ENVIRONMENTAL IMPACT REPORT FOR AN EIA FOR A PROSPECTING RIGHT APPLICATION FOR OFFSHORE SEA CONCESSIONS 14B, 15B & 17B, WEST COAST

Prepared for: Belton Park Trading 127 (Pty) Ltd

DMRE Authority References:
WC30/5/1/1/2/10311PR
WC30/5/1/1/2/10312PR
WC30/5/1/1/2/10313PR

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EXECUTIVE SUMMARY

1. INTRODUCTION

Belton Park Trading 127 (Pty) Ltd (BPT127) lodged separate applications for Prospecting Rights with the Department of Mineral Resources and Energy (DMRE) to undertake offshore prospecting activities in Sea Concessions 14B, 15B and 17B, located off the West Coast of South Africa (See Figure 1). The applications were lodged in terms of Section 16 of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002; MPRDA) (as amended by the Mineral and Petroleum Resources Development Amendment Act 49 of 2008).

In terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended by GN40772 on 7 April 2017), promulgated in terms of the National Environmental Management Act (No. 107 of 1998; NEMA), an application for a prospecting right requires Environmental Authorisation (EA) from the competent authority, which in this case is the Minister of Mineral Resources and Energy, to carry out the proposed prospecting activities. The applications for EA, in terms of NEMA, was submitted to the DMRE at the same time as the prospecting right application. In terms of the EIA Regulations Listing Notices, a Scoping and Environmental Impact Assessment (EIA) process is required for the proposed prospecting activities.

SLR Consulting (South Africa) (Pty) Ltd (SLR) has been appointed by BPT127 as the independent Environmental Assessment Practitioner (EAP) to determine the biophysical, social and economic impacts, by means of the required EIA process, associated with undertaking the proposed prospecting activity. This report presents the process followed and the findings of the EIA.

2. OPPORTUNITY FOR COMMENT

This draft Environmental Impact Report (EIR) is available to Interested and Affected Parties (I&APs) for a 30-day review and comment period from **27 August to 27 September 2021**. Copies of the full report have been made available on: the SLR website (at https://www.slrconsulting.com/public-documents/belton-park-trading) and zero-data rated website (https://slrpublicdocs.datafree.co/public-documents/belton-park-trading). Any comments should be forwarded to SLR at the address, telephone numbers or e-mail address shown below[1]. For comments to be included in the final EIR, comments should reach SLR by no later than **27 September 2021**.

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[1] It is assumed that in providing your Personal Information to be registered as an Interested and Affected Party for this Project you authorise SLR to retain and use your Personal Information as part of a contact database for this and/or other Social and Environmental Impact Assessment Project(s) and that you confirm your acceptance for SLR to contact you regarding this and/or other Social and Environmental Impact Assessment processes. SLR warrants that we will not process your Personal Information, other than as permitted or required by Social and Environmental Impact Assessment processes or as required by Law or public policy. SLR will use reasonable, appropriate security safeguards in order to protect Personal Information, and to reasonably prevent any damage to, loss of, or unauthorised access or disclosure of Personal Information, other than as required for Social and Environmental Impact Assessment processes or as required by any Law or public policy. You may request for your Personal Information to be deleted from the I&AP database at any time by contacting SLR by e-mail or in writing at the address below.

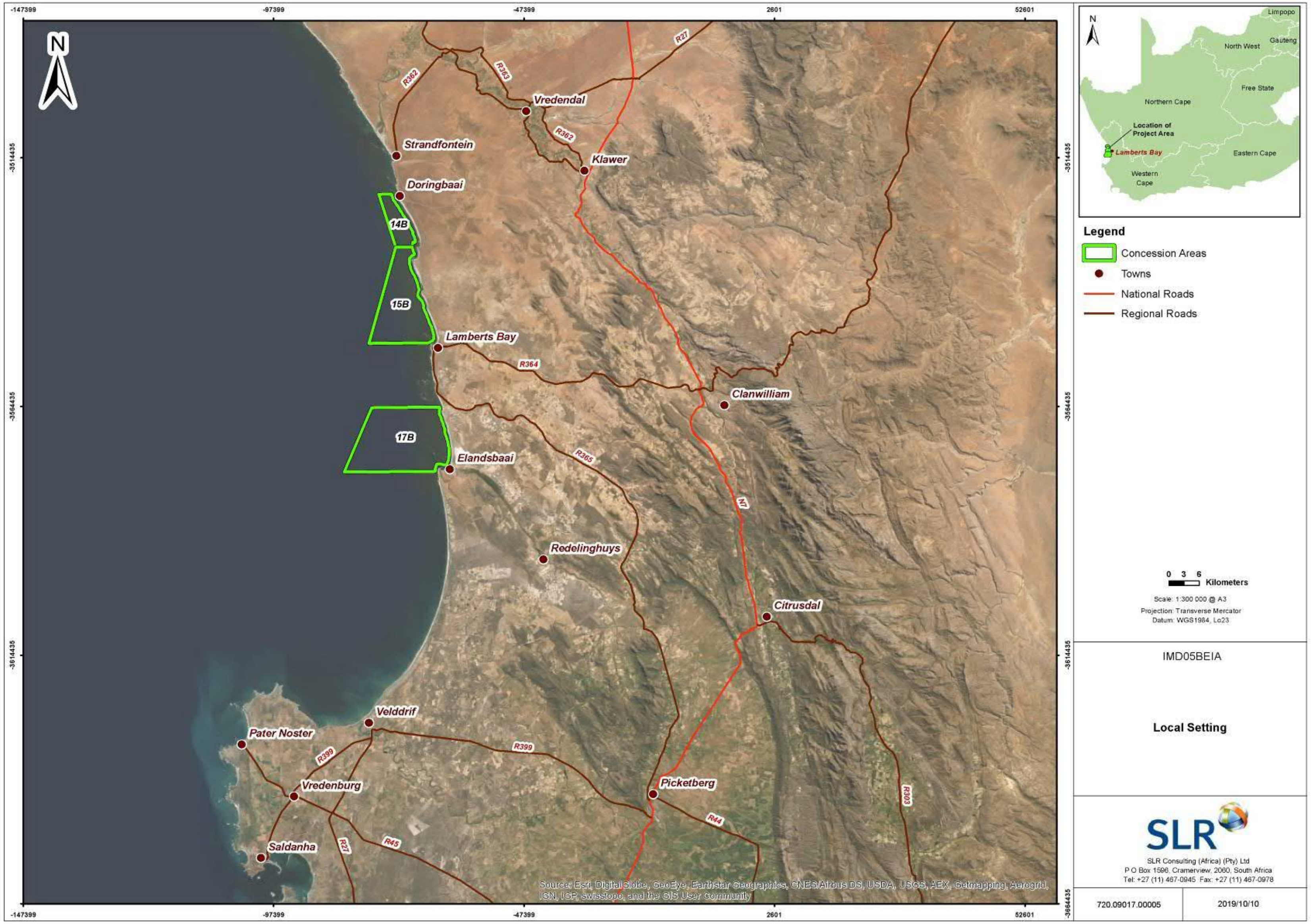

FIGURE 1: LOCATION OF THE 14B, 15B AND 17B SEA CONCESSION AREAS, OFF THE WEST COAST OF SOUTH AFRICA.

After the conclusion of the comment period, all comments received will be collated into a Comments and Responses Report. The comments will be duly taken into account in compiling the final EIR, which will be submitted to the DMRE for consideration and decision-making.
After DMRE has reached a decision, all registered I&APs will be notified of the outcome of the application and the reasons for the decision. A statutory appeal period in terms of the National Appeal Regulations, 2014 will follow the issuing of the decision.

3. SCOPING AND EIA PROCESS

3.1. SCOPING PHASE

3.1.1. Application for Environmental Authorisation

An "Application Form for Environmental Authorisation" form was submitted to DMRE at the same time as the Prospect Right applications were submitted. While five separate applications for EA have been submitted, DMRE has confirmed that one consolidated Scoping and EIA process could be undertaken for all three Sea Concession area applications. Accordingly, should DMRE decide to grant authorisation, a separate EA for each application would be issued (i.e., three EAs in total).

3.1.2. Compilation and review of the Scoping Report

The final Scoping Report was prepared in compliance with Appendix 2 of the EIA Regulations 2014 (as amended). I&AP submissions were received during the draft Scoping Report review and comment period. The submissions have been responded to in the Comments and Responses Report (see Appendix3.2). The key issues raised relate to the potential impact of the proposed project on marine fauna (specifically seabirds and cetaceans), cultural heritage, and on the West Coast pelagic fishery. The Final Scoping Report was submitted and accepted by the DMRE.

3.2. EIA PHASE

3.2.1. Specialist Studies

The specialist studies commissioned to address the key issues and potential impacts were: (1) an Underwater Heritage Impact Assessment, (2) a Marine Faunal Assessment, and (3) a Fisheries Impact Assessment. The impacts in the studies were assessed according to a defined impact assessment methodology and the mitigation measures were defined to avoid or reduce negative impacts and enhance potential benefits.

3.2.2. Integration and Assessment

Information from the specialists, desktop analysis, and the generic EMP prepared for marine diamond mining off the West Coast, have been integrated into this EIR and Environmental Management Programme (EMPr). After closure of the comment period, all comments received on the draft report will be incorporated and responded to in an updated Comments and Responses Report. The draft report will then be updated to a final report, to which the updated Comments and Responses Report will be appended and will be submitted to

DMRE for consideration and decision-making. The decision taken by DMRE will be distributed to all I&APs on the project database as part of the statutory appeal period.

4. PROJECT DESCRIPTION

4.1 GENERAL INFORMATION

The proposed prospecting activities would be undertaken within Sea Concessions 14B, 15B and 17B off the West Coast of South Africa. The minerals targeted by the proposed operations would be diamonds, gemstones, heavy minerals, industrial minerals, precious metals, ferrous and base metals. The proposed prospecting activities are summarised in the table below:

Prospecting activity	Maximum anticipated area of disturbance	Duration
Geophysical Surveys	600 - 1 200 km per concession area.	**Four days per year** for each concession area (i.e. 20 days per year for **4 years**).
Drill Sampling	4 800 drill samples with a cumulative footprints of 1.44 ha per sea concession area.	**Four days per year** for each concession area (i.e. 20 days per year **for 4 years**).
Bulk Sampling	Ten trenches per concession area with a cumulative footprint of 3.6 ha per a concession area.	**Six to seven days per year** for each concession area (i.e. 21 days per year **for 2 years**).

