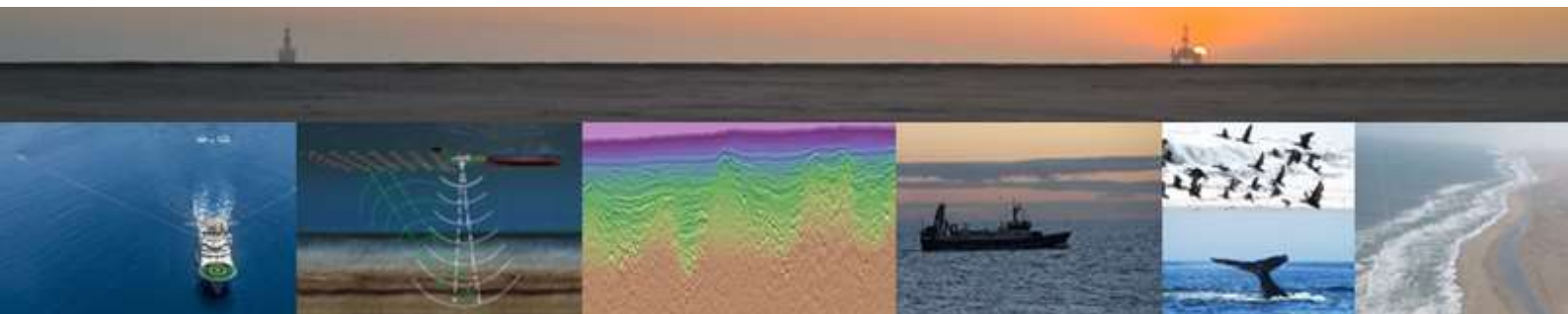


Searcher Geodata UK Ltd

Final Updated Environmental Management Plan (EMP) Report to Support the Application for Amendment of the Environmental Clearance Certificate (ECC) APP No. 3794 for the Proposed Multiclient or Proprietary 2D/3D Seismic Survey over the Remainder of the Entire Petroleum Exploration License (PEL) No. 0085, Block 2914A Area and the Existing Area of Interest (AOI) covering Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712A, 2712B, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, 2914A, 2915, 2814A, and 2814B (Excluding Tripp Seamount), Orange Basin,
OFFSHORE SOUTHERN NAMIBIA



July 2023

Unit 6, Albion House,
High Street, Woking, GU21 6BG,
UNITED KINGDOM

SUMMARY INFORMATION

Proponent

Searcher Geodata UK Ltd

Project Title / Subject on the ECC

Proposed Multiclient or Proprietary 2D/3D Seismic Survey over the Remainder of the Petroleum Exploration License (PEL) No. 0085, Block 2914A Area and the existing Area of Interest (AOI) covering Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712A, 2712B, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, 2914A, 2915, 2814A, and 2814B (Excluding Tripp Seamount),
Orange Basin, Offshore Southern Namibia

MEFT ECC Reference Application No.

APP-003794

Petroleum Exploration Activities

Multiclient or Proprietary 2D/3D Seismic Survey

Location Survey Area of Interest

Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712A, 2712B, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, 2914A (Whole Block), 2915, and Kudu Gas Field Blocks 2814A, and 2814B (Excluding Tripp Seamount), Orange Basin,
Southern Offshore, Namibia

National Regulatory Framework

Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations No. 30 of 2012

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CITATION: *Risk-Based Solutions (RBS), 2023. Updated Environmental Management Plan (EMP) Report to Support the Application for Amendment of the Environmental Clearance Certificate (ECC) APP No. 3794 for the Proposed Multiclient or Proprietary 2D/3D Seismic Survey over the Remainder of the Petroleum Exploration License (PEL) No. 0085, Block 2914A Area and the existing Area of Interest (AOI) covering Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712A, 2712B, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, 2914A, 2915, 2814A, and 2814B (Excluding Tripp Seamount), Orange Basin, Offshore Southern Namibia.*

**DR SINDILA MWIYA, TEAM LEADER / ENVIRONMENTAL ASSESSMENT PRACTITIONER
(EAP), PERMITTING / DE-RISKING ADVISORS / ENVIRONMENTAL CONSULTANTS
DECLARATION**

I, Dr Sindila Mwiya, working for Risk-Based Solutions (RBS) CC, the Permitting / De-Risking Advisors / Environmental Consultants and being the Environmental Assessment process Team Leader and EAP for the preparation of this Updated Environmental Management Plan (EMP) Report to Support the Application for Amendment of the Environmental Clearance Certificate (ECC) for the Proposed Multiclient or Proprietary 2D/3D Seismic Survey over the Remainder of the Petroleum Exploration License (PEL) No. 0085, Block 2914A Area and the existing Area of Interest (AOI) covering Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712A, 2712B, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, 2914A, 2915, 2814A, and 2814B (Excluding Tripp Seamount), Orange Basin, Offshore Southern Namibia by Searcher Geodata UK Ltd (the Proponent), by hereby declares that:

1. This updated EMP Report has been prepared in accordance with the provisions of the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), the Environmental Management Act, 2007, (Act No. 7 of 2007), all other applicable national laws, and Regulations and Good International Industry Practice (GIIP).
2. I am highly qualified and experienced in environmental assessment and management, marine seismic survey operations, offshore oil and gas exploration and production operations and hold a PhD with research interests, academic training, and technical knowledge in Engineering Geology, Geotechnical, Geoenvironmental and Environmental Engineering, Artificial Intelligence and Knowledge-Based Systems with special focus on EIAs, EMPs, EMSs, SEAs, SEMP and ESG with respect to subsurface resources (minerals, petroleum, water) and energy in arid and semiarid environments.
3. I am an Engineering and Environmental Geologist with extensive technical knowledge and experience in conducting environmental assessments, management, and monitoring for offshore and onshore subsurface resources (petroleum, solid state minerals, water, geothermal), and have undertaken more than 200 projects since 2004, including more than sixty (60) oil and gas exploration and production related environmental assessments, management, and monitoring projects in different parts of the World.
4. I have performed the work relating to this project in an objective manner, even if the outcomes will result in views or Records of Decision that may not be favourable to the Stakeholders or the Proponent, and.
5. I am an independent consultant not related to the Proponent, I co-own and operate an independent company (Risk-Based Solutions CC) which is not related to the Proponent. Except for the fees payable for professional consulting services rendered to the Proponent, I have no shares, interests, or involvement in the license, financial or other affairs or business or operational decisions of either the Proponent or the decision-making structures of Government



.....
Dr Sindila MWIYA
Environmental Assessment Practitioners (EAPs)\Team Leader
Permitting / De-Risking Advisors / Environmental Consultants
RISK-BASED SOLUTIONS (RBS) CC

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NONTECHNICAL SUMMARY

Searcher Geodata UK Ltd (the “**Proponent**”) has been granted an Environmental Clearance Certificate (ECC) APP No. 3794 by the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT) to conduct Multiclient or Proprietary 2D/3D seismic survey operations totalling approximately 77270km² over Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712B, 2712A, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, part of 2914A, and 2915, situated in the Orange Basin, offshore, Southern Namibia. The current ECC Area of Interest (AOI) excludes the Tripp Seamount and a 255 km² semicircle area of the Petroleum Exploration License (PEL) No. 0085, covering Block 2914A.

The current ECC APP No. 3794, was granted on the 8th September 2022 and will expire on 8th September 2025 (Annex 1). The Proponent is hereby proposing to amend the current ECC to include the initially excluded 255 km² semicircle area of the PEL No. 0085, Block 2914A. PEL 0085 covering Block 2914A is held and operated by Rhino Resources and Partners, and the license holders intend to acquire 3D seismic survey data sets over the 255 km² semicircle area using the current ECC of the Proponent (Searcher Geodata UK Ltd).

The proposed Multiclient or Proprietary 2D/3D seismic survey operations are listed activities in Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and cannot be undertaken without an Environmental Clearance Certificate (“ECC”). Searcher Geodata UK Ltd is required to have undertaken environmental assessment comprising updated Environmental Impact Assessment (“EIA”) and this updated Environmental Management Plan (“EMP”) to support the application for amendment of the current ECC.

In fulfilment of this updated Environmental requirements, Searcher Geodata UK Ltd., appointed Risk-Based Solutions (RBS) CC as the Environmental Consultant to prepare all the required updated reports and apply for the amended ECC to include a 255 km² semicircle remainder area of the Petroleum Exploration License (PEL) No. 0085, covering Block 2914A inclusive of the operational area for the full fold data during vessel run-in and run-outs. The water depth of the existing AOI covered by the current ECC falls within the Photic (ca-200m) and Abyssal Zones with steep to very steep seafloor profile (ca-4000 m). The water depth over the proposed additional area to be added to the current ECC average ca-1000 m.

This Updated Environmental Management Plan (“**EMP**”) Report is prepared based on the findings and recommendations of the impact assessment results presented in the Updated Environmental Impact Assessment (“**EIA**”) Report. This Updated EMP Report provides key mitigations measures with respect to the significant impacts that the proposed Multiclient or Proprietary 2D/3D seismic survey activities are likely to have on the receiving marine environments (physical, biological, socioeconomic and ecosystem). The mitigation measures cover the entire outlined project area in the northern offshore Namibia and the immediate surrounding areas with respect to routine and non-routine or accidental events / activities during the mobilisation and pre-survey preparation, actual survey, and post survey / demobilisation operations project stages.

The environmental assessment process inclusive of the preparation of the Updated EIA and this Updated EMP Reports has been undertaken in accordance with the provisions of Petroleum (Exploration and Production) Act 1991 (Act 2 of 1991) and associated amendments, the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and the Environmental Management Act, 2007 as well as international best practices. Key project alternatives as described in the EIA Report have been considered and include: Project location and the no-action alternative, other marine users and potential user conflicts, influence on the ecosystem function, services, use values and non-use or passive.

Detailed mitigation measures and monitoring plan have been developed and are presented in this Updated EMP Report for implementation and monitoring by the Proponent (Searcher Geodata UK Ltd). Searcher Geodata UK Ltd takes the environmental sensitivities of the offshore marine habitats seriously and integrates both environmental and social issues into the corporate governance of the company during the appraising and undertaking of marine seismic survey operations globally. The mitigation measures presented in this report are modelled around two main concepts and these are: The industry

and Searcher Geodata UK Ltd best practices and local phenomena unique to the area of exploration (offshore Namibia).

In addition to the company's strict compliance with all the relevant national regulations and standards of the country where the company operates, Searcher Geodata UK Ltd always considers international standards of protection developed through the Joint Nature Conservation Committee (JNCC) "guidelines for minimising the risk of injury and disturbance to marine mammals from seismic survey", and the International Association of Geophysical Contractors (IAGC)'s "recommended mitigation measures for cetaceans during geophysical operations". These international best industry practices have proved to be effective in several different countries like Canada, Australia, Norway, and the United States. These guidelines have been developed based on noise attenuation modelling, international experiences during seismic acquisition and a cautious approach to the disturbance of marine mammals from seismic survey.

Searcher Geodata UK Ltd has also tailored mitigation measures by merging the company's standard measures with local species events like turtle nesting windows, whale migration corridors, key fish spawning areas, key fishing seasons, breeding and feeding areas as well as several unique marine ecosystems of local area and in this case, the Orange Basin, offshore, southern Namibia. The overall EMP Framework and mitigation measures as presented in this report are tailored-made to Namibia's southern offshore environment.

The following is the summary of basis for the key mitigation measures that are presented in this Updated EMP Report and to be implemented by Searcher Geodata UK Ltd with respect to the proposed 2D/3D seismic survey in the Orange Basin, offshore, southern Namibia:

- 1) Seasonality, timing, and establishment of 500m exclusion zone around the vessels.
- 2) Use of Marine Mammal Observer (MMO).
- 3) Use of Fisheries Liaison Officers (FLOs).
- 4) Use of Passive Acoustic Monitoring (PAM) Technology.
- 5) Soft starts' and 'pre-firing' observations.
- 6) Termination of firing in the 500m exclusion zone with respect to marine mammals.
- 7) The use of Turtle friendly tail buoys.
- 8) The use of support vessel and fisheries liaison officer.
- 9) Pollution management.
- 10) Spill management.
- 11) Compliance to all MARPOL (marine pollution) regulations and waste disposal procedures, and.
- 12) Adoption of the precautionary principles in the absence of any specific mitigation measures being provide in this EMP, the Proponent shall always adopt the precautionary approach.

The Updated EIA Report also provides further mitigatory measures included in this Updated EMP Report. It is hereby recommended that the Proponent (Searcher Geodata UK Ltd) be issued with an Environmental Clearance Certificate (ECC) for the proposed Multiclient or Proprietary 2D/3D seismic survey operations in the Orange Basin, offshore, southcentral Namibia. Good communication and pre-notification practices will limit unnecessary disruption and delays to other marine users. Due consideration should be given to the presence of all fishing vessels while running survey lines and communication channels should kept open to avoid close encounters.

Additionally, support vessels moving to/from Walvis Bay and Lüderitz Bay Ports may encounter commercial fishing vessels of other fishing sectors and potentially cause disruption, but on a very short-term. Adherence to prescribed maritime communication procedures will limit any likely encounters. In the interests of amicable co-use of the BCLME resources, and also for marine safety, the following procedures should mitigate any negative interactions with fisheries and other marine users (Table 1):

- 1) The Proponent shall formally notify the Petroleum Commissioner (MME) of the survey, stating the proposed location of the survey lines, the commencement date and the anticipated duration.
- 2) This information should also be relayed to all affected parties (Directorate of Maritime Affairs, Namibian Ports Authority, South African HydroSAN and the MFMR Monitoring, Control and Surveillance Unit - Walvis Bay).
- 3) In the interest of good relations, direct communication and facilitation with any vessels in the area at the time of the survey is important. Openness to the possibilities of adjusting survey lines and trawling location to cause minimum disruption of operations to both parties.
- 4) Good communications through MFMR to the fisheries (i.e., Association of Namibian Fishing Industries and the Namibian Large Pelagic and Hake Longlining Association) with pre-notification of survey activities and vessel paths (navigational co-ordinates of the survey area, timing and duration of proposed activities).
- 5) Notices to Mariners should be distributed timeously to fishing companies and directly to fishing vessels, stating the following:
 - a) The co-ordinates of the proposed survey lines.
 - b) The proposed survey timeframes and day-to-day location of the seismic vessel.
 - c) The proposed safe operational limits of the survey vessel, and.
 - d) Movements of support vessels.
- 6) Radio Navigation Warnings and Notices to Mariners should be distributed via Navigational Telex (Navtext) and Lüderitz radio for the duration of the survey.
- 7) It is recommended that updates of the scheduled weekly survey plan be circulated to the operators of affected fishing vessels on a daily basis and notify trawlers when the survey may move into trawling areas.
- 8) Establish communications with the known long-line fishers if drifting buoys (with radar responders) are sighted, and.
- 9) An experienced Fisheries Liaison Officer (FLO) should be deployed on board the survey vessel to initiate and facilitate radio communications with maritime vessels in the vicinity of the survey area. The FLO should report daily on vessel activity, ramp up procedures, environmental matters, fauna sightings, and respond and advise on action to be taken in the event of encountering fishing gear.

November to April is the most favourable weather window to undertake the proposed 2D/3D seismic survey operation especially in the deeper waters where there are less likely negative influences / overlaps of the proposed survey activities / area on the receiving sensitivity marine environments such as the fish, fisheries, and marine mammals (Table 1). Within the deep-water portion of survey area, operations may be undertaken without major influences from the other marine users except the for the poor winter weather between June-October (Table 1).

All environmental liabilities rest with Searcher Geodata UK Ltd (the Proponent) and thus the company is ultimately responsible for the EMP implementation, environmental performance monitoring and

reporting thereof to the Environmental Commissioner in the Ministry of Environment, Forestry, and Tourism as may be stipulated in the ECC to be issued.

A “close out” monitoring report shall be prepared and submitted to the Government (Ministry of Mines and Energy, (MME), Ministry of Environment, Forestry, and Tourism (MEFT), Ministry of Fisheries and Marine Recourse (MFMR) and the Ministry of Work and Transport (MWT), Department of Maritimes Affairs) after completing each event of the proposed 2D/3D seismic survey operations.

Table 1: Log frame for evaluating the window of opportunity for undertaking the proposed 2D/3D seismic survey activities with respect to other marine activities around AOI covered by the current ECC and inclusive of the proposed additional 255 km² area covering Block 2814A.

MONTH OF YEAR (NORTHERN, CENTRAL AND SOUTHERN OFFSHORE NAMIBIA)	KEY FISHING SEASON (KEY SPECIES)	MAIN SPAWNING ACTIVITIES (KEY SPECIES)	KEY CETACEOUS PRESENCES / MIGRATORY TIMES	OTHER KEY USERS	WEATHER WINDOW	COMMENTS ON OFFSHORE SEISMIC SURVEY OPPORTUNITY WINDOW
January	Pole and line Tuna, Hake Longline, Hake Trawl, Surface Longline, Monk, Rock Lobster	Hake Stock Survey (Ministry of Fisheries and Marine Resources)		❖ Marine Diamond Exploration and Mining in shallow water less than -200m. ❖ The Survey area covers an area which is a busy international shipping lane	Good	Impact – Hake Stock Survey (less than-1000m), Tuna migrating (Trip Seamount)
February	Pole and line Tuna, Hake Longline, Hake Trawl, Surface Longline, Monk, Rock Lobster	Hake Stock Survey (Ministry of Fisheries and Marine Resources)				Impact – Hake Stock Survey (less than-1000m), Tuna migrating (Trip Seamount)
March	Pole and line Tuna, Hake Longline, Hake Trawl, Surface Longline, Monk, Rock Lobster					Impact – Tuna migrating (Trip Seamount)
April	Pole and line Tuna, Hake Longline, Hake Trawl, Surface Longline, Monk, Rock Lobster				Moderate Mixed	Impact – Tuna migrating (Trip Seamount)
May	Hake Trawl, Monk					No Impacts
June	Snoek, Hake Trawl, Monk	Snoek			Very Poor	No Impacts
July	Hake Trawl, Monk	Snoek, Orange Roughy, Southern Right Whales	Southern Right Whales			Impact – Orange Roughy spawning (shallow waters), Snoek migrating in deepwater
August	Hake Trawl, Monk	Orange Roughy, Right whales	Southern Right Whales			Impact – Orange Roughy aggregated spawning, Snoek migrating in deepwater
September	Surface Longline, Hake Trawl, Monk	Right whales	Southern Right Whales – Crucial month		Poor	Impact – Snoek migrating in deepwater
October	Pole and line Tuna, Surface Longline, Monk	Right whales, Rock Lobster Stock Survey (Ministry of Fisheries and Marine Resources)	Southern Right Whales – Crucial month		Moderate Mixed	Impact – Shallow water rock Lobster Stock Survey, Tuna migrating (Trip Seamount) SURVEY PLANNED TO START 2023
November	Pole and line Tuna, Hake Longline, Hake Trawl, Surface Longline, Monk, Rock Lobster	Right whales, Rock Lobster, Monk Stock Survey ((Ministry of Fisheries and Marine Resources)	Southern Right Whales		Good	Impact – Hake Stock Survey (less than-1000m), Tuna migrating (Trip Seamount). SURVEY PLANNED TO START 2023
December	Pole and line Tuna, Hake Longline, Hake Trawl, Surface Longline, Monk, Rock Lobster					Impact – Tuna migrating (Trip Seamount)

1. INTRODUCTION

1.1 General Overview

Searcher Geodata UK Ltd (the “**Proponent**”) is proposing to amend the current ECC APP No. 3794, covering an area of interest (AOI) falling in the Orange Basin, offshore southern Namibia comprising Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712B, 2712A, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, part of 2914A, and 2915, to include the initially excluded 255 km² semicircle area of the PEL No. 0085, Block 2914A (Figs. 1.1-1.5).

The amended ECC will allow the Proponent to acquire 3D seismic survey data sets over the additional 255 km² semicircle area of PEL 0084 covering Block 2914A. The Tripp Seamount is excluded from the proposed additional area which is situated 15 km to the south of the AOI (Figs. 1.1-1.5). The proposed additional survey area is relatively small covering a 255 km² semicircle area portion of the PEL 0084, Block 2914A and can be surveyed over a very short period of time and the proposed short-lived operations will not significantly affect the other marine users such as the fisheries.

The proposed Multiclient (MC) 3D seismic survey operations are listed activities in Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and cannot be undertaken without an Environmental Clearance Certificate (“ECC”). Searcher Geodata UK Ltd is required to have undertaken environmental assessment comprising updated Environmental Impact Assessment (“EIA”) and updated Environmental Management Plan (“EMP”) to support the application for amendment of the current ECC.

In fulfilment of this updated Environmental requirements, Searcher Geodata UK Ltd., has appointed Risk-Based Solutions (RBS) CC as the Environmental Consultant to prepare all the required updated reports and apply for the amended ECC to include the entire PEL 0085 covering Block 2914A.

The proposed seismic survey operations over the outlined AOI will be undertaken over multiple annual survey events subject to the ECC and other permits conditions, expression of interest and prefunding availability by the PEL holders covered by the AOI, favourable weather and other receiving environmental components window between November to April.

The duration of each 3D or 2D seismic survey event will be variable but averaging ninety (90) days at sea. The activities associated with proposed project have been characterised and grouped as follows:

- (i) Routine and physical presence of the survey and support vessels in the area including the Ports of Walvis Bay or Lüderitz, physical presence of survey and support vessels, Physical disturbance of the survey operations., sound generation from proposed 2D or 3D seismic survey airguns including sound of the survey and support vessels engines, increased light levels from routine vessels operations, atmospheric emissions from routine operations of the survey and support vessels, and planned marine discharges, and.
- (ii) Accidental events covering: Unplanned marine discharges (e.g., minor spillages of fuel, lubricants / maintenance oils, loss of vessel, equipment or material, collision with marine wildlife during vessel operations, and, loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or another major event.

The following is the summary of the proposed project implementation stages as assessed in this Environmental Impact Assessment (EIA) Report with mitigation measures provided in the Environmental Management Plan (EMP) Report:

- (i) Mobilisation and pre-survey preparations.
- (ii) Actual survey operations.
- (iii) Post survey operations, and.

- (iv) Non-routine or accidental events.

Logistic support will be provided through the existing facilities in the Ports of Walvis Bay or Lüderitz for supplies, fuelling and crew changeover as may be required and if required. No helicopter crew transfer support is anticipated except in event of an emergency.

1.2 Searcher Geodata UK Ltd (Proponent)

Searcher is the largest privately owned Seismic survey company in the World, with its headquarters based in Perth, Australia (www.searcherseismic.com). The company has been providing high quality exploration data and leading-edge tech to the global exploration industries for the past seventeen (17) years. As a result of Searcher being privately owned, the company chooses the projects to work on and is committed to the countries and the people where the company operates.

The company has acquisition capabilities for seismic, coring, and airborne projects on a global scale. Searcher designs, manages, and markets MC geoscience data to the global energy and resource industries. In addition to extensive global geophysical and geological data libraries that include MC 2D and 3D seismic data, magnetics and gravity data, geochemical surveys, digital well databases and prospectivity studies.



