

3D Seismic Survey in PEL 83

Environmental & Social Management Plan

July 2024

PEL 83, Namibia

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1. Introduction

1.1 Background

"PEL83" is a Joint Venture between the license partners, namely Windhoek PEL28 B.V. (a wholly owned subsidiary of Galp Energia E&P B.V (i.e. Galp)), the National Petroleum Corporation of Namibia (NAMCOR) and Custos Investments, holding Petroleum Exploration Licence (PEL) 83. PEL 83 covers an area of approximately 9 954 m², located between 130 km and 250 km from the coastline in water depths ranging from approximately 500 m to 2500 m in the Orange Basin off the coast of Namibia (see Figure 1). GALP is currently the operator of PEL 83.

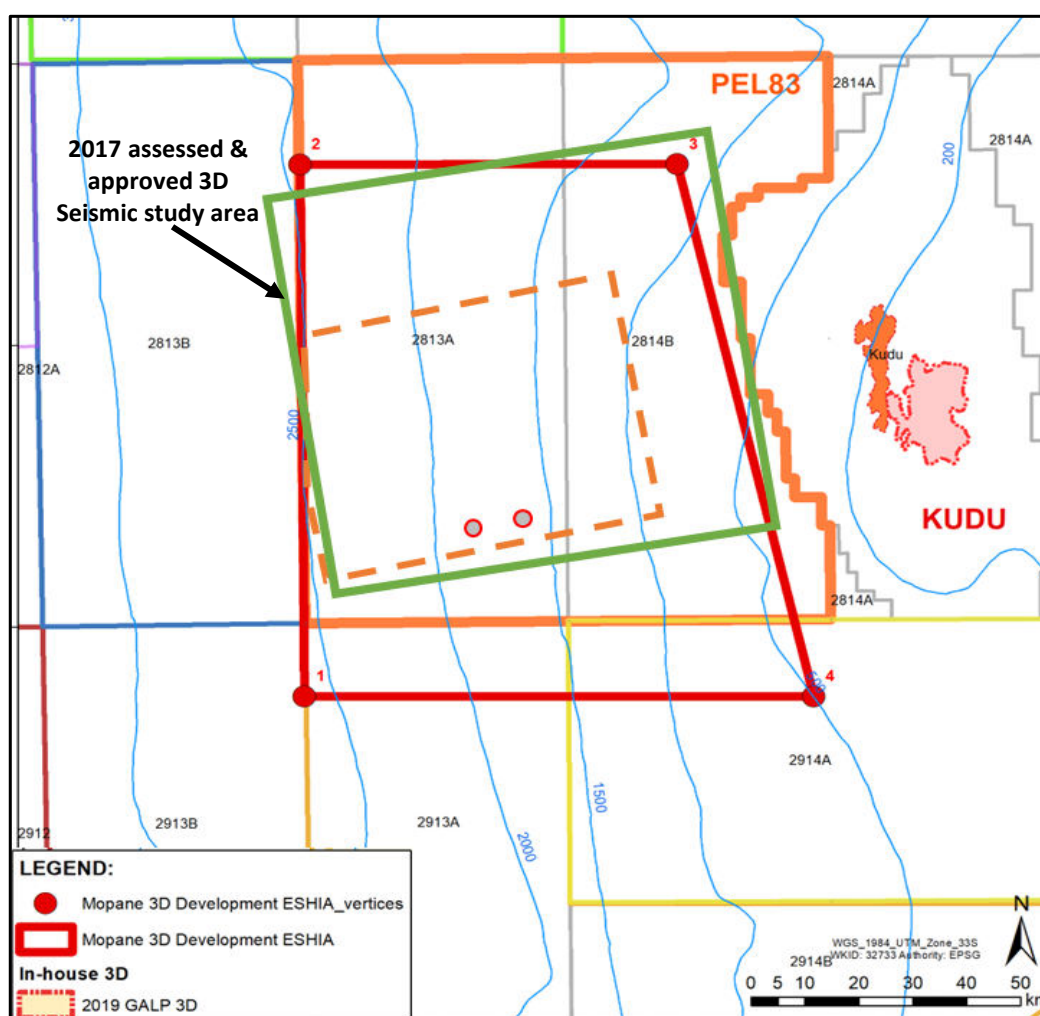


FIGURE 1: LOCATION OF PEL83 OFF THE COAST OF NAMIBIA

In 2017 Galp proposed a 3-Dimensional (3D) marine seismic survey in PEL 83, for which the company appointed Environmental Resources Management Iberia S.A ("ERM") to conduct an Environmental Impact Assessment (EIA). Galp received an approved Environmental Clearance Certificate (ECC) for

this initial 3D towed streamer seismic survey activities in PEL 83, based on the approved EIA process and associated EIA Report and Environmental & Social Management Plan (ESMP). This ECC expired in November 2020.

Galp has successfully completed a 3D-seismic survey between January and March 2019, over an area covering $\sim 3,015$ km² of the PEL 83. The area that was surveyed in 2019 is shown in Figure 1 (orange dotted polygon). The (bigger) area that was, however, assessed and approved for the related activities are shown in Figure 1 (green polygon).

In June 2023 Galp proposed to conduct well / flow testing activities to reduce the subsurface and or well performance uncertainties and to support the appraisal of a discovery. Accordingly, an Amendment Application to MEFT for the existing ECC was necessary. Galp appointed Namisun Environmental Projects and Development (Namisun), as an independent environmental consulting company to undertake the required EIA process, to compile the EIA Amendment Report and to update the ESMP as part of an Amendment Application to MEFT to the existing ECC. Galp received the ECC on the 10th of October 2023 (i.e. for its offshore exploration well drilling, including the well flow testing in PEL 83), based on the approved amendment application. The ECC is still valid until 7 March 2026.

Galp plans to continue their exploration / appraisal activities in PEL 83 and requires a new environmental clearance from MEFT for their appraisal wells drilling campaign (i.e. similar activities, but changes only in numbers of wells to be drilled over a period of three years). In addition, Galp also requires a new application for the proposed 3D towed streamer seismic survey and an Ocean Bottom Node (OBN) seismic acquisition of PEL 83. Galp appointed Namisun in April 2024 to conduct this parallel EIA process, which includes a scoping phase (and an update of the assessment of impacts from the original EIAs) and the subsequent amendment to the existing (approved) ESMP for the exploration well drilling activities. A new ESMP for the 3D towed streamer seismic survey and an OBN seismic acquisition of PEL 83 (this document) is also implied.

The proposed area to be surveyed by Galp, likely towards the first quarter 2025, will be ~ 4000 km² within the red polygon as shown in Figure 1. With reference to Figure 1, the survey would extend partially into the neighbouring blocks (to the south). Galp will engage with the neighbouring licence holders to obtain permission to survey in their blocks.

It must be noted that the previous ESMP for the seismic activities was integrally part of the EIA Report of ERM (ERM, 2017). To the contrary, this new ESMP (this document) is a 'stand-alone' document.

However, this “new” ESMP does not stand in isolation of the content of the previous ESMP but even retains some of its relevant parts – with the necessary referencing and acknowledgement.

1.2 Scope and Objectives

The 2017-ESMP identifies the potential environmental and social impacts and outlines the actions required, assigns responsibilities and sets target dates for completion, to be incorporated into the overall environmental and social management of the project. The plan acted as a “live” document to track progress through to completion of the seismic programme. The plan also provided a mechanism for monitoring the environmental performance of the contractor and instigated further remedial action as required. The mitigation measures and the parties responsible for their implementation were summarised and presented in Table 6.1 of Chapter 6 in EIA Report of 2017. Furthermore, the ESMP was designed to serve as the connection between the mitigation and management measures identified in the EIA and the seismic survey programme execution with the following main objectives (ERM, 2017):

- Providing the mechanism to ensure compliance with Namibian legislation, GALP HSE policies, management system and procedures, international law and standards, and Oil & Gas industry best practices;
- Providing the mechanism for ensuring that all proposed mitigation measures identified in the EIA to mitigate potentially adverse impacts are implemented;
- Providing a framework for mitigating impacts that may be unforeseen or unidentified;
- Evaluating effectiveness or inefficiency of these mitigation measures and, if required, modify them or include new mitigation/preventive measures; and
- Establishing a monitoring programme and record-keeping protocols so that pertinent additional information that was not available during the compilation of the EIA can be collected in order to provide quality assurance for the conclusions of the EIA.

The ESMP of 2017 (ERM, 2017) also set longer-term objectives as an integral part of a system:

- Ensuring that health, safety, social and environmental issues are integrated into the business risk management and decision-making process;
- Rationalising and streamlining health, social and environmental activities throughout the lifetime of the project to add value and efficiency;
- Encouraging and achieving the highest environmental and safety performance and response from all employees and contractors;

- Providing the standards for overall planning, operation, audit and review; and
- Enabling management to establish environmental priorities.

1.3 Supporting Documentation

The additional management plans, which will be prepared by Galp and the appointed contractor(s), include:

- Survey design: Galp will develop and finalise the survey design prior to going out for tender, including survey extent, survey line orientation, seismic array specifications, etc.
- Contractor HSSE Plan: This plan details the specificities and equipment of the survey vessel related to the operations and associated environmental, socio-economic and health aspects, as well as the organisation supporting the vessel management system (objectives, resources, documentation, risk management and control, etc.). All staff and contractors are required to comply with this document when working on the project.
- Plans and procedures: The ESMP will be integrated with Galp's overall Environmental (and Social) Management System, and will include a Waste Management Procedure, a Stakeholder Engagement Plan, Monitoring Procedure(s), etc for the seismic and associated activities.