4.2 NEED AND DESIRABILITY

The over-arching framework for considering the need and desirability of development in general is taken at the policy level and should be aligned with the content of regional and local plans, frameworks, and strategies. With respect to the national policy and planning framework, prospecting and mining is identified as a sector with substantial potential for growth stimulation and/or employment and is supported in numerous national planning instruments, such as the National Development Plan 2030 (2012), as well as Operation Phakisa (2014) and Mining Phakisa.

In the regional planning context, the West Coast District Municipality Spatial Development Framework (2020) notes that the District Municipality has a vast number of mineral resources, of which some are currently not being exploited. It is concluded that mining has the potential to make bigger contribution to the overall economy of the District Municipality, when unexploited resources are utilised in future. Thus, the proposed prospecting operations are considered to be aligned with the above-mentioned planning frameworks.

Marine mining at present contributes about 10% of South Africa's total diamond production. In 2019, about 7.2 million carats of diamonds were produced locally. Diamond revenues, levied through income tax on diamonds, mining leases, mining rights and diamond export duties, are put into the Central Revenue Fund from where they are allocated to various budgets by the South African Government.
Prospecting activities are needed to:

- Confirm and obtain additional information concerning potential targets through non-invasive activities (i.e. desk-top studies and geophysical surveys) and invasive activities (i.e. drilling).

- Assess if the resource can be extracted through future mining in an economically viable manner while being socially and environmentally responsible.

Should prospecting activities prove that there is a feasible mineral resource for mining, a new mining area could be developed, which would generate significant employment opportunities.

4.3 PROJECT OVERVIEW

The proposed prospecting programme would entail geophysical surveying, drill sampling and bulk (trench) sampling activities. The principal objective of the proposed prospecting activities is to identify and estimate the potential mineral resources within each Sea Concession area for possible future mining. The proposed activities may be divided into stages subject to data reviews and follow-up sampling. Each of the proposed prospecting activities are described below.

4.3.1 Geophysical Surveys

The geophysical surveying will be undertaken using the group-owned dedicated survey vessel, the *DP Star* which has a length of 45 m. The vessel is equipped with:

- a multibeam echosounder designed to produce high resolution digital terrain models of the seafloor in a wide swath below the vessel; and
- a sub-bottom profiler which can generate profiles up to 60 m beneath the seafloor, thereby giving a cross section view of the sediment layers.
-

Sound levels from the acoustic equipment would range between 190 to 220 dB re 1 µPa at 1 m. The proposed surveys would be undertaken in specific priority areas in each of the concessions, at water depths between approximately 45 - 200 m. The surveys would have a line spacing of between 100 to 1 000 m apart. The total line kilometres surveyed per concession will be between 600 and 1 200 km. The planned duration for the proposed geophysical surveys would be a total of four days per concession area (20 days in total) per year over a four year period (i.e. the duration of the validity of the prospecting right).

In general terms, sound sources that have high sound pressure and low frequency will travel the greatest distances in the marine environment. Conversely, sources that have high frequency will tend to have greater attenuation over distance due to interference and scattering effects (Anon 2007). It is for this reason that the acoustic footprint of the above-mentioned sonar survey tools is considered to be much lower than that of deeper penetration low frequency seismic surveys and in addition have lower sound pressure levels. It should be noted that a decibel is a logarithmic scale of pressure where each unit of increase represents a tenfold increase in the quantity being measured.

4.2.2 Drill Sampling

The proposed drill sampling activities would be undertaken using the group-owned dedicated sampling vessel, the *MV The Explorer* which has an overall length of 114.4 m. The vessel is equipped with a subsea sampling tool, which can be operated in water depths up to 200 m. The sampling tool comprises a 2.5 m diameter drill bit operated from a drill frame structure, which is launched through the moon pool of the support vessel and positioned on the seabed.

The drill bit can penetrate sediments up to 12 m depth above bedrock. The sediments are fluidised with strong water jets and airlifted to the support vessel where they are treated in the onboard mineral recovery plant. All oversized and undersized tailings are discharged back to the sea on site.

A sample spacing of as little as 20 m can be achieved by the dynamically positioned vessel. Depending on sea and the subseabed geotechnical conditions, up to 60 samples can be successfully taken per day. The samples would be undertaken at intervals of 50 to 500 m. With a planned duration for the proposed drill sampling of four days per year for each concession area, the total number of drill samples that would be obtained during the prospecting right period would be up to a maximum of 4 800. As the drill has a footprint of 5 m^2, a total area of 1.44 ha would be sampled.

4.3.3 Bulk Sampling

Following analysis of the drill samples and establishment of a potential resource, bulk trench sampling may be conducted to confirm the economic viability of the resource for mining. Trenching would be undertaken by a seabed crawler, deployed off the group-owned dedicated mining vessel, the *MV Ya Toivo* which has a length of 150 m. The vessel is equipped with a track-mounted subsea crawler capable of working to depths up to 200 m below sea level. The crawler, which is fitted with highly accurate acoustic seabed navigation and imaging systems, and equipped with an anterior suction system, is lowered to the seabed and is controlled remotely from the surface support vessel through power and signal umbilical cables. Water jets in the crawler's suction loosen seabed sediments, and sorting bars filter out oversize boulders. The sampled sediments are pumped to the surface for shipboard processing. The area of the seabed to be sampled by crawler can only be determined following analysis of drill samples and development of a resource model.

It is proposed that up to ten trenches, each 180 m long and 20 m wide would be excavated within each concession area. Thus, the area to be disturbed in each concession would be 3.6 ha and for all five concessions 18 ha. The planned duration of the proposed bulk sampling would be a total of six to seven days per a concession area over a two-year period. It is noted that the trenches will not be contiguous, but located in the prospective areas derived from the drill sampling results. The aim of the trench sampling is to determine the geotechnical characteristics of the footwall and overburden which is essential in establishing the optimal approach to mining in these areas.

4.4 Consideration of Alternatives

The project alternatives considered in this EIA are described below.

No.	Alternatives	Description
1. Site / location alternatives		
1.1	Exploration site	As the intention of the proposed prospecting operations is to determine the presence of

<table>
<tr><th>No.</th><th>Alternatives</th><th>Description</th></tr>
<tr><td></td><td></td><td>economically viable mineral deposits that occur within the Sea Concession areas, no further location alternatives are considered in the Scoping and EIA process.</td></tr>
<tr><td>1.2</td><td>Onshore logistics</td><td>The proposed prospecting operations are of such short duration (four days per concession per annum) that bunkering or provision of spares, consumables or crew changes would not be required. It is expected that once the required prospecting activity has been completed, the vessel would move off location and dock at the Port of Cape Town.</td></tr>
<tr><td colspan="3">2. Activity alternatives</td></tr>
<tr><td>2.1</td><td>Prospecting</td><td>The principal objective of the proposed prospecting activities is to discover and estimate the potential mineral resources within each Sea Concession area for possible future mining. Feasible and reasonable activity alternatives are limited by the proponent's motivation and intention to conduct prospecting to enhance the understanding of possible mineral resources occurring within the Sea Concession areas. Thus, no other activity alternatives for the proposed prospecting operations have been considered in this report.</td></tr>
<tr><td colspan="3">3. Design alternatives</td></tr>
<tr><td>3.1</td><td>Number of Sampling Cores, etc.</td><td rowspan="2">The dynamic nature of the proposed prospecting activities are such that they may be divided into stages subject to outcomes of reviews of the results of the previous round of surveying/sampling. Consequently, the proposed works programme may be modified, extended or curtailed as data and results become available over the duration of the validity of the prospecting right period. Thus, the description of the proposed prospecting operations provided below is deemed to be the most realistic at this stage and is the anticipated maximum work scope that would be undertaken.</td></tr>
<tr><td>3.2</td><td>Scheduling</td></tr>
<tr><td colspan="3">4. Technology / process alternatives</td></tr>
<tr><td>4.1</td><td>Vessel</td><td>Offshore mineral exploration is highly specialised with a limited number of possible vessels equipped to carry out this work. BPT127 intends to contract the vessels as indicated in the section below to undertake the work.</td></tr>
<tr><td>4.2</td><td>Bulk Sampling</td><td>Feasible and reasonable technology alternatives for the proposed activity are constrained by the best available proven technology for conducting the proposed bulk sampling operations. There are two possible basic configurations of vessel available for bulk sampling: (i) the vertical method, utilising a vertically mounted tool on a drill string; and (ii) the horizontal method, using a seabed crawler. As the vessel BPT127 intend on contracting to undertake the bulk sampling activities makes use of the horizontal method, only this approach has been considered in this report.</td></tr>
<tr><td colspan="3">5. No-Go alternative</td></tr>
<tr><td>5.1</td><td>No-go</td><td>The No-Go alternative represents the option not to proceed with exploration, which leaves the project areas of influence in their current state except for variation by natural causes and other human activities. It thus represents the current status quo and the baseline against which all potential project-related impacts are assessed.

While prospecting does not automatically lead to mining, it is an essential stage in the process, which might lead to further exploration and, thereafter mining, which results in long-term economic opportunities in mining sector, if commercial reserves can be exploited. The 'do</td></tr>
</table>

No.	Alternatives	Description
		nothing' or 'no-go' option forgoes these possible advantages. In addition, the implications of not going ahead with the proposed exploration are as follows: • South Africa would lose the opportunity to further establish the extent of offshore diamond reserves; • Lost economic opportunities related to sunken costs (i.e., costs already incurred) of exploration in the sea concession areas; and • If economic diamond reserves do exist and are not developed, South Africa would lose the opportunity to maximise the use of its own indigenous diamond reserves.

5. AFFECTED ENVIRONMENT

5.1 PHYSICAL ENVIRONMENT

The sea concession areas lie within the southern zone of the Benguela Current region and is characterised by the cool Benguela upwelling system. The dominant southerly and south-easterly winds in summer drive the massive offshore movement of surface water, resulting in strong upwelling of nutrient-rich bottom waters. Nutrient-rich upwelled water enhances primary production, and the West Coast region consequently supports economically significant pelagic fisheries.