REPUBLIC OF NAMIBIA
MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM
OFFICE OF THE ENVIRONMENTAL COMMISSIONER

ENVIRONMENTAL CLEARANCE CERTIFICATE
ISSUED

In accordance with Section 37(2) of the Environmental
Management Act (Act No. 7 of 2007)

TO

Searcher Geodata UK Limited
Unit 6, Albion House, High St, Woking GU21 6BG, United Kingdom

TO UNDERTAKE THE FOLLOWING LISTED ACTIVITY

Proposed Multiclient 3D Seismic Survey by Searcher Geodata UK Limited
over the Area of Interest (AOI) / Operational area covering Blocks 2614,
2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712A, 2712B, 2812B, 2813A,
2814B, 2814A, 2912, 2913B, 2914B, 2914A and 2915 and Kudu Gas Field
Blocks 2814A, and 2814B (Excluding Tripp Seamount) Orange Basin,
Offshore Southern Namibia (As Amended).

Issued on the date: 2022-09-08
Expires on this date: 2025-09-08



(See conditions printed over leaf)

This certificate is printed without erasures or alterations



Figure 1.1: Copy of the ECC APP No. 3794 granted to the Proponent and needed to be amended to include the 255 km² semicircle area portion of PEL 0084, Block 2914A, Orange Basin, offshore Namibia.

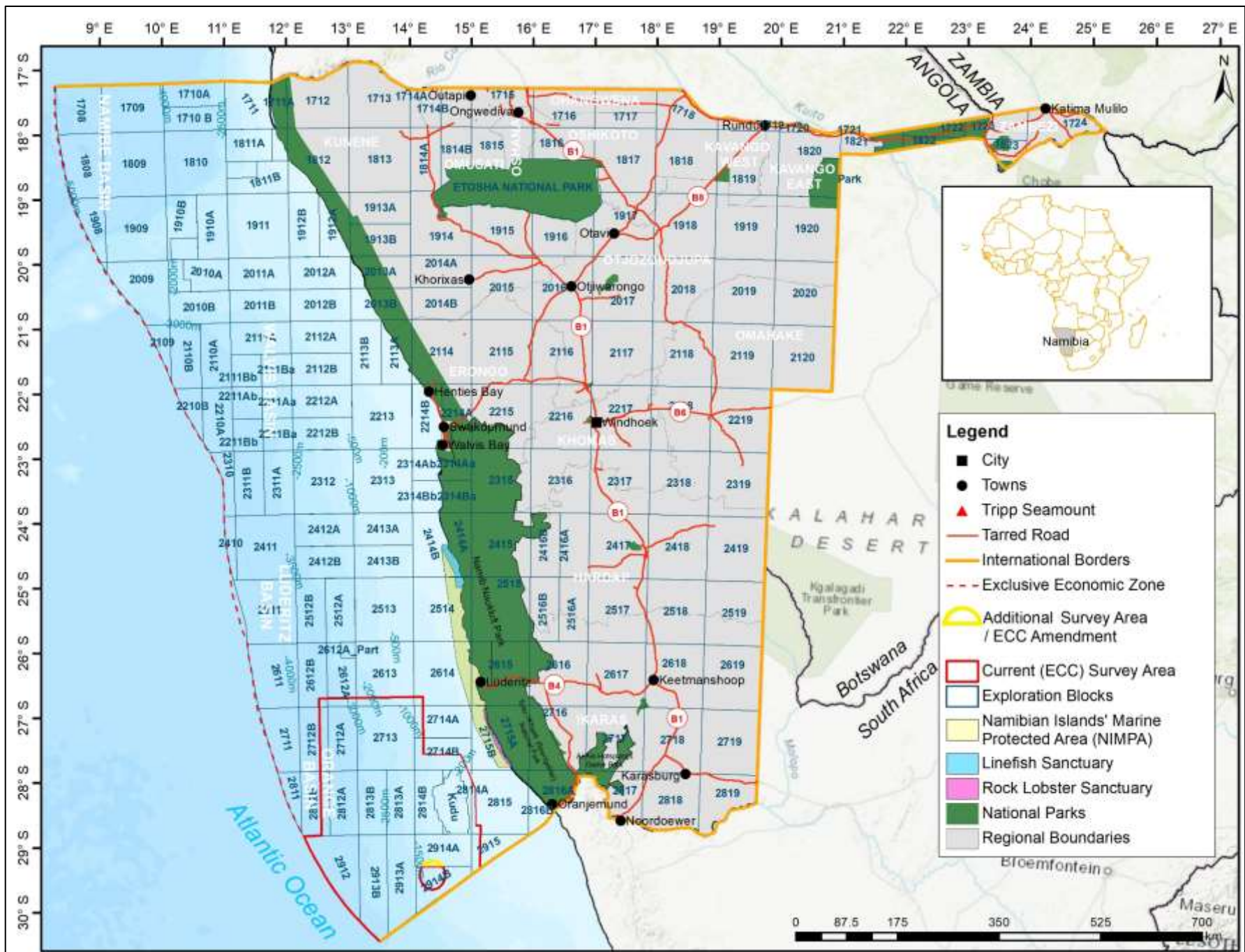


Figure 1.2: Regional location of the proposed Multiclient or Proprietary 2D/3D seismic survey coverage areas in the Orange Basin, southern Namibia inclusive of the 255 km² semicircle area portion of PEL 0084, Block 2914A additional survey area / ECC amendment.

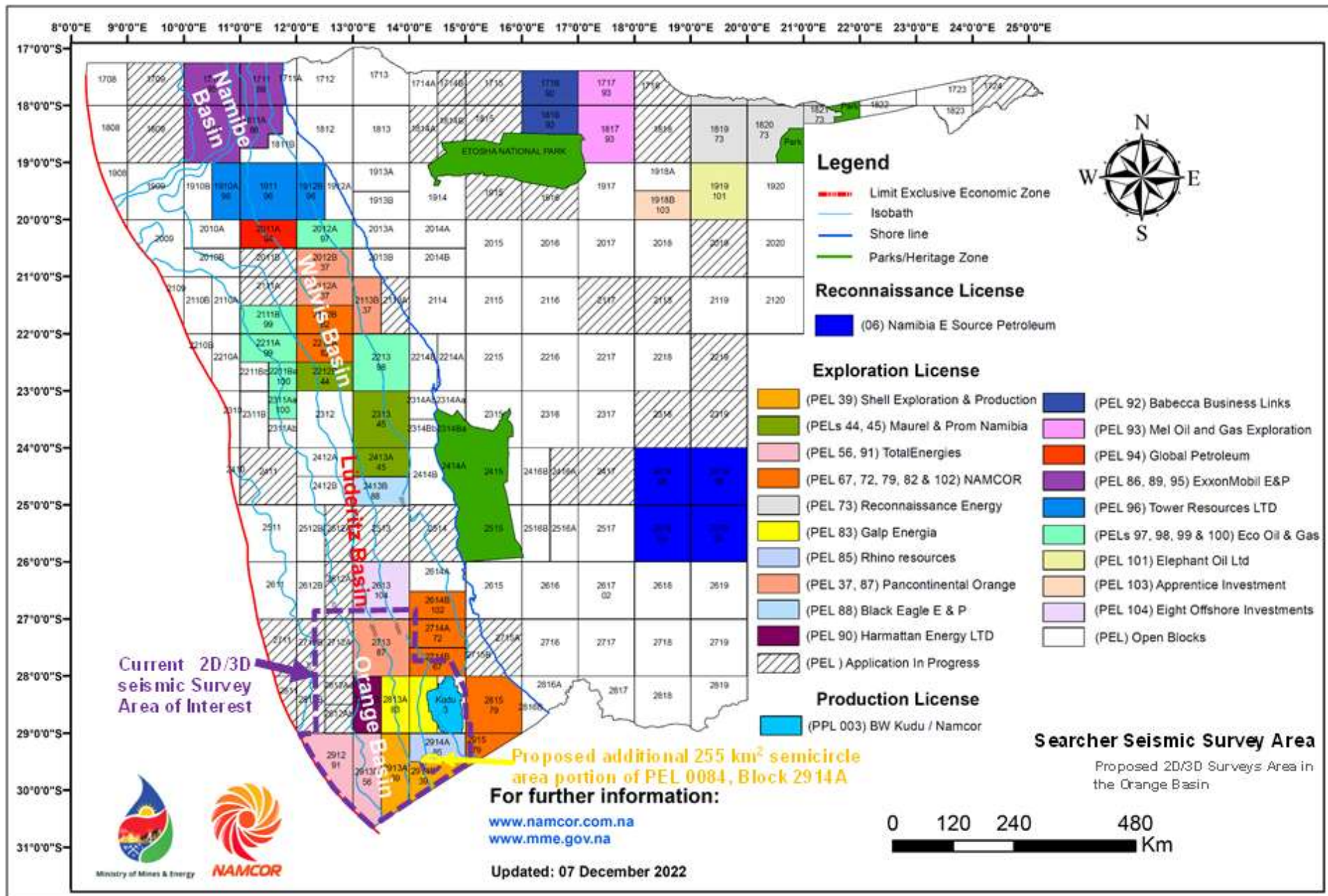


Figure 1.3: Hydrocarbon map of Namibia showing the current ECC proposed 2D/3D seismic survey area inclusive of the 255 km² semicircle area portion of PEL 0084, Block 2914A additional survey area / ECC amendment and excluding Tripp Seamount (Source: www.mme.gov.na).

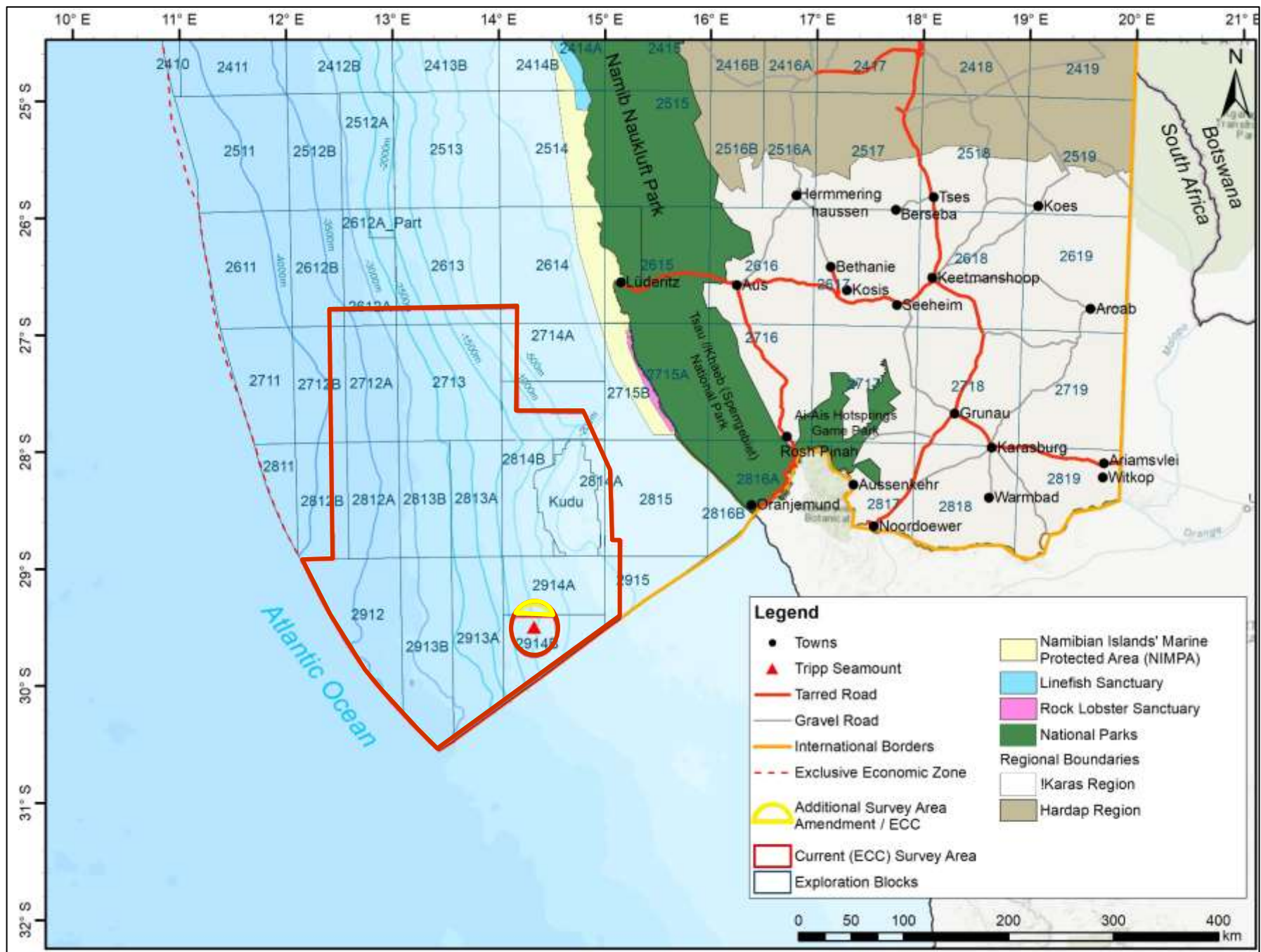


Figure 1.4: Detailed location of Searcher Geodata UK Ltd proposed Multiclient or Proprietary 2D/3D seismic survey area inclusive of the 255 km² area portion of PEL 0084, Block 2914A additional survey area / ECC amendment and excluding Tripp Seamount.

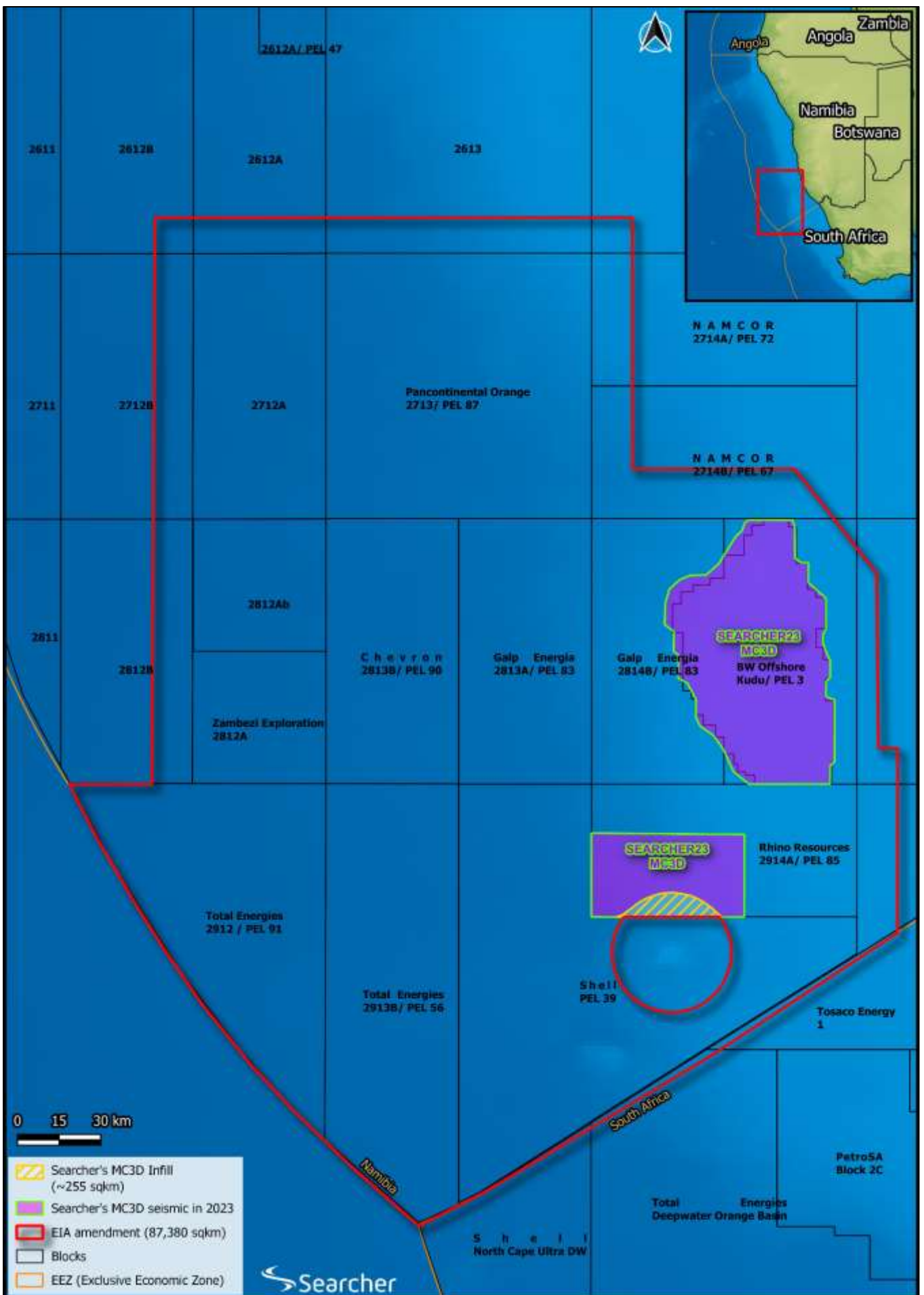


Figure 1.5: Detailed outline of the current ECC proposed 2D/3D seismic survey area by Searcher Geodata UK Ltd inclusive of the 255 km² semicircle area portion of PEL 0084, Block 2914A additional survey area / ECC amendment and excluding Tripp Seamount (Source: Searcher, 2023).

1.3 Need, Desirability, Scope and Permitting Process

1.3.1 Need, and Desirability

Although offshore seismic survey operations in Namibia began as far back as 1968, a lot more still need to be done to have a full understanding of the petroleum systems of the deep-water offshore Namibia (Figs. 1.6 and 1.7).

The datasets from the proposed 2D / 3D seismic survey by Searcher will provide critical insight into the subsurface geological evolution, offshore basin architecture, depositional, structural history and delineate potential drill-ready subsurface geological structures. The data sets to be acquired will:

- (i) Expand the overall offshore seismic survey data coverage for Namibia (Figs. 1.6 and 1.7), and.
- (ii) Enhance the interpretation contrast, confidence, and overall quality of the results over the anticipated subsurface structures within the AOI.

The results and data from the proposed survey are likely to increase the interest by multinational oil and gas companies in conducting oil and gas exploration activities in Namibia. The increase in exploration activities could lead to additional commercial discovery of economic petroleum reserves. Recent discovery of light oil by Total Energies Venus prospect in Petroleum Exploration License (PEL) 56 and Shell Upstream Namibia BV Graff-1 in PEL 39 are likely to propel Namibia into an oil and gas producing country in the next six (6) to ten (10) years (Fig. 1.8).

Although the proposed AOI may appear large, the actual areas to be surveyed are likely to be highly localised, limited and subject to the interest for seismic survey datasets by the Petroleum Exploration License (PEL) holders covered by the outlined AOI. Overall, the proposed 3D seismic survey can be classified as a small, short-term, local project aimed at supporting the development of fossil fuel opportunities offshore Namibia while at the same time will provide datasets that could support the development of other resources such as offshore wind energy, suitable industrial hydrogen sites, minerals resources and large-scale CCS facilities terrains. Namibia and indeed the global offshore continental shelves broadly represent the largest potential storage for Gigaton-scale Carbon Capture and Storage (CCS). CCS is a promising and great potential emission reductions strategy towards meeting globally commitments targets, national regulatory compliances, meeting corporate performance targets, participating in potential new CO₂ banking and markets systems and meeting overall Environment, Social and Governance (ESG) national and corporate pillars.

Extensive researches and monitoring continue to be undertaken on various aspects of CCS globally (Pernin, et., al., 2022, Rosa, L and Mazzotti, 2021, Page, et, al., 2020, Martin-Roberts, et al, 2020, Tomić,, et, al., 2018, and Capros, et, al., 2018). According to Pernin, et., al., 2022, at present there are less than 30 sites worldwide storing around 40 Mt of CO₂/year and additional Carbon Capture storage (CCS) sites are needed to achieve ambitious net carbon dioxide (CO₂) emissions goals. As illustrated in Fig. 1.9, seismic data to be collected offshore Namibia can also be used in the search for future CO₂ subsurface storage sites container and containment facilities that may prove viable as potential future CO₂ subsurface business banking system aligned to global Climate Change NetZero CO₂ Emissions Goals by 2025 and beyond.

CCS will not prevent CO₂ from being emitted but it will remove low-cost CO₂ being generated by heavy industries such as gas processing, steel and cement plants where separation and transportation system already exists. The existing infrastructure involved in heavy industries separation process generates very concentrated streams of CO₂ which is easy to capture, transport and store, thereby making the industrialised CCS systems achievable provided that the storage facilities exist within the local industrialised area. Seismic survey methods can greatly support the search for suitable onshore and offshore industrial zones / sites with suitable geology for storing industrial CO₂ (Pernin, et., al., 2022 and Fig. 1.9). Geophysics and indeed seismic survey can provide all the key geological information needed in CCS site selection, monitoring and verification of stored CO₂ in the reservoir and its capability of storing CO₂ (Fig. 1.9). Therefore, the expansion of the national marine seismic data coverage in Namibia, may open up future opportunities and create potential future industry and jobs opportunities within the area of CCS and international CO₂ trade.

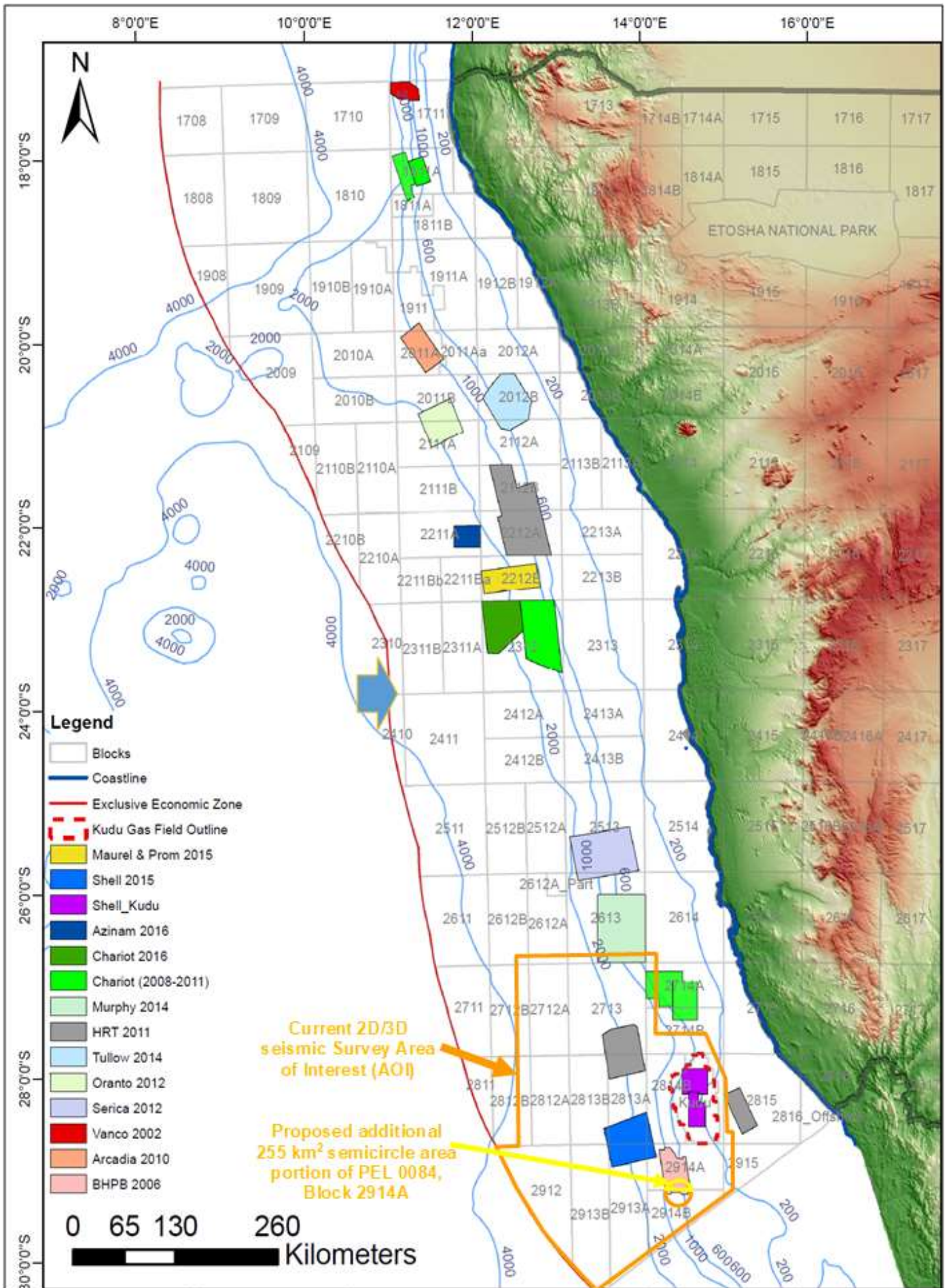


Figure 1.6: Overview of the 3D seismic survey database coverage of Namibia as of 2016 with respect the current ECC AOI and the proposed additional 255 km² semicircle area portion of PEL 0084, Block 2914A survey area / ECC amendment, excluding Tripp Seamount (Source: www.namcor.com.na).