The 2017 ESMP (ERM, 2017) also states that *GALP will comply with the requirements of applicable international and national maritime law and will follow best industry standards such as those promulgated by the International Marine Organisation (IMO), International Association of Geophysical Contractors (IAGC), the International Association of Oil and Gas Producers (IOGP, formerly E&P Forum) as well as the Namibian Authorities.* More specifically, the ESMP of 2017 refers to the following standards, i.e. further supporting documents to be integrated by Galp:

- Environmental Standards and Guidelines applicable in Namibia;
- MARPOL 73/78 (the International Convention for the Prevention of Pollution from Ships) standards for waste management and discharges to the marine environment;
- International Convention for the Safety of Life at Sea (SOLAS), 1974 requirements for maritime safety;
- 'E&P Forum Health, Safety and Environmental Schedules for Marine Geophysical Operations' (Report No. 6.34/206);
- IAGC 'Marine Geophysical Operations Safety Manual' published by the International Association of Geophysical Contractors (2004); and

- IAGC 'Environmental Guidelines for Worldwide Geophysical Operations' (2001).

The following subsidiary plans will also be in place prior to the commencement of seismic activities:

- Galp's Emergency Procedures document and Medical Emergency Response Plan.
- Seismic Contractor Emergency Response Plan (including MEDIVAC plan).
- Helicopter Operator Emergency Response Plan.
- Shipboard Oil Pollution Emergency Plan (SOPEP) as required by MARPOL.
- Emergency Response Plan submitted to the Petroleum Commissioner.
- Marine Faunal Management Plan.
- Ballast Water Management Plan
- Local Employment and Supply Management Plan.
- Preventive Maintenance Plan.
- Chemical Management Plan.
- Corrective Action Plan.

Furthermore, the ESMP of 2017 states that: *... to mitigate the impacts of underwater noise to marine mammals and turtles, internationally accepted "JNCC Guidelines for minimizing the risk of injury to marine mammals from geophysical surveys" (JNCC, 2017) shall be always followed (ERM, 2017).*

1.4 ESMP Structure

Description of the structure and content of the ESMP is given in Table 1 below.

TABLE 1: DESCRIPTION OF THE STRUCTURE AND CONTENT OF THE ESMP

Section	Contents
Section 1	Introduction Background, objectives of the ESMP and lists the supporting documents.
Section 2	Environmental and Social Aspects and Potential Impacts A summary of the key activities, aspects and impacts
Section 3	Roles and Responsibilities Key environmental management roles and responsibilities with respect to implementation and management of the ESMP.
Section 4	Training, Awareness and Competency

Section	Contents
	Training and awareness provisions for the operator’s staff and contractors involved in the project.
Section 5	Compliance Verification and Corrective Actions Measures to ensure compliance with the ESMP and implementation of corrective actions.
Section 6	Management of Change Procedures to be followed for the 3D towed streamer seismic survey and OBN seismic acquisition of PEL 83.
Section 7	Communication Communication channels between the operator, the contractor(s) and external stakeholders.
Section 8	Document Control and Reporting Document control and reporting requirements (internal and external).
Section 9	Environmental and Social Mitigation Measures Management commitments that will be implemented to prevent, minimise or manage significant negative impacts and optimise and maximise any potential benefits of the project.
Section 10	References

2. Environmental and Social Aspects and Potential Impacts

Relevant to Galp's proposed 3D towed streamer seismic survey and an OBN seismic acquisition of PEL 83, a summary of the environmental and social aspects and potential impacts is provided in TABLE 2.



TABLE 2: SUMMARY OF THE ENVIRONMENTAL AND SOCIAL ASPECTS AND POTENTIAL IMPACTS, LINKED TO THE FURTHER 3D SEISMIC SURVEY ACTIVITIES

Activities	Aspects	Receptor	Potential Impacts
<i>Mobilisation phase</i>			
Transit of survey vessels between the survey area and the onshore logistics	Underwater noise levels	Marine ecology	Disturbance to marine fauna
	Routine discharge to sea (e.g. deck and machinery space drainage, sewage and galley wastes) and local reduction in water quality	Marine ecology	Physiological effect on marine fauna
			Increased food source for marine fauna
			Increased predator - prey interactions
	Vessel Lighting	Marine ecology	Disorientation and mortality of marine birds
Increased predator - prey interactions			
Discharge of ballast water and equipment fouling	Marine ecology	Loss of biodiversity due to the introduction of invasive alien species	
<i>Operation Phase</i>			
Operation of survey vessels	Increase in underwater noise levels	Marine ecology	Disturbance to marine fauna
	Routine discharge of waste to sea (e.g. deck and machinery space drainage, sewage and galley wastes) and local reduction in water quality	Marine ecology	Physiological effect on marine fauna
			Increased food source for marine fauna
			Fish aggregation and increased predator - prey interactions
	Increase in ambient lighting	Marine ecology	Disorientation and mortality of marine birds
Increased predator - prey interactions			



Activities	Aspects	Receptor	Potential Impacts
Deployment of streamers	Safety exclusion zone	Fishing Industry	Temporary cessation or displacement of marine traffic and transport within the survey area.
		Marine traffic and transport	
Deployment of OBN's	Movement of ROV close to the seafloor and placement of the OBN's	Marine ecology	Disturbance of seabed sediments and crushing of benthic macrofauna due to OBN placement
Seismic acquisition	Acoustic emissions from sound sources, i.e. increase in underwater noise levels	Marine ecology	Disturbance / behavioural changes to marine fauna
			Physiological effect on marine fauna
			Fish avoidance of key feeding areas
		Fishing Industry	Reduced fish catch and increased fishing effort
Operation of helicopters (Only used for Medical evacuations or any hypothetical rescue exercises)	Increase in noise levels	Marine ecology	Avoidance of key breeding areas (e.g. coastal birds and cetaceans)
			Abandonment of nests (birds) and young (birds and seals)
<i>Demobilisation Phase</i>			
Survey vessels leave survey area and transit to port or next destination	Increase in underwater noise levels during transit	Marine ecology	Disturbance to marine fauna
		Marine ecology	Physiological effect on marine fauna
	Increased food source for marine fauna		
	Increased predator - prey interactions		
	Increase in noise levels	Marine ecology	Avoidance of key breeding areas (e.g. coastal birds and cetaceans)
Abandonment of nests (birds) and young (birds and seals)			



Activities	Aspects	Receptor	Potential Impacts
<i>Unplanned Events</i>			
Collision with survey vessels and equipment / deployment of streamers	Collision and entanglement with marine fauna	Marine ecology	Physiological effect on marine fauna
	Safety exclusion zone	Fishing Industry	Disturbance to fishing activities from accidental interactions with fishing gear.
Dropped objects / Lost equipment	Increased hard substrate on seafloor	Marine ecology	Physical damage to and mortality of benthic species / habitats
			Obstruction to or damage of fishing gear
Hydrocarbon spills	Release of fuel into sea during bunkering and localised reduction in water quality	Marine ecology	Effect on faunal health (e.g. respiratory damage) or mortality (e.g. suffocation and poisoning)

3. Roles and Responsibilities

The project will have dedicated competent personnel that will manage and oversee the HSSE aspects over the project lifecycle. Galp will retain the primary responsibility for meeting environmental and social commitments throughout the project life span. The key HSSE management roles and responsibilities will be defined by Galp prior to the commencement of any exploration activities.

This section defines the roles and responsibilities of the various parties involved in the Project environmental management. These include following:

- Galp
- Exploration / seismic contractor (i.e. lead)
- Observers:
 - Marine Mammal Observer (MMO)
 - PAM Operator
- Fisheries Liaison Officer (FLO)

3.1 Galp

Galp will be responsible for the overall implementation of the ESMP. The following key responsibilities are implied:

- Develop the survey design, which will include this ESMP.
- Select the preferred contractor and ensuring that the ESMP forms part of the contract.
- Ensure the seismic contractor implements the ESMP and any additional approval conditions contained in the Environmental Clearance Certificate issued by MEFT.
- Ensure that environmental audits are done to assess performance and compliance against the commitments and objectives.
- Ensuring that environmental monitoring and reporting are done by all parties, including the contractors, the seismic / support vessels and helicopter).
- Stakeholder engagement.

A Galp HSSE representative will oversee the execution of environmental matters related to the Project. This person will be on the survey vessel during the survey and present in the port during change overs. The person must ensure compliance with the various commitments and supervise seismic

contractor coordination, especially with the Marine Mammal Observer (MMO), PAM and Fishing Liaison Officer (FLO), and resolve issues that may arise related to the implementation of environmental mitigation or monitoring requirements.

3.2 Exploration / Seismic Contractor

Galp will appoint an Exploration / Seismic Contractor who will have overall responsibility for the execution of the seismic and associated activities. The contractor will have responsibility for ensuring activities are carried out in accordance with the requirements of this ESMP and will verify that environmental requirements are implemented in full.

The contractor shall:

- Be responsible for and convey the requirements of the ESMP to all staff and any sub-contractors (including MMOs, PAM operators, FLOs and other subcontractors, e.g. support vessels, helicopter, emergency support, catering, etc.), and ensure that they comply with their obligations.
- Ensure that sufficient resources are deployed in order to efficiently implement this ESMP; and
- Ensure that all staff are given an Environmental and Social Induction and that further training is undertaken at crew changes.
- Establish and maintain a functional grievance mechanism that allows stakeholders to submit specific grievances related to operations, by ensuring they are informed about the process and that resources are mobilized to manage the resolution of all grievances.

The contractor will be responsible for ensuring that final details of the survey (including coordinates of seismic lines, schedule and seismic survey vessel specifications) are communicated to the relevant authority prior to commencing the survey.

All employees of the contractor must be informed and understand environmental requirements before the commencement of activities.