5.2 BIOLOGICAL OCEANOGRAPHY

The sea concession areas fall is in the cold temperate Namaqua Bioregion. The Namaqua Coastal Area is characterized by high productivity and community biomass along its shores. A large proportion of the area is characterized by habitat that is in relatively good (natural/pristine) condition. The Namaqua Coastal consists of coastal, inner, mid and outer shelf ecosystem types (Sink et al., 2019). The associated pelagic environment is characterized by very high productivity, high chlorophyll and very cold water (mean SST = 15.2°C) caused by upwelling (Lagabrielle 2009, Roberson et al., 2017), also serving as an important area for coastal fish (Turpie et al., 2000).

The demersal fish species likely to be encountered in the general project area occupy waters of <100 m depth and include species such as various skate species, St Joseph, Houndshark, Soupfin shark, Tigar catshark and Bramble shark. Small pelagic species occurring beyond the surfzone and generally within the 200 m contour include the sardine/pilchard, anchovy, chub mackerel, horse mackerel and round herring. Large pelagic species such as tunas, billfish and pelagic sharks, migrate throughout the southern oceans, between surface and deep waters (> 300 m). The distribution of these species is dependent on food availability in the mixed boundary layer between the Benguela and warm central Atlantic waters. Concentrations of large pelagic species are also known to occur associated with underwater feature such as canyons and seamounts as well as meteorologically induced oceanic fronts.

Most seabirds in the region reach highest densities offshore of the shelf break (200 to 500 m depth) and are likely to be encountered. Marine mammals likely to be encountered include sperm whales, migrating humpback and southern right whales and various baleen and toothed whales known to frequent offshore waters.

5.3 HUMAN UTILISATION

The commercial fisheries sectors that could be affected by the proposed prospecting operations are the small pelagic purse-seine, tuna pole, traditional line-fish, West Coast Rock Lobster and gillnet fisheries. The majority of shipping traffic is located on the outer edge of the continental shelf with traffic inshore of the continental shelf along the South-West Coast largely comprising fishing vessels. Most of the shipping traffic would be limited to the western edge of the Sea Concessions.

Exploration for oil and gas is currently undertaken in a number of licence blocks off the West Coast. The Sea Concession areas overlap with Block 3A/4A for which PetroSA and Sasol are the licence holders. There is no oil and gas production offshore of the South African West Coast. However, a subsea production pipeline to export gas from the iBhubesi Gas Field to a location on the Saldanha peninsula and Grotto Bay has been approved for development by Sunbird SA. A few proposed prospecting areas for phosphate are located off the West Coast, these overlap with the western edge of the Sea Concession areas. A few marine diamond mining right and prospecting concession areas are also located in proximity to the Sea Concession areas under this application.
While the sea concessions areas do not overlap any Marine Protected Areas, there is overlap between Sea Concession 17B and the Conservation Zone of the Cape Canyon and Associated Islands, Bays and Lagoon Ecologically or Biologically Significant Areas (EBSA). The principal objective of EBSAs is the identification of features of higher ecological value that may require enhanced conservation and management measures, however, they currently carry no legal status.

6. ENVIRONMENTAL IMPACT ASSESSMENT

Table 1 provides a summary of the significance ratings assigned to each potential impact of the proposed prospecting activities.

Table 1: Summary of the significance of the potential impacts associated with the proposed prospecting activities and No-Go Alternative.

Potential impact	Significance	
	Without mitigation	With mitigation
Impact of the Vessel Discharges / Disposal to Sea		
Normal discharges	VL	**VL**
Noise from Survey/Sampling Vessel and Support Vessels	VL	**VL**
Impact on Marine Fauna:		
Acoustic Impacts:		
Geophysical Surveys	VL	**VL**
Sampling Operations	VL	**VL**
Crushing of Benthic Fauna During Sampling Operations	L	**L**
Generation of Sediment Plumes	VL	**VL**
Smothering of Benthos in Redepositing Sediments:		
Redeposition of discarded sediments on soft-sediment macrofauna	VL	**VL**
Redeposition of discarded sediments on rocky outcrop communities	M	**L**

Potential impact		Significance	
		Without mitigation	With mitigation
Impact on Other Users of the Sea:			
Fishing industry	Exclusion of fisheries	VL	**VL**
	Sediment plume impact on fish stock recruitment	VL	**VL**
	Acoustic Impacts of Geophysical Surveying on Fisheries	VL	**VL**
Marine mining and prospecting		INSIG	**INSIG**
Petroleum exploration		L - VL	**VL**
Marine transport routes		INSIG	**INSIG**
Socio-Economic Impact			
Impact on Cultural Heritage Material		M	**INSIG**
Impact related to Job creation and business opportunities		*VL+*	***VL+***
No-Go Alternative:			
Lost project and economic opportunity to establish whether or not a viable offshore diamond resources exists off the West Coast.		L	**N/A**
Cumulative Impact:			
Cumulative Impacts		L	**L**

VH=Very High H=High M=Medium L=Low VL=Very low INSIG = insignificant N/A= Not applicable

7. CONCLUSIONS

The impacts associated with the prospecting vessel operations would be of short-term duration and limited to the immediate areas where the prospecting activities are being undertaken. As a result, the impacts associated with the vessels are considered to be of **VERY LOW** significance after mitigation. Key mitigation includes ensuring that the vessels used comply with MARPOL 73/78 standards; prior notification is provided to key stakeholders (including fishing industry and adjacent rights holders); and Radio Navigation Warnings and Notices to Mariners are released prior to undertaking the prospecting activities.

Potential impacts on marine fauna as a result of the proposed prospecting activities would be of medium- to short-term duration and limited to the immediate area. As a result, the impacts on marine fauna associated with the sampling activities are considered to be of **VERY LOW** to **LOW** significance after mitigation. Key mitigation includes ensuring that a designated onboard Marine Mammal Observer (MMO) is aboard the survey vessel to ensure compliance with mitigation measures during geophysical surveying; terminating the survey if any marine mammals show affected behaviour within 500 m of the survey vessel or equipment; and avoiding undertaking sampling in rocky outcrop areas or other identified sensitive habitats in the concession areas.

Commercial fishing sectors could potentially be affected by the proposed prospecting activities are the West Coast rock lobster nearshore and offshore sub-sectors, small pelagic purse-seine sector, tuna pole and linefish sectors. In addition they fall within the designated management areas of the netfish and seaweed sectors. It is recognised that elements of the Small Scale Fisheries may also be affected. Given the highly-localised nature of the prospecting operation over the short-term, the potential impact on these fisheries would be of **VERY LOW** significance with or without mitigation.

The likelihood of disturbing a shipwreck is expected to be very low considering the vast size of the South African offshore area. In the event that any cultural heritage material is disturbed during sampling operations, the impact would be at the national level, and of high intensity. Without mitigation this is of **Medium** significance. However, with the implementation of mitigation, cultural heritage sites can largely be avoided and if sampling is terminated in the unlikely event of encountering a shipwreck, the impact is regarded as **INSIGNIFICANT**.

The No-Go alternative represents the option not to proceed with exploration, which leaves the project areas of influence in their current state except for variation by natural causes and other human activities. While prospecting does not automatically lead to mining/production, it is an essential stage in the process, which might lead to further exploration and, thereafter mining, which results in significant employment opportunities in mining sector, if commercial reserves can be exploited. The 'do nothing' or 'no-go' option forgoes these possible advantages. In addition, the implications of not going ahead with the proposed exploration are that:

- South Africa would lose the opportunity to further establish the extent of offshore diamond reserves;
- Lost economic opportunities related to sunken costs (i.e. costs already incurred) of exploration in the licence area; and
- If economic diamond reserves do exist and are not developed, South Africa would lose the opportunity to maximise the use of its own indigenous diamond reserves.

This potential impact of the No-Go Alternative is considered to be of **LOW** significance.

8. KEY MITIGATION MEASURES

This section contains a summary of the key mitigation measures and contained in the EMPr which is attached as Appendix 1 to the main report.

8.1 COMPLIANCE WITH ENVIRONMENTAL MANAGEMENT PROGRAMME AND MARPOL 73/78 STANDARDS

- All phases of the proposed project must comply with the Environmental Management Programme presented in Chapter 7; and
- The vessels used during prospecting (including any required support vessels) must ensure compliance with MARPOL 73/78 standards.

8.2 NOTIFICATION AND COMMUNICATION WITH KEY STAKEHOLDERS

- As part of the stakeholder notification process, BPT127 should inform the Department of Forestry, Fisheries and the Environment (DFFE) fisheries research survey programme;
- Notify PetroSA and their contractors, as well as any other neighbouring petroleum exploration rights holders, as well as any companies undertaking marine prospecting or mining activities in the study area, prior to the commencement of activities.
- Liaise with PetroSA and any overlapping mineral prospecting rights holders to ensure that there is no overlapping of activities in the same area over the same time period.
- Prior to the commencement of the proposed survey and/or sampling activities the following key stakeholders should be notified of the proposed activities (including navigational co-ordinates of the sampling areas, timing and duration of proposed activities) and the likely implications thereof:
  - Fishing industry / associations (these include South African Small Pelagic Fishing Industry Association, South African Tuna Association, South African Commercial Linefish Association, South African Hake Longline Association, South African Deepsea Trawling Industry Association, FishSA the West Coast Rock Lobster Association and the National SMME Fishing Forum);

    > Representatives of small-scale local fishing co-operatives; and
    > Other: DFFE, South African Maritime Safety Authority (SAMSA), South African Navy (SAN) Hydrographic office, overlapping and neighbouring exploration right holders and applicants, and Transnet National Ports Authority (ports of Cape Town and Saldanha Bay).
- The required safety zones around the prospecting vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office.
- The SAN Hydrographic office should be notified when prospecting activities are complete.

8.3 DISCHARGES

- Undertake training and awareness of crew in spill management to minimise contamination.
- Low-toxicity biodegradable detergents and reusable absorbent cloths should be used in cleaning of all deck spillage.
- All hydraulic systems should be adequately maintained.
- Minimise the discharge of galley waste material should obvious attraction of marine fauna be observed.