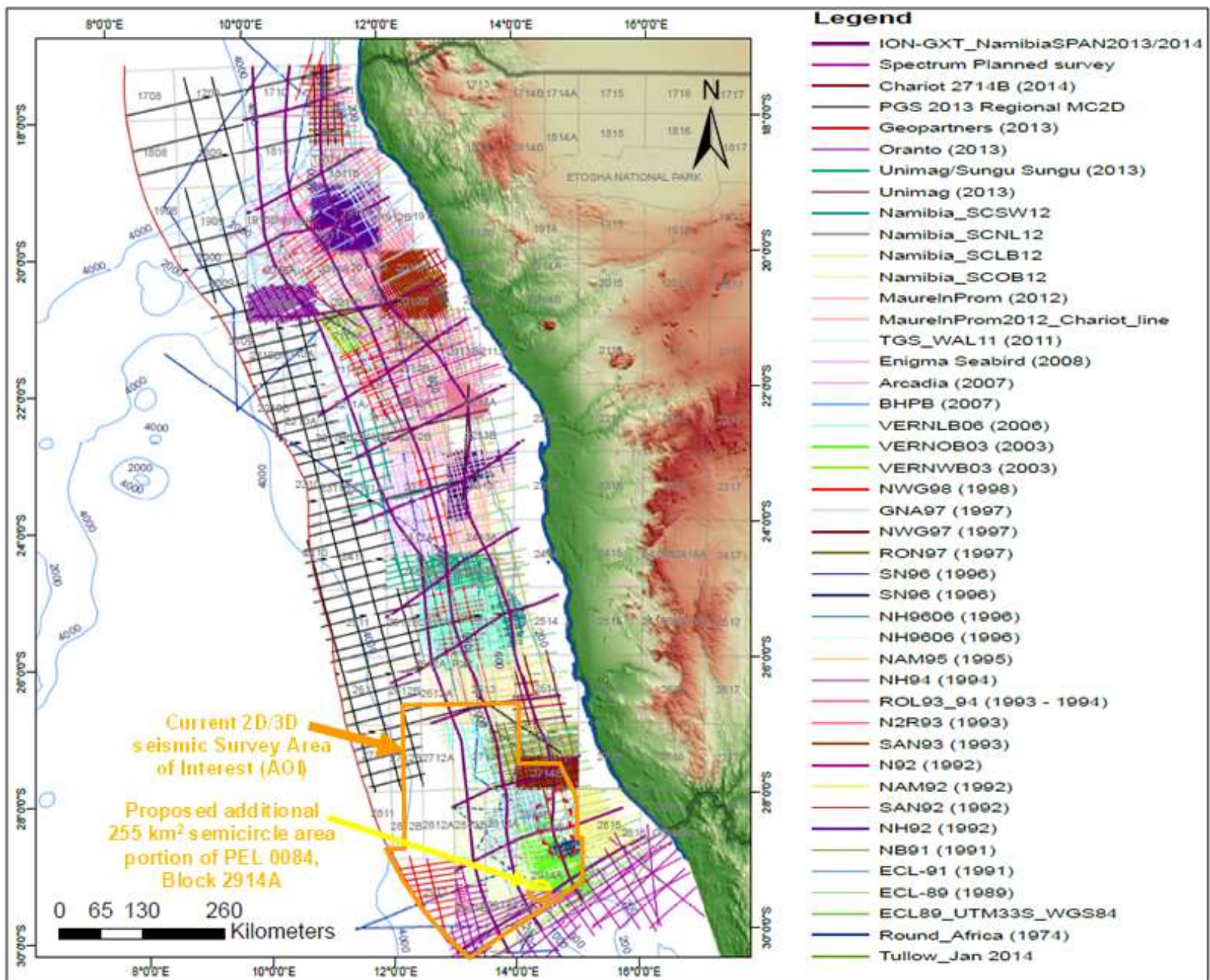


Figure 1.7: Overview of the 2D seismic survey database coverage of Namibia as of 2016 with respect to the current ECC AOI and the proposed additional 255 km² semicircle area portion of PEL 0084, Block 2914A survey area / ECC amendment, excluding Tripp Seamount (Source: www.namcor.com.na).

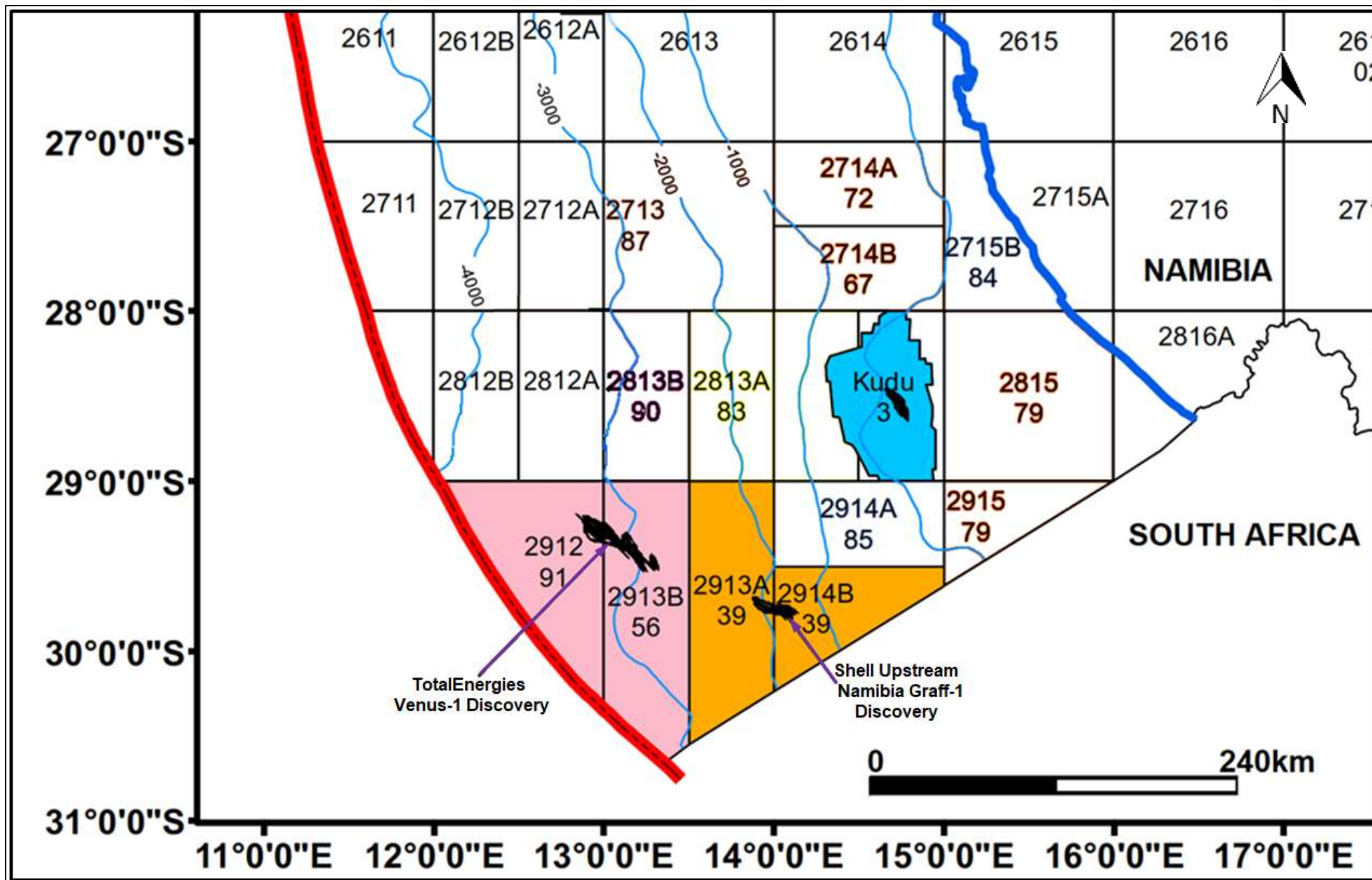


Figure 1.8: Locations of the known oil and gas discoveries offshore Namibia showing the Kudu Gas Field, the TotalEnergies Venus-1 discovery in Petroleum Exploration License (PEL) 56 covering Blocks 2912 and 2913B and the Shell Upstream Namibia BV Graff-1 discovery in PEL 39 covering Blocks 2913A and 2913B situated in the deep-water Orange Basin (Base map Source: www.mme.gov.na).

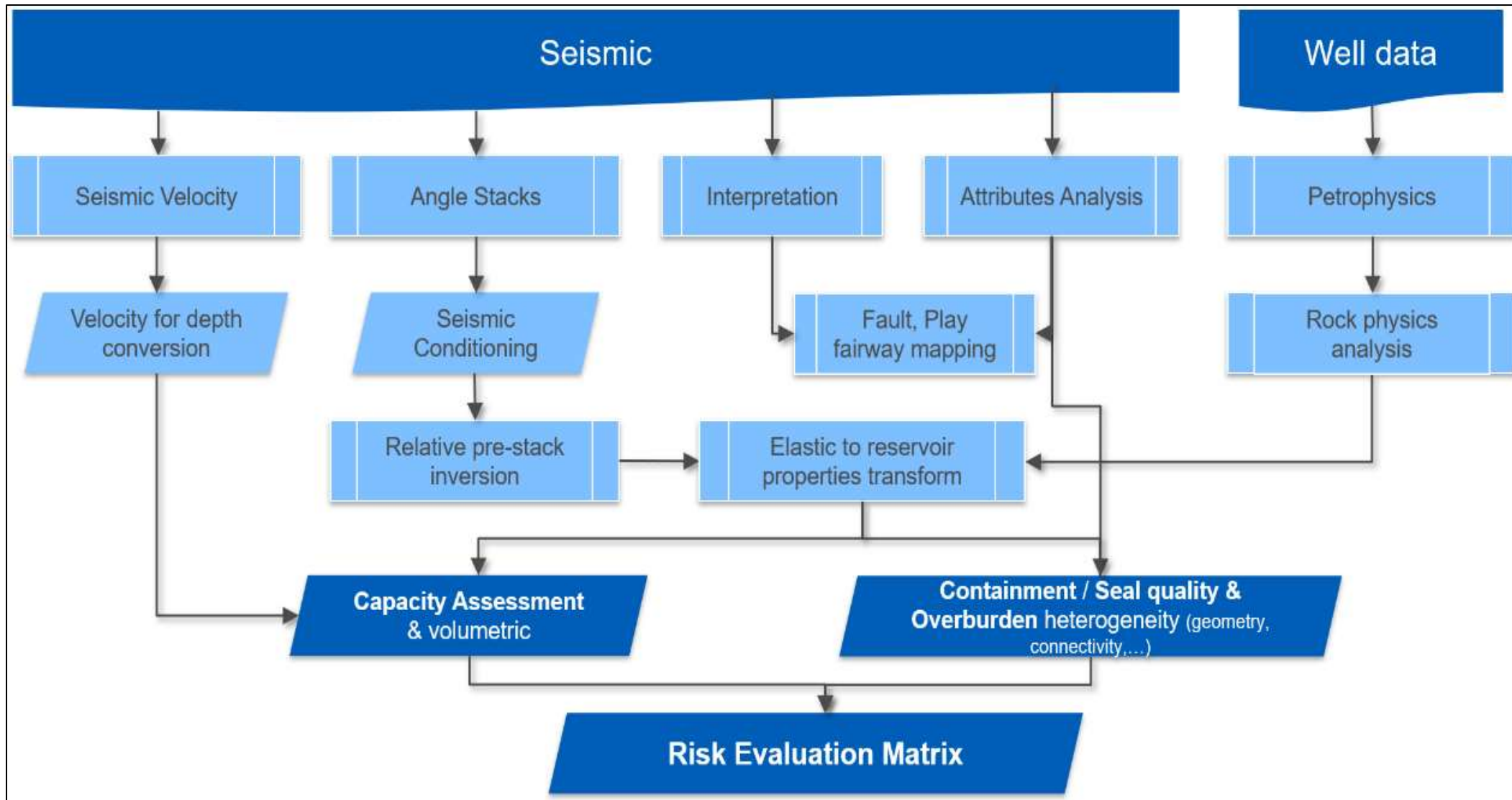


Figure 1.9: General overview of the seismic data analysis workflow implemented for the CO₂ subsurface storage sites container and containment analysis (Source: Pernin, *et. al.*, 2022).

1.3.2 Spatial Scope, and Survey Coverage

The spatial scope of the proposed 2D/3D seismic survey operations and impact assessment and management thereof covers the following:

- ❖ Current ECC and proposed ECC amendment areas outlines defined as the immediate impact zone. The receiving environment in this area likely to be directly influenced by the survey activities will includes a radius of 500 m safety exclusion zone around the survey vessel and surrounding areas where discharges to sea and sound may propagate and affect marine wildlife and immediate environment, and.
- ❖ Survey area broader impact zone include all the surrounding socioeconomic zones likely to be affected by the proposed survey operations and logistics including support vessels.

1.3.3 Permitting Regulatory Requirements

Oil and gas exploration and production regulatory framework in Namibia provides for strict contractual obligations by a Proponent with respect to environmental performances. The proposed activities (2D/3D seismic survey) fall under Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991) is administered by the Petroleum Commissioner in the Ministry of Mines and Energy as the Competent Authority. Under Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991) the implementation of 2D/3D seismic survey requires the Proponent to adhere to environmental laws and regulations of the country.

Under the Environmental Impact Assessment (EIA) Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007), the proposed 2D/3D seismic survey cannot be undertaken without an Environmental Clearance Certificate (ECC). The Proponent (Searcher) is required to have prepared EIA and Updated EMP Reports to support the application for the ECC for the proposed seismic survey operations.

The environmental assessment process used for this project took into considerations the provisions of the Environmental Impact Assessment (EIA) Regulations, 2012 and the Environmental Management Act (EMA), 2007, (Act No. 7 of 2007) as outlined in Fig. 1.10. The following is the summary of the steps:

1. Project screening, preparation of the Draft BID, Draft Scoping Repot and Public notice were prepared undertaken in **April 2022**.
2. Public and stakeholder consultations process including publishing of notices once a week for two (2) consecutive weeks in at least two (2) newspapers circulated widely in Namibia. The comments / inputs period shall not be less than twenty-one (21) days. To be undertaken in **April and May 2022**.
3. Closing date for submission of comments/ inputs to the environmental assessment process is **Friday, 27th May 2022**
4. Prepare the Draft EIA and EMP Reports including specialist studies as may be applicable—**April-June 2022**.
5. Comments and inputs from the public and stakeholder consultations used to be used to finalise the Draft Scoping, EIA and EMP Reports – **June 2022**.
6. The final EIA and EMP reports used to support the application for the current issued ECC for the proposed Multiclient or Proprietary 2D/3D seismic survey. The application for the current ECC submitted to the Office Environmental Commissioner through the Ministry of Mines and Energy (Competent Authority) – **20th June 2022**.
7. Current ECC granted on the **8th September 2022** and expiring on the **8th September 2025**.

8. Prepared first updated EIA Report and a separate updated EMP Report to support the application for the amendment of the current ECC to include the Kudu Gas Field Area covering Blocks Blocks 2814A, and 2814B - **September 2022**.
9. Prepared this 2nd updated EIA Report and a separate updated EMP Report to support the application for the amendment of the current ECC to include the proposed additional 255 km² semicircle area portion of PEL 0084, Block 2914A survey area / ECC amendment, excluding Tripp Seamount – **July 2023**, and.
10. The final updated EIA and EMP reports used to support the application for amendment of the current ECC for the proposed Multiclient or Proprietary 2D/3D seismic survey to include the proposed additional 255 km² semicircle area portion of PEL 0084, Block 2914A survey area / ECC amendment, excluding Tripp Seamount submitted to the Office Environmental Commissioner through the Ministry of Mines and Energy (Competent Authority)—**July 2023**.

1.3.4 Multiclient, Proprietary Surveys and the ECC

1.3.4.1 Overview

Geophysical and geological related surveys and data sets are acquired, processed, owned, stored and sold on either a Multiclient (MC) or proprietary (Exclusive) contractual business arrangements.

1.3.4.2 Multiclient (MC) Surveys

Under a MC system, seismic survey is conducted by a seismic contractor company over an area that might be covering either a single or multiple Petroleum Exploration Licenses (PELs) and unlicensed areas under the control of the State. The collected MC datasets are sold / licensed to multiple clients on a non-exclusive basis. The data acquired is held under a MC seismic data library owned by the contractor and later may be transferred to a partner/s / Government depending on the contractual and confidentiality arrangements.

The cost and findings from MC seismic survey data sets are shared among the different parties involved which may include: Seismic contractor, Government and Licence (PEL) holder/s. Contractually, the partnership decides how they split the cost and decide upon how the data will be managed and proceeds shared.

1.3.4.3 Proprietary / Exclusive Surveys

Proprietary also called Exclusive seismic survey is undertaken for a single client or partnership, and the area of coverage is often limited to specific licensed (PEL) area. The cost of the survey and ownership of the data under a proprietary seismic survey business arrangement falls under the responsibilities of the individual license (PEL) holder. On relinquishment of the petroleum exploration rights, the seismic data sets collected is handed over to the Government.

1.3.4.4 ECC for Multiclient (MC) or Proprietary Surveys

An Environmental Clearance Certificate (ECC) granted to a Proponent who is a seismic contractor may be used to acquire both MC and Proprietary (Exclusive) seismic survey, on conditions that all the contractual arrangements and data ownership requirements among the various parties involved in the partnership including the Government have been agreed.

However, an ECC granted to a Proponent who is a license (PEL) holder may be used to acquire only Proprietary or Exclusive seismic survey data in line with provisions of the Petroleum Agreement with respect to the data ownership. The ECC applied for this project covers both MC and Proprietary (Exclusive) seismic survey business arrangements.

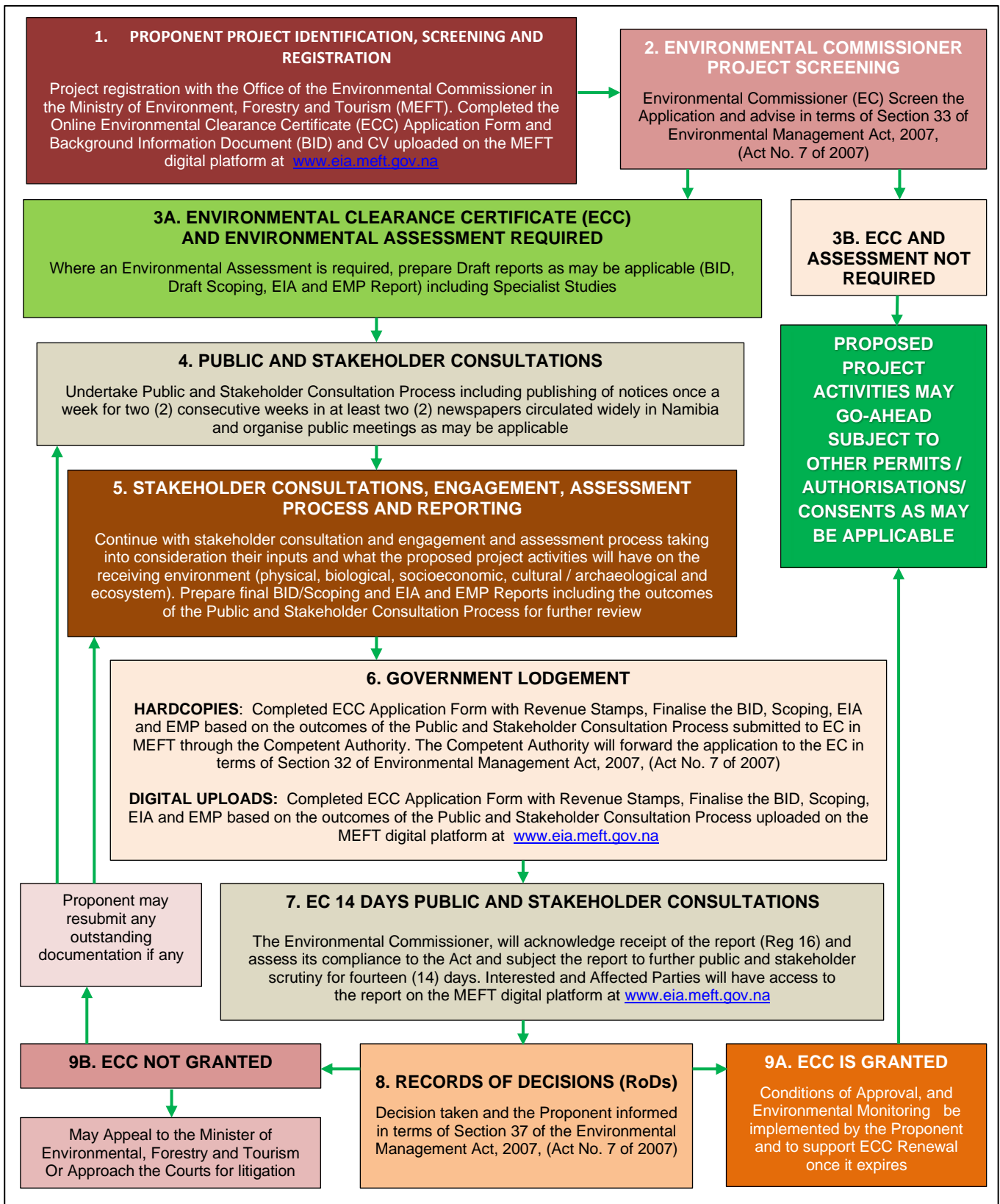


Figure 1.10: RBS schematic presentation of Namibia's Environmental Assessment procedure.