The contractor will be responsible for ensuring that all operations permissions (including relevant clearances, permits, licences and necessary approvals from the relevant authorities) are valid prior to commencing the survey.

The contractor shall be responsible for ensuring the health and safety of all personnel on the project vessels.

3.3 Observer(s)

3.3.1 MMOs

The duties of the MMOs would be to:

- Provide effective regular briefings to crew members, and establish clear lines of communication and procedures for onboard operations;
- Record airgun activities, including sound levels, 'soft-start' procedures and pre-firing regimes;
- Observe and record responses of marine fauna to seismic shooting from optimum vantage points, including seabird, large pelagic fish (e.g. shoaling tuna, sunfish, sharks), turtle, seal and cetacean incidence and behaviour and any mortality or injuries of marine fauna as a result of the seismic survey. Data captured should include species identification, position (latitude/longitude), distance/bearing 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 seismic activities. Both the identification and the behaviour of the animals must be recorded accurately along with current seismic sound levels. Any attraction of predatory seabirds, large pelagic fish or cetaceans (by mass disorientation or stunning of fish as a result of seismic survey activities) and incidents of feeding behaviour among the hydrophone streamers should also be recorded;
- Record sightings of any injured or dead marine mammals, large pelagic fish (e.g. sharks), seabirds and sea turtles, regardless of whether the injury or death was caused by the seismic vessel itself. If the injury or death was caused by a collision with the seismic vessel, the date and location (latitude/longitude) of the strike, and the species identification or a description of the animal should be recorded and included as part of the daily report;
- Record meteorological conditions at the beginning and end of the observation period, and whenever the weather conditions change significantly;
- Request the delay of start-up or temporary termination of the seismic survey or adjusting of seismic shooting, as appropriate. It is important that MMO decisions on the termination of firing are made confidently and expediently, and following dialogue between the observers on duty at the time. A log of all termination decisions must be kept (for inclusion in both daily and "close-out" reports);
- Use a recording spreadsheet (e.g. JNCC 2017) in order to record all the above observations and decisions; and

- Prepare daily reports of all observations, to be forwarded to the necessary authorities as required, to ensure compliance with the mitigation measures.

3.3.2 PAM Operators

The duties of the PAM operator would be to:

- Provide effective regular briefings to crew members, and establish clear lines of communication and procedures for onboard operations;
- Ensure that the hydrophone cable is optimally placed, deployed and tested for acoustic detections of marine mammals;
- Confirm that there is no marine mammal activity within 500 m of the airgun array prior to commencing with the 'soft-start' procedures;
- Record species identification, position (latitude/longitude), distance and bearing from the vessel and acoustic source, where possible;
- Record general environmental conditions;
- Record airgun activities, including sound levels, 'soft-start' procedures and pre-firing regimes; and
- Request the delay of start-up and temporary termination of the seismic survey, as appropriate.

3.3.3 Fisheries Liaison Officer (FLO)

The FLOs must, at a minimum, be able to speak English and Afrikaans and must be familiar with fisheries operations in the survey area. The FLO will have the following responsibilities during survey operations:

- Facilitate communication with fishing vessels in the area;
- Provide effective regular briefings to crew members, and establish clear lines of communication and procedures for onboard operations;
- For the duration of the survey, circulate a daily survey schedule (look-ahead), via email, to the interested stakeholders (maritime authorities and key fishing associations);
- Record and respond to stakeholder concerns and questions, receive grievances and follow-up on the resolution process in coordination with the HSE representative and Galp representative.
- Relay information about the survey, safety zone and lack of manoeuvrability of the survey vessel to fishing and other maritime vessels via appropriate lines of communication; and

- Keep a log of all incidents and communications with fishing and other maritime vessels.

4. Training, Awareness and Competency

Galp will identify, plan, monitor and record training needs for personnel whose work may have a significant adverse impact upon safety, the environment and in the community. Employees, contractors and subcontractors at all levels will be made aware of the potential impacts of their activities, and the roles and responsibilities in achieving conformance with the internal policy and procedures.

Personnel with responsibilities in specific HSSE practices will be adequately trained to ensure effective implementation of the works instructions and procedures for which they have responsibilities.

This training will include awareness and competency with respect to the following:

- General awareness relating to 3D towed streamer seismic survey and an OBN seismic acquisition of PEL, including environmental and social impacts that could potentially arise from project activities.
- Legal requirements in relation to safety and environmental performance.
- Necessity of conforming to the requirements of the ECC and ESMP, including reporting requirements (i.e. such as incident reporting).
- Activity-specific training (i.e. waste management practices).
- Roles and responsibilities to achieve compliance, including change management and emergency response.

Training will take cognisance of the level of education, designation and language preferences of the personnel.

Each of the appointed contractors will also be required to institute training programmes for its personnel. Each contractor will be responsible for site HSSE awareness training for personnel working on the project and for identification of any additional training requirements to maintain required competency levels. The contractor training programme will be subject to approval by Galp and it will be audited to ensure that:

- Training programmes are adequate;
- All personnel requiring training have been trained; and
- Competency is being verified.

Galp will also ensure the following:

- That a copy of the EIA Report and ESMP is supplied to the contractor and sub-contractors and is on board all project vessels during the operation.
- Undertake HSSE Awareness Training, including induction training to ensure the project personnel (including seismic and support vessels, MMO, PAM operator, FLO) are appropriately informed of the purpose and requirements of the ESMP, including emergency procedures, spill management, etc.
- Ensure that ESMP responsibilities are clearly defined in Job Descriptions of relevant staff.
- Establish training and exercise programmes to ensure that the response activities can be effectively executed.
- Ensure that MMOs and PAM operators are briefed on the area-specific sensitivities and on the seismic survey planning (including roles and responsibilities, and lines of communication).
- Ensure FLOs are briefed on their role regarding stakeholder engagement and grievance management.

5. Compliance Verification and Corrective Actions

Inspections, monitoring and auditing will be undertaken to confirm appropriate implementation of the ESMP, as well as the effectiveness of mitigation measures. Corrective actions include those intended to improve performance, non-compliances and non-conformances.

5.1 Inspection

Contractors will be required to conduct daily and weekly HSSE inspections in an effort to monitor compliance and implement conditions stipulated in this ESMP. The results of the inspection and monitoring activities will be reported to the operator.

5.2 Monitoring

Monitoring will be conducted to ensure compliance with regulatory requirements and the performance objectives specified in the ESMP, as well as to evaluate the effectiveness of operational controls and mitigation measures. The main objectives of the monitoring programme include:

- Gathering, recording and analysing data required for regulatory and ESMP purposes.
- Verifying the predictions and conclusions made in the EIA Reports.
- Identifying changes in the physical, biological and social environment.
- Producing information to evaluate environmental performance specified in the ESMP.
- Producing information about emergencies that require an immediate response.
- Obtaining information on the actual and potential environmental and social impacts of exploration activities.
- Using monitoring results as a source of information and as grounds for decision-making regarding the design of new mitigation measures.
- Describing whether and to what extent discharges from exploration activities have had impacts on the marine environment.
- (Voluntary) monitoring of marine mammals and other marine biology indicators

Monitoring will include, but not limited to, those criteria listed in TABLE 3. Further monitoring requirements are specified in Chapter 9.

TABLE 3: MONITORING DURING THE 3D TOWED STREAMER SEISMIC SURVEY AND OBN SEISMIC ACQUISITION OF PEL 83 AND ASSOCIATED ACTIVITIES

No.	Risk	Criteria to be monitored	Inspections	Accountability (indicative)
1.1	Deck drainage / machinery space / bilge water	<ul style="list-style-type: none"> Correct operation of oil separating / filtering equipment and oil content meter (compliance with MARPOL 73/78 standards) 	Prior to surveying / sampling and once during campaign	Contractor (Vessel Captain)
1.2	Sewage discharge	<ul style="list-style-type: none"> Correct operation of sewage treatment system (compliance with MARPOL 73/78 standards) Discharge volumes 	Recorded daily in the operational log inspection	Contractor (Vessel Captain)
1.3	Galley waste and air emissions	<ul style="list-style-type: none"> Type and volume discharged / incinerated Greenhouse gas (GHG) emissions from incineration 	Recorded daily in the operational log inspection	Contractor (Vessel Captain)
		<ul style="list-style-type: none"> Correct operation of macerator 	At start and once during campaign	
1.4	General waste	<ul style="list-style-type: none"> Type and volume of waste generated Type and volume transferred for onshore disposal / incinerated Compliance with Waste Management Plan 	Prior to waste transfers to supply vessel / port	Contractor (Vessel Captain)
1.5	Hazardous waste	<ul style="list-style-type: none"> Volume of waste generated Volume transferred for onshore disposal Compliance with Waste Management Plan 	Prior to waste transfers to supply vessel / port	Contractor (Vessel Captain)
1.6	Fuel usage and air emissions	<ul style="list-style-type: none"> Type and volume on board Volume consumed GHG emissions from fuel combustion 	Daily operational log inspection Fuel transfer log sheet	Contractor (Vessel Captain)