8.4 VESSEL SEAWORTHINESS AND SAFETY

- Vessels used during prospecting must be certified for seaworthiness through an appropriate internationally recognised marine certification programme (e.g. Lloyds Register, Det Norske Veritas).
- Collision prevention equipment should include radar, multi-frequency radio, foghorns, etc. Safety equipment and training of personnel to ensure the safety and survival of the crew in the event of an accident is a further legal requirement.
- A Notice to Mariners should provide the co-ordinates of the location of the planned areas in which prospecting is to take place.

8.5 GEOPHYSICAL ACTIVITIES

- A designated onboard Marine Mammal Observer (MMO) must ensure compliance with mitigation measures during geophysical surveying.
- The MMO should conduct visual scans for the presence of cetaceans around the survey vessel prior to the initiation of any acoustic impulses.
- Pre-survey scans should be of at least a 15-minute duration prior to the start of survey equipment.
- Where equipment permits, “soft starts” should be carried out for equipment with source levels greater than 210 dB re 1 µPa at 1 m over a period of 20 minutes to give adequate time for marine mammals to leave the vicinity. Where this is not possible, the equipment should be turned on and off over a 20 minute period to act as a warning signal and allow cetaceans to move away from the sound source.
- Pause the survey if any marine mammals show distressed behaviour within 500 m of the survey vessel or equipment until the mammal has vacated the area.
- Avoid planning geophysical surveys during the period for movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (beginning of June to end of November), and ensure that migration paths are not blocked by operations.
- Avoid undertaking prospecting activities during peak fishing periods of the small pelagic purse-seine sector. It is recommended that survey and sampling activities be carried out between mid-November and mid-January at a time when the small pelagic sector normally stops operations. This would also

avoid possible impacts to the linefish fishery as linefish operations have a seasonal signal mostly driven by the availability of snoek in the winter period.

- For the months of June and November ensure that Passive Acoustic Monitoring (PAM) is incorporated into any survey programme.

8.6 SAMPLING ACTIVITIES

- Sampling activities of any kind should avoid rocky outcrop areas or other identified sensitive habitats in the concession area.
- Use should be made of geophysical data to conduct a pre-sampling geohazard analysis of the seabed, and near-surface substratum to map potentially vulnerable habitats and prevent potential conflict with the sampling targets.
- A buffer zone of 150 m will be established around any identified sensitive communities or rocky-outcrop areas.
- Avoid undertaking prospecting activities during peak fishing periods of the small pelagic purse-seine sector. It is recommended that survey and sampling activities be carried out between mid-November and mid-January at a time when the small pelagic sector normally stops operations. This would also avoid possible impacts to the linefish fishery as linefish operations have a seasonal signal mostly driven by the availability of snoek in the winter period.

8.7 CULTURAL HERITAGE MATERIAL

- Areas where shipwreck sites are identified during geophysical surveys must be excluded prior to undertaking sampling activities.
- It is recommended that the onboard BPT127 representative must consult the Maritime and Underwater Cultural Heritage (MUCH) Unit of the South African Heritage Resources Agency in developing a procedure for archaeological site and artefact recognition, as well as the procedure to follow should archaeological material be encountered during sampling.
- The contractor must be notified that archaeological sites could be exposed during drill and bulk sampling activities, as well as the procedure to follow should archaeological material be encountered.
- If shipwreck material is encountered during the course of bulk sampling in the concession area, the following mitigation measure should be applied:
  - Cease work in the directly affected area to avoid damage to the wreck until the South African Heritage Resources Agency (SAHRA) has been notified and the contractor/BPT127 has complied with any additional mitigation as specified by SAHRA; and
  - Where possible, take photographs of them, noting the date, time, location and types of artefacts found. Under no circumstances may any artefacts be removed, destroyed or interfered on the site, unless under permit from SAHRA.

The possibility of realising core log information and samples of the coarser fraction (i.e. gravel and stone between 20 mm and 150 mm) of sorted seabed sediment for assessment by an archaeologist for the presence of prehistoric lithic material should be considered by BPT127.

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APPENDICES

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BPT127	Belton Park Trading 127 (Pty) Ltd
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GN	Government Notice
I&AP	Interested and/or Affected Party
IEM	Integrated Environmental Management
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973/1978
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (No. 107 of 1998)
NEM: AQA	National Environmental Management: Air Quality Act, 2004 (No. 39 of 2004)
NEM: WA	National Environmental Management: Waste Act, 2008 (No. 59 of 2008)
SLR	SLR Consulting (South Africa) (Pty) Ltd

1. INTRODUCTION

This chapter describes the purpose of this report, provides a brief description of the project background, summarises the legislative authorisation requirements and terms of reference, describes the structure of the report and outlines the opportunity for comment on the report.

1.1 PURPOSE OF THIS REPORT

This Environmental Impact Report (EIR) has been compiled and distributed for review and comment as part of the Scoping and Environmental Impact Assessment (EIA) process that is being undertaken for the proposal by Belton Park Trading 127 (Pty) Ltd (BPT127) to undertake offshore prospecting activities in Sea Concessions 14B, 15B and 17B, located off the West Coast of South Africa, as part of a Prospecting Right application.

This report summarises the process followed to date and provides an overview of the proposed project and affected environment. It also presents the findings of the specialist studies and provides an assessment of the impacts of the proposed project.

SLR Consulting (South Africa) (Pty) Ltd (SLR) has been appointed by BPT127 as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and EIA process for the proposed prospecting activities in accordance with the requirements of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) (as amended), Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA) (as amended) and Regulations thereto.

1.2 PROJECT BACKGROUND

On 4 October 2019 Belton Park Trading 127 (Pty) Ltd (BPT127) lodged an application for a Prospecting Right with the Department of Mineral Resources and Energy (DMRE) to undertake offshore prospecting activities in Sea Concessions 14B, 15B and 17B, located off the West Coast of South Africa. The application was lodged in terms of Section 16 of the MPRDA, as amended. On 17 October 2019, the application was accepted by DMRE.

Sea Concessions 14B, 15B and 17B are situated approximately 180 km north of Cape Town, with the inshore boundaries located 1 km seaward of the coast between Elands Bay to the south and Strandfontein to the north (see Figure 1).

BPT127 proposes to undertake prospecting operations for various minerals (specifically diamond, gemstones, heavy minerals, industrial minerals, precious metals, ferrous and base metals) within each of the Sea Concession areas. The proposed prospecting operations would entail:

- Geophysical surveys;
- Drill sampling; and
- Bulk (trench) sampling.

For the geophysical surveys, the total line kilometres to be surveyed per concession would be between 600 and 1 200 km. The total footprint of disturbance associated with the drill sampling and bulk (trench) sampling would be approximately 12.24 ha in total. The duration of each exploration activity would be four days per annum in each concession area. It is pointed out the proposed bulk sampling activities would only be undertaken in the event that the prior exploration activities (i.e. geophysical surveys and drill sampling) identify the possibility of economically viable mineral deposits being located within the concession areas.

1.3 AUTHORISATION REQUIREMENTS

The proposed prospecting activities require Environmental Authorisation (EA) in terms of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as amended and a Prospecting Right has to be obtained in terms of the MPRDA. These two regulatory processes are summarised below and presented in more detail in Section 2.1.

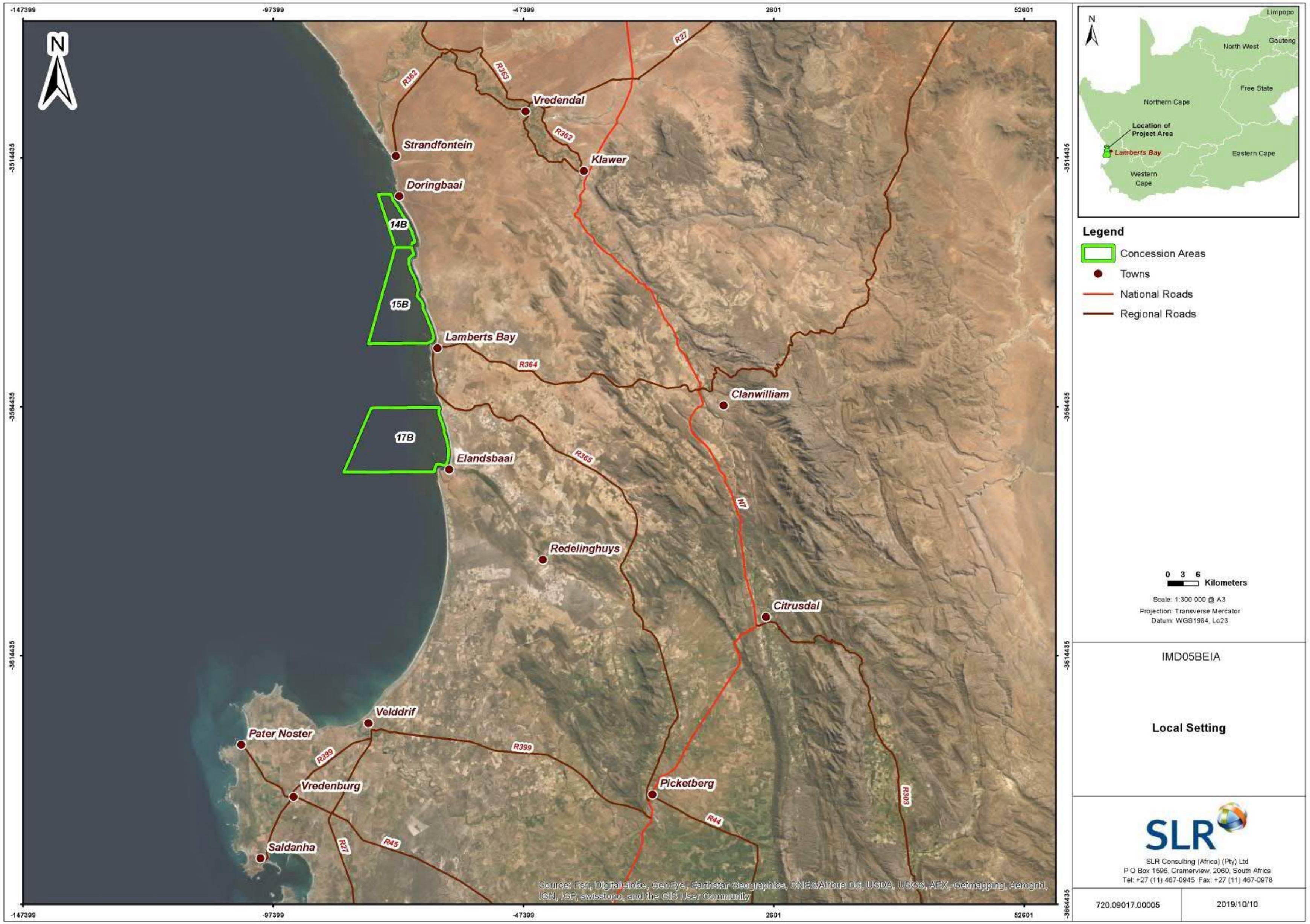

FIGURE 1-1: LOCATION OF THE 14B, 15B AND 17B SEA CONCESSION AREAS, OFF THE WEST COAST OF SOUTH AFRICA.

