (for seismic survey only);
 - > The existence of an internationally agreed 500 m safety zone around the survey vessel;
 - > 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 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 on-board waste minimisation system;
- Ensure on-board 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 and key stakeholders

- Prior to survey commencement the following key stakeholders should be consulted and informed of the proposed survey activity (including navigational coordinates of the survey area, timing and duration the proposed activities) and the likely implications thereof:
 - > Fishing industry/associations: South African Tuna Association, South African Tuna Long-Line Association, Fresh Tuna Exporters Association, South African Deep-Sea Trawling Industry Association, South African Hake Long-Line Association and South African Pelagic Fishing Industry Association; Namibian Large Pelagic Long-Line Association; and
 - > Other key stakeholders include: DAFF, Port Captains, SAMSA and South African Navy Hydrographic office.
- OK Energy 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 area, (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 to Mariners should be distributed timeously to fishing companies and directly onto vessels where possible;
- 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; and
- Marine mammal incidence data and data arising from the survey should be made available, if requested, to the Marine Mammal Institute, DEA: Branch Oceans and Coasts, DAFF and PASA.