No.	Risk	Criteria to be monitored	Inspections	Accountability (indicative)
1.7	Accidental oil and chemical spills	<ul style="list-style-type: none"> Type Volume Compliance with SOPEP 	Ongoing through daily operational log and incident reporting system	Contractor (Vessel Captain)
1.8	Lost equipment	<ul style="list-style-type: none"> Establish a hazards database listing: <ul style="list-style-type: none"> > the type of gear left on the seabed > date of abandonment / loss > location; and > where applicable, the dates of retrieval 	Ongoing through daily operational log and incident reporting system	Contractor (Vessel Captain)
1.9	Disruption / interference to fishing / shipping	<ul style="list-style-type: none"> Interactions with other vessels (via radio) Notice to Mariners Number of grievances / incidents logged 	Continuous	Contractor (Vessel Captain)
1.10	Ballast water	<ul style="list-style-type: none"> Volume discharged and location Compliance with Ballast Water Management Plan 	After de-ballasting	Contractor (Vessel Captain)
1.11	Fauna interaction	<ul style="list-style-type: none"> Presence of marine mammal activity within 500 m of the vessel prior to commencing with the "soft-start" procedures (visually during the day) Responses of marine fauna to seismic shooting, including seabird, fish (e.g. sharks, schooling tuna, sunfish), turtle, seal and cetacean incidence and behaviour and any mortality of marine fauna as a result of the seismic survey. Data captured should include species identification, 	Ongoing through daily operational log and incident reporting system	MMO

No.	Risk	Criteria to be monitored	Inspections	Accountability (indicative)
		position latitude/longitude), distance/bearing 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 seismic activities <ul style="list-style-type: none"> • A log of all seismic activity and shut-down decisions. 		
		<ul style="list-style-type: none"> • Presence of marine mammal activity within 500 m prior to commencing with the "soft-start" procedures • Species, position (latitude/longitude) and distance from the vessel, where possible • A log of all seismic activity and shut-down decisions 	Ongoing through daily operational log and incident reporting system	Passive Acoustic Monitoring (PAM) Operator
1.12	Air emissions	<ul style="list-style-type: none"> • GHG emissions 	Daily operational log inspection Fuel transfer log sheet	Contractor (Vessel Captain)

5.3 Auditing

5.3.1 Monthly Audits

Beyond the routine inspection and monitoring activities conducted, formal monthly audits will be carried out internally by Galp's onboard HSSE representative to ensure compliance with the ESMP and its own HSSE standards and policies. The audit data will include the contractor's monitoring and inspection records.

The audit will include amongst other things, checking:

- Completeness of HSSE documentation, including planning documents and inspection records.
- Conformance with monitoring requirements.
- Efficacy of activities to address any non-conformance with monitoring requirements.
- Training activities and record keeping.

Findings will be documented in monthly audit reports, which will be submitted to the Operations Manager for action and follow-up.

5.3.2 ESMP close-out compliance audit

An ESMP close-out compliance audit(s) will also be conducted at the end of the seismic surveys. These reports will, amongst other things, outline the implementation of the mitigation measures and compliance levels with achieving the performance objectives as detailed in the ESMP.

5.3.3 Audit methodology

An audit methodology, programme and protocol will be developed for the internal monthly audits and the ESMP close-out compliance audits. These audits are an integral part of the implementation of the ESMP and audit findings can be used as a basis to measure compliance and confirm the efficacy and efficiency of the mitigation measures. The proposed approach to auditing consists of four basic steps:

- Planning the audit.
- Conducting the audit.
- Producing audit findings (measuring compliance and identifying problems).
- Reporting audit findings for management action.

Audit findings will undergo a root cause analysis to identify underlying causes to non-compliance events. Management actions will be taken to correct the underlying causes behind the audit findings and improvements will be made before another audit is conducted. This audit process allows for problems to be corrected, compliance to be improved and prevention of the same findings during subsequent audits.

A four-level rating scale is proposed to assess the performance of the ESMP against each individual element. Elements are rated individually as "full compliance", "partial compliance", "non-compliance" or "not applicable" as per TABLE 4.

TABLE 4: AUDIT RATING SCALE

Full compliance	All of the requirements of the ESMP element have been fulfilled. Element has been documented and monitored and upon verification is found to be fully implemented.
Partial compliance	Only certain of the key requirements have been fulfilled and a plan is in place to progress to full compliance. Element has been documented and monitored but not consistently or completely implemented.
Non-compliance	The requirements of the ESMP have not been fulfilled. No evidence or incomplete evidence of compliance.
Not applicable	The ESMP elements are not applicable.

5.4 Corrective Actions

HSSE staff of Galp and its contractors will implement a formal non-compliance and corrective action tracking procedure for investigating cause and identifying corrective actions in response to accidents, HSSE and or social non-compliances.

Where corrective actions are deemed necessary, specific measures will be developed, with designated responsibility and timing, and implemented. In this way, continuous improvement in performance will be achieved.

HSSE staff of Galp and its contractors will be responsible for keeping records of corrective actions and for overseeing the modification of environmental or social protection procedures and or training programmes to avoid repetition of non-conformances and non-compliances.

6. Management of Change

The development and implementation of the ESMP is an ongoing process that is iterative in nature. This document must thus be seen as a 'living' document and amendments may need to be implemented during the project. Typical changes that can affect the ESMP include:

- A material project design change that occurs after the ESMP has been compiled and approved.
- Changes in the feasibility / availability of specific mitigation measures.
- Personnel changes on the project.

Certain aspects of this document may be further expanded / made more specific during the detailed design stage to ensure, firstly, that it includes all conditions of approval and, secondly, that it addresses all issues related to the detailed design.

These changes will be subject to a Management of Change procedure.

7. Communication

Channels of communication will be established between Galp, the contractor(s) and external stakeholders. Galp will establish and maintain procedures for:

- Internal communication between the various levels and functions of the project staff organisation;
- Communication of planned activities with the Directorate of Marine Affairs (DMA) at the Ministry of Works and Transport (MWT) and request that the DMA send out a Notice to Mariners to share this information with other parties;
- Communication with the relevant parties in the fishing industry and the MFMR about planned activities, as frequent as possible, and
- Receiving, documenting and responding to relevant communication from external interested parties.

A grievance procedure will be established and maintained by Galp to record any complaints or comments received from the public. The grievance procedure will be underpinned by the following principles and commitments:

- Disseminate key information to directly impacted stakeholders;
- Seek to resolve all grievances timeously; and
- Maintain full written records of each grievance case and the associated process of resolution and outcome.

Galp to ensure the following agreements and ongoing communication are in place with other relevant (i.e. Companies with neighboring PELs):

- Synergy between the various Companies undertaking exploration activities (i.e. where activities are overlapping in time) to ensure impacts of respective activities on other Companies' activities can be avoided.
- Internal agreement between relevant Companies to be reached in terms of any activities being planned by Galp into neighbouring block(s).
- Where certain activities can be combined (also in terms of communication with Ministries, other stakeholders, etc.) these need to be considered and agreed between the Companies - depending on the timing of relevant activities planned.

- Continue to communicate (regularly) to ensure proper planning and to always ensure safe operations, taking all related activities into account.
- Communicate (detailed) planned schedule of activities, once available.
- Various protocols and operational agreements between the companies will be established.

8. Document Control and Reporting

8.1 Documentation

Galp will control HSSE documentation, including project licences, approvals, management plans, associated procedures, checklists, forms and reports, through a formal procedure. The document control procedure will describe the processes that the project will employ for official communication of both hardcopy and electronic documents and the requirement for electronic filing, document tracking and version control numbers.

Contractor(s) will be required to develop a system for maintaining and controlling its own HSSE documentation and describe these systems in their respective HSSE plans.

8.2 Incident Reporting

Following any HSSE incidents, Galp will conduct an incident investigation and prepare a report detailing the events, root causes of the incident(s) and corrective and preventative measures implemented as a result. All incidents where local regulatory standards are exceeded will be reported to MEFT, the Ministry of Fisheries and Marine Resources (MFMR), the DMA at the MWT and the Petroleum Commissioner at the Ministry of Mines and Energy (MME).

8.3 ESMP Close-Out Compliance Report

Galp will submit an ESMP close-out compliance report to MME at the end of each seismic survey. Amongst other things, these reports will outline the implementation of the mitigation measures and compliance levels with achieving the performance objectives as detailed in the ESMP.

9. Environmental and Social Mitigation and Management Measures

9.1 Mitigation and management measures (and further monitoring requirements) tables

This section (i.e. Tables below) details the specific management and mitigation commitments and further monitoring requirements that will be implemented to prevent, minimise or manage significant negative impacts and optimise and maximise any potential benefits of the project.

TABLE 5: MANAGEMENT AND MITIGATION ACTIONS: PLANNING / MOBILIZATION PHASE

No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
P1	<ul style="list-style-type: none"> Survey Planning 	Impacts of Seismic Surveys on Marine Fauna	Project Controls: <ul style="list-style-type: none"> ❖ The operator will ensure that the proposed seismic survey is undertaken in a manner consistent with good international industry practice and Best Available Techniques.
P2			<ul style="list-style-type: none"> Plan seismic surveys to avoid movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (June to November inclusive), and their aggregation on the summer feeding grounds of the Lüderitz upwelling cell from late October to late December and ensure that migration paths are not blocked by seismic operations.
P3			<ul style="list-style-type: none"> Plan survey, as far as possible, so that the first commencement of airgun firing in a new area (including gun tests) are undertaken during daylight hours.
P4			<ul style="list-style-type: none"> Prohibit airgun use (including airgun tests) outside of the area of operation.
P5			<ul style="list-style-type: none"> Although a seismic vessel and its gear may pass through a declared Marine Protected Area, acoustic sources (airguns) must not be operational during this transit.
P6			<ul style="list-style-type: none"> A 5 km buffer zone where no airgun operation is permitted is recommended around all MPAs.
P7			<ul style="list-style-type: none"> Coordinate survey design and timing with marine authorities and other operators, if required and as far as possible, to avoid potential cumulative noise impacts associated with more than one survey occurring at the same time in adjacent areas.
P8	<ul style="list-style-type: none"> Key equipment - Passive Acoustic Monitoring (PAM) 	Acoustic Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> Ensure the seismic vessel is fitted with Passive Acoustic Monitoring (PAM) technology, which detects some animals through their vocalisations. The PAM technology must have enough bandwidth to be sensitive to the whole frequency range of sensitive marine life expected in the area.
P9			<ul style="list-style-type: none"> As the survey area would largely be in waters deeper than 1 000 m where sperm whales and other deep-diving odontocetes are likely to be encountered, implement the use of PAM 24-hr a day when the airgun is in operation.
P10			<ul style="list-style-type: none"> Ensure that the PAM hydrophone streamer is towed in such a way that the interference of vessel noise is minimised.
P11			<ul style="list-style-type: none"> Ensure the PAM streamer is fitted with at least four hydrophones, of which two are HF and two LF, to allow directional detection of cetaceans.
P12			<ul style="list-style-type: none"> Ensure spare PAM hydrophone streamers (e.g. 4 heavy tow cables and 6 hydrophone cables) are readily available in the event that PAM breaks down, in order to ensure timely redeployment.
P13	<ul style="list-style-type: none"> Key equipment - Acoustic Source 	Acoustic Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> Define and enforce the use of the lowest practicable airgun volume for production, and design arrays to maximise downward propagation, minimise horizontal propagation and minimise high frequencies in airgun pulses. Have this verified by independent evaluators.