In terms of the MPRDA a Prospecting Right must be issued prior to the commencement of any prospecting activities. A requirement for obtaining a Prospecting Right is that an applicant must comply with Chapter 5 of NEMA with regards to consultation and reporting.

In terms of the Environmental Impact Assessment (EIA) Regulations 2014 (as amended), promulgated in terms of Chapter 5 of NEMA, an application for a Prospecting Right requires EA from the competent authority, the Minister of Mineral Resources and Energy (or delegated authority), to carry out the proposed prospecting operations. In order for DMRE to consider an application for EA for the proposed prospecting operations, a Scoping and EIA process must be undertaken.

1.4 TERMS OF REFERENCE

The terms of reference for the Scoping and EIA are as follows:

1. Ensure the Scoping and EIA is undertaken in accordance with the requirements of NEMA and the EIA Regulations, 2014 (as amended);
2. Ensure the Scoping and EIA is undertaken in an open, participatory manner to ensure that all potential impacts are identified;
3. Undertake a formal public participation process, which specifically addresses the distribution of information to Interested & Affected Parties (I&APs) and provides the opportunity for I&APs to raise any concerns/issues, as well as an opportunity to comment on all Scoping and EIA documentation;
4. Commission specialists to undertake studies, identified during the scoping process, to assess key issues and concerns; and
5. Integrate all the information, including the finding of the specialist studies, into an Environmental Impact Report (EIR) to allow an informed decision to be taken concerning the proposed project.

1.5 STRUCTURE OF THIS REPORT

This report consists of eight sections and seven appendices, the contents of which are outlined below.

Section	Contents
Executive Summary	Provides a summary of the EIR.
Chapter 1	**Introduction** Describes the purpose of this report, provides a brief description of the project background, summarises the legislative authorisation requirements, presents the terms of reference of the EIA, and describes the structure of the report and the opportunity for comment.
Chapter 2	**Legislative requirements and study process** Outlines the key legislative requirements applicable to the proposed mining activities and outlines the methodology and consultation process followed in the EIA process.
Chapter 3	**Project overview** Describes the need and desirability for the proposed project, provides general project information, an overview of the proposed mining activities and a description of the project alternatives.
Chapter 4	**Description of the affected environment** Describes the existing biophysical and social environment that could potentially be affected by the proposed project.
Chapter 5	**Impact description and assessment** Describes and assesses the potential impacts of the proposed project on the affected environment. It also presents mitigation or optimisation measures that could be used to reduce the significance of any negative impacts or enhance any benefits, respectively.

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2. LEGISLATIVE REQUIREMENTS AND EIA PROCESS

This chapter outlines the key legislative requirements applicable to the proposed prospecting activities and outlines the methodology and I&AP consultation process followed in the Scoping and EIA process.

2.1 LEGISLATIVE REQUIREMENTS

2.1.1 Mineral and Petroleum Resources Development Act, 2002

In terms of the MPRDA, a Prospecting Right must be obtained prior to the commencement of any prospecting activities. A requirement for obtaining a Prospecting Right is that an applicant must submit an application in terms to Section 16(1) of the MPRDA to the Regional Manager, who must accept the application within 14 days if, inter alia, no other person holds a Prospecting Right, Mining Right, Mining Permit or Retention Permit for the same mineral and land. If the application for a Prospecting Right is accepted, the Regional Manager must request that the applicant comply with Chapter 5 of NEMA with regards to consultation and reporting (see Section 2.1.2 below).

As mentioned previously, BPT127 has lodged an application for a Prospecting Right in terms of the MPRDA and an Application for Environmental Authorisation in terms of NEMA with DMRE.

2.1.2 National Environmental Management Act, 1998

Chapter 2 of NEMA sets out a range of environmental principles that are to be applied by all organs of state when taking decisions that significantly affect the environment. Included amongst the key principles is that all development must be socially, economically and environmentally sustainable and that environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably. NEMA also provides for the participation of I&APs and stipulates that decisions must take into account the interests, needs and values of all I&APs.

Chapter 5 of NEMA outlines the general objectives and implementation of Integrated Environmental Management (IEM), which provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. Section 24 provides a framework for granting of EAs. In order to give effect to the general objectives of IEM, the potential impacts on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority. Section 24(4) provides the minimum requirements for procedures for the investigation, assessment and communication of the potential impact of activities.

The EIA Regulations 2014 (as amended) promulgated in terms of Chapter 5 of NEMA and published in Government Notice (GN) No. R982 (as amended), provides for the control of certain listed activities. These activities are listed in GN No. R983 (Listing Notice 1), R984 (Listing Notice 2) and R985 (Listing Notice 3) of 4 December 2014 (as amended) and are prohibited until EA has been obtained from the competent authority. The Minister of Mineral Resources and Energy remains responsible for the granting of an EA for the proposed prospecting activities in terms of NEMA. Such EA, which may be granted subject to conditions, will only be considered once there has been compliance with GN No. R982.

GN No. R982 sets out the procedures and documentation that need to be complied with when applying for EA. A Basic Assessment process must be applied to an application if the authorisation applied for is in respect of an activity(ies) listed in Listing Notice 1 and / or 3 and a Scoping and EIA process must be applied to an application if the authorisation applied for is in respect of an activity(ies) listed in Listing Notice 2.

The inclusion of bulk sampling activities as part of prospecting operations (which include offshore diamonds) would trigger listed activity 19 of Listing Notice 2 (GN No. R984 of 4 December 2014, as amended) of the EIA Regulations 2014 (as amended). Thus, a full Scoping and EIA process must be undertaken in order for DMRE to consider the application in terms of NEMA and make a decision as to whether to grant EA or not. All the listed activities triggered by the proposed project are indicated in Table 2-1 below.

TABLE 2-1: LIST OF APPLICABLE ACTIVITIES IN TERMS OF LISTING NOTICE 1 AND 2.

Activity No.	Activity Description	Description of activity in relation to the proposed project
GN No. R983: Listing Notice 1		
19A	*"The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from:* *(iii) the sea. …"*	The proposed sampling activities would result in various forms of disturbance to the seafloor and would result in more than 5 m^3 of sediment being disturbed and moved.
20	*"Any activity including the operation of that activity which requires a prospecting right in terms of section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including* *(a) associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource; or* *(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing;* *but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies."*	The proposed project entails the removal and primary processing of seabed sediments to determine the presence of the proposed target minerals, thus the proposed sampling activities would trigger this listed activity.
22	*"The decommissioning of any activity requiring-* *(i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or* *(ii) a …prospecting right… where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure."*	On completion of the proposed prospecting operation, BPT127 would be required to apply to the DMRE for a closure certificate. The process of applying for a Closure Certificate would trigger this listed activity.
GN No. R984: Listing Notice 2		
19	*"The removal and disposal of minerals contemplated in terms of section 20[3] of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly*	The proposed bulk sampling would involve the removal and disposal of, amongst other minerals, marine diamonds and would include extraction, screening and washing during the bulk sampling operations.

3 Section 20 (2) of the Mineral and Petroleum Resources Development Act (MPRDA), 2002 (Act 28 of 2002) states that "*the holder of a prospecting right must obtain the Minister's written permission to remove and dispose for such holder's own account of diamonds and bulk samples of any other minerals found by such holder in the course of prospecting operations.*"

Activity No.	Activity Description	Description of activity in relation to the proposed project
	related to prospecting of a mineral resource; the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies."	

2.1.3 National Environmental Management: Air Quality Act, 2004

The National Environmental Management: Air Quality Act, 2004 (No. 39 of 2004) (NEM:AQA) regulates all aspects of air quality, including prevention of pollution, providing for national norms and standards and including a requirement for an Atmospheric Emissions Licence (AEL) for listed activities, which result in atmospheric emissions and have or may have a significant detrimental effect on the environment.

Activities that require an AEL are listed in GN No. 893 (22 November 2013), published in terms of Section 21(1)(b) of the NEM: AQA. In terms of Section 22 of NEM: AQA no person may conduct a listed activity without an AEL. The incineration of waste is a listed activity (Category 8.1 – Thermal treatment of Hazardous and General Waste) and requires an AEL for all installations treating 10 kg or more of waste per day.

In terms of Section 36 of the Act, the metropolitan and district municipalities are charged with implementing the AEL system. However, as the offshore area of activity and the Exclusive Economic Zone (EEZ) do not fall within the borders of any municipality or province of South Africa as set out in the Constitution, there is no formal means in terms of NEM: AQA by which application can be made for incineration from vessels in the offshore. Furthermore, the on-board incineration of waste is permitted in terms of the International Convention for the Prevention of Pollution from Ships, 1973/1978 (MARPOL), to which South Africa is a signatory. Thus, there is uncertainty of the applicability of NEM:AQA to offshore operations, given that MARPOL, an international convention, allows for the on-board incineration of waste and there is no formal implementing authority for AEL applications associated with offshore operations.

2.1.4 National Environmental Management: Waste Act, 2008

The National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM: WA) regulates all aspects of waste management and has an emphasis on waste avoidance and minimisation. NEM: WA creates a system for listing and licensing waste management activities. Listed waste management activities above certain thresholds are subject to a process of impact assessment and licensing. Activities listed in Category A require a Basic Assessment, while activities listed in Category B require a Scoping and EIA process.

The Department of Forestry, Fisheries and Environment (DFFE, previously Department of Environmental Affairs) has indicated that NEM: WA is not applicable to offshore activities. Thus, a Waste Management Licence would not be required for offshore waste management activities, such as those related to sewage. These aspects would be managed in terms of and comply with the requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).