2. PROJECT SUMMARY AND REGULATORY REGISTER

2.1 Summary of the Proposed Survey

The following is the general summary specifications of the proposed 2D / 3D seismic survey activities by Searcher (Figs. 2.1-2.3):

- ❖ **Seismic Contractor / Proponent:** Searcher Geodata UK Ltd.
- ❖ **Proposed activities** – Multiclient (MC) / Proprietary / Exclusive 2D/3D Seismic Surveys.
- ❖ **Location** – The Remainder of the Petroleum Exploration License (PEL) No. 0085, Block 2914A Area and the existing Area of Interest (AOI) covering Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712A, 2712B, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, 2914A, 2915, 2814A, and 2814B (Excluding Tripp Seamount), Orange Basin, Offshore Southern Namibia.
- ❖ **Summary of the 3D seismic survey specifications to be confirmed.**
- ❖ **Summary of the 2D seismic survey specifications to be confirmed.**
- ❖ **Seismic survey Water Depth of the main key target area** – Current ECC area falls within the Photic (ca-200m) and Abyssal Zones with steep to very steep seafloor profile (ca-4000 m) and proposed additional survey area averages ca-1000m.
- ❖ **Nearest Namibian Port** –Port of Lüderitz or Walvis Bay.
- ❖ **Operating company** – Searcher (Proponent).
- ❖ **Survey vessel (s)** – To be confirmed and multiple seismic vessels (2) may be used with up to four (4) support vessels.
- ❖ **Type of Survey** – 2D / 3D Streamers.
- ❖ **Desired acquisition time** –Survey scheduled October / November 2023 if amended ECC is granted, and.
- ❖ **Estimated survey duration** – averaging ninety (90) days per survey event with only a few weeks spend over the very small proposed additional survey area.

2.2 General Description of a Typical Seismic Survey

Seismic survey is a key tool that resources companies exploring for hydrocarbons (oil and natural gas) use to map the subsurface and kilometres below the ground either on land (onshore) or in the sea (offshore).

The basic principle of seismic survey method is the application of controlled generation of sound / acoustic waves by a seismic source to obtain an image of the subsurface. The generated acoustic wave that travels deep into the earth, is reflected by the various rock formations of the earth and returns to the surface where it is recorded and measured by receiving devices called hydrophones (Figs. 2.1 and 2.2).

Airguns are the most common sound source used in modern offshore seismic survey (Plate 2.1 and Figs. 2.1 and 2.2). An airgun is an underwater pneumatic device from which high-pressure air is released suddenly into the surrounding water. On release of pressure the resulting bubble pulsates rapidly producing an acoustic signal that is proportional to the rate of change of the volume of the bubble. The frequency of the signal depends on the energy of the compressed air prior to discharge. Arrays of airguns are made up of towed parallel strings (Figs. 2.1 and 2.2).

A single airgun could typically produce sound levels of the order of 220 - 230 dB re 1 mPa @ 1 m, while arrays produce sounds typically in the region of 250 dB re 1 mPa @ 1 m. Most of the energy produced is in the range of between 0 - 120 Hz bandwidth, although energy at much higher frequencies is also produced and recorded. High-resolution surveys and shallow penetration surveys require relatively high frequencies of between 100 – 1, 000 Hz, while the optimum wavelength for deep seismic work is in the 10 - 80 Hz range.

During the survey operation, the seismic vessel records the data from all the hydrophones, including accurate coordinates of the vessel and its hydrophones. The proposed 2D/3D seismic survey will employ numerous streamers and many hydrophones, providing enough data to give a detailed subsurface profile of the rock layers as illustrated in Figs. 2.1 and 2.2.

The depths of the reflecting layers are calculated from the time taken for the sound to reach the hydrophones via the reflector. This is known as the two-way travel time. The pulse of sound from the guns radiates out as a hemispherical wave front, a portion is reflected towards the hydrophones from rock interfaces. The path of the minute portion of the reflected wave-front intercepted by a hydrophone group is called a ray path. Hydrophone groups spaced along the streamer pick out ray paths that can be related to specific points on the reflector surface.

Graphs of the intensity of the recorded sound plotted against the two-way time are displayed as wiggle traces. Seismic recording at sea always uses the Common Depth Point (CDP) method. A sequence of regularly spaced seismic shots is made as the survey vessel accurately navigates its course. Shots are usually timed to occur at distances equal to the separation of the hydrophone groups. In this way up to 120 recordings of the echoes from any one of 240 reflecting points can be collected.

Each represents sound, which has followed a slightly different ray path, but has all been reflected from the same common depth point. By analysing the time, it takes for the seismic waves to travel between the rock formations and the surface, geophysicists, geologists, and petroleum engineers use sophisticated software to create subsurface images /maps showing potential drill-ready subsurface geological structures called reservoirs that may contain hydrocarbons (Fig. 2.3).

2.3 Envisaged Logistical Arrangements Support

The vessel/s, helicopter and all other supporting equipment to be used for the proposed 2D/3D seismic survey will be in full compliance with all the requirements of the international convention on the prevention of pollution from ship (MARPOL) policies and practices as well as all the national marine related regulations administered by the Department of Maritime Affairs in the Ministry of Works and Transport (MWT) and Ministry of Fisheries and Marine resources (MFMR).

The Port of Walvis Bay will serve as the operations base as may be required for the supply of materials, consumables, port requirements and services where needed.

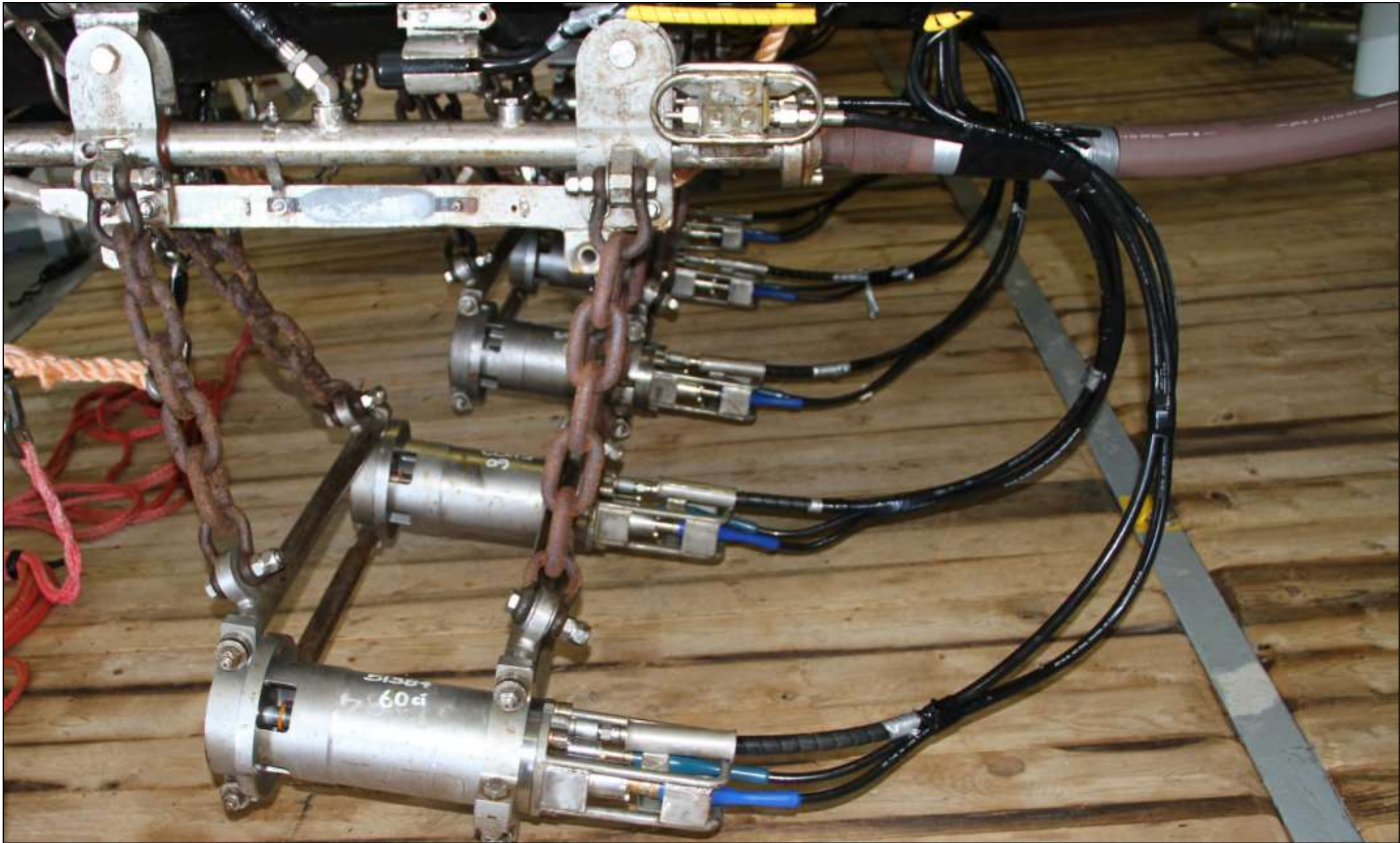


Plate 2.1: Example of the air guns used in marine seismic survey operations.

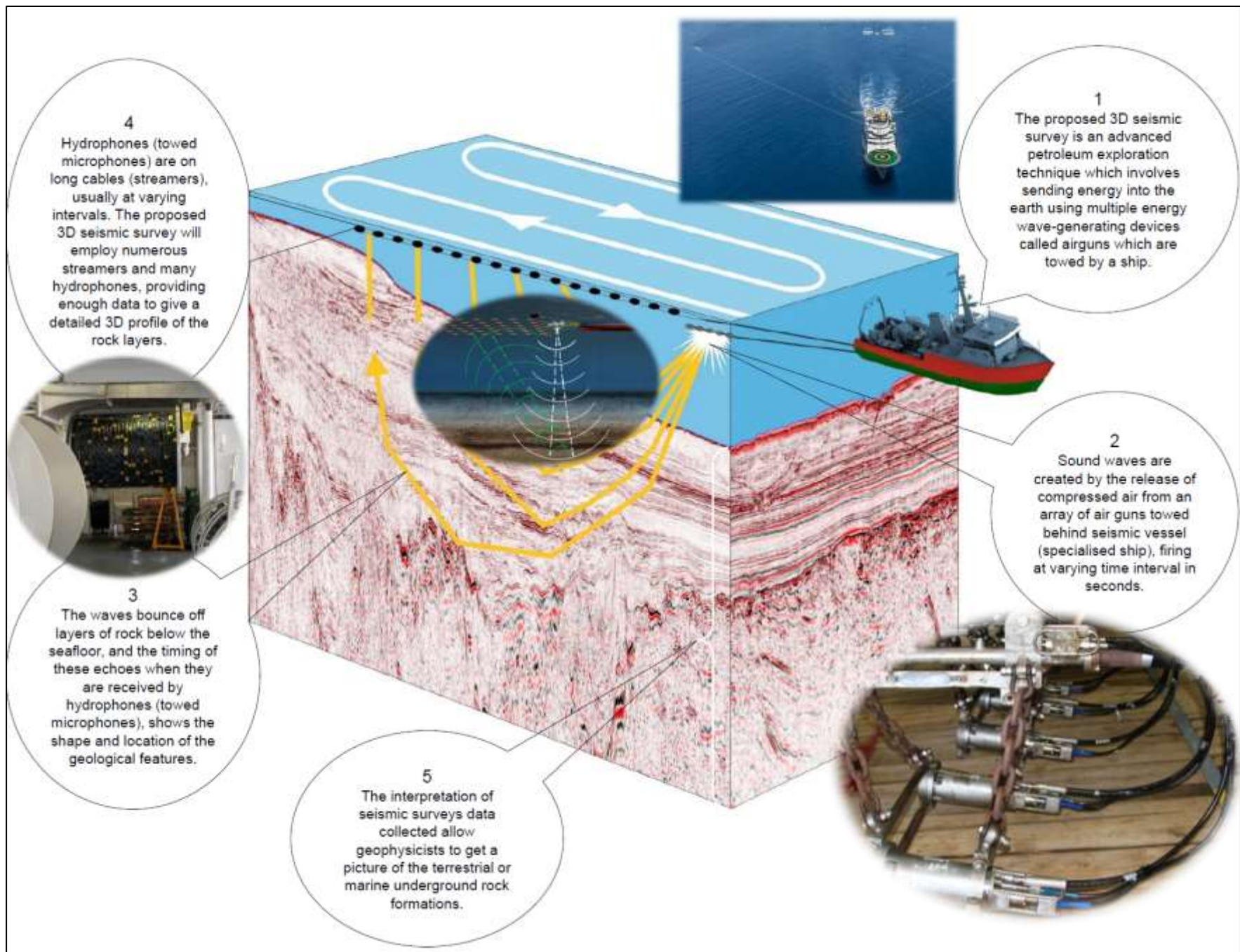


Figure 2.1: Illustration of the principles of marine / offshore seismic survey method.

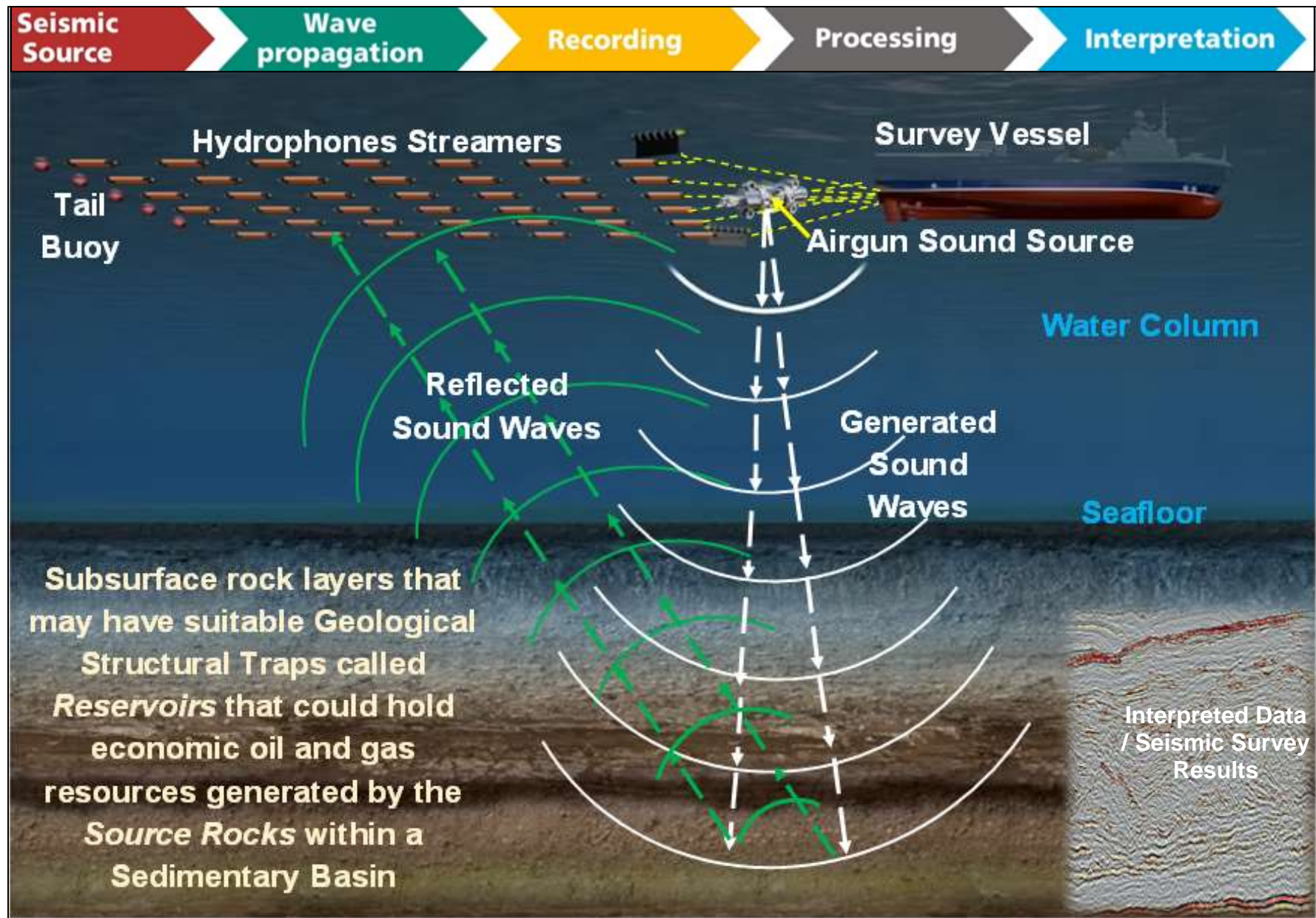


Figure 2.2: Illustration of the application of marine seismic survey method involving data collection and analyses of the times for seismic waves to travel between the various subsurface rock formations. Geophysicists, geologists, and petroleum engineers use sophisticated software to create subsurface images /maps showing potential drill-ready subsurface geological structures called reservoirs that may contain commercial hydrocarbons as shown in Fig. 2.3 (Image Source: www.youtube.com/watch?v=FN8IAb0rG9A).

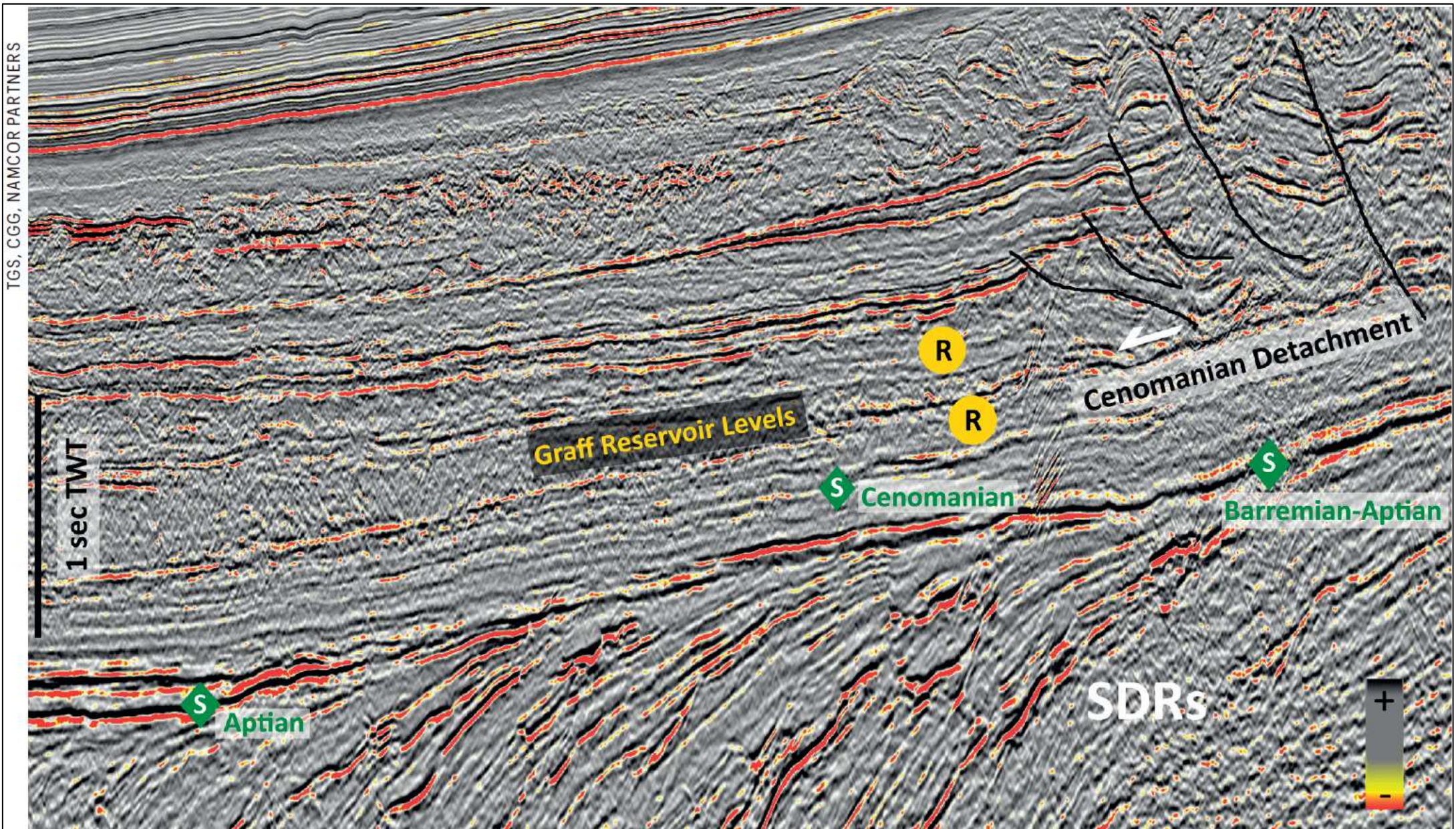


Figure 2.3: An example of the results of seismic survey data interpretation from the Orange Basin, offshore Namibia showing the SW–NE dip line through the Graff light oil discovery trend at the western end of the toe-thrust system and the base of the collapse structures. The Santonian–Campanian turbidites have been trapped above the outer high, which likely acts as a backstop for the reservoir influx from the east. Light oil in two different reservoir levels has been discovered by Shell in 2022 (Source: Winter, *et. al.*, 2022).

2.4 Summary of Proposed Project Regulatory Register

The following is the summary of the regulatory register for all applicable legislations with respect to the proposed 2D/3D seismic survey:

1. Namibian Constitution Articles 91(c) and 95.
2. Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations No. 30 of 2012.
3. Petroleum Products and Energy Act 13 of 1990 (as amended by the Petroleum Products and Energy Amendment Act 29 of 2004, Act 3 of 2000 and Act 16 of 2003).
4. Namibian Ports Authority Act 2 of 1994 (as amended in 2000 and the accompanying 2001 Port Regulations).
5. Health Act (No. 21 of 1988) and Public and Environmental Health Act, 2015 (Act No. 1 of 2015).
6. Foreign Investment Act 27 of 1990.
7. Merchant Shipping Act 57 of 1951.
8. Water Act 54 of 1956 (as amended).
9. Sea Shore Ordinance 37 of 1958.
10. Aviation Act 74 of 1962 (as last amended by the Aviation Amendment Act 10 of 1991 and the Aviation Amendment Act 27 of 1998) (and the Namibian Civil Aviation Regulations 2001).
11. National Monuments Act 28 of 1969 (as amended by the National Monuments Amendment Acts 22 of 1970 and 30 of 1971, the Expropriation Act 63 of 1975, and the National Monuments Amendment Act 35 of 1979).
12. Hazardous Substance Ordinance 14 of 1974.
13. Atmospheric Pollution Prevention Ordinance 11 of 1976.
14. Dumping at Sea Control Act 73 of 1980.
15. Marine Traffic Act 2 of 1981 (as amended by the Marine Traffic Amendment Act 5 of 1983, the Marine Traffic Amendment Act 15 of 1991, and the Namibia Ports Authority Act 2 of 1994).
16. Prevention and Combating of Pollution of the Sea by Oil Act 6 of 1981 (as amended by the Prevention and Combating of Pollution of the Sea by Oil Amendment Act 59 of 1985, Act 63 of 1987, and Act 24 of 1991, and the Namibian Ports Authority Act 2 of 1994).
17. Territorial Sea and Exclusive Economic Zone of Namibia Act 3 of 1990 (and the Territorial Sea and Exclusive Economic Zone of Namibia Amendment Act 30 of 1991).
18. Nature Conservation Amendment Act 5 of 1996.
19. The Marine Resources Act 27 of 2000 (and the Regulations relating to the Exploitation of Marine Resources 2001).
20. Wreck and Salvage Act 5 of 2004.
21. National Heritage Act 27 of 2004 (and the Regulations/Appointments/Declarations made under the National Monuments Act 28 of 1969 and the Regulations 2005).