No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
P14			<ul style="list-style-type: none"> Ensure a display screen for the acoustic source operations is provided to the marine observers. All information relating to the activation of the acoustic source and the power output levels must be readily available to support the observers in real time via the display screen and to ensure that operational capacity is not exceeded.
P15			<ul style="list-style-type: none"> Ensure the ramp-up noise volumes do not exceed the production volume.
P16			<ul style="list-style-type: none"> Limit horizontal sound propagation by adopting suitable array configurations and pulse synchronization and eliminating unnecessary high frequencies.
P17	<ul style="list-style-type: none"> Key equipment - Streamers 	Acoustic Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> Ensure that 'turtle-friendly' tail buoys are used by the survey contractor or that existing tail buoys are fitted with either exclusion or deflector 'turtle guards'.
P18			<ul style="list-style-type: none"> Ensure that solid streamers rather than fluid-filled streamers are used to avoid leaks.
P19	<ul style="list-style-type: none"> Appointment personnel 	Key personnel for linked to the Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> Make provision for the placing of at least two qualified MMOs on board the seismic vessel. As a minimum, one must be on watch during daylight hours for the pre-shoot observations and when the acoustic source is active. <ul style="list-style-type: none"> Refer to section 3.4.1 for the duties of the MMOs.
P20			<ul style="list-style-type: none"> Make provision for placing of a qualified PAM operator on board the seismic vessel. As a minimum, one must be on "watch" during the pre-shoot observations and when the acoustic source is active. <ul style="list-style-type: none"> Refer to section 3.4.2 for the duties of the PAMs.
P21			<ul style="list-style-type: none"> Ensure MMOs and PAM operators are briefed on the area-specific sensitivities and on the seismic survey planning (including roles and responsibilities, and lines of communication).
P22	<ul style="list-style-type: none"> Transit of vessels to survey area 	Impact of Vessel and Helicopter Noise on Marine Fauna	<ul style="list-style-type: none"> Refer to Table 6 (Management and mitigation measures: Vessels, aircraft and ROV operations)
P23		Impact of Survey Vessel Lighting on Pelagic Fauna	
P24		Impacts of normal vessel discharges on marine fauna	
P25	<ul style="list-style-type: none"> Hull Fouling and Ballast Water Discharge 	Impacts of marine biodiversity through the introduction of non-native species in ballast water and on ship hulls	<p>Project Controls:</p> <ul style="list-style-type: none"> ❖ Ballast water is discharged subject to the requirements of the International Maritime Organisation's (IMO) 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments. The Convention aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. The Convention stipulates that all ships are required



No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
			to implement a Ballast Water Management Plan and that all ships using ballast water exchange will do so at least 200 nautical miles from nearest land in waters of at least 200 m deep; the absolute minimum being 50 nautical miles from the nearest land. Project vessels would be required to comply with this requirement.
P26			<ul style="list-style-type: none"> Avoid the unnecessary discharge of ballast water.
P27			<ul style="list-style-type: none"> Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.
P28			<ul style="list-style-type: none"> Ensure that routine cleaning of ballast tanks is carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's Ballast Water Management Plan.
P29			<ul style="list-style-type: none"> Ensure all equipment (e.g. arrays, streamers, tail buoys etc) that has been used in other regions is thoroughly cleaned prior to deployment.
P30	<ul style="list-style-type: none"> Transit of vessels to survey area 	Faunal Strikes with Project Vessels and Equipment	<ul style="list-style-type: none"> Refer to Table 10 (Management and mitigation measures: Unplanned events)
P31		Loss of fuel from vessel accident	
P32	<ul style="list-style-type: none"> Appointment of suppliers 	Contracting of local companies	<ul style="list-style-type: none"> Apply fair, transparent and reasonable preferential contracting of local companies to maximise benefits in Walvis Bay or Lüderitz.
P33			<ul style="list-style-type: none"> Include as a condition of contracting that any non-local service providers will apply reasonable preferential subcontracting of companies located in Walvis Bay or Lüderitz.



TABLE 6: MANAGEMENT AND MITIGATION ACTIONS: VESSELS, AIRCRAFT (I.E. EMERGENCIES ONLY) AND ROV OPERATIONS

No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
V1	<ul style="list-style-type: none"> Operation of survey vessels and helicopters (emergencies only) 	Impact of Vessel and Helicopter Noise on Marine Fauna	Project Controls: <ul style="list-style-type: none"> ❖ The seismic contractor will ensure that the proposed seismic survey is undertaken in a manner consistent with good international industry practice and Best Available Techniques. ❖ All whales and dolphins are given protection under the Namibian Law. The regulations under the Namibian Marine Resources Act, 2000 (No. 27 of 2000) states that no whales or dolphins may be harassed, killed or fished. Although not legislated in Namibia, no vessel or aircraft should approach closer than 300 m to any whale and a vessel or aircraft should move to a minimum distance of 300 m from any whales if a whale surfaces closer than 300 m from a vessel or aircraft. ❖ The operation of helicopters aircraft is governed by the Civil Aviation Act (No. 6 of 2016) and associated regulations.
V2			<ul style="list-style-type: none"> Pre-plan flight paths to ensure that no flying occurs over seabird and seal colonies and offshore islands by at least 1 852 m (i.e. 1 nm).
V3			<ul style="list-style-type: none"> Avoid extensive low-altitude coastal flights by ensuring that the flight path is perpendicular to the coast, as far as possible.
V4			<ul style="list-style-type: none"> Maintain a flight altitude >1 000 m except when taking off and landing or in a medical emergency.
V5			<ul style="list-style-type: none"> Maintain an altitude of at least 762 m or 2 500 ft above the highest point of a National Park or World Heritage Site.
V6			<ul style="list-style-type: none"> Comply fully with aviation and authority guidelines and rules.
V7			<ul style="list-style-type: none"> Brief all pilots on the ecological risks associated with flying at a low level along the coast or above marine mammals.
V8	<ul style="list-style-type: none"> Operation of survey vessel and support vessel 	Impact of Survey Vessel Lighting on Pelagic Fauna	Project Controls: <ul style="list-style-type: none"> ❖ The seismic contractor will ensure that the proposed seismic survey is undertaken in a manner consistent with good international industry practice and Best Available Techniques.
V9			<ul style="list-style-type: none"> The lighting on the survey and support vessels should be reduced to a minimum compatible with safe operations whenever and wherever possible. Light sources should, if possible and consistent with safe working practices, be positioned in places where emissions to the surrounding environment can be minimised.
V10			<ul style="list-style-type: none"> Automatically or manually controlling lighting in areas where it is not a continuous requirement through the process control system.
V11			<ul style="list-style-type: none"> Keep disorientated, but otherwise unharmed, seabirds in dark containers (e.g. cardboard box) for subsequent release during daylight hours. Ringed/banded birds should be reported to the appropriate ringing/banding scheme (details are provided on the ring).



No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
V12	Transit to survey area	Emissions to the atmosphere during operation	<ul style="list-style-type: none"> • Use a low sulphur fuel that has a maximum sulphur content as specified by MARPOL.
V13			<ul style="list-style-type: none"> • Ensure no incineration of waste occurs within the port limits.
V14			<ul style="list-style-type: none"> • Implement a maintenance plan to ensure all diesel motors and generators receive adequate maintenance to minimise soot and unburnt diesel released to the atmosphere.