2.1.5 Other Relevant Legislation

In addition to the foregoing, BPT127 must also comply with the provisions of other relevant conventions and legislation, which includes, amongst others, the following:

INTERNATIONAL MARINE POLLUTION CONVENTIONS

- International Convention for the Prevention of Pollution from Ships, 1973/1978 (MARPOL);

- Amendment of the International Convention for the Prevention of Pollution from Ships, 1973/1978 (MARPOL) (Bulletin 567 – 2/08);
- International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC Convention);
- United Nations Convention on Law of the Sea, 1982 (UNCLOS);
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (the London Convention) and the 1996 Protocol (the Protocol);
- International Convention relating to Intervention on the High Seas in case of Oil Pollution Casualties (1969) and Protocol on the Intervention on the High Seas in Cases of Marine Pollution by substances other than oil (1973);
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (1989); and
- Convention on Biological Diversity (1992).

OTHER SOUTH AFRICAN LEGISLATION

- Carriage of Goods by Sea Act, 1986 (No. 1 of 1986);
- Hazardous Substances Act, 1983 and Regulations (No. 85 of 1983);
- Marine Living Resources Act, 1998 (No. 18 of 1998);
- Marine Traffic Act, 1981 (No. 2 of 1981);
- Marine Pollution (Control and Civil Liability) Act, 1981 (No. 6 of 1981);
- Marine Pollution (Prevention of Pollution from Ships) Act, 1986 (No. 2 of 1986);
- Marine Pollution (Intervention) Act, 1987 (No. 65 of 1987);
- Maritime Safety Authority Act, 1998 (No. 5 of 1998);
- Maritime Safety Authority Levies Act, 1998 (No. 6 of 1998);
- Maritime Zones Act 1994 (No. 15 of 1994);
- Merchant Shipping Act, 1951 (No. 57 of 1951);
- Mine Health and Safety Act, 1996 (No. 29 of 1996);
- National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004);
- National Environmental Management: Integrated Coastal Management Act, 2008 (No. 24 of 2008);
- National Environmental Management: Protected Areas Act, 2003 (No. 57 of 2003)
- National Heritage Resources Act, 1999 (No. 25 of 1999);
- National Ports Act, 2005 (No. 12 of 2005);
- National Water Act, 1998 (No. 36 of 1998);
- Occupational Health and Safety Act, 1993 (No. 85 of 1993) and Major Hazard Installation Regulations;
- Sea Birds and Seals Protection Act, 1973 (No. 46 of 1973);
- Ship Registration Act, 1998 (No. 58 of 1998);
- South African Maritime Safety Authority Act, 1998 (No. 5 of 1998);
- South African Maritime Safety Authority Levies Act, 1998 (No. 6 of 1998); and
- Wreck and Salvage Act, 1995 (No. 94 of 1995).

2.2 LEGISLATION CONSIDERED IN THE PREPARATION OF THE ENVIRONMENTAL IMPACT REPORT

In accordance with the EIA Regulations 2014 (as amended), all legislation and guidelines that have been considered in the EIA process must be documented. Table 2-2 below provides a summary of the applicable legislative context and policy.

TABLE 2-2: LEGAL FRAMEWORK.

Applicable legislation and guidelines	Relevance or reference
Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002)	Refer to Section 2.1.1
National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA)	Refer to Section 2.12
EIA Regulations 2014, as amended (GN No. R982), Listing Notice 1 (GN No. R983), Listing Notice 2 (GN No. R984).	Refer to Section 2.1.2. The proposed project triggers activities listed in Listing Notice 1 and Listing Notice 2 and, therefore, requires a Scoping and EIA process to inform the application for EA. This Scoping Report has been compiled in accordance with Appendix 2 of the EIA Regulations 2014 (as amended).

2.3 GUIDELINES AND POLICIES

The guidelines and policies listed in Table 2 3 have been / or will be taken into account during the Scoping and EIA process.

TABLE 2-3: GUIDELINES AND POLICIES RELEVANT TO THE PROPOSED PROJECT.

Guideline	Governing body	Applicability
Specialist Studies, Integrated Environmental Management, Information Series 4 (2002)	DFFE	This guideline was consulted to ensure adequate development of terms of reference for specialist studies.
Impact significance, Integrated Environmental Management, Information Series 5 (2002)	DFFE	This guideline was consulted to inform the assessment of significance of impacts of the proposed project.
Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7 (2004)	DFFE	This guideline will be consulted to inform the consideration of potential cumulative effects of the proposed project.
Criteria for determining Alternatives in EIA, Integrated Environmental Management, Information Series 11 (2004)	DFFE	This guideline was consulted to inform the consideration of alternatives.
Environmental Management Plans, Integrated Environmental Management, Information Series 12 (2004)	DFFE	This guideline will be consulted to ensure that the Environmental Management Programme (EMP) has been adequately compiled.
Environmental Impact Reporting, Integrated Environmental Management, Information Series 15 (2004)	DFFE	This guideline was consulted to inform the approach to impact reporting.
Guideline on need and desirability (2017)	DFFE	This guideline informed the consideration of the need and desirability aspects of the proposed project.
Public Participation guideline in terms of NEMA (2017)	DFFE	The purpose of these guidelines is to ensure that an adequate public participation process was undertaken during the EIA process.

2.4 SCOPING AND EIA PROCESS

2.4.1 Details of the EIA Project Team

As noted in Section 1, SLR has been appointed as the independent EAP to undertake the EIA for the proposed prospecting operations. The details of the EIA project team that were involved in the preparation of this Environmental Impact Report are provided in Table 2-4 below.

SLR has no vested interest in the proposed project other than fair payment for consulting services rendered as part of the EIA process and has declared its independence as required by the EIA Regulations 2014, as amended (see Appendix C).

TABLE 2-4: DETAILS OF THE EIA PROJECT TEAM.

General				
Organisation	SLR Consulting (South Africa) (Pty) Ltd			
Postal address	PO Box 10145, CALEDON SQUARE, 7905			
Tel No.	+27 (0)21 461 1118 / 9			
Fax No.	+27 (0)21 461 1120			
Nigel Rossouw	MSc (Envi. & Geog. Sci.)	Member IAIAsa	25	Report review
Nicholas Arnott	Hons. (Earth & Geog. Sci.), University of Cape Town	Pr.Sci.Nat., Member IAIAsa	15	Management of the EIA process, including process review, specialist study review and report compilation
Rizqah Baker	Hons. (Envir. & Geog. Sci.), University of Cape Town	Member IAIAsa	4	Project assistant

2.4.2 Qualifications and Experience of the EAPs

Nigel Rossouw is an environmental and social specialist with 25 years of experience in the corporate, project implementation and consulting environments. Nigel has diverse experience spanning the energy, extractives, infrastructure and natural resource sectors. Nigel has in-depth project experience in working in coastal, marine and deep-water environments. Nigel has worked in South African, Namibia, Botswana, Mozambique, Kenya, Tanzania, Uganda, Ethiopia, Egypt, Reunion Island, India, Thailand, Malaysia, Indonesia, Philippines and the United Arab Emirates.

Nicholas Arnott has worked as an environmental assessment practitioner since 2006 and has been involved in a number of projects covering a range of environmental disciplines, including Basic Assessments, Environmental Impact Assessments and Environmental Management Programmes. He has gained experience in a wide range of projects relating to mining and prospecting, infrastructure projects (e.g. roads), housing and industrial developments.

Rizqah Baker has been working in the environmental field for four years, two of which as a consultant. She has worked in both the public and private sector, having worked for the City of Cape Town and an environmental landscape contractor respectively. She has compiled EMPrs for a range of clients from various sectors, including infrastructure, mining and the built environment. She brings with her strong report writing skills and practical experience in the review and implementation of EMPrs.

2.4.3 Assumptions and Limitations

The Scoping and EIA assumptions and limitations are listed below:

- The Scoping and EIA assumes that SLR has been provided with all relevant project information and that it was correct and valid at the time it was provided;
- Specialists will be provided with all the relevant project information in order to produce accurate and unbiased assessments;
- There will be no significant changes to the project description or surrounding environment between the completion of the EIR and implementation of the proposed project that could substantially influence findings, recommendations with respect to mitigation and management, etc.; and
- The assessment will be based, to a large extent, on a generic description of the proposed prospecting activities, as the specific details were not available at the time of writing this report (e.g. exact timing and duration, sound levels, etc.).

These assumptions and limitations, however, are not considered to have any negative implications in terms of the credibility of the results of the Scoping and EIA process.

2.5 SCOPING PHASE

2.5.1 Objectives

In accordance with Appendix 2 of GN No. R982 (as amended), the objectives of the Scoping process were:

- To identify the relevant policies and legislation relevant to the activity;
- To present the need and desirability of the proposed activity and its preferred location;
- To identify feasible alternatives related to the project proposal;
- To ensure that all potential key environmental issues and impacts that would result from the proposed project are identified;
- To provide a reasonable opportunity for I&APs to be involved in the Scoping and EIA process;
- To assess potential impacts of the proposed project alternatives during the different phases of project development;
- To present appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits, respectively; and
- Through the above, to ensure informed, transparent and accountable decision-making by the relevant authorities.

The scoping process consisted of a series of steps to ensure compliance with these objectives and the EIA Regulations 2014 as set out in GN No. R982 (as amended by GN No. 326). The process involved an open, participatory approach to ensure that all potential impacts were identified and that decision-making takes place in an informed, transparent and accountable manner. A flowchart indicating the generic EIA process is presented in Figure 2-1. Box 2-1 describes the public participation tasks undertaken during the Scoping Phase.