22. Atomic Energy and Radiation Protection Act 5 of 2005 (and the Radiation Protection and Waste Disposal Regulations 2011).
23. Labour Act 11 of 2007 (and the Labour Amendment Act 2 of 2012).
24. Tobacco Products Control Act 1 of 2010 (and the Regulations).
25. Disaster Risk Management Act 10 of 2012.
26. International Conventions and Protocols:
 - a) International Plant Protection Convention (IPPC) 1951 (as last amended in 1997).
 - b) Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (The Ramsar Convention on Wetlands) 1971.
 - c) Declaration of the United Nations Conference on the Human Environment 1972.
 - d) Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) 1972 (as amended).
 - e) Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (and amendments)
 - f) International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 (as modified by the Protocol of 1978.
 - g) International Convention for the Safety of Life at Sea (SOLAS) 1974 (as amended).
 - h) United Nations Convention on the Law of the Sea (UNCLOS) 1982.
 - i) Vienna Convention for the Protection of the Ozone Layer 1985 and Montreal Protocol on Substances that Deplete the Ozone Layer 1987.
 - j) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal 1989.
 - k) International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) 1990.
 - l) United Nations (UN) Framework Convention on Climate Change 1992 and Kyoto Protocol to the UN Framework Convention on Climate Change 1997.
 - m) Convention on Biological Diversity (CBD), Rio de Janeiro, 1992.
 - n) Stockholm Convention on Persistent Organic Pollutants (POPs) 2001 (as amended in 2009 and 2011).
 - o) United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Protection of the Underwater Cultural Heritage 2001.
 - p) Convention for the Safeguarding of the Intangible Cultural Heritage 2003.
 - q) Convention on the Protection and Promotion of the Diversity of Cultural Expressions 2005.
 - r) Revision of International Standards for Phytosanitary Measures No. 15 Regulation of Wood Packaging.
 - s) Regional Agreements: Southern African Development Community (SADC) Protocol on Mining 1997 and on Energy 1998.

3. EIA RESULTS AND MITIGATIONS MEASURES

3.1 Introduction

The potential positive and negative impacts likely to be associated with the proposed 2D/3D seismic survey have been identified, described, and assessed in the EIA Report. Mitigation measures are described in this Updated EMP Report.

3.2 Summary Assessment of Positive Impacts

The following is summary of the key positive impacts that the proposed 2D/3D seismic survey activities will have on socioeconomic landscape of Namibia:

- ❖ Increased earnings by the State through rights' rentals and payment of direct and indirect taxes.
- ❖ Increased understanding and knowledge of the deep-water petroleum systems of Namibia that could finally lead to the discovery of economic oil or gas resources that will change the economic landscape of Namibia for benefits of its people.
- ❖ Contributions to the national geosciences' skills development and knowledge transfer through on job training and short-term job attachments of Namibians.
- ❖ Contributions to the short and long-term strategies of attracting investments in the petroleum exploration sector in Namibia through new data acquisition, research, monitoring and management.
- ❖ Contribution to the long-term strategy that will promote the coexistence of petroleum operations with other marine users in Namibia.
- ❖ Direct contributions to the training of young Namibians through increased contributions to the national PetroFund which is currently offering several scholarships to Namibians to be able to study at foreign universities.
- ❖ Contributions to economic growth through ongoing exploration investments and potential future oil and gas discovery.
- ❖ Creation of employment opportunities through short and long-term contracts, and.
- ❖ Contribution to the development of local infrastructures and new businesses to support the ongoing oil and gas exploration opportunities particularly around the Ports of Walvis Bay and Lüderitz.

3.3 Summary Assessment of Negative Impacts

3.3.1 Overall EIA Negative Impact Assessment Framework

The overall impact assessment framework adopted for this project used the Leopold matrix which is one of the best known internationally matrix methodology available for predicting the impact of a project on the environment. The Leopold matrix is a two-dimensional matrix cross-referencing the following:

- ❖ The activities linked to the project stages covering mobilisation and pre-survey preparations, actual survey operations, post survey operations, and non-routine or accidental events that are likely to have an impact on the receiving environment, and.
- ❖ The existing environments (physical, biological, and socioeconomic) that could possibly be affected by the project.

The activities linked to the proposed 2D/3D seismic survey operations are listed on one axis, while the receiving environments (physical, biological and socioeconomic) are listed on the other axis, and divided in following three (3) major groups:

- ❖ Physical conditions: marine and coastal air quality, change climate, seawater quality, seabed topography and sediment quality.
- ❖ Biological conditions: marine and coastal benthic ecology, fishes, turtles, seabirds, seals and cetaceans, and.
- ❖ Socioeconomic conditions and other users: marine and coastal fishing industry, tourism and recreation, minerals exploration and mining, other petroleum exploration licence.

The proposed 2D/3D seismic survey activities have the potential to affect the receiving environments in many ways. The first step in impact identification has been to identify the various types of activities associated with the mobilisation and pre-survey preparations, actual survey operations, post survey operations stages of the proposed survey, together with their associated emissions and discharges where appropriate.

At a high level, the main sources of impact of the proposed survey operations are:

- ❖ Planned or routine events: where an aspect (i.e., impact producing factor) is a result of routine Project activities. For example, the generation of atmospheric emissions from the survey and support vessels can be considered a planned event, and.
- ❖ Unplanned or non-routine (accidental) events: where an aspect is a result of mishaps or failures, including failure of equipment, procedures not being followed, human error, unforeseen events, or process equipment not performing as per design parameters. Typical examples are spills, leaks, emergency emissions, collisions, and explosions.

Overall, the following is the summary of the project related activities linked to planned/ routine and unplanned / accidental events of the mobilisation and pre-survey preparations, actual survey operations, post survey operations stages of the proposed survey:

1. Port of Walvis Bay or Lüderitz including onshore support operations and waste management.
2. Physical presence of survey and support vessels.
3. Physical disturbance of the survey operations.
4. Sound generation from 2D/3D seismic survey airguns including sound of the survey and support vessels.
5. Increased light levels from routine vessels operations.
6. Atmospheric emissions from routine operations of the survey and support vessels.
7. Planned marine discharges.
8. Unplanned marine discharges (e.g., minor spillages of fuel, lubricants / maintenance oils.
9. Accidental event: Loss of vessel, equipment or material.
10. Accidental event: Collision with marine wildlife during vessel operations.
11. Accidental Event: Loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or another major event.

Accidental events can potentially lead to significant impacts, for example in the event of an oil spill. However, they are clearly not a part of the intended activity and their potential occurrence has a low probability of occurrence associated with it.

The activities / sources of potential impact due to the project and the receiving environment that could potentially be affected has been assessed in the EIA report and presented in form of a two-dimensional cross-referencing Leopold matrix covering the following:

- ❖ Sensitivity of receptors (Table 3.1).
- ❖ Impact magnitude (Table 3.2).
- ❖ Duration of exposure (Table 3.3).
- ❖ Geographical extent (Table 3.4).
- ❖ Probability, likelihood of occurrence (Table 3.5), and.
- ❖ Overall significant impacts (Table 3.6).

Table 3.1: Sensitivity of receptors.

RECEIVING ENVIRONMENT SENSITIVITY			RECEPTORS / TARGETS THAT MAY BE IMPACTED (MARINE AND COASTAL RESOURCES)																	
SENSITIVITY RATING		CRITERIA	PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC ENVIRONMENT							
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.	Air Quality	Change Climate	Seawater Quality	Seabed Topography	Sediment Quality	Benthic Ecology	Fishes	Turtles	Seabirds	Seals	Cetaceans	Fishing Industry	Tourism and Recreation	Minerals Exploration and Mining	Other Petroleum Exploration Licence Holders	International Shipping Line	International Communication Lines / Cables	
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.																		
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance																		
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.																		
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.																		
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	ONSHORE / COASTAL																		
		1.	Port of Walvis Bay including Onshore support operations and waste management	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		OFFSHORE																		
		2.	Physical presence of survey and support vessels	1	1	2	1	1	1	2	4	2	2	4	4	1	1	1	1	1
		3.	Physical disturbance of the survey operations	1	1	1	1	1	1	2	4	2	2	4	4	1	1	1	1	1
		4.	Sound generation from the proposed 2D/3D seismic survey airguns including sound of the survey and support vessels	1	1	1	1	1	1	4	4	4	2	4	4	1	1	1	1	1
		5.	Increased light levels from routine vessels operations	1	1	1	1	1	1	2	2	4	2	4	2	1	1	1	1	1
	6.	Atmospheric emissions from routine operations of the survey and support vessels	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	7.	Planned marine discharges	1	1	2	1	1	1	2	2	2	2	3	2	1	1	1	1	1	
	ACCIDENTAL	8.	Unplanned marine discharges (e.g., minor spillages of fuel, lubricants / maintenance oils	1	1	2	1	1	1	2	2	2	2	3	2	1	1	1	1	1
		9.	Accidental event: Loss of vessel, equipment or material	1	1	1	1	1	1	2	2	2	2	3	2	1	1	1	1	1
10.		Accidental event: Collision with marine wildlife during vessel operations	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	
11.		Accidental Event: Loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or other major event.	1	1	4	1	1	1	4	4	4	4	4	4	1	1	1	1	1	

Table 3.2: Impact magnitude.

MAGNITUDE		RECEPTORS / TARGETS THAT MAY BE IMPACTED (MARINE AND COASTAL RESOURCES)																		
		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC ENVIRONMENT								
		SCALE	DESCRIPTION	Air Quality	Climate Change	Seawater Quality	Seabed Topography	Sediment Quality	Benthic Ecology	Fishes	Turtles	Seabirds	Seals	Cetaceans	Fishing Industry	Tourism and Recreation	Minerals Exploration and Mining	Other Petroleum Exploration Licence Holders	International Shipping Line	International Communication Lines / Cables
0	no observable effect																			
1	low effect																			
2	tolerable effect																			
3	medium high effect																			
4	high effect																			
5	very high effect (devastation)																			
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	ONSHORE / COASTAL																		
		1.	Port of Walvis Bay including Onshore support operations and waste management	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		OFFSHORE																		
		2.	Physical presence of survey and support vessels	0	0	3	0	0	0	3	3	3	3	3	2	1	0	1	1	0
		3.	Physical disturbance of the survey operations	0	0	0	0	0	0	3	3	3	3	3	2	1	0	1	1	0
		4.	Sound generation from the proposed 2D/3D seismic survey airguns including sound of the survey and support vessels	0	0	0	0	0	0	3	1	1	1	3	2	1	0	1	1	0
		5.	Increased light levels from routine vessels operations	0	0	0	0	0	0	1	1	3	1	3	0	1	0	1	1	0
		6.	Atmospheric emissions from routine operations of the survey and support vessels	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7.	Planned marine discharges	0	0	3	0	0	0	1	3	3	3	3	0	1	0	1	1	0	
	ACCIDENTAL	8.	Unplanned marine discharges (e.g. minor spillages of fuel, lubricants / maintenance oils)	0	0	1	0	0	0	3	3	3	3	3	4	1	0	1	1	0
		9.	Accidental event: Loss of vessel, equipment or material	0	0	1	0	0	0	1	1	1	1	3	3	1	0	1	1	0
10.		Accidental event: Collision with marine wildlife during vessel operations.	0	0	0	0	0	0	0	0	0	0	3	0	1	0	1	1	0	
11.		Accidental Event: Loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or other major event.	0	0	1	0	0	0	4	4	4	4	4	4	1	0	1	1	0	

Table 3.3: Duration of exposure.

DURATION OF IMPACT EXPOSURE		RECEPTORS / TARGETS THAT MAY BE IMPACTED (MARINE AND COASTAL RESOURCES)																	
		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC ENVIRONMENT							
		Air Quality	Climate Change	Seawater Quality	Seabed Topography	Sediment Quality	Benthic Ecology	Fishes	Turtles	Seabirds	Seals	Cetaceans	Fishing Industry	Tourism and Recreation	Minerals Exploration and Mining	Other Petroleum Exploration Licence Holders	International Shipping Line	International Communication Lines / Cables	
SCALE	DESCRIPTION																		
T	Temporary																		
P	Permanent																		
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	ONSHORE / COASTAL																	
		1.	Port of Walvis Bay including Onshore support operations and waste management	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
		OFFSHORE																	
		2.	Physical presence of survey and support vessels	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
		3.	Physical disturbance of the survey operations	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
		4.	Sound generation from the proposed 2D/3D seismic survey airguns including sound of the survey and support vessels	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
		5.	Increased light levels from routine vessels operations	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	6.	Atmospheric emissions from routine operations of the survey and support vessels	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	7.	Planned marine discharges	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
	ACCIDENTAL	8.	Unplanned marine discharges (e.g., minor spillages of fuel, lubricants / maintenance oils	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
		9.	Accidental event: Loss of vessel, equipment or material	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
10.		Accidental event: Collision with marine wildlife during vessel operations.	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
11.		Accidental Event: Loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or another major event.	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	

Table 3.4: Geographical coverage / extent.

GEOGRAPHICAL COVERAGE		RECEPTORS / TARGETS THAT MAY BE IMPACTED (MARINE AND COASTAL RESOURCES)																		
		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC ENVIRONMENT								
		Air Quality	Climate Change	Seawater Quality	Seabed Topography	Sediment Quality	Benthic Ecology	Fishes	Turtles	Seabirds	Seals	Cetaceans	Fishing Industry	Tourism and Recreation	Minerals Exploration and Mining	Other Petroleum Exploration Licence Holders	International Shipping Line	International Communication Lines / Cables		
SCALE	DESCRIPTION																			
L	limited impact on location																			
O	impact of importance for municipality;																			
R	impact of regional character																			
N	impact of national character																			
M	impact of cross-border character																			
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	ONSHORE / COASTAL																		
		1.	Port of Walvis Bay including Onshore support operations and waste management	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
		OFFSHORE																		
		2.	Physical presence of survey and support vessels	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
		3.	Physical disturbance of the survey operations	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
		4.	Sound generation from the proposed 2D/3D seismic survey airguns including sound of the survey and support vessels	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
		5.	Increased light levels from routine vessels operations	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	6.	Atmospheric emissions from routine operations of the survey and support vessels	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
	7.	Planned marine discharges	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
	ACCIDENTAL	8.	Unplanned marine discharges (e.g., minor spillages of fuel, lubricants / maintenance oils	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
		9.	Accidental event: Loss of vessel, equipment or material	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
10.		Accidental event: Collision with marine wildlife during vessel operations.	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
11.		Accidental Event: Loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or another major event.	L	L	O	L	L	L	O	O	O	O	O	O	L	L	L	L	L	

Table 3.5: Probability, likelihood of occurrence.

PROBABILITY, LIKELIHOOD		RECEPTORS / TARGETS THAT MAY BE IMPACTED (MARINE AND COASTAL RESOURCES)																		
		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC ENVIRONMENT								
		Air Quality	Climate Change	Seawater Quality	Seabed Topography	Sediment Quality	Benthic Ecology	Fishes	Turtles	Seabirds	Seals	Cetaceans	Fishing Industry	Tourism and Recreation	Minerals Exploration and Mining	Other Petroleum Exploration Licence Holders	International Shipping Line	International Communication Lines / Cables		
SCALE	DESCRIPTION																			
A	Extremely unlikely (e.g. never heard of in the industry)																			
B	Unlikely (e.g. heard of in the industry but considered unlikely)																			
C	Low likelihood (egg such incidents/impacts have occurred but are uncommon)																			
D	Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)																			
E	High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)																			
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	ONSHORE / COASTAL																		
		1.	Port of Walvis Bay including Onshore support operations and waste management	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
		OFFSHORE																		
		2.	Physical presence of survey and support vessels	A	A	C	A	A	A	C	C	C	C	C	C	A	A	A	A	A
		3.	Physical disturbance of the survey operations	A	A	A	A	A	A	C	C	C	C	C	C	A	A	A	A	A
		4.	Sound generation from the proposed 2D/3D seismic survey airguns including sound of the survey and support vessels	A	A	A	A	A	A	C	C	C	C	C	C	A	A	A	A	A
		5.	Increased light levels from routine vessels operations	A	A	A	A	A	A	A	A	C	A	A	A	A	A	A	A	A
	6.	Atmospheric emissions from routine operations of the survey and support vessels	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
	7.	Planned marine discharges	A	A	B	A	A	A	B	B	B	A	A	A	A	A	A	A	A	
	ACCIDENTAL	8.	Unplanned marine discharges (e.g., minor spillages of fuel, lubricants / maintenance oils)	A	A	B	A	A	A	B	B	B	B	B	B	A	A	A	A	
		9.	Accidental event: Loss of vessel, equipment or material	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	A	
10.		Accidental event: Collision with marine wildlife during vessel operations.	A	A	B	A	A	A	B	B	B	B	B	B	A	A	A	A	A	
11.		Accidental Event: Loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or other major event.	A	A	B	A	A	A	B	B	B	B	B	B	A	A	A	A	A	

Table 3.6: Significance of impacts.

SIGNIFICANCE						RECEPTORS / TARGETS THAT MAY BE IMPACTED (MARINE AND COASTAL RESOURCES)																		
						PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC ENVIRONMENT								
IMPACT SEVERITY [Magnitude, Duration, Extent, Probability]	RECEPTOR CHARACTERISTICS (SENSITIVITY)					Air Quality	Climate Change	Seawater Quality	Seabed Topography	Sediment Quality	Benthic Ecology	Fishes	Turtles	Seabirds	Seals	Cetaceans	Fishing Industry	Tourism and Recreation	Minerals Exploration and Mining	Other Petroleum Exploration Licence Holders	International Shipping Line	International Communication Lines / Cables		
	Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)																			
Very High (5)	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5																			
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]																			
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]																			
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]																			
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]																			
SOURCES OF POTENTIAL IMPACT		ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	ONSHORE / COASTAL																					
			1.	Port of Walvis Bay including Onshore support operations and waste management	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
			OFFSHORE																					
			2.	Physical presence of survey and support vessels	2/1	1/1	2/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	2/1	2/1	2/1	4/1	1/1	1/1	1/1	1/1	1/1	1/1
			3.	Physical disturbance of the survey operations	2/1	2/1	2/1	2/1	2/1	2/1	4/1	3/2	3/2	3/2	3/2	4/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
			4.	Sound generation from the proposed 2D/3D seismic survey airguns including sound of the survey and support vessels	1/1	1/1	1/1	1/1	1/1	1/1	4/2	4/2	2/1	2/1	4/2	4/2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
			5.	Increased light levels from routine vessels operations	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
		6.	Atmospheric emissions from routine operations of the survey and support vessels	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
		7.	Planned marine discharges	1/1	1/1	3/2	1/1	1/1	1/1	3/2	3/2	3/2	3/2	3/2	2/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
		ACCIDENTAL	8.	Unplanned marine discharges (e.g. minor spillages of fuel, lubricants / maintenance oils	1/1	1/1	3/2	1/1	1/1	1/1	3/2	3/2	3/2	3/2	3/2	3/2	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
			9.	Accidental event: Loss of vessel, equipment or material	1/1	1/1	1/1	1/1	1/1	1/1	1/1	3/2	3/2	3/2	4/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
10.	Accidental event: Collision with marine wildlife during vessel operations.		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	4/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1			
11.	Accidental Event: Loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or other major event.		1/1	1/1	4/1	1/1	1/1	1/1	3/2	3/2	3/2	3/2	3/2	3/2	3/2	1/1	1/1	1/1	1/1	1/1	1/1			

3.3.2 Impact Assessment Summary on Marine Mammals, Birds, Fish and Fisheries

3.3.2.1 Summary of the Overall Impacts

Table 3.7 summarises the potential impacts discussed in detail in the specialist report on marine mammals, birds, fish and fisheries (Annex 2 to the EIA Report). The assessment of the impacts in Table 3.7 are given without mitigation measures applicable. The impacts are considered at different levels, (such as physiological, perceptual and behavioural), but the overall impact is presented. The source of impact (noise, seismic vessel, support craft, pollution) and duration of the impact (short/long term) are also considered, as well as whether the impact is to an individual or at population level. In the end, population and long-term impacts are the defining criteria. Table 3.8 summarises the potential impacts if the suggested mitigation measures are applied.

3.3.2.2 Assessment of Potential Impacts on Cape Fur Seals

Noise from the seismic survey is expected to have no impact on seal populations. Noise disturbance from support aircraft, such as helicopters, can cause startle response and panic behaviour. The impact would be high in the immediate short term, however, in the long term, impact on marine mammals from the noise of low-flying aircraft related to the survey operations is considered negligible in comparison to other aircraft noise sources in the region. Individual seals may be impacted by discarded waste and gear lost overboard, but this will be equal to any similar threat posed by fishing or other vessels.

3.3.2.3 Assessment of Potential Impacts on Marine Mammals

Air gun noise is only expected to impact low-frequency cetaceans within close range of the operating airgun. As there are no known resident low-frequency cetaceans, the impact will be on migrating mammals. The number of mammals migrating through the Namibian waters is relatively low and wide-spread. If mitigation measures such as soft-starts, visual observation and exclusion limits are applied, the impacts of seismic noise can be lessened to acceptable levels. Overall, the expected impacts at population level are considered low in the long-term.

Noise from support vessels will have an insignificant impact, because whales and dolphins are likely to display avoidance reactions at a distance of about 1 km. The communication and navigation sounds emitted by whales and dolphins should not be masked by noise emitted by supply vessels and therefore, it is considered to be of insignificant impact.

The impact of prey displacement as a result of seismic activities is considered to be of very low significance overall, as marine mammals have an adaptable diet and prey on more than one fish species. In addition, these creatures are highly mobile and able to follow prey in different directions. The impact of the seismic survey on feeding would be of very low significance.

3.3.2.4 Assessment of Potential Impacts on Sea Turtles

Although the occurrence of sea turtles in the region has increased in recent years, they are, by and large, still only occasional visitors. The likelihood of encountering turtles during the survey operations is moderate to low. None-the-less, should a turtle be in very close range of the seismic array, the potential impact on turtle physiology, behaviour and feeding is considered to be of high intensity in the short-term, but of low probability.

The impact on turtle mortality due to entanglement or garbage consumption can be high, but if turtle exclusion tail buoys are fitted to the hydrophone array and MARPOL 73/78 solid waste disposal procedures are followed this impact will be lessened to low significance. The impact of seismic noise on turtle migration is considered to be insignificant, since turtles make use of magnetic cues rather than acoustics for navigation.

3.3.2.5 Assessment of Potential Impacts on Sea Birds

Only a few sea bird species frequent deep, offshore waters and the likelihood of encountering significant numbers of endangered species is slim. The potential physiological impact of seismic pulses on non-

diving birds is considered to be insignificant as birds would be expected to stay away from the noise source and the buoys of the seismic array. The potential of pathological impact is considered to be of low-moderate significance on diving sea birds without mitigation and of very low significance with mitigation such as warning ramp-up procedures and if marine mammal observers are employed. In comparison to the impact of long-line fishing on pelagic birds, the potential impact of noise from this seismic survey on bird populations in the long term, is considered insignificant.