TABLE 7: MANAGEMENT AND MITIGATION ACTIONS: PRE-START AND SEISMIC ACQUISITION

No	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
SA1	<ul style="list-style-type: none"> Airgun testing 	Acoustic Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> Maintain a pre-shoot watch of 60-minutes before any instances of airgun testing. If only a single low-est power airgun is tested, the pre-shoot watch period can be reduced to 30 minutes.
SA2			<ul style="list-style-type: none"> Implement a 'soft-start' procedure if testing multiple higher powered airguns. <ul style="list-style-type: none"> The 'soft-start' should be carried out over a time period proportional to the number of guns being tested and not exceed 20 minutes; airguns should be tested in order of increasing volume; If testing all airguns at the same time, a 20 minute 'soft-start' is required; If testing a single lowest power airgun a 'soft-start' is not required.
SA3	<ul style="list-style-type: none"> Pre-Start Protocols 	Acoustic Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> Implement a dedicated MMO and PAM pre-shoot watch of at least 60 minutes (to accommodate deep-diving species in water depths greater than 200 m).
SA4			<ul style="list-style-type: none"> Implement a 'soft-start' procedure of a minimum of 20 minutes' duration on initiation of the seismic source if: <ul style="list-style-type: none"> during daylight hours it is confirmed: <ul style="list-style-type: none"> visually by the MMO during the pre-shoot watch (60 minutes) that there are no penguins or feeding aggregations of diving seabirds, shoaling large pelagic fish, turtles, seals or cetaceans within 500 m of the seismic source, and by PAM technology that there are no vocalising cetaceans detected in the 500 m mitigation zone. during times of poor visibility or darkness it is confirmed by PAM technology that no vocalising cetaceans are present in the 500 m mitigation zone during the pre-shoot watch (60 minutes).
SA5			<ul style="list-style-type: none"> Delay 'soft-starts' if penguins or feeding aggregations of diving seabirds, shoaling large pelagic fish, turtles, seals or cetaceans are observed within the mitigation zone. <ul style="list-style-type: none"> A 'soft-start' should not begin until 30 minutes after cetaceans depart the 500 m mitigation zone or 30 minutes after they are last seen or acoustically detected by PAM in the mitigation zone. In the case of penguins, diving seabirds, shoaling large pelagic fish and turtles, delay the 'soft-start' until animals are outside the 500 m mitigation zone. In the case of fur seals, which may occur commonly around the vessel, delay 'soft-starts' for at least 10 minutes until it has been confirmed that the mitigation zone is clear of all seal activity. However, if after a period of 10 mins seals are still observed within 500 m of the airgun, the normal 'soft-start' procedure should be allowed to commence for at least a 20-minute duration. Seal activity should be carefully monitored during 'soft-starts' to determine if they display any obvious negative responses to the airgun and gear or if there are any signs of injury or mortality as a direct result of the seismic activities.



No	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
SA6			<ul style="list-style-type: none"> As noted above for planning, when arriving at the survey area for the first time, survey activities should, as far as possible, only commence during daylight hours with good visibility and wind speeds below Beaufort 3. However, if this is not possible due to prolonged periods of poor visibility (e.g. thick fog) or unforeseen technical issue which results in a night-time start, the initial acoustic source activation (including gun tests) may only be undertaken if the normal 60-minute PAM pre-watch and 'soft-start' procedures have been followed.
SA7			<ul style="list-style-type: none"> Schedule 'soft-starts' so as to minimise, as far as possible, the interval between reaching full power operation and commencing a survey line. The period between the end of the soft start and commencing with a survey line must not exceed 20 minutes. If it does exceed 20 minutes, refer to breaks in firing below.
SA8	<ul style="list-style-type: none"> Seismic acquisition - Line Turns 	Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> If line changes are expected to take longer than 40 minutes: <ul style="list-style-type: none"> ➢ Terminate airgun firing at the end of the survey line and implement a pre-shoot search (60 minutes) and 'soft-start' procedure (20 minutes) when approaching the next survey line. ➢ If line turn is shorter than 80 minutes (i.e. shorter than a 60-minute pre-shoot watch and 20-minute 'soft-start' combined), the pre-shoot watch can commence before the end of the previous survey line.
SA9			<ul style="list-style-type: none"> If line changes are expected to take less than 40 minutes, airgun firing can continue during the line change if: <ul style="list-style-type: none"> ➢ The power is reduced to 180 cubic inches (or as close as is practically feasible) at standard pressure. Airgun volumes of less than 180 cubic inches can continue to fire at their operational volume and pressure; and ➢ The Shot Point Interval (SPI) is increased to provide a longer duration between shots, with the SPI not to exceed 5 minutes; and ➢ The power is increased and the SPI is decreased in uniform stages during the final 10 minutes of the line change (or geophone repositioning), prior to data collection re-commencing (i.e. a form of mini soft start). ➢ Normal MMO and PAM observations continue during this period when reduced power airgun is firing.
SA10	<ul style="list-style-type: none"> Seismic acquisition – Shut downs 	Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> Terminate seismic shooting on: <ul style="list-style-type: none"> ➢ observation and/or detection of penguins or feeding aggregations of diving seabirds, turtles, slow swimming large pelagic fish (including whale sharks, basking sharks, manta rays [and devil rays-Namibia only]) or cetaceans within the 500 m mitigation zone. ➢ observation of any obvious mortality or injuries to cetaceans, turtles, seals or mass mortalities of squid and fish (specifically large shoals of tuna or surface shoaling small pelagic species such as



No	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
			sardine, anchovy and mackerel) when estimated by the MMO to be as a direct result of the survey.
SA11			<ul style="list-style-type: none"> Depending on the species, specific mitigation will be implemented to continue the survey operations, as specified below: <ul style="list-style-type: none"> For specific species such as turtles, penguins, diving seabirds and slow swimming large pelagic fish (including whale sharks, basking sharks, manta rays [and devil rays-Namibia only]), terminate shooting until such time as the animals are outside of the 500 m mitigation zone (seismic "pause" over ~53 shot-points, which depending on current and vessel speed equates to about 7-9 minutes break in firing, no soft-start required). For cetaceans, terminate shooting until such time as there has been a 30 minute delay from the time the animal was last sighted within the mitigation zone before the commencement of the normal soft start procedure.
SA12	<ul style="list-style-type: none"> Seismic acquisition – Breaks in Airgun Firing 	Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> If after breaks in firing, the airgun can be restarted within 10 minutes, no soft-start is required and firing can recommence at the same power level provided no marine mammals have been observed or detected in the mitigation zone during the break-down period.
SA13			<ul style="list-style-type: none"> For all breaks in firing of longer than 10 minutes, but less than 20 minutes, implement a 'soft-start' of similar duration, assuming there is continuous observation by the MMO and PAM operator during the break.
SA14			<ul style="list-style-type: none"> For all breaks in firing of 20 minutes or longer, implement a 60-minute pre-shoot watch and 20-minute 'soft-start' procedure prior to the survey operation continuing.
SA15			<ul style="list-style-type: none"> For planned breaks, ensure that there is good communication between the seismic contractor and MMOs and PAM operators in order for all parties to be aware of these breaks and that early commencement of pre-watch periods can be implemented to limit delays.
SA16	<ul style="list-style-type: none"> PAM Malfunctions 	Impacts of Seismic Surveys on Marine Fauna	<ul style="list-style-type: none"> If the PAM system malfunctions or becomes damaged during night-time operations or periods of low visibility, continue operations for 30 minutes without PAM if no marine mammals were detected by PAM in the mitigation zones in the previous 2 hours, while the PAM operator diagnoses the issue. If after 30 minutes the diagnosis indicates that the PAM gear must be repaired to solve the problem, reduce power to 180 cubic inches. Firing of the reduced power gun may continue for 30 minutes while PAM is being repaired, the last 10-minute of which is a 10-minute ramp up to full power (mini 'soft-start'). If the PAM repair will take longer than 60 minutes, stop surveying until such time as a functional PAM system can be redeployed and tested.
SA17			<ul style="list-style-type: none"> If the PAM system breaks down during daylight hours, continue operations for 20 minutes without PAM, while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM gear must



No	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
			<p>be repaired to solve the problem, operations may continue for an additional 2 hours without PAM monitoring as long as:</p> <ul style="list-style-type: none"> ➤ No marine mammals were detected by PAM in the mitigation zones in the previous 2 hours; ➤ Two MMOs maintain watch at all times during operations when PAM is not operational; ➤ The time and location in which operations began and stop without an active PAM system is recorded.
SA18	<ul style="list-style-type: none"> • Ocean Bottom Node placement 	Disturbance of seabed sediments and crushing of benthic macrofauna due to OBN placement	<p>Project Controls:</p> <ul style="list-style-type: none"> ❖ Contactors will ensure that the proposed OBN campaign is undertaken in a manner consistent with good international industry practice and BAT.
SA19			<ul style="list-style-type: none"> • Implement procedures for ROVs that stipulate that the ROV does not land or rest on the seabed as part of normal operations.
SA21			<ul style="list-style-type: none"> • Ensure that nodes are not placed on sensitive hard grounds.
SA22	<ul style="list-style-type: none"> • Seismic acquisition: • Operations of survey vessel and deployment of streamers 	Displacement of Fishing Vessels due to Temporary Safety Zone around Survey Vessel	<p>Project Controls:</p> <ul style="list-style-type: none"> ❖ 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. Furthermore, in terms of the Petroleum (Exploration and Production) Act, 1991 (No. 2 of 1991) a seismic vessel is classed as an "offshore installation" and as such it is protected by a 500 m exclusion zone. It is an offence for an unauthorised vessel to enter the exclusion 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.
SA23			<ul style="list-style-type: none"> • Inform affected fishing operators via email or other means of the proposed survey at least three weeks prior to commencement. Notification should include details of (1) the co-ordinates of the vessel area of operation inclusive of the acquisition area, run-ins and vessel turning circles, (2) an indication of the proposed survey timeframes, (3) the required safety distance from the vessel, and (4) provide details on the support vessels servicing the seismic operation. • The following affected stakeholders have been identified: <ul style="list-style-type: none"> ➤ Fishing industry / associations: Confederation of Namibian Fishing Association, Large Pelagic and Hake Longlining Association of Namibia. ➤ Other key stakeholders: Directorate of Maritime Affairs, South African Navy Hydrographic Office (SANHO), Namibian Ports Authority and the MFMR Monitoring, Control and Surveillance Unit in Walvis Bay (Vessel Monitoring System in particular).