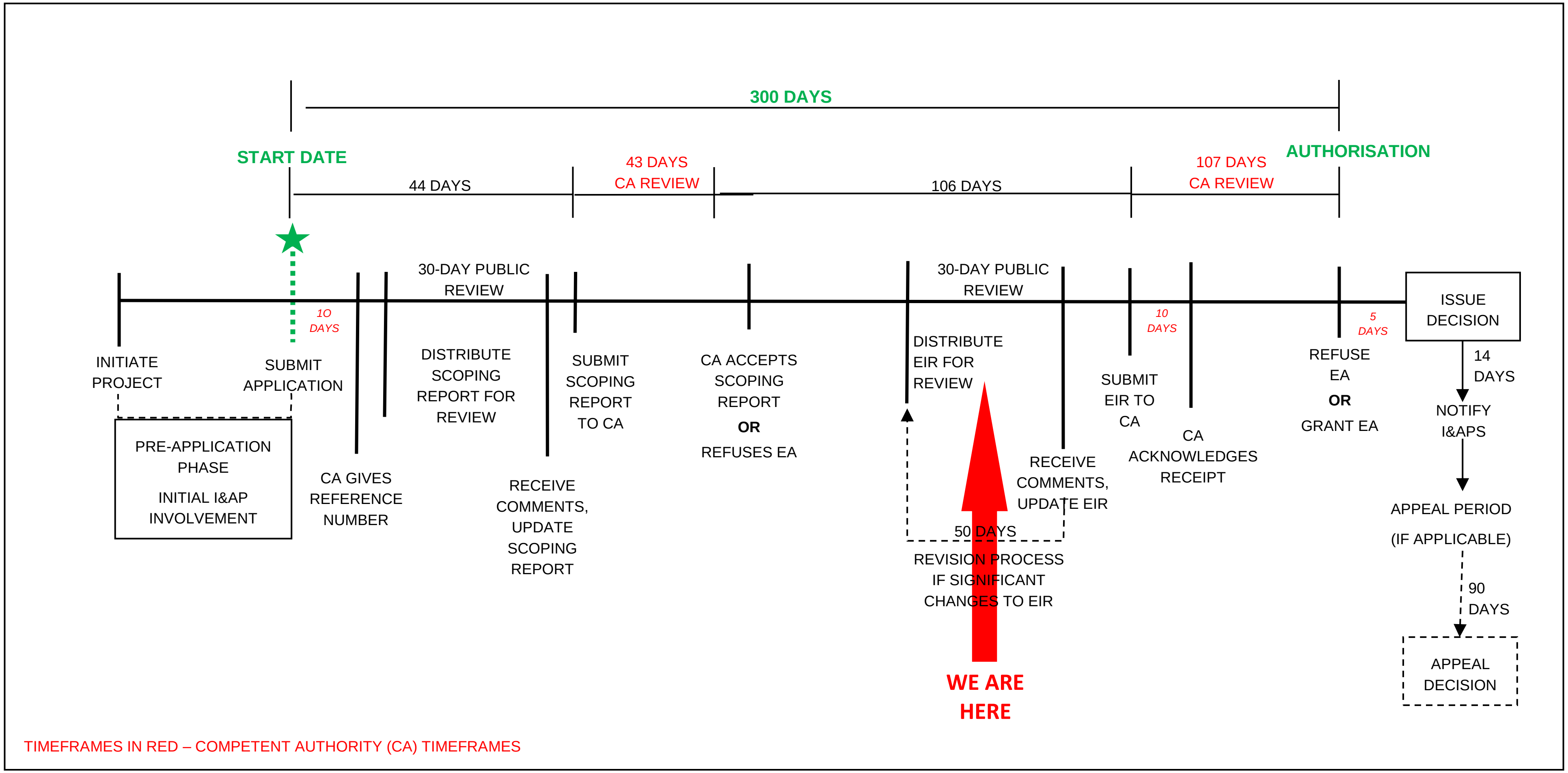

FIGURE 2-1: FLOW DIAGRAM SHOWING THE EIA PROCESS.

2.5.2 Public Participation

The scoping phase public participation process provided an opportunity to:

(i) notify key stakeholders of the proposed project;

(ii) raise any initial issues or concerns regarding the proposed project; and

(iii) review and comment on the draft Scoping Report.

The steps undertaken during the Scoping process are summarised in Box 2-1.

The key issues and concerns identified by the project team, with I&AP input, during the Scoping Phase are summarised in Box 2-2. This information provided the basis on which the specialist studies and associated terms of references were determined.

The Scoping Report was accepted by DMRE on 26 November 2019. DMRE's acceptance of the Scoping Report stated that the next phase of the EIA may proceed as outlined in the Plan of Study for EIA, which was appended to the Scoping Report.

Subsequently, the COVID-19 pandemic ensued and consequently the legislated timeframe for the submission of the final Environmental Impact Assessment Report to the DMRE had lapsed. On 3 May 2021, BPT127 resubmitted the application for EA and in accordance with Regulation 21(2) of the EIA Regulations 2014 (as amended), and are thus able to proceed with the EIA phase without the requirement of resubmitting the Scoping Report.

BOX 2-1: TASKS UNDERTAKEN DURING THE SCOPING PROCESS

- **I&AP identification**

  A preliminary I&AP database of authorities (including State Departments with jurisdiction in the area, municipal offices and ward councillors), Organs of State, Non-Governmental Organisations, Community-based Organisations, adjacent landowners and other key stakeholders with a potential interest in the proposed project was compiled. To date 109 I&APs have been registered on the project database (see Appendix 3.1).

- **I&AP Notification Letters**

  The identified potential I&APs have been notified of the proposed project, Application for EA and EIA process by means of a notification letter. The purpose of the notification letter was to convey information on the proposed project, EA process, as well as to invite them to register as I&APs on the project database and notify them of the availability of the draft Scoping Report for review and comment. The draft Scoping Report review and comment period was from 14 October to 13 November 2019.

- **Press advertisement**

  A press advertisement providing notification of the proposed project, EA process and availability of the Scoping Report for review and comment was placed in the "Die Burger" newspaper on 14 October 2019.

- **Scoping Report availability**

  The draft Scoping Report was made available on the SLR website (www.slrconsulting.com) and at the Cape Town offices of SLR for the duration of the review and comment period (14 October to 13 November 2019). Twelve submissions were received during the draft Scoping Report review and comment period.

- **Telephonic Discussions**

  Following the release of the draft Scoping Report, telephonic discussions were held with Ward Councillors and Municipal Managers for the nearest Wards, District and Local Municipalities. The purpose of these discussions was to confirm that the notification of the availability of the draft Scoping Report for comment had been received, to provide additional information on the proposed project and to respond to any issues or comments that they may have had regarding the proposed project. The following stakeholders were contacted:

- Ward Councillor for Ward 5, Cederberg Municipality (24 October 2019);
- Ward Councillor for Ward 2, Matzikama Municipality (21 October 2019);
- Ward Councillor for Ward 5, Matzikama Municipality (21 October 2019, 28 October 2019 and 29 October 2019);
- Cederberg Local Municipality Municipal Manager (16 October 2019);
- Matzikama Local Municipality Municipal Manager (16 October 2019); and
- West Coast District Municipality Municipal Manager (21 October 2019 and 24 October 2019).

In addition to the above, on 24 October 2019, a telephonic discussion was held with the president of the South African Tuna Association (SATA). The purpose of the call was to discuss the initial concerns raised with respect to the potential impact of the proposed project on the migration patterns of tuna and in turn the tuna pole fishery.

- **Revise Scoping Report and submission to DMRE for acceptance**

  The Scoping Report was updated to include the submissions received during the Scoping Report review and comment period. The key issues raised related to the potential impact of the proposed project on marine fauna, cultural heritage and on the West Coast rock lobster, tuna pole- and line-fisheries. The submission was responded to in the updated Comments and Responses Report attached to the revised Scoping Report. As indicated in Section 2.5.2 above, the Scoping Report was accepted by DMRE on 26 November 2019.

BOX 2-2: KEY ISSUES IDENTIFIED BY THE PROJECT TEAM, WITH I&APS INPUT, DURING THE SCOPING PHASE

Potential impact on marine fauna:

- Normal discharges to the marine environment from a variety of sources, including deck drainage, machinery space drainage, sewage and galley wastes from prospecting vessel(s) and support vessels;
- Potential impacts of multi-beam bathymetry and or sub-bottom profiler noise / pulses on marine fauna. Potential impacts could include physiological injury, behavioural avoidance of the survey area, masking of environmental sounds and communication, and indirect impacts due to effects on prey.
- Localised disturbance of marine fauna due to noise and lighting from the prospecting vessel(s), seabed crawler and support vessels;
- Physical damage to the seabed, alteration of sediment structure, alteration in benthic faunal community composition and potential reduction in benthic biodiversity due to drill and bulk sampling activities;
- Impacts on benthic fauna due to the discharge of processed sediments, including direct mortality, smothering of relatively immobile or sedentary species; and
- Accidental oil spills during normal operations (e.g. bunkering at sea). Oil spilled in the marine environment would have an immediate detrimental effect on water quality.

Potential impact on fishing:

- Disruption to fishing operations;
- Loss of access to fishing grounds in the proposed mine area over the life-of-mine;
- Fish avoidance (flight response) of the mine area and changes in feeding behaviour; and
- Possible loss of income due to the decreased fishing effort and / or loss of catch.

Potential impact on other marine mining and exploration operations:

- Disruption of activities as a result of statutory safety zone around the prospecting vessel(s).

Potential impact on marine transport routes:

- Interference with shipping routes as a result of statutory safety zone around the prospecting vessel(s).

Potential socio-economic impacts:

- Employment and business opportunities; and
- Generation of direct revenues.

2.6 EIA PHASE

2.6.1 Objectives

In accordance with Appendix 3 of GN R982 (as amended) the key activities of the EIA are to:

- Determine the policies and legislation relevant to the activity and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity in the context of the development footprint on the approved site as contemplated in the accepted Scoping Report;
- Identify feasible alternatives related to the project proposal;
- Ensure that all potential key environmental issues and impacts that would result from the proposed project are identified;
- Assess potential impacts of the proposed project alternatives during the different phases of project development;
- Identify the most ideal location of the activity within the development footprint of the approved site based on the lowest level of environmental sensitivity identified during the assessment;
- Present appropriate mitigation or optimisation measures to avoid, manage or mitigate potential impacts or enhance potential benefits, respectively;
- Identify residual risks that need to be managed and monitored; and
- Provide a reasonable opportunity for I&APs to be involved in the EIA process.

Through the above, ensure informed, transparent and accountable decision-making by the relevant authorities.

2.6.2 Specialist Studies

Three specialist studies have been undertaken to address the key issues that required further investigation and detailed assessment, namely: (1) the impact on marine fauna, (2) the impact on fishing, and (3) the impact on underwater cultural heritage materials. A list of the specialists and their details are provided in Table 2-5.