Avoidance behaviour would be limited to the immediate vicinity of the airgun array and only for the duration of the actual firing and vessel passage. The impact on behaviour is thus considered to be of MEDIUM intensity and of short duration, but overall, of very low significance in the long term. The impact of the seismic noise on non-diving bird behaviour is considered to be insignificant.

The impact of prey displacement as a result of the survey on the foraging of diving and non-diving birds is considered to be of moderate intensity in the medium term in the immediate vicinity of the shooting operations, and of very low significance overall. Research has shown that shoaling fish disturbed by seismic firing return to the area within a relatively short time period. In addition, the extent of prey species and wide ranges over which sea birds feed indicate that the impact of the seismic survey on feeding would be of very low significance.

Birds are generally only drawn to vessels to scavenge on discarded waste, or by lights at night. As long as the vessels comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations, general waste should not pose a threat to and have zero impact on marine bird populations.

There is the possibility of a sea bird becoming entangled in, or colliding with lines and structures, particularly at night when shipboard lighting may cause disorientation and temporarily lowered visual ability. However, if lighting is reduced to minimal onboard safety requirements, then such incidents are likely to be scarce and the significance level and impact is considered low.

Noise disturbance from aircraft can cause startle responses and avoidance behaviour. The impact can be high in the immediate short term, however, if aircraft avoid known breeding colonies the aircraft noise directly related to the survey operations is considered negligible in comparison to other aircraft noise sources.

Sea birds are most likely to be severely impacted by the seismic vessel in the event of an oil spill or other major water-borne pollution. Such an event could be of high intensity in a localised area for a short term. The fact that the survey activities are generally offshore and away from any large or sensitive breeding colonies, and that foraging birds will likely to be able to avoid any such spills, will lessen the impact. The chances of such an incident are equal to any other vessel operating within the Benguela Current Large Marine Ecosystem Programme. Thus, the overall impact of the survey on sea birds is regarded as low.

3.3.2.6 Assessment of Potential Impacts on Fish

The impact on larvae close to the surface in the vicinity of the airgun will be of high intensity in the short term, but in overall comparison with natural mortality, the impact of the seismic survey is considered to be of very low significance to larval stages, particularly if timing and spatial mitigating measures are employed. Seismic noise disturbance may impact the spawning activities of certain fish species. However, most of the commercially important species spawn inshore and north of the proposed survey area, and in view of the relatively short duration of the disruption to species and the wide distribution of fish, the impacts of the survey on fish recruitment at the population level are considered to be of low significance.

The potential impact of physiological damage to pelagic species in close proximity to the noise source would be of high intensity. The potential impact would be limited to the short-term period of surveying activities in the population locale. The overall impact of physiological damage to pelagic fish species is considered to be of low to very low significance dependant on the mitigation measures employed. However, the potential impact on demersal species and on species in shallow and inshore water would be insignificant as they are expected to be well out of the range of damage. Also, certain species of

commercial importance (herring, mackerel, gobi, sharks) have under-developed or no swim bladders and there is little risk of injury from seismic noise. The physiological impact on large pelagic species is considered to be negligible.

The fish of the are generally highly mobile and exhibit large migration patterns and ranges, so while the potential impact on fish behaviour could be of high intensity, this would be limited to shallow waters and /or close proximity to the airgun, and restricted to the short-term duration of the survey operating in the area., but limited to the survey area. The impact of fish behaviour is, thus, considered to be of low significance both with and without mitigation measures.

3.3.2.7 Assessment of Potential Impacts on Fisheries

The fishing industry in Namibia is arguably the most socio-economically sensitive of all the marine activities currently being undertaken in Namibian waters. The Namibian commercial fishing industry plays an important role in the general economy of the country and the numerous companies are a great source of employment.

Commercially exploited demersal species include both shallow- and deep-water Cape Hake, Monkfish and Kingklip. These species are fished on the continental shelf, between -200 m and -400 m, where the distribution varies seasonally. Data indicates that there is no long-term reduction in catch per unit effort for species such as hake and cod as a result of airgun surveys. The proposed seismic survey may affect fish behaviour and distribution in the short-medium term; however, research shows that catch rates should be resumed to normal within 24 hours for long-liners and from 12 hours up to a maximum of 5 days for demersal trawling. Although there may be some disruption to fishing operations, it is expected that the fish populations and distribution will return to normal within a relatively short time period after cessation of seismic activities.

The expected impact of the seismic activity on commercial catch and effort is considered to be of LOW significance. The seismic survey vessel locations and timetable should be communicated to this fishery well in advance of the onset of proposed operations.

The most commercially valuable mid-water fish are adult Cape Horse mackerel and juvenile Hake. The Cape horse mackerel are exploited by two sectors of the fishing industry: juveniles are caught by purse seiners and adults by midwater-trawler. These fisheries operate inshore of the proposed AOI and so the proposed seismic operations should have no impact on this fishery.

The pelagic purse seine fishery targets small pelagic fish such as anchovy, pilchard, juvenile Cape horse mackerel and pelagic goby. The purse seine fishing grounds are inshore and north of the AOI, so will receive NO IMPACT from surveys within the AOI.

The AOI lies mostly north of the tuna fishery. While the seismic survey will not impact the species as a whole, seismic noise may cause the fish to alter their migration route and avoid the areas of seismic operations. This can have a direct impact on the fishing industry, which targets tuna species in known locations. The pole-and-line fishery, in particular, is a very small and seasonal fishery, operating only a couple of months in the year. The effort is variable and dependent on fish availability. The fishery operates on windows of opportunity. When a shoal is located, many vessels will congregate at one location for a number of days. Albacore tuna movement between South Africa and Namibia is poorly understood and there is no clear pattern.

Due consideration must be given to this fishery and negotiations regarding the timing of the seismic survey could lessen any negative associated impacts. Flexibility is paramount in limiting impacts on this fishery, which could be medium to high if no mitigation or consultation is undertaken, but low depending on the timing of the survey and fish stock availability.

Any proposed seismic survey could impact commercial fishing due to the safety zones required around the operational seismic vessel (commonly 500 m exclusion zone). Good communication and pre-notification practices will limit unnecessary disruption and delays to both parties. Due consideration should be given to the presence of all fishing vessels while running survey lines and communication channels should kept open to avoid close encounters. Additionally, support vessels moving to/from

Lüderitz and Walvis Bay may encounter commercial fishing vessels and potentially cause short-term disruption. Adherence to prescribed maritime communication procedures will limit any likely encounters. Precautionary action needs to be initiated to avoid entanglement with fishing equipment, such as long-lines or purse seine nets. Damage and associated delays can be costly to both sectors. The overall potential impact of entanglement of seismic gear with fishing gear is considered negligible if the vessel operators are aware of the presence of other vessels, although any such incidents would be of high intensity, but limited to the immediate timing of the event.

In the interests of amicable co-use of the Benguela Current Large Marine Ecosystem (BCLME) resources, and also for marine safety, the following procedures should mitigate any negative interactions with fisheries:

- ❖ The surveyor must formally notify the Commissioner for Petroleum Affairs (MME) of the survey, stating the proposed location of the survey lines, the commencement date and the anticipated duration.
- ❖ This information should also be relayed to all affected parties (Directorate of Maritime Affairs, Namibian Ports Authority, South African HydroSAN and the MFMR Monitoring, Control and Surveillance Unit - Walvis Bay).
- ❖ In the interest of good relations, direct communication and facilitation with any vessels in the area at the time of the survey is important. Openness to the possibilities of adjusting survey lines, and trawling location to cause minimum disruption of operations to both parties.
- ❖ Good communications through MFMR to the fisheries (i.e., Association of Namibian Fishing Industries and the Namibian Large Pelagic and Hake Longlining Association) with pre-notification of survey activities and vessel paths (navigational co-ordinates of the survey area, timing and duration of proposed activities).
- ❖ Notices to Mariners should be distributed timeously to fishing companies and directly to fishing vessels, stating:
 - a) the co-ordinates of the proposed survey lines.
 - b) the proposed survey timeframes and day-to-day location of the seismic vessel.
 - c) the proposed safe operational limits of the survey vessel, and.
 - d) movements of support vessels.
- ❖ Radio Navigation Warnings and Notices to Mariners should be distributed via Navigational Telex (Navtext), and local Lüderitz and Walvis Bay Radio for the duration of the survey.
- ❖ It is recommended that updates of the scheduled weekly survey plan be circulated to the operators of affected fishing vessels on a daily basis and notify trawlers when the survey may move into trawling areas.
- ❖ Establish communications with the known long-line fishers if drifting buoys (with radar responders) are sighted, and.
- ❖ An experienced Fisheries Liaison Officer (FLO) should be deployed on board the survey vessel to initiate and facilitate radio communications with maritime vessels in the vicinity of the survey area. The FLO should report daily on vessel activity, ramp up procedures, environmental matters, fauna sightings, and respond and advise on action to be taken in the event of encountering fishing gear.

3.3.2.8 Overall Impact Assessment

Fishing areas, marine mammals (Cetacean migratory routes), and sensitive coastal environments with respect to the proposed are all shown in Fig. 3.1. Known commercial fishing grounds and MFMR stock assessment survey areas relative to the proposed 2D / 3D seismic survey area are shown in Fig. 3.2. Table 3.7 summarises the potential impacts detailed in the EIA Report, marine mammals, birds, fish and fisheries and underwater acoustic modelling specialist reports.

The assessment of the impacts is given without mitigation measures are shown in Table 3.7. The impacts have been considered at different levels, (such as physiological, perceptual and behavioural), with the overall impact also presented. The source of impact (noise, seismic vessel, support craft, pollution) and duration of the impact (short/long term) are also considered, as well as whether the impact is to an individual or at population level. In the end, population and long-term impacts are the defining criteria.

Table 3.8 summaries the potential impacts with mitigation measures applied. The overall impact of this proposed survey is regarded as being of moderate significance in the short-term and low significance in the long-term, assuming mitigation measures are applied (Table 3.8).

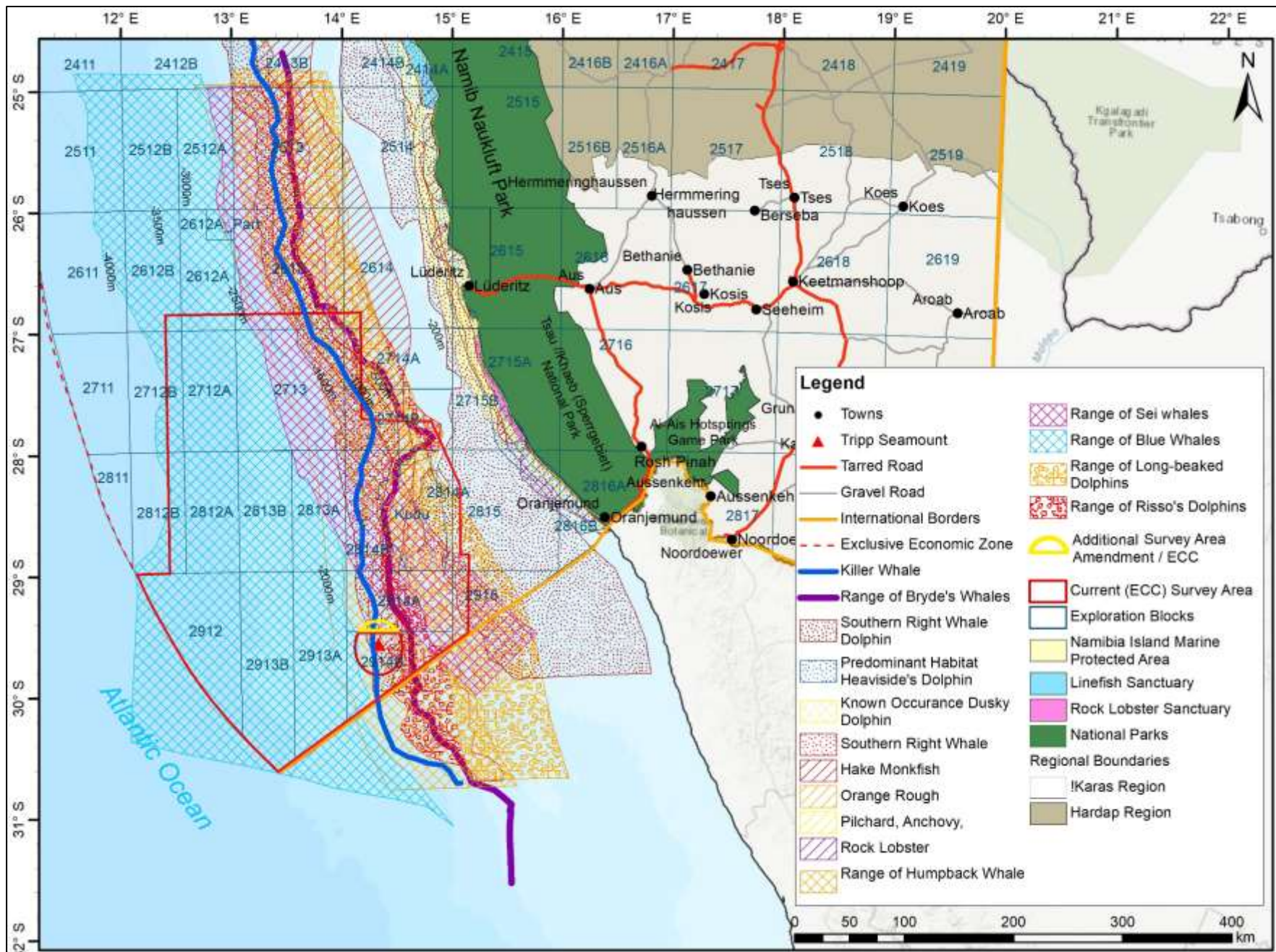


Figure 3.1: Fishing areas, marine mammals (Cetacean migratory routes), and sensitive coastal environments with respect to the current 2D/3D seismic survey ECC AOI and the proposed additional 255 km² semicircle area portion of PEL 0084, Block 2914A survey area (Data Source: Geological Survey of Namibia and National Marine Information and Research Centre, 2003).

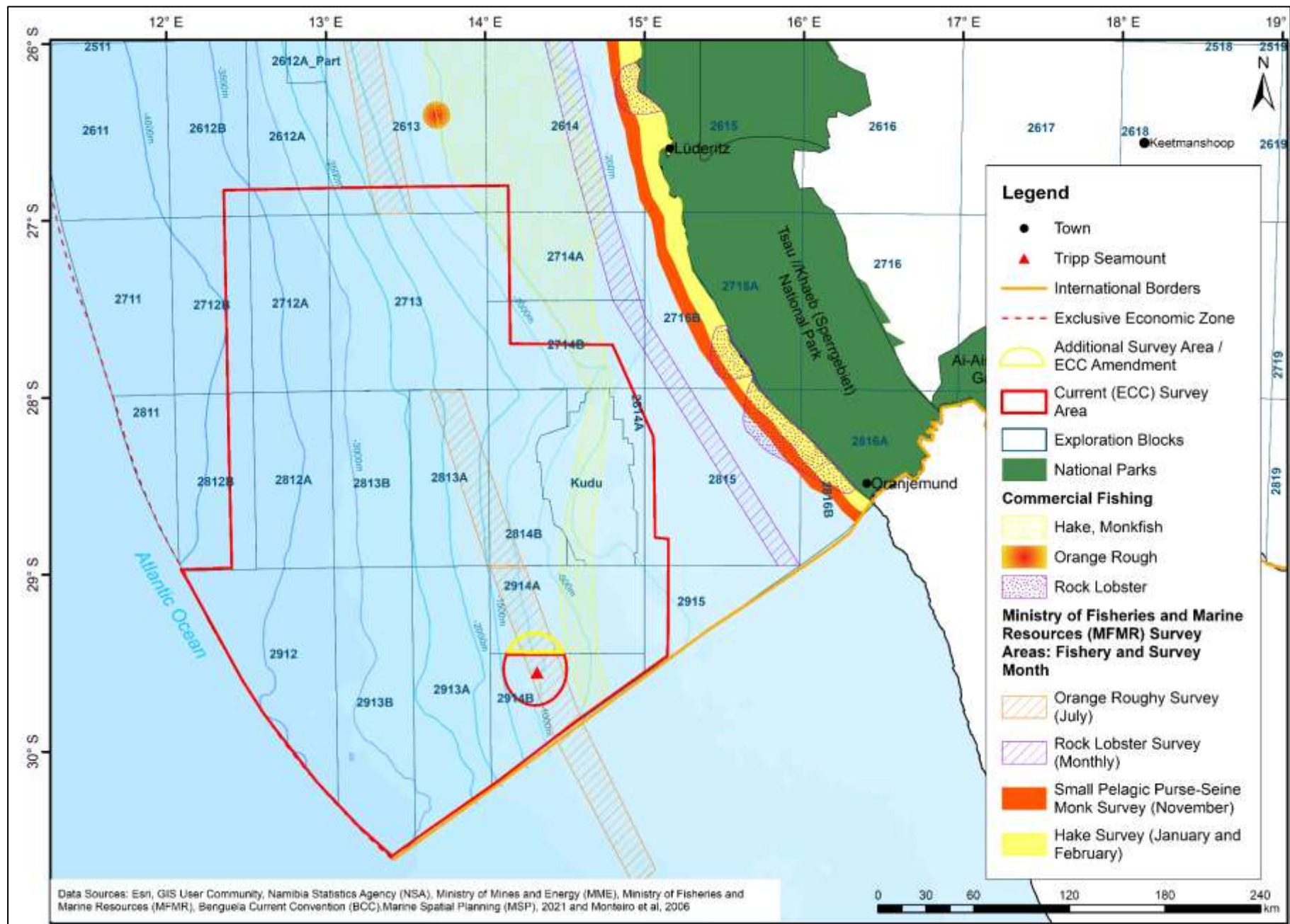


Figure 3.2: Known commercial fishing grounds and MFMR stock assessment survey areas with respect to the current 2D/3D seismic survey ECC AOI and the proposed additional 255 km² semicircle area portion of PEL 0084, Block 2914A survey area (Data Source: MFMR and Monteiro *et al*, 2006).

Table 3.7: Summaries of the potential impacts without mitigation measures are applied.

Potential Impacting Factors	Impacted Sectors – WITHOUT mitigation measures applied									
	Air quality	Water quality	Marine Mammals Cape Fur Seals	Cetaceans	Marine Turtles	Sea Birds	Shore Birds	Fish	Fisheries	Tuna Fishery
Seismic Noise – short term	No impact	No impact	Insignificant impact	Moderate impact	Low-Moderate impact	Low-Moderate impact	No impact	Low-Moderate impact	Low-Moderate impact	Moderate impact
Seismic Noise – long term	No impact	No impact	Insignificant impact	Low impact	Insignificant impact	Insignificant impact	No impact	Low impact	Low impact	Low-Moderate impact
Light disturbance	No impact	No impact	No impact	No impact	No impact	Low-Moderate impact	No impact	No impact	No impact	No impact
Aircraft Noise – short term	No impact	No impact	Moderate - High impact	Low impact	No impact	Low impact	Moderate - High impact	No impact	No impact	No impact
Aircraft Noise – long term	No impact	No impact	Low impact	No impact	No impact	No impact	Low impact	No impact	No impact	No impact
Vessel exclusion zone – short term	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	Moderate impact	Moderate impact
Vessel exclusion zone – long term	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	Low impact	Low impact
Waste generation	No impact	Moderate impact	Moderate impact	Low impact	Moderate - High impact	Moderate impact	Low-Moderate impact	Low-Moderate impact	Low impact	Low impact
Air Emissions	Moderate impact	No impact	No impact	No impact	No impact	Insignificant impact	Insignificant impact	No impact	No impact	No impact
Major accidental spill of diesel/oil	Insignificant impact	High impact	Moderate impact	Moderate impact	Moderate impact	Low-Moderate impact	High impact	Moderate impact	Moderate - High impact	Moderate - High impact
Small accidental spills	No impact	Low impact	Insignificant impact	Insignificant impact	Insignificant impact	No impact	Insignificant impact	Insignificant impact	No impact	No impact
Ballast water	No impact	Moderate - High impact	No impact	No impact	No impact	No impact	No impact	Low-Moderate impact	Low impact	No impact

Table 3.8: Summaries of the potential impacts with mitigation measures are applied.

Potential Impacting Factors	Impacted Sectors – WITH mitigation measures applied									
	Air quality	Water quality	Marine Mammals Cape Fur Seals Cetaceans		Marine Turtles	Sea Birds	Shore Birds	Fish	Fisheries	Tuna Fishery
Seismic Noise – short term	No impact	No impact	Insignificant impact	Low impact	Low impact	Low impact	No impact	Low impact	Low-Moderate impact	Low impact
Seismic Noise – long term	No impact	No impact	Insignificant impact	Insignificant impact	No impact	Insignificant impact	No impact	Insignificant impact	Low impact	Low impact
Light disturbance	No impact	No impact	No impact	No impact	No impact	Low impact	No impact	No impact	No impact	No impact
Aircraft Noise – short term	No impact	No impact	Moderate impact	Insignificant impact	No impact	Insignificant impact	Moderate – impact	No impact	No impact	No impact
Aircraft Noise – long term	No impact	No impact	Insignificant impact	No impact	No impact	No impact	Low impact	No impact	No impact	No impact
Vessel exclusion zone – short term	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	Moderate impact	Low impact
Vessel exclusion zone – long term	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	Insignificant impact	Low impact
Waste generation MARPOL	No impact	Low impact	Insignificant impact	Insignificant impact	Low impact	Insignificant impact	Insignificant impact	No impact	No impact	No impact
Air Emissions MARPOL	Low-Moderate impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact
Major accidental spill of diesel/oil	Insignificant impact	Moderate - High impact	Low-Moderate impact	Low-Moderate impact	Low-Moderate impact	Low impact	Moderate - High impact	Low impact	Moderate impact	Moderate impact
Small accidental spills	No impact	Insignificant impact	Insignificant impact	Insignificant impact	Insignificant impact	No impact	Insignificant impact	Insignificant impact	No impact	No impact
Ballast water Control	No impact	Insignificant impact	No impact	No impact	No impact	No impact	No impact	Insignificant impact	No impact	No impact

4. EMP IMPLEMENTATION AND MITIGATION MEASURES

4.1 Aims and Objectives of the EMP

This Updated EMP Report has the following specific objectives:

1. Ensure that the key environmental impacts identified and assessed in the EIA Report are addressed.
2. Ensure compliance with all applicable national regulations and MARPOL (marine pollution) regulations and waste disposal procedure and all legal frameworks and other requirements that must be adhered to.
3. Promote environmental management and communicate the aims and goals of the project EMP to all stakeholders, contractor, subcontractor and all key employees of the Proponent who will be involved in the proposed 2D/3D seismic survey activities operations.
4. Incorporate environmental management principles into project design and operational procedures.
5. Ensure all workers, contractors, sub-contractors and all those who are involved in the project are meeting all requirements with respect to environmental management.
6. Address issues and concerns raised in the EIA process.
7. Serve as an action plan for environmental management.
8. Provide a framework for implementing commitments to address all the key impacts identified in the EIA Report.
9. Provided a framework for preparing and maintaining records of project environmental performance (i.e., monitoring, audits and compliance tracking), and.
10. Provide an environmental monitoring plan whose aim is to ensure that the mitigation measures during the project mobilisation and pre-survey preparations, actual survey operations, post survey operations, and non-routine or accidental events are effectively implemented, and the positive impacts are enhanced, and.
11. Provide a basis for preparing the “close out” report to be submitted to the Government (Ministry of Mines and Energy, (MME), Ministry of Environment, Forestry, and Tourism (MEFT), Ministry of Fisheries and Marine Recourse (MFMR) and the Ministry of Work and Transport (MWT), Department of Maritimes Affairs) once the proposed 2D/3D seismic survey activities operations have been completed.