No	Activities / equipment	Aspect / potential impact	Mitigation and Management actions		
SA24			<ul style="list-style-type: none"> These stakeholders should again be notified when the seismic survey vessel and support vessels are off location. 		
SA25			<ul style="list-style-type: none"> Request, in writing, SANHO to broadcast a navigational warning via Navigational Telex (Navtext), Lüderitz Port Control and Lüderitz radio for the duration of the activity. 		
SA26			<ul style="list-style-type: none"> A Fisheries Liaison Officer (FLO) will be present on board the seismic vessel or guard vessel for the duration of the survey in order to facilitate communications with fishing vessels in the project area. For the duration of the survey, a daily survey look-ahead should be circulated via email to key fishing associations. Time-sharing between the survey operations and fishing vessel operators should be encouraged in order to minimize loss of access to targeted fishing areas. 		
SA27			<ul style="list-style-type: none"> Manage the lighting on the seismic vessel and support vessels to ensure that it is sufficiently illuminated to be visible to fishing vessels and compatible with safe operations. 		
SA28			<ul style="list-style-type: none"> Notify any fishing vessels at a radar range of 10 nm from the survey vessel via radio regarding the safety requirements. 		
SA29			<ul style="list-style-type: none"> Maintain standard vessel watch procedures. 		
SA30			<ul style="list-style-type: none"> Enforce the 500 m safety zone around the survey vessel and seismic array. 		
SA31			<ul style="list-style-type: none"> Ensure project vessels fly standard flags and /or lights to indicate that they are engaged in towing surveys and are restricted in maneuverability. 		
SA32			<ul style="list-style-type: none"> Practice weekly emergency response drills 		
SA33			<ul style="list-style-type: none"> Ensure access to current weather information. 		
SA34			<ul style="list-style-type: none"> Use flares or foghorn where necessary. 		
SA35			<ul style="list-style-type: none"> Seismic acquisition 	Impact of Underwater Noise from 3D Seismic Surveys on Fishing Industry (i.e. on catch rates)	<p>Project Controls:</p> <ul style="list-style-type: none"> ❖ The seismic contractor will ensure that the proposed surveys are undertaken in a manner consistent with good international industry practice and BAT regarding fisheries management. At least one escort vessel with appropriate radar and communications will patrol the area during the seismic survey to ensure that other vessels adhere to the safe operational limits. This vessel would assist in alerting other vessels (e.g. fishing, cargo vessel, etc.) about the survey and the lack of manoeuvrability of the survey vessel.
SA36					<ul style="list-style-type: none"> Seismic survey operations should be avoided during the month of July, to preclude the period of peak spawning activity of orange roughy within the license area.



No	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
SA37			See management and mitigation measures above (i.e. "Displacement of Fishing Vessels due to Temporary Safety Zone around Survey Vessel"
SA38			<ul style="list-style-type: none"> Implement a "soft-start" procedure of a minimum of 20 minutes' duration on initiation of the seismic source if during daylight hours it is confirmed visually by the MMO during the pre-shoot watch (60 minutes) that there are no shoaling large pelagic fish within 500 m of the seismic source.
SA39			<ul style="list-style-type: none"> For the duration of the survey, a daily survey look-ahead should be circulated via email to key fishing associations.
SA40	<ul style="list-style-type: none"> Deployment of streamers 	Safety exclusion zone Impact on Marine traffic and transport	<ul style="list-style-type: none"> Vessels involved in the survey will adopt industry standard warning and navigation equipment and procedures in order to reduce the risk of interaction with other vessels that may be present in the area. These will include the use of radar, foghorns, and issuing a Notice to Mariners through the relevant Hydrographic Office and port captains (i.e. Port of Luderitz and Walvis Bay) to warn that the survey is taking place and conveying the limited maneuverability of the survey vessel.
SA41			<ul style="list-style-type: none"> Marine users and stakeholders shall be informed of the survey details including survey location, timing, priority of passage safety, exclusion zones and general safety distances) through appropriate communication channels (i.e. email, radio navigation warnings and notices to mariners). A constant watch must be kept for approaching vessels during operations. In the event of approaching vessels warn by radio and chase boat if required. Appropriate radio broadcasts shall be made on the relevant shipping channels to make other marine users in the area aware of the survey location.



TABLE 8: MANAGEMENT AND MITIGATION ACTIONS: STAKEHOLDER NOTIFICATION AND CONSULTATION

No	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
SC1	<ul style="list-style-type: none"> Stakeholder Notification and Consultation 	Interaction, engagement & communication with national authorities and key stakeholders	<ul style="list-style-type: none"> Refer to Table 7 (Management and mitigation measures: Pre-Start and Seismic acquisition)
SC2			Implement a public information programme to ensure local fisheries and the interested and affected parties are regularly informed of the seismic survey activities. This will support ongoing engagement and assist in drawing out any ongoing or new issues and concerns.
SC3			<ul style="list-style-type: none"> Focus should be placed on Lüderitz and possibly Walvis Bay (dependent on location of onshore logistic base). Ensure that all service providers/contractors actively manage community expectations related to local procurement, local content, and local employment opportunities, with support from TEPNA.



TABLE 9: MANAGEMENT AND MITIGATION ACTIONS: WASTE MANAGEMENT

No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
W1	<ul style="list-style-type: none"> Operation of survey vessels and transit of support vessels between the survey area and the logistics base Waste management 	Impacts of normal vessel discharges	<p>Project Controls:</p> <ul style="list-style-type: none"> ❖ The operator will ensure that the proposed seismic survey is undertaken in a manner consistent with good international industry practice and in compliance with the applicable requirements in MARPOL 73/78, as summarised below. ❖ The discharge of biodegradable wastes from vessels is regulated by MARPOL 73/78 Annex V, which stipulates that: <ul style="list-style-type: none"> - No disposal to occur within 3 nm (\pm 5.5 km) of the coast. - Disposal between 3 nm (\pm 5.5 km) and 12 nm (\pm 22 km) needs to be comminuted to particle sizes smaller than 25 mm. - Disposal overboard without macerating can occur greater than 12 nm from the coast when the vessel is sailing. ❖ Discharges of oily water (deck drainage, bilge and mud pit wash residue) to the marine environment are regulated by MARPOL 73/78 Annex I, which stipulates that vessels must have: <ul style="list-style-type: none"> - A Shipboard Oil Pollution Emergency Plan (SOPEP). - A valid International Oil Pollution Prevention Certificate, as required by vessel class. - Equipment for the control of oil discharge from machinery space bilges and oil fuel tanks, e.g. oil separating/filtering equipment and oil content meter. Oil in water concentration must be less than 15 ppm prior to discharge overboard. - Oil residue holding tanks. - Oil discharge monitoring and control system. ❖ Sewage and grey water discharges from vessels are regulated by MARPOL 73/78 Annex IV, which specifies the following: <ul style="list-style-type: none"> - Vessels must have a valid International Sewage Pollution Prevention Certificate. - Vessels must have an onboard sewage treatment plant providing primary settling, chlorination and dichlorination before discharge of treated effluent. - The discharge depth is variable, depending upon the draught of the seismic vessel / support vessel at the time, but will be in accordance with MARPOL 73/78 Annex IV. - Discharge of sewage beyond 12 nm requires no treatment. However, sewage effluent must not produce visible floating solids in, nor cause the discolouration of, the surrounding water. - Sewage must be comminuted and disinfected for discharges between 3 nm (\pm 6 km) and 12 nm (\pm 22 km) from the coast. This will require an onboard sewage treatment plant or a sewage comminuting and disinfecting system.



No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
			<ul style="list-style-type: none"> - Disposal of sewage originating from holding tanks must be discharged at a moderate rate while the ship is proceeding on route at a speed not less than 4 knots. ❖ Sewage will be treated using a marine sanitation device to produce an effluent with: <ul style="list-style-type: none"> - A biological oxygen demand (BOD) of <25 mg/l (if the treatment plant was installed after 1/1/2010) or <50 mg/l (if installed before this date). - Minimal residual chlorine concentration of 0.5 mg/l. - No visible floating solids or oil and grease. ❖ The project will also comply with industry best practices with regard to waste management, including: <ul style="list-style-type: none"> - Waste management will follow key principles: Avoidance of Waste Generation, adopting the Waste Management Hierarchy (reduce, reuse, recycle, recover, residue disposal), and use of Best Available Technology. - An inventory will be established of all the potential waste generated, clarifying its classification (hazardous, non-hazardous or inert) and quantity, as well as identifying the adequate treatment and disposal methods. - Waste collection and temporary storage shall be designed to minimise the risk of escape to the environment (for example by particulates, infiltration, runoff or odours). - On-site waste storage should be limited in time and volume. - Dedicated, clearly labelled, containers (bins, skips, etc.) will be provided in quantities adapted to anticipated waste streams and removal frequency.
W2			<ul style="list-style-type: none"> • Implement a waste management system that addresses all wastes generated at the various sites, shore-based and marine. This should include: <ul style="list-style-type: none"> ➢ Separation of wastes at source; ➢ Recycling and re-use of wastes where possible; ➢ Treatment of wastes at source (maceration of food wastes, compaction, incineration, treatment of sewage and oily water separation).
W3			<ul style="list-style-type: none"> • Segregate, classify and store all hazardous waste in suitable receptacles on board in order to ensure the safe containment and transportation of waste • Dispose of hazardous waste at a facility that is appropriately licensed and accredited.
W4			<ul style="list-style-type: none"> • Initiate a waste minimisation system.
W5			<ul style="list-style-type: none"> • No disposal of general waste overboard.
W6			<ul style="list-style-type: none"> • Ensure on-board solid waste storage is secure.
W7			<ul style="list-style-type: none"> • Incinerate (non-hazardous) or transport to a licensed onshore waste management facility for disposal/recycling. Retain waste receipts.



No.	Activities / equipment	Aspect / potential impact	Mitigation and Management actions
W8			<ul style="list-style-type: none"> Prohibit operational discharges when transiting through the MPAs and EBSAs during transit to and from the survey area.
W9			<ul style="list-style-type: none"> Implement an awareness programme that addresses reduced water usage and waste generation at the various sites, shore-based and marine.
W10			<ul style="list-style-type: none"> Use drip trays to collect run-off from equipment that is not contained within a bunded area and route contents to the closed drainage system.
W11			<ul style="list-style-type: none"> Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc.
W12			<ul style="list-style-type: none"> Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages.