4.2 Principles of Environmental Management

The following principles of environmental management, as stated in Part II, Section 3 of the Environmental Management Act, 2007, Act No. 7 of 2007 have been considered in the preparation of this EMP for proposed 2D/3D seismic survey activities in the Orange Basin:

1. Use renewable resources on a sustainable basis for the benefit of present and future generations.
2. Involve the community in natural resources management and promote and facilitate the sharing of benefits from the use of resources.
3. Promote public participation in decisions affecting the environment and ensure that their interests, needs and values are considered.

4. Promote equitable access to all environmental resources and consider the functional integrity of ecological systems so that the sustainability of systems is ensured and that harmful effects are prevented.
5. Undertake environmental assessments for all projects that may adversely impact on the environment, or the use of natural resources.
6. Promote sustainable development in all aspects relating to the environment.
7. Protect and respect Namibia's cultural and natural heritage, including its biological diversity, for the benefit of present and future generations.
8. Reduce the generation of waste and polluting substances at source by adopting the option that provides the most benefit or causes the least environmental damage, at costs acceptable by society, in the short- and long term.
9. Promote the reduction, re-use and recycling of waste.
10. Adopt the "polluter pays" principle.
11. In cases where there is enough evidence to conclude that there are threats of serious or irreversible damage to the environment, the lack of full scientific certainty may not be used as an excuse for postponing cost-effective measures to prevent environmental degradation, and.
12. Prevent damage to the environment. if this is not possible, reduce, limit, or control activities that may cause damage to the environment.

4.3 The EMP Framework

The following is the summary of the EMP Framework based on the precautionary principles and principles of environmental management as detailed in the Environmental Management Act, 2007, Act No. 7 of 2007 for the proposed offshore 2D/3D seismic survey activities:

- ❖ The proposed 2D/3D seismic survey activities can only be implemented once the MEFT has issued an Environmental Clearance Certificate.
- ❖ All interested and affected parties (I&APs), particularly other users of the marine environment, must be notified prior to the survey start.
- ❖ Attempts must be made to reduce the likelihood of possible cumulative impacts through co-ordination of activities with other operators / users of the marine environment.
- ❖ All communications and public consultation should be channelled through a single interface, usually the Proponent's Representative (PR) / Operations Manager (OM).
- ❖ Conditions and provisions as detailed in this EMP shall be adhered to for conservation and preservation of the natural environment.
- ❖ The Proponent's Representative (PR) / Operations Manager (OM) is responsible for the implementation of the remediation of any environmental damage in accordance with the recommended methodology and/or the best available procedures / practices.
- ❖ Vessel crew should be trained in good environmental practices and onboard supervision shall always be applied.
- ❖ A Marine Mammal Observer (MMO/ Fisheries Liaison Officer (FLO) and /or Independent Marine Observer (IMO) who is familiar with fisheries sectors in the area and experienced in seabird and

marine mammal identification and observation techniques must be appointed to be onboard throughout the survey period, and.

- ❖ In the absence of any specific mitigation measures being provided in this EMP, the Proponent shall always adopt the precautionary approach.

4.4 Hierarchy of Mitigation Measures Implementation

A hierarchy of methods for mitigating significant adverse effects has been adopted in order of preference and as follows:

- (i) Enhancement, e.g., protection of habitats through operational approaches.
- (ii) Avoidance, e.g., flexible implementation timing to avoid effects on ecological receptors.
- (iii) Reduction, e.g., limitation of effects on receptors through design or operational changes, and.
- (iv) Compensation, e.g., community benefits.

4.5 Roles and Responsibilities

4.5.1 Overview

Management and monitoring of the environmental elements that may be affected by the different activities of the 2D/3D seismic survey through the allocation of resources, roles and responsibilities is an important element of the mitigatory process. This EMP provides for the human resources roles and responsibilities necessary for the implementation and monitoring of the key components of the mitigation measures.

4.5.2 Proponent's Representative (PR) / Operations Manager (OM)

The proponent shall appoint a **Proponent's Representative (PR) / Operations Manager (OM)** with responsibilities not limited to the following with respect to the EMP implementation:

- ❖ Act as the PR and implementing agent on behalf of the proponent.
- ❖ Ensure that the proponent's responsibilities are executed in compliance with the relevant national and international regulations and best practices.
- ❖ Ensure that all the necessary environmental authorisations and permits have been obtained before the implementation of the proposed activities.
- ❖ Assist any contractor / subcontractor and monitoring specialists in finding environmentally responsible solutions to challenges that may arise during the survey.
- ❖ Should the operations manager believe a serious threat to, or impact on the receiving environment may be caused by the seismic survey activities, he/she may stop work and the proponent must be informed of the reasons for the stoppage as soon as possible.
- ❖ The OM has the authority to issue fines for transgressions of basic conduct rules and/or contravention of the EMP.
- ❖ Should any contractor / subcontractor and monitoring specialists or his/her employees fail to show adequate consideration for the environmental aspects related to the EMP, the operations manager can have person(s) and/or equipment removed from the vessel or work suspended until the matter is remedied.

- ❖ Maintain an open and direct lines of communication between the stakeholders and proponent, as well as any other identified Interested and Affected Parties (I&APs) with regards to environmental matters, and.
- ❖ Attend regular meetings / daily briefings and inspections as may be required.

4.5.3 Safety, Health and Environment (SHE) Officer / Environmental Coordinator

The proponent shall appoint a Safety, Health and Environment (SHE) Officer / Environmental Coordinator with responsibilities not limited to the following with respect to the EMP implementation:

- ❖ Assist the OM in ensuring that the necessary environmental authorisations and permits have been obtained and any subsequent fillings are prepared and lodged accordingly.
- ❖ Assist the OM and Contractor in finding environmentally responsible solutions to challenges that may arise.
- ❖ Conduct daily safety and environmental management briefings as per EMP requirements or as may be required.
- ❖ Carry out regular site inspections (on average once per week) with regards to compliance with the EMP. report any non-compliance(s) to the OM as soon as possible.
- ❖ Continuously review the EMP and recommend additions and/or changes to the EMP document as may be required and in consultations with the OM and monitoring specialists.
- ❖ Monitor the Contractor's environmental awareness training for all new personnel joining the operations.
- ❖ Keep records of all activities related to environmental control and monitoring. the latter to include a photographic record of all the major incidents / incidences, and.
- ❖ Attend regular meetings.

4.5.4 Other Contractors and Subcontractors

The responsibilities of the **Contractors and Subcontractors** that may be appointed by the proponent to undertake certain activities of the proposed include but not limited to the following with respect to the EMP implementation:

- ❖ Comply with the EMP provisions of relevant national and international regulations and best practices.
- ❖ Preparation and submission to the proponent through the Project HSE of the following Management Plans:
 - Environmental Awareness Training and Inductions.
 - Emergency Preparedness and Response.
 - Waste Management, and.
 - Health and Safety.
- ❖ Ensure adequate environmental awareness training for senior site personnel.

- ❖ Environmental awareness presentations (inductions) to be given to all personnel prior to work commencement. the Project HSE shall provide the content and topics that should be covered the awareness materials and should not be limited to the following guidance:
 - The importance of complying with the EMP provisions.
 - Roles and responsibilities, including emergency preparedness.
 - Basic rules of conduct (Do's and Don'ts).
 - EMP: aspects, impacts and mitigation.
 - Fines for failure to adhere to the EMP, and.
 - Health and safety requirements.
- ❖ Record keeping of all environmental awareness training and induction presentations, and.
- ❖ Attend regular meetings and environmental reviews /inspections of the operations.

4.5.5 Environmental Monitoring Specialist (MMO and FLO)

The proponent shall appoint a Marine Mammal Observation (MMO) and Fishery Liaison Officers (FLO) with responsibilities not limited to the following with respect to the EMP implementation:

- (i) MMO:
 - ❖ Record a written physical description of a marine mammal.
 - ❖ Log which direction it is travelling in.
 - ❖ Describe its behaviour.
 - ❖ Log the time.
 - ❖ Inform the contractor's seismic observers that they need to stop firing until further notice (which will be when the marine mammal has exited the exclusion zone).
 - ❖ Track the marine mammal and keep the seismic observers informed.
 - ❖ Attend regular meetings and environmental reviews /inspections of the operations, and.
 - ❖ Prepare daily, weekly, monthly / final closure monitoring report as may be applicable.
- (ii) FLO:
 - ❖ Act as the link between fishing vessels in the seismic survey area and seismic vessel.
 - ❖ Work closely with the OM and the fishing industry to minimise any potential impact of the project upon local fishing. The objective is to facilitate as far as possible, an arrangement based on coexistence.
 - ❖ Keeps local fishing vessels informed of ongoing work on major projects within that area. This allows local fishermen to understand the potential hazards and to plan their fishing activities accordingly. It also enables the seismic survey project to proceed unhindered by fishing vessels, saving significant time and money for the client or seismic contractor.
 - ❖ Attend regular meetings and environmental reviews /inspections of the operations, and.

- ❖ Prepare daily, weekly, monthly / final closure monitoring report as may be applicable.

4.6 Specific Mitigation Measures

4.6.1 Specific Mitigation Measures Implementation

Based on the findings of the impact assessment as detailed in the EIA Report and summarised in Table 3.1-3.6 in this report, Table 4.1-4.3 provides the detailed specific mitigations measures to be implemented by the proponent with respect to the proposed 2D/3D seismic survey operations. The following is the summary of the key project stages linked to the migration measures:

(i) Mobilisation and Pre-Survey Preparations (Table 4.1):

- ❖ Pre-survey planning.
- ❖ Emergency and Contingency planning.
- ❖ EIA submission and approval.
- ❖ Environmental mitigation.
- ❖ Compliance with EIA and EMP.
- ❖ Notification of and coordination with relevant parties., and.
- ❖ Appointment of MMO and FLO.

(ii) Actual Survey Operations (Table 4.2):

- ❖ Adherence to EMP.
- ❖ monitoring of effects and performance assessment.
- ❖ Pollution control and waste management.
- ❖ Equipment management.
- ❖ Airgun operation.
- ❖ Communication and notification to other vessels.
- ❖ Exclusion of other vessels.
- ❖ Prevention of emergencies, and.
- ❖ Emergency management procedures including oil spills.

(iii) Post Survey Operations (Table 4.3):

- ❖ Survey vessels to leave.
- ❖ Inform relevant parties of survey completion.
- ❖ Final waste disposal.
- ❖ Final observation reports, and.
- ❖ Close-out reports.

Table 4.1: Mobilisation and Pre-Survey Preparations.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Pre-survey Planning	Allocate provisions for Environmental monitoring and Liaison with fishing, mining, petroleum industries and other users of the sea.	<ol style="list-style-type: none"> 1) Make provision for including Marine Mammal Observation (MMO) and Fishery Liaison Officers (FLO) as crew on board the seismic vessel. 2) Notify relevant government departments Ministry of Mines and Energy (MME), Ministry of Environment, Forestry, and Tourism (MEFT), Ministry of Fisheries and Marine Recourse (MFMR) and the Ministry of Work and Transport (MWT) Department of Maritimes Affairs Search and Rescue, Namibian Ports Authority and port captains 3) Determine the extent of local fishing, petroleum and mining activities within the survey area. 4) Notify other marine users, fishing industry (Namibian and foreign), marine petroleum, mineral prospecting and mining licence holders. <ul style="list-style-type: none"> - Notification must include <ul style="list-style-type: none"> ➢ navigational co-ordinates of the survey area ➢ timing and duration of proposed activities ➢ designated safety zone around the seismic vessel (500 m) 5) Finalise negotiations and resolve any conflict over the allocation of user rights prior to the commencement of operation. 6) Charter a local vessel to act as chase boat 	Searcher Geodata UK Ltd, Operations Manager Seismic Contractor Environmental Coordinator		Prior to commencing survey operations	Minutes of meetings Copies of all correspondence MMO / FLO /SHE reports
Emergency and Contingency Planning	Preparation for any emergency that could result in an environmental impact	<ol style="list-style-type: none"> 1) Company (or representative) Emergency Response Plan. 2) Seismic & support vessel Contractor Emergency Response Plan (including. MEDIVAC) 3) Helicopter Operator Emergency Response Plan. 4) Oil Pollution Emergency Plan should refer to the National Marine Pollution Contingency Plan (NMPCP) 5) Ensure there is adequate protection and indemnity insurance cover for oil pollution 6) Produce vessel's seaworthiness certificate and/or classification stamp 	Seismic Contractor SHE Officer	Copies of all correspondence		Confirm compliance and justify any omissions
EIA submission and Approval / Environmental Clearance	Compliance with legislative requirements – Namibian EA Policy	Submit EIA and EMP to Ministry of Environment, Forestry, and Tourism for approval and issuing of Environmental Clearance Certificate (ECC)	Searcher Geodata UK Ltd / Subcontractor		Prior to commencing survey operations	Final EIA and Updated EMP Reports with ECC issued
Environmental Mitigation	Minimise impact on cetaceans and turtles	<ol style="list-style-type: none"> 1) Employ an MMO 2) Use visual monitoring during daytime 3) Use passive acoustic monitoring system for detections. 4) Initiate soft-start procedure. 5) Use 'turtle-friendly' tail buoys. Alternatively, the existing tail buoys should be fitted with either exclusion or deflector 'turtle guards'. 	Searcher Geodata UK Ltd, Seismic Contractor Environmental Coordinator		Prior to commencing survey / appointment contractors	None

Table 4.1: Cont.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Compliance with EIA and EMP	Searcher Geodata UK Ltd and contractor to fulfil requirements set by MEFT, MME and MARPOL Commit to adherence to EMP	1) Ensure copies of ECC, EIA and Updated EMP Reports are onboard throughout survey period 2) Ensure that a copy of the EIA report is provided to the Seismic contractor. 3) Elucidate all personnel of the EMP requirements and motivation. Assign duties appropriately. 4) Ensure availability of relevant personnel and suitable equipment to meet EMP requirements. 5) Notify other marine users and promote cooperation to minimise cumulative impacts.	Seismic Contractor Operations Manager, Environmental Coordinator, Equipment Quartermaster, SHE Officer	Minutes of meetings Copies of all environmental awareness training manuals and schedules Self-audit	Prior to commencing survey operations	Minutes of meetings Signed acknowledgment of receipt of EIA by Contractor Confirm compliance and justify any omissions
Notification of and coordination of activities with relevant parties	Ensure that other users are aware of the seismic survey. Promote cooperation and coexistence with other users to minimise cumulative environmental impacts	1) Notify relevant government ministries and departments – MFMR, MEFT, MME and MWT / Maritimes Affairs (SAR) 2) Notify other marine users, fishing industry (Namibian and foreign), marine petroleum, mineral prospecting and mining licence holders. - Notification must include <ul style="list-style-type: none"> ➢ Navigational co-ordinates of the survey area ➢ Timing and duration of proposed activities ➢ Designated safety zone around the seismic vessel (500m). 3) Notify fishing operators through recognised fishing associations, MFMR, fishing companies, agents or through MME <ul style="list-style-type: none"> ➢ Notify operational fishing vessels directly where required or encountered 4) Transmit Daily Radio Navigation Warnings and Notices to Mariners the survey vessel's position and operation progress	Seismic Contractor Operations Manager, Environmental Coordinator	Copies of all correspondence Copies of notices sent	Notice to Mariners at least 24 hours before start of survey Daily positional updates throughout survey	Copies of notices and list of recipients/ addressees
Appointment of FLO / MMO	Ensure compliance with EMP Minimise impacts	Appoint trained FLO who are familiar with fisheries operational in the area and MMO must have experience in seabird, turtle, seal and marine mammal identification and observation techniques.	Seismic Contractor	FLO / MMO contract and reports	Prior to commencing survey	Monitoring reports

Table 4.2: Actual survey operations.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Adherence to EMP and Industry Best Practices	Operate in an environmentally responsible manner	1) Comply fully with the EMP (compliance means all activities are undertaken successfully and details recorded). 2) Abide by terms of internationally recognised Environmental Management Policy <ul style="list-style-type: none"> ➢ Include environmental awareness training, waste management, environmental monitoring, procedure and data recording. 3) Comply with the Joint Nature Conservation Committee (JNCC) "guidelines for minimising the risk of injury and disturbance to marine mammals from seismic survey" 4) Comply with " <i>Environmental Guidelines for Worldwide Geophysical Operations</i> " as issued by the International Association of Geophysical Contractors (IAGC).	Operations Manager and Seismic Contractor, FLO and MMO	Self-audits	During the survey period	Copies of self-audit reports FLO and MMO reports
Helicopters Crew changes, Services or in an event of an Emergency as may be required	Minimise noise impact to coastal fauna	1) Instruct helicopter operator and pilots not to overfly Ramsar sites, islands, coastal reserves, bird and seal breeding colonies. If not possible <ul style="list-style-type: none"> ➢ Minimum altitudes of 600 m over nature conservation/breeding areas ➢ No-fly zone 3km seaward and 1km landward of sensitive area ➢ Avoid seabird colonies on the numerous offshore islands 2) Brief all pilots on the ecological risks associated with flying over seabird and seal colonies and at a low level parallel to the coast. 3) Avoid prolonged coast-parallel flights within 1 nautical mile of the shore) 4) Maintain reasonable altitude over sea (600 m) if cetaceans are spotted. 5) Report any deviations from pre-set flight paths.	Operations Manager Environmental coordinator Helicopter operator	Report deviation from prescribed flight path	Ad Hoc As required	Log of flight paths
Equipment management	Minimise equipment loss overboard and minimise hazards on seafloor or floating	1) Keep a record of all items lost overboard including time and location 2) Inform relevant authorities (MEFT, MFMR, MME), and other users in the area (mining houses, fishing companies). 3) When any items that constitute a seafloor or navigation hazard are lost a standard form must be completed including: <ul style="list-style-type: none"> ➢ Date and cause of loss ➢ Details of equipment (Type, Size) ➢ Vessel ➢ Location ➢ Sea state and weather ➢ Nature of the Seafloor 	Seismic Contractor Operations Manager Equipment quartermaster Environmental officer	Incident records	During the operation	List of lost equipment Copy of record sheet

Table 4.2: Cont.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Pollution control and Waste Management	Minimise marine pollution Maximise recycling Adherence to MARPOL 73/78	<p>1) Minimise pollution and maximise recycling by implementing and maintaining a company waste management policy.</p> <p>2) Comply with legal requirements for waste management and pollution control (for air and water quality levels at sea) by educating crew, adhering to MARPOL policies and monitoring practices.</p> <p>3) Ensure all crew is trained in spill management.</p> <p>4) Ensure that a waste disposal contractor disposes of waste returned to port at a licensed landfill site.</p> <p>5) Ensure waste disposal is carried out in accordance with appropriate laws.</p> <p>5) Supply vessels must comply with internationally agreed MARPOL standards</p> <p>MARPOL Procedures and Guidelines</p> <ul style="list-style-type: none"> • <i>General waste:</i> Minimise waste generation -No disposal overboard. • <i>Galley waste:</i> Reduce to < 25 mm prior to disposal overboard if < 12 NM from shore - No disposal within 3 NM of the coast. • Disposal without macerating – vessel must be >12 nautical miles from shore. • <i>Medical waste:</i> Seal in aseptic containers for disposal onshore. • <i>Deck drainage:</i> Use biodegradable, non-toxic cleaning agents • Ensure that weather decks are kept free of spillage. Mop any spill immediately. Collect in oily water separator systems. • <i>Machinery space drainage:</i> Collect used oil and oily water • Filter oily water and release water of < 5ppm oil in water • Dispose of sludge in appropriate facility at port. • Return waste oil to shore for processing • <i>Solid waste:</i> Incinerate onboard or store and transport to port for disposal on land. • <i>Hazardous waste:</i> record volume and type brought onboard • Store in dedicated waste containers • Dispose of in the designated site at port. • <i>Sewage:</i> use approved treatment plants set to MARPOL standards. Discharge only where the high wind and wave energy is expected to result in rapid dispersal. Discharge treated sewage between 4 and 12 NM from the coast. No sewage discharge within 4 NM of the coast. No treatment needed if beyond 12 NM from coast, However, vessel must be moving at ≥4 knots before discharging at a moderate rate. • <i>Metal:</i> Send to shore for recycling or disposal. • <i>Minor oil spill:</i> Use oil absorbent. • <i>Atmospheric emissions:</i> Maintain and tune all hydraulic hoses, engines, motors, generators to minimise soot and unburned diesel. 	Seismic Contractor Operations Manager Environmental coordinator	Self-audit Registers Record books Daily reports	Throughout survey operations	Summary of waste record book Waste disposal schedule Receipts from disposal agents/sites Record destination of waste for on land disposal Report occurrence of minor oil spills

Table 4.2: Cont.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
<p>Communication and notification to other vessels, Coordination with other users</p>	<p>Minimise disruption to other users. Promote cooperation Promote safe navigation Minimise cumulative impacts</p>	<p>1) Notify relevant government ministries and departments – MFMR, MEFT, MME, Namibian Ports Authority. Port Captains and Commissioner for Petroleum Affairs 2) Notify other marine users, fishing industry (Namibian and foreign), marine petroleum, mineral prospecting and mining licence holders. - Notification must include <ul style="list-style-type: none"> ➢ Navigational Coordinates of the Survey Area ➢ Timing and Duration of Proposed Activities ➢ Designated safety zone around the seismic vessel (500 m). 3) Notify fishing operators through recognised fishing associations, MFMR, fishing companies, agents. <ul style="list-style-type: none"> ➢ Notify operational fishing vessels directly 4) Transmit Daily Radio Navigation Warnings and Notices to Mariners re the survey vessel's position and operation progress 5) Co-operate with other users to minimise disruption of their activities. 6) Co-operate with other legitimate users of the sea to minimise cumulative impacts on marine life.</p>	<p>Seismic Contractor Operations Manager Environmental Coordinator FLO</p>	<p>Copies of written notices and correspondence</p>	<p>Notice to Mariners at least 24 hours before start of survey Daily positional updates throughout survey During survey operations as required</p>	<p>Copies of notices and list of recipients/ addressees/ FLO Reports / notes/ minutes</p>
<p>Exclusion of other vessels</p>	<p>Minimise probability of collision or contact incidents</p>	<p>1) Use communication channels (radio and email) to inform all other potential users about the survey locations, timing, priority of passage, safety exclusion zones. 2) Keep constant watch for approaching vessels during operations. 3) Warn by radio and chase boat if required. 4) Communicate any delays or equipment loss. 5) Record any unusual incidents</p>	<p>Survey Contractor Environmental Coordinator Operations Manager FLO Officer of the watch Chase boat skipper</p>	<p>Daily Reports Copies of written communication Incident Report</p>	<p>During the survey operations</p>	<p>Copies of written communication Incident Reports/FLO Reports / notes/ minutes</p>
<p>Prevention of emergencies</p>	<p>Minimise potential emergency Minimise environmental damage Minimise extraneous costs</p>	<p>1) Prevent collisions by ensuring good communications with relevant parties. 2) Ensure seismic and support vessels display correct signals by day and lights by night (including twilight) 3) Set watches – visual, radar and standby vessel. 4) Identify any long-line activity in survey area and communicate with fishers as to location of gear. 5) Service equipment regularly 6) Conduct weekly emergency drills. 7) Establish lines of communication with emergency response: <ul style="list-style-type: none"> ➢ MEFT, MFMR, MWTC, Sea Rescue Institute of Namibia, Ports Captains. </p>	<p>Survey Contractor Environmental Coordinator Operations manager FLO Officer of the watch Chase boat skipper</p>	<p>Daily Reports Copies of written communication Incident Report</p>	<p>Throughout survey operations</p>	<p>Copies of written communication Incident Reports/ FLO Reports / notes/ minutes</p>