TABLE 10: MANAGEMENT AND MITIGATION ACTIONS: UNPLANNED EVENTS

No.	Activities / equipment	Aspect / Potential Impact	Mitigation and Management actions
U1	<ul style="list-style-type: none"> Operation of survey vessels Seismic acquisition 	<ul style="list-style-type: none"> Faunal Strikes with Project Vessels and Equipment Collision with or entanglement in towed seismic apparatus. 	Project Controls <ul style="list-style-type: none"> The operator will ensure that the proposed seismic survey is undertaken in a manner consistent with good international industry practice and Best Available Techniques.
U2			<ul style="list-style-type: none"> When in transit, the vessel operators should keep a constant watch for marine mammals and turtles in the path of the vessel.
U3			<ul style="list-style-type: none"> Keep watch for marine mammals behind the vessel when tension is lost on the towed equipment and either retrieve or regain tension on towed gear as rapidly as possible.
U4			<ul style="list-style-type: none"> Should a cetacean become entangled in towed gear, contact the MFMR to provide verbal specialist assistance in releasing entangled animals where necessary.
U5			<ul style="list-style-type: none"> Ensure that 'turtle-friendly' tail buoys are used by the survey contractor or that existing tail buoys are fitted with either exclusion or deflector 'turtle guards'.
U6			<ul style="list-style-type: none"> Ensure vessel transit speed between the survey area and port is a maximum of 12 knots (22 km/hr), except in the MPAs where it is reduced further to 10 knots (18 km/hr).
U7			<ul style="list-style-type: none"> Report any collisions with large whales to the International Whaling Commission (IWC) database, which has been shown to be a valuable tool for identifying the species most affected, vessels involved in collisions, and correlations between vessel speed and collision risk.
U8			Monitoring requirements <ul style="list-style-type: none"> Should a collision with a large whale occur, the event must be reported to the IWC database, which has been shown to be a valuable tool for identifying the species most affected, vessels involved in collisions, and correlations between vessel speed and collision risk.
U9	<ul style="list-style-type: none"> Operation of survey vessels Vessel transfer 	<ul style="list-style-type: none"> Impacts on benthic and pelagic fauna due to accidental loss of equipment to the seabed or the water column Loss of Equipment to Sea impacting the Fishing Industry 	Project Controls <ul style="list-style-type: none"> The seismic contractor will ensure that the proposed seismic survey is undertaken in a manner consistent with good international industry practice and Best Available Techniques.
U10			<ul style="list-style-type: none"> Ensuring that loads are lifted using the correct lifting procedure and within the maximum lifting capacity of crane system.
U11			<ul style="list-style-type: none"> Minimise the lifting path between vessels.
U12			<ul style="list-style-type: none"> Undertake frequent checks to ensure items and equipment are stored and secured safely on board each vessel.
U13			<ul style="list-style-type: none"> In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations. Establishing a hazards database listing the type of gear left on the seabed and/or in PEL 83 with the dates of abandonment/loss and locations, and where applicable, the dates of retrieval.



No.	Activities / equipment	Aspect / Potential Impact	Mitigation and Management actions
U14			<ul style="list-style-type: none"> Notify Ministry of Works and Transport (Directorate of Maritime Affairs) and SANHO of any hazards left on the seabed or floating in the water column, and request that they send out a Notice to Mariners with this information.
U15			<ul style="list-style-type: none"> Establish a functional grievance mechanism that allows stakeholders to register specific grievances related to operations, by ensuring they are informed about the process and that resources are mobilised to manage the resolution of all grievances, in accordance with the Grievance Management procedure.
U16	<ul style="list-style-type: none"> Loss of fuel from vessel accident Bunkering of fuel 	<ul style="list-style-type: none"> Impacts of an operational spill or vessel collision on marine fauna Safety exclusion zone – impact on Fishing industry 	<p>Project Controls</p> <ul style="list-style-type: none"> ❖ Compliance with COLREGS (the Convention dealing with safety at sea, particularly to reduce the risk of collisions at sea) and SOLAS (the Convention ensuring that vessels comply with minimum safety standards). ❖ The operator will ensure that the proposed seismic survey is undertaken in a manner consistent with good international industry practice and Best Available Techniques. The purpose of the Operator’s performance standards is to reduce the risk of pollution and oil spills for projects to As Low As Reasonably Practicable (ALARP). The objectives of the Operator’s policies and procedures are to: <ul style="list-style-type: none"> - Apply the hazard management process; - Careful HSSE management by all parties; - Design and install equipment and/or implement Procedures to reduce the impact of discharges to the environment; - Assess the Maritime Safety Risks and put controls in place to manage these risks to ALARP; - Establish and maintain procedures for managing the risk of maritime operations that comply with the Operator’s Maritime Safety Requirements for Design, Engineering and Operation. ❖ Escort vessels with appropriate radar and communications will be used during the survey operation to warn vessels that are in danger of breaching the safety/exclusion zone. ❖ Regulation 37 of MARPOL Annex I will be applied, which requires that all ships of 400 gross tonnage and above carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). The purpose of a SOPEP is to assist personnel in dealing with unexpected discharge of oil, to set in motion the necessary actions to stop or minimise the discharge, and to mitigate its effects on the marine environment. ❖ As standard practice, an Emergency Response Plan (ERP) / Evacuation Plan will be prepared and put in place. A Medical Evacuation Plan (Medevac Plan) will form part of the ERP. ❖ Project vessels will be equipped with appropriate spill containment and clean-up equipment, e.g. booms, dispersants and absorbent materials. All relevant vessel crews will be trained in spill clean-up equipment use and routine spill clean-up exercises.



No.	Activities / equipment	Aspect / Potential Impact	Mitigation and Management actions
U17			<ul style="list-style-type: none"> • Ensure personnel are adequately trained in both accident prevention and immediate response, and re-sources are available on each vessel.
U18			<ul style="list-style-type: none"> • Use low toxicity dispersants cautiously and only with the permission of the MFMR.
U19			<ul style="list-style-type: none"> • As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill.
U20			<ul style="list-style-type: none"> • Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station.
U21			<ul style="list-style-type: none"> • Ensure offshore bunkering is not undertake in the following circumstances: <ul style="list-style-type: none"> ➢ Wind force and sea state conditions of ≥ 6 on the Beaufort Wind Scale; ➢ During any workboat or mobilisation boat operations; ➢ During helicopter operations; ➢ During the transfer of in-sea equipment; and ➢ At night or times of low visibility.



TABLE 11: MANAGEMENT AND MITIGATION ACTIONS: DEMOBILISATION PHASE

No.	Activities	Aspect / Potential Impact	Mitigation and Management actions
D1	<ul style="list-style-type: none"> Survey vessels leave survey area and transit to port or next destination 	Impact of Vessel and Helicopter Noise on Marine Fauna	<ul style="list-style-type: none"> Refer to Table 6 (Management and mitigation measures: Vessels, aircraft and ROV operations) Ensure that all deployed equipment is retrieved. Dispose all waste retained onboard at a licensed waste site using a licensed waste disposal contractor.
D2		Impact of Survey Vessel Lighting on Pelagic Fauna	
D3		Impacts of Waste Discharges to Sea	
D4		Waste management	
D5	<ul style="list-style-type: none"> Ship strikes during transit to port or next destination 	Faunal Strikes with Project Vessels and Equipment	<ul style="list-style-type: none"> Refer to Table 10 (Management and mitigation measures: Unplanned events) Inform all key stakeholders (refer to Row 2.1) that the vessels are off location.
D6	<ul style="list-style-type: none"> Loss of fuel from vessel accident 	Impacts of an operational spill or vessel collision on marine fauna	

9.2 Best Environmental Practice

The Best Environmental Practice (BEP) for seismic surveys, include the following:

- “Baseline studies of biological abundance and distribution of sensitive species, including turtles, fish, and invertebrates, must occur at least a year, preferably two, in advance of seismic surveys. These must be of sufficient quality and statistical power to meaningfully mitigate impacts”. The proposed monitoring technology includes fixed acoustic detectors (buoys, bottom recorders, etc.) or mobile gliders, which can be used both for vocal marine mammals and fish species.
- Monitoring should be statistically powerful enough to detect subtle impacts. BDA (Before During After) or BACI (Before After Control Impact) studies to examine impacts must contain power analyses to show whether possible impacts would be detectable or not. Impact and biological baseline studies should include fish, turtles, and invertebrates. All biological and impact data collected for mitigation should be publicly available.
- Results of sound propagation modelling studies should be verified in the field.
- Seismic surveys should not be allowed to proceed without some proof of efficacy of the mitigation measures used and for all sensitive species.

In striving to achieve these BEPs in southern Africa, it is recommended that seismic operators and holders of hydrocarbon exploration licences give consideration to contributing to a centrally managed research fund. Collaboration across the industry to collectively fund pro-active research would provide opportunity for the development and implementation of a structured and experimentally sound acoustic study to quantitatively inform the authorities and stakeholders of acoustic impacts to the various faunal groups in southern African waters.

10. References

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ALL REFERENCES MADE IN THE TWO SPECIALIST REPORTS, REFERRED TO IN THIS REPORT, ARE NOT ALL REPEATED IN THE RELEVANT SECTIONS (OF THIS REPORT) AND CAN BE VIEWED IN THESE TWO RESPECTIVE REPORTS (SEE APPENDICES F AND G OF THE EIA SCOPING (INCLUDING IMPACT ASSESSMENT) REPORT – NAMISUN, 2024)