Table 4.2: Cont.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Emergency management procedures (include. Oil Spills)	Minimise environmental damage Minimise distress and tragedy	<p>1) Adhere to code of conduct and Law of the Sea obligations regarding other vessels in distress.</p> <p>2) In the event of an onboard crisis implement health and safety procedures in accordance with emergency plans.</p> <p>3) In the event of an oil spill immediately notify NAMPORT and the Commissioner for Petroleum Affairs. Information required when reporting a spill includes:</p> <ul style="list-style-type: none"> ➤ The type and circumstances of incident ➤ Ship name, type, port of registry ➤ Nearest agent representing the ships company ➤ Location (lat, long), distance offshore and extent of oil spill ➤ Prevailing weather conditions and sea state ➤ Persons and authorities already informed of the spill. <p>Where diesel, which evaporates relatively quickly, has been spilled, the water should be agitated or mixed using a propeller boat to aid dispersal and evaporation.</p> <p>Dispersants are most effective:</p> <ul style="list-style-type: none"> ➤ On fresh crude oils. under turbulent sea conditions (dispersants require mixing). ➤ When applied within 12 hours or at a maximum of 24 hours after the spill. <p>The volume of dispersant application should not exceed 20-30% of the oil volume.</p> <p>Dispersants should not be used without authorisation by MFMR.</p> <p>Dispersants should not be used:</p> <ul style="list-style-type: none"> ➤ On diesel or light fuel oil or on heavy fuel oil. ➤ On slicks > 0.5 cm thick. ➤ On any oil spills within 5 nautical miles offshore ➤ In water depths < 30 m ➤ When spill is so far offshore there is little chance of oil reaching the shore. 	Survey Contractor Environmental Coordinator Operations manager/ SHE Officer of the watch	Daily Reports Copies communication Incident Report	Throughout survey operations	Copies of communication Incident Reports

Table 4.2: Cont.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Airgun Operation	Minimise impact of seismic noise on marine fauna	<p>1) Maintain continuous watch for marine life within 500 m of vessel and airgun array. PAM should be used at night and in periods of poor visibility.</p> <p>2) Use of the lowest practicable airgun volume as defined by the operator.</p> <p>3) Implement the following procedures before and during shooting:</p> <ul style="list-style-type: none"> • No seismic activity if birds and/or animals are observed within 500 m of the vessel or the airgun array. • Commence "soft-start" procedures if no animals or diving birds have been sighted within the safe zone (500 m) for at least 30 minutes. If after 30 minutes, small cetaceans (dolphins) and seals are still in area, normal "soft start" procedures may commence • Re-initiate "soft starts" after a cessation in firing of 20 minutes or longer. Ramp-up proportionally if break was shorter than 20 minutes. • Fire low level warning shots during turns and repositioning, unless using PAM. <p>Temporarily terminate seismic shooting when:</p> <ul style="list-style-type: none"> • Negative behaviour indicating distress directly related to the airgun is observed • Animals and/or birds are observed within 500 m of the operating airgun or the vessel (except dolphins and seals) • Animals and/or birds approach the airgun (except dolphins and seals) • Injury occurs as a direct result of the survey. • Natural avoidance behaviour is over-ridden by feeding response near the seismic array (e.g. Due to the presence of stunned fish) • There is mass mortality or evidence of mass disorientation or injury of fish and/or invertebrates. <p>At night:</p> <ul style="list-style-type: none"> • PAM will be used. • Lighting on board survey vessels should be reduced to the minimum safety levels to minimise the potential stranding of pelagic seabirds • Any stranded seabirds must be retrieved and released according to appropriate guidelines <p>4) Record sightings of any injured or dead protected species, 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 (lat, long) of the strike and the species and a description of the animal and/or bird should be recorded.</p>	Survey Contractor Environmental Coordinator Officer of the watch MMO	Self-audit Daily Reports Shut-down logs IMO/MMO reports Incident Report Records of marine fauna observations and "soft-start" procedures	Prior to and throughout survey operations	IMO/MMO reports Copies of completed marine fauna observation forms and seismic activity log showing "soft-start" Initiation. Log of shutdowns, including all decisions and discussions relevant to the termination.

Table 4.2: Cont.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Ongoing monitoring of effects	Ongoing monitoring programmes (in conjunction with government if required)	1) Initiate monitoring programmes as per specific indication by authorities, 2) Monitor performance against objectives and targets 3) Document all activities and findings for internal and external audits 4) Undertake daily monitoring and recording of the following: <ul style="list-style-type: none"> ➤ Marine mammals and sea birds sighted ➤ Record species and numbers in relation to survey activities ➤ Responses of animals and birds to seismic activity ➤ Fish or invertebrate mortality associated with airgun firing ➤ Record sound levels and "soft start procedures" ➤ Record changes in behaviour (swimming motion, feeding, diving patterns, change in swimming direction and speed, startle responses) ➤ Record vessel interaction, particularly if chase boat was used to maintain safe operational zone ➤ Details of unattended fishing gear ➤ Document communication with other vessels 	Seismic Contractor Environmental Coordinator MO	Daily Reports	During survey operations	Daily reports MMO reports
Performance assessment	Ongoing monitoring programme and EMP Performance Assessments	1) Implement the ongoing monitoring programmes and EMP Performance Assessment as determined by MME 2) Submit Environmental Performance Assessment reports to MME and MEFT 3) Performance assessment based on successful implementation of EMP Data recorded should include: <ul style="list-style-type: none"> ➤ Species and numbers ➤ Location (lat, long) ➤ Relation to vessels (distance, approaching/retreating) ➤ Swimming direction and speed ➤ Change in swimming direction/speed as a result of survey activities ➤ Stunning or mortality as a result of survey activities Take note of: <ul style="list-style-type: none"> • Airgun activities, including sound levels, "soft-start" procedures, shut-down and pre-firing regimes, night-time survey, relocation • Meteorological conditions and sea state • Compliance with (MARPOL 73/78 regulations) 4) Submit reports to ministries weekly and to research institutes such as the National Marine Information and Research Centre (NatMirc) in the MFMR for analyses of survey impacts in local waters.	Seismic Contractor SHE FLO and MMO	Daily reports MMO reports	During survey operations and after completion of survey Required regularity of performance assessment to be determined by MEFT and MME	Monitoring reports Provide all recorded information

Table 4.3: Post survey operations.

ACTIVITY	RATIONALE and MOTIVATION	COURSE OF ACTION TO FULFIL EMP PROVISOS	DESIGNATED PERSON RESPONSIBLE	CONTROL and VERIFICATION	TIMING	REQUIREMENT FOR "CLOSEOUT" REPORT
Survey vessels to leave area	Leave area in state that it was prior to survey operations	Ensure that all deployed equipment is retrieved.	Seismic Contractor Operations Manager SHE Equipment Quartermaster	Self-Audit Equipment records	On completion of survey operations	SHE / Environmental Coordinator Report
Inform relevant parties of survey completion	Ensure all relevant parties are aware of completion of survey operations	1) Inform MEFT, MME and MFMR of completion of survey operations 2) Inform other users of completion of survey operations (Fishing Industry Mining Companies) <ul style="list-style-type: none"> Inform fishing companies and vessels through recognised fishing associations. 	Seismic Contractor Operations manager SHE Environmental Officer	Records of communication	Within a fortnight of survey completion	Copies of communication and notification documents
Final waste disposal	Minimise pollution, maximise recycling Ensure correct disposal of all waste brought to port	1) Dispose of all waste retained onboard at a licensed waste site through a licensed waste disposal contractor.	Seismic Contractor operations manager SHE Environmental Officer	Receipts from waste disposal contractor	In port	Receipts from waste disposal contractor and sites
Final observation reports	Share information with interest groups	1) Share faunal observation reports with relevant parties/associations and MFMR, MEFT.	MMO and FLO	Reports	After completion of survey	FLO and MMO monitoring reports
Close-out report	Ensure corrective action and EMP compliance	1) Compile a seismic survey "close-out" report on completion of the survey. 2) Base "close-out" report on the monitoring requirements and the EMP. 3) Provide information / records asked for in "close-out" report column of EMP 4) Submit copies to MEFT and MME	Searcher Geodata UK Ltd / External Consultant such as Risk-Based Solutions (RBS) CC		Three (3) months after survey close	Above information, records and reports

5. MONITORING AND REPORTING

5.1 OVERVIEW

The current Namibian environmental assessment and management procedure requires the submission of biannual Environmental Monitoring Reports (EMRs) or as the Environmental Clearance Certificate (ECC) additional conditions that may be stipulate.

It recommended that the EMRs as submitted when due even if no activities did take place. The EMRs are used to support the renewal of the ECC once it expires after three (3) years.

The EMRs shall comprise the summary description of the activities undertaken for the period under review, the EMP implementation and the submission of the monitoring datasets collected. The regular submission of EMRs and collation of data may facilitate recognition of effects and impacts not previously foreseen and allow for the implementation of precautionary measures and mitigation before the impacts become significant.

The monitoring programme acts as a quality assurance check list on all environmental procedures and environmental performances with respect to the implementation on the EMP. The following is the summary of the key general component of the EMP monitoring framework that shall be monitored and documented in addition to the specific reporting by the SHE / Environmental Coordinators, FLO and MMO activities:

- 1) I&AP consultation and communication records:
 - a. Pre-survey meetings.
 - b. Communication with I&APs, and.
 - c. Notice to Mariners.
- 2) Port calls.
- 3) Vessel operations:
 - a. Fuel consumption.
 - b. Oil consumption, and.
 - c. Water consumption.
- 4) Weather and Climate:
 - a. Atmospheric weather conditions, and.
 - b. Sea state.
- 5) Marine Fauna sightings and interactions
 - a. Invertebrates (sightings / reaction to survey).
 - b. Turtles (sightings / reaction to survey).
 - c. Sea Birds (sightings / reaction to survey /landing on vessel).
 - d. Seals (sightings / reaction to survey).

- e. Baleen whales (sightings / reaction to survey).
 - f. Toothed whales and dolphins (sightings /reaction to survey).
 - g. Cetaceans (sightings /reaction to survey), and.
 - h. Fish / fishing vessel/s (sightings / reaction to survey).
- 6) Incidents involving other marine users:
- a. Daily updates (survey position and progress).
 - b. Fishing industry interaction (incident record – vessels / gear), and.
 - c. Other Vessels (incident record).
- 7) Onboard environmental awareness:
- a. Environmental training.
 - b. Waste management:
 - i. Discharge to atmosphere (volume).
 - ii. Discharge to sea:
 - o Sewage (volume), and.
 - o Galley waste (tonnage).
 - iii. Disposal at port:
 - o Solid waste (tonnage/ disposal site).
 - o Hazardous Waste (volume/ disposal site), and.
 - o Other waste (volume/ disposal site)
- 8) Emergencies:
- a. Service record.
 - b. Major Oil/ Chemical spills.
 - c. Emergency Drills / Training, and.
 - d. Health and Safety Briefings.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 EMP Conclusions

Searcher Geodata UK Ltd (the “**Proponent**”) is proposing to amend the current Environmental Clearance Certificate (ECC) APP No. 3794, to include the initially excluded 255 km² semicircle area portion of the Petroleum Exploration License (PEL) No. 0085, Block 2914A situated in Orange Basin, offshore southern Namibia (Figs. 1.1- 1.3). PEL 0085 covering Block 2914A is held and operated by Rhino Resources and Partners. The Proponent / license holders / operator intend to acquire Multiclient or Proprietary 2D/3D over the 255 km² semicircle area using the amended current ECC of the Proponent (Fig. 1.1). The current ECC was granted on the 8th September 2022 and will expire on 8th September 2025 (Fig. 1.1).

The current area of interest (AOI) covers Blocks 2614, 2613, 2612A, 2612B, 2714A, 2714B, 2713, 2712B, 2712A, 2812B, 2813A, 2814B, 2814A, 2912, 2913B, 2914B, part of 2914A, and 2915, and excludes a 255 km² semicircle area of the Petroleum Exploration License (PEL) No. 0085, Block 2914A and the Tripp Seamount.

Several specific mitigation measures have been provided in this Updated EMP Report based on the findings and recommendations of the Updated EIA Report to mitigate the potential negative impacts that the proposed 2D/3D seismic survey may have on the receiving coastal and marine environments (physical, biological, and socioeconomic components). If the mitigation measures are implemented and monitored, any likely negative impacts that the proposed 2D/3D seismic survey may have on the receiving environment are likely to be reduced significantly, thereby promoting the coexistence of petroleum exploration activities with natural marine environment and other marine users such as fisheries.

6.2 EMP Framework Recommendations

Based on the results of the Updated EIA Report and the mitigation measures detailed in this Updated EMP Report, it is hereby recommended that the proponent (Searcher Geodata UK Ltd) be issued with an amended Environmental Clearance Certificate (ECC) for the proposed 2D/3D seismic survey operations over the 255 km² semicircle area portion of the Petroleum Exploration License (PEL) No. 0085, Block 2914A, excluding the Tripp Seamount situated 15 km to the south of the AOI in the Orange Basin, offshore, southern Namibia.

Searcher Geodata UK Ltd and the survey contractor are responsible for ensuring that all the provisions of this EMP are implemented and monitored accordingly. The ultimate responsibility rests with the Proponent (Searcher Geodata UK Ltd), for providing all appropriate resources and ensure that all employees, including contractors and sub-contractors are informed of, understand and are familiar with the EMP requirements for the proposed 2D/3D seismic survey. The following is the summarised local tailor made EMP prepared for easy incorporation in the project / contract documents with respect to the proposed 2D/3D seismic survey in the Orange Basin, offshore, southern, Namibia and based on the standard Searcher Geodata UK Ltd EMP framework:

1. Procedure for Commencement of Operations:

- (i) Exclusion zone:
 - 500 m horizontal radius from centre of source array.
- (ii) Visually monitor the exclusion zone:
 - In water depths of greater than 200m, for at least 30 minutes prior to activating seismic sources, observer(s) should visually survey the 500 m exclusion zone for cetaceans.
 - Observer(s) assigned to visual observations during commencement of operations:

- Observer(s) should be trained to an acceptable standard.
 - Observer(s) may be crew members, other employees, or third-party contractors, and.
 - All visual observations and operations should be electronically documented and made available for evaluation and study.
- If cetaceans are present within the 500m exclusion zone, delay the start of soft-start procedure until at least 20 minutes after the last sighting of a cetacean, and.
 - If there are no cetaceans present, initiate soft-start procedure.

(iii) Soft Start Procedure:

- To achieve the soft start principle of commencing with the smallest volume element in the array and progressing to the full operating volume of the source over a specified period, the following key elements will be implemented:
 - The first stage of soft start will involve activating the smallest volume element in the array.
 - Subsequent stages will involve doubling the number of active elements at the commencement of each stage.
 - All stages should ideally be of approximately equal length.
 - The total duration of the soft start should be at least 20 minutes.
 - As there will generally be one stage in which doubling the number of elements is not possible (due to the number of elements in the full array not being, for example, 8, 16 or 32) it is preferable to make this stage the last one of the soft start sequences (as opposed to adjusting the increments of other stages or placing a lower increment early in the soft start sequence).
 - To minimise additional noise in the marine environment, a soft-start (from commencement of soft-start to commencement of the line) should not be significantly longer than 20 minutes (for example, soft-starts greater than 40 minutes are considered to be excessive, and an explanation should be provided within the MMO report), and.
 - Operators should avoid unnecessary firing at full power before commencement of the line.

(iv) Periods of poor visibility and darkness:

- Initiate soft-start procedure as above, and.
- Use passive acoustic monitoring system for detections.

2. Procedure for Ongoing Operations:

- (i) If seismic sources are silent for 5 minutes or more, use soft-start procedure.
- (ii) Report immediately to MMO or FLO if there is any animal in distress, animal carcasses, etc.
- (iii) The vessels involved in the project must not move towards cetaceans and sea turtles whenever it is possible. Wherever possible the vessels must avoid and distance themselves from these animals.

- (iv) Whenever possible the speed of the project vessels must be limited to a maximum of 13 knots.
- (v) Whenever protected marine mammals are observed within the exclusion zone, **the shots must be interrupted** and thereafter a slow-start procedure followed, and.
- (vi) If marine mammals are detected within 500 metres of the centre of the airgun array whilst the airguns are firing, either during the soft-start procedure or whilst at full power, **there is no requirement to stop firing the airguns.**

3. Procedure for Testing Source Elements:

- (i) If a source test is necessary whereby each source element must be activated individually.
- (ii) Visually monitor the exclusion zone before any instances of gun testing.
 - At least 30 minutes prior to activating seismic sources, observer(s) should visually survey the 500m exclusion zone for cetaceans.
 - Observer(s) assigned to visual observations during commencement of operations
 - Observer(s) should be trained to an acceptable standard.
 - Observer(s) may be crew members, other employees, or third-party contractors.
 - All visual observations and operations should be electronically documented and made available for evaluation and study.
 - If cetaceans are present within the 500m exclusion zone, delay the start of soft-start procedure until at least 20 minutes after the last sighting of a cetacean.
 - If cetaceans are absent from the 500m zone, initiate the seismic source, starting with the smallest volume source element and working up to the larger volumes, and.
 - If the intention is to test a single airgun on low power, then a soft start is not required.

4. General Practices:

- (i) Environmental awareness programmes must be organised for all crew members to explain the conservation status of the cetaceans and turtles and to highlight the importance of the mitigation measures.
- (ii) Ensure that the support vessel(s) are in watch of the safety zone established around the seismic vessel (5.5km ahead and abeam and 13 km as clearance from the vessel) this measure will allow the reduction of potential safety risks associated with the seismic operations especially with the fishing vessels while working in the shallow waters.
- (iii) High intensity unnecessary noise must be avoided where possible.
- (iv) Any occurrence of large marine mammals should be brought to the attention of MMO or FLO.
- (v) MMO and FLO observations shall always be made when the vessel is moving (not only during seismic acquisition).
- (vi) Regular maintenance must be performed on the project vessels and the maintenance team must pay special attention to the noise produced by the vessels.

- (vii) Whenever possible, ensure that the towed exploration materials (buoys, air cannons, etc.) do not have gaps (or these must be covered or reduced) in which the animals (e.g., turtles) can get stuck.
- (viii) All crew members must be forbidden from killing or causing injuries to marine fauna. Any crew member that deliberately kills or causes any damage to marine fauna must be immediately dismissed, reported to the relevant authorities and sent to shore.
- (ix) There must be someone in the support vessels who is responsible for watching out for the possible occurrence of these animals in the vicinity of ships.
- (x) In the event of entanglement, all activities must stop and the rescue actions to rescue the animal must be put into practice.
- (xi) Through the Petroleum Commissioner in the Ministry of Mines and Energy or directly, request from the Namibian Maritime Search and Rescue (SAR), Department of Maritimes Affairs in the Ministry of Works and Transport in their capacity as the national maritime authority, for instructions on the rules and procedures that shall be adhered to, prior-to and during the seismic operations in Namibian territorial (jurisdictional) waters, and.
- (xii) It shall be ensured that the "Navigation Warnings" are issued and disseminated through the Petroleum Commissioner in the Ministry of Mines and Energy or directly through Namibian Maritime Search and Rescue (SAR), Department of Maritimes Affairs in the Ministry of Works and Transport maritime communications network, as well as through other means of dissemination as may be available while at sea.

5. Pollution Management:

- (i) The procedures for deposition applied must comply with national legislation (e.g., Regulation for the Prevention of Pollution and Marine and Coastal Environmental Protection, Decree No. 45/2006 of 30 November) and international best practices (e.g., International Convention for the Prevention of Pollution by Ships – Marpol 73/78).
- (ii) The treatment of sewage must be done before it is discharged into the sea, according to the recommendations by Marpol 73/78.
- (iii) The ships must perform the treatment of the bilge waters onboard or do the transshipment offshore, in compliance with the recommendations by Marpol 73/78.
- (iv) Implement a Pollution Control Programme, including the treatment, adequate disposal and minimizing waste, according to the recommendations by Marpol 73/78.
- (v) The frequent monitoring of the disposed waters, as a means of ensuring that the levels of pollutants are within the recommended standards.
- (vi) The seismic vessel shall possess a manual of procedures to deal with domestic garbage that if correctly applied, prevent and minimize the potential negative effects of this impact.
- (vii) Searcher Geodata UK Ltd must ensure that the seismic vessel possesses a Plan for Domestic Residues Management that is in conformity with Annex V of the MARPOL Convention: Prevention of Pollution by Garbage from Ships.
- (viii) All atmospheric pollution emissions shall comply with the Mozambican Laws and International Guidelines.
- (ix) According to Annex VI of the MARPOL 73/78 Convention, the content of the oils sulphuric shall have a maximum value of 4.5% m/m except in cases that the seismic vessel is equipped with an approved cleaning system for the treatment of exhaustion gases or any

other technical method that is verifiable and that reduces the SO₂ emissions to a maximum of 6.0 g/kWh¹, and.

- (x) The incineration of packaged contaminated materials on board the seismic vessel and Polychlorinated Biphenyls (PCBs) is prohibited. Furthermore, the deliberate emission of substances that are prejudicial to the Ozone Layer, including halon and the chlorofluorcarbonates (CFCs) is also prohibited.

6. Spills Management:

- (i) All equipment and machinery that could potentially leak or spill fuel must be regularly maintained, inspected and tested.
- (ii) An Emergency Response Plan for Oil Spills must be prepared and must include, at least, the requirements specified by the World Bank related to Health, Safety and the Environment during Offshore Petrol and Gas operations (World Bank Group, 2015).
- (iii) In the event of fuel spills or other chemicals, an Emergency Response Plan for Oil Spills must be put into action /implemented. The capacity to implement that plan must be proven before the start of any activities.
- (iv) The Emergency Response Plan for Oil Spills must consider the best measure and the state-of-the-art methods for containing spills or loss of fuels, oil and chemical products, in all the vessels involved in the Project.
- (v) Regular adequate training must be provided for all Project workers, related to the prevention, containment and response to spills.
- (vi) All equipment involved in the response to spills must be frequently maintained, inspected and tested.

7. Overall Compliances:

- (i) Compliance to all relevant national, regional and international (MARPOL) marine pollution prevention regulations, standards, guidelines and procedures, and.

8. Adoption of the Precautionary Principles:

- (i) In the absence of any specific mitigation measures being provide in this EMP, the Proponent (Searcher Geodata UK Ltd) and / or Contractor shall always adopt the precautionary approach.

7. REFERENCES

Refer to the Updated EIA Reports Linked to this Updated EMP Report