The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed prospecting operations. These impacts were assessed according to pre-defined rating scales (see Appendix 4.1). Specialists also recommended appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits, respectively.

TABLE 2-5: LIST OF SPECIALIST STUDIES AND SPECIALISTS.

No.	Specialist study	Specialist/s	Qualifications	Company
1	Marine Fauna	Dr Andrea Pulfrich	PhD, (Fisheries Biology), Christian-Albrechs University, Kiel, Germany	Pisces Environmental Services (Pty) Ltd
2	Fisheries	Mr Dave Japp	MSc (Ichthyology and Fisheries Science), Rhodes University	Capricorn Marine Environmental (Pty) Ltd
		Ms Sarah Wilkinson	BSc (Hons), (Botany), University of Cape Town	

No.	Specialist study	Specialist/s	Qualifications	Company
3	Underwater Cultural Heritage Material	Mr John Gribble	Master of Arts, (Archaeology) University of Cape Town	ACO Associates cc

2.6.3 Compilation and Review of the draft EIR

This draft EIR has been prepared in compliance with Appendix 3 of the EIA Regulations, 2014 (as amended) (see Table 2-6). The specialist studies and other relevant information have been integrated into this report.

The specialist information and other relevant information has been integrated into the EIR and includes an Environmental Managements Programme (EMPr). The EIR has been released for a 30-day comment period and all I&APs on the project database have been notified.

TABLE 2-6: REQUIREMENTS OF AN EIR IN TERMS OF APPENDIX 3 OF THE EIA REGULATIONS, 2014 (AS AMENDED)

Appendix 3	Content of an EIR	Completed (Y/N or N/A)	Location in report
2(a)	*(i & ii) Details and expertise of the Environmental Assessment Practitioner (EAP) who prepared the report, including a CV.*	Y	Section 2.4.1.
(b)	*The location of the activity, including:*		
	(i) the 21 digit Surveyor General code of each cadastral land parcel; or	N/A	N/A
	(ii) where available, the physical address and farm name		
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Y	Section 3
(c)	*A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is:*	Y	Figure 1-1
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	N/A	N/A
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A	N/A
(d)	*A description of the scope of the proposed activity, including:*		Section 3
	(i) all listed and specified activities triggered;	Y	
	(ii) a description of the activities to be undertaken, including associated structures and infrastructure.	Y	Section 3
(e)	*A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.*	Y	Section 2.1
(f)	*A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.*	Y	Section 3.2
(h)	*A full description of the process followed to reach the proposed preferred activity, site and location within the site, including:*		
	(i) details of all the alternatives considered;	Y	Section 3.3
	(ii) details of the public participation process undertaken in terms of	Y	Section 2.5.2 and 2.6.3

Appendix 3	Content of an EIR	Completed (Y/N or N/A)	Location in report
	Regulation 41 of the Regulations, including copies of the supporting documents and inputs;		and Appendix 3.
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Y	Section 2.5.2
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Y	Section 4
	(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts *(aa) can be reversed;* *(bb) may cause irreplaceable loss of resources; and* *(cc) can be avoided, managed or mitigated.*	Y	Section 5
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Y	Section 5 and Appendix 4.
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Y	Section 5
	(viii) the possible mitigation measures that could be applied and level of residual risk;	Y	Section 6.
	(ix) the outcome of the site selection matrix;	N/A	N/A
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Y	Section 3.3
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	Y	Section 3.3
(i)	*A full description of the process undertaken to identify, assess and rank the impacts the activity and associated infrastructure will impose on the preferred location through the life of the activity, including:* *(i) a description of all environmental issues and risks that were identified during the EIA process; and* *(ii) an assessment of the significance of each issue and risk and an indication of the extent to which each issue and risk could be avoided or addressed by the adoption of mitigation measures.*	Y	Section 5 and Appendix 4.
(i)	*An assessment of each identified significant impact and risk, including:* *(i) Cumulative impacts;* (ii) *The nature, significance and consequence of the impact and risk;* (iii) *The extent and duration of the impact and risk;* (iv) *The probability of the impact occurring;* (v) *The degree to which the impact and risk can be reversed;* (vi) *The degree to which the impact and risk may cause irreplaceable loss of resources*; and (vii) *The degree to which the impact and risk can be mitigated*.	Y	Section 5 and Appendix 4.
(k)	*Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been*	Y	Section 6

Appendix 3	Content of an EIR	Completed (Y/N or N/A)	Location in report
	included in the final assessment report.		
(l)	*An environmental impact statement which contains:*		
	i) A summary of the key findings of the EIA;	Y	Section 6.1
	ii) A map at an appropriate scale which superimposes the activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	N/A	N/A
	iii) A summary of the positive and negative impacts of the proposed activity and identified alternatives.	Y	Section 6.1
(m)	*Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.*	Y	Section 6.2
(n)	*The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.*	Y	Section 3
(o)	*Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.*	N/A	N/A
(p)	*A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.*	Y	Section 2.4.3
(q)	*A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.*	Y	Section 6.1.3
(r)	*Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.*	N/A	N/A
(s)	*An undertaking under oath or affirmation by the EAP in relation:* *(i) The correctness of the information provided in the report;* *(ii) The inclusion of comments and inputs from stakeholders and I&APs;* *(iii) The inclusion of inputs and recommendations from the specialist reports where relevant; and* *(iv) Any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs.*	Y	Appendix 5
(t)	*Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.*	Y	Section 3.1.4
(u)	*An indication of any deviation from the approved Scoping Report, including the plan of study, including:* *(i) Any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and* *(ii) A motivation for the deviation.*	N/A	N/A
(v)	*Any specific information that may be required by the competent authority.*	N/A	N/A
(w)	*Any other matter required in terms of section 24(4)(a) and (b) of the Act.*	N/A	N/A

2.6.4 Completion of the EIA Phase

The following steps are envisaged for the remainder of the EIA process (see Figure 2-1):

- After closure of the comment period, the draft EIR will be updated and finalised. All comments received on the draft EIR will be assimilated and, where relevant, responded to in a Comments and Responses Report that will be appended to the final report.
- The final EIR will be submitted to DMRE for consideration and decision-making.
- After DMRE has reached a decision, all I&APs on the project database will be notified of the outcome of the application and the reasons for the decision.

A statutory appeal period in terms of the National Appeal Regulations (GN No. R993), will follow the issuing of the decision. In terms of Regulation 4(1)(a), an appellant must submit an appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered I&AP and any organ of state with interest in the matter within 20 days from the date that the notification of the decision on the issuing of a EA was sent to the registered I&APs by the applicant.

3. PROJECT DESCRIPTION

This section provides general project information, describes the need and desirability for the proposed project, considers alternatives, and provides information on the proposed prospecting activities.

3.1 GENERAL PROJECT INFORMATION

3.1.1 Applicant

Belton Park Trading 127 (Pty) Ltd is the applicant.

Address:	**Belton Park Trading 127 (Pty) Ltd** 19 Chain Avenue Montague Gardens Cape Town, 7405	
Responsible Persons:	Mr Peter Looijen	Mr Paolo Esposito
Telephone:	+27 (0) 21 510-1881	+27 (0) 21 510-1881
Cell:	+27 (0) 83 375 2217	+27 (0) 78 419 5770

3.1.2 Details of the Sea Concession Area

The proposed prospecting operations would be undertaken within Sea Concessions 14B, 15B and 17B, located off the West Coast of South Africa (see Figure 3 1). The co-ordinates of the boundary points of the sea concessions are provided in TABLE 3-1 below.

TABLE 3-1: CO-ORDINATES OF THE BOUNDARY POINTS OF SEA CONCESSIONS SEA CONCESSIONS 14B, 15B AND 17B.

Point	Latitude	Longitude	Total Area (km²)
Sea Concession Area 14B			
1	31.8165569 S	18.1941662	38.13 km²
2	31.8164463 S	18.2212334	
3	31.9128456 S	18.2629242	
4	31.9129848 S	18.2290993	
Sea Concession Area 15B			
1	31.9129848 S	18.2290993	143.69 km²
2	31.9128456 S	18.2629242	
3	31.926199 S	18.2660122	
4	32.0794258 S	18.3058624	
5	32.08675 S	18.2937469	
6	32.0871849 S	18.1708546	
Sea Concession 17B			
1	32.2041435 S	18.1752834	219.87 km²
2	32.2036591 S	18.31707	
3	32.294857 S	18.3363647	
4	32.3095665 S	18.3283997	
5	32.306076 S	18.3107071	
6	32.3200417 S	18.3068485	
7	32.3205872 S	18.1155205	

FIGURE 3-1: LOCATION OF THE 14B, 15B AND 17B SEA CONCESSION AREAS, OFF THE WEST COAST OF SOUTH AFRICA.

3.1.3 Target Minerals

The minerals targeted in the proposed prospecting operations include the following:

- Diamonds;
- Gemstones;
- Heavy minerals;
- Industrial minerals;
- Precious metals; and
- Ferrous and Base metals.

3.1.4 Financial Provision

In terms of Section 24P of NEMA and associated regulations pertaining to the financial provision (GN No. R1147), an applicant for Environmental Authorisation relating to mining must, before the Minister of Mineral Resources issues the Environmental Authorisation, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.

BPT127 would put in place the required financial provision for the proposed prospecting activities and the contracted vessel would maintain appropriate insurance against operational risks. Such insurance would be held for and in relation to operations, against (inter alia) pollution damage, damage to property, the cost of removing wrecks or clean-up operations pursuant to an operational accident, injury to employees and other persons, in accord with good practice.

3.2 NEED AND DESIRABILITY

The Integrated Environmental Management Guideline on Need and Desirability (2017) notes that while addressing the growth of the national economy through the implementation of various national policies and strategies, it is also essential that these policies take cognisance of strategic concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of our ecosystem services. Thus, the over-arching framework for considering the need and desirability of development in general is taken at the policy level through the identification and promotion of activities / industries / developments required by civil society as a whole. The DEA guideline further notes that at a project level (as part of an EIA process), the need and desirability of the project should take into consideration the content of regional and local plans, frameworks and strategies.

In light of the above, and in alignment with the above-mentioned guideline (DEA, 2017), this section aims to provide an overview of the need and desirability for the proposed project by highlighting how it is aligned with the strategic context of national development policy and planning, broader societal needs and regional and local planning, as appropriate.

3.2.1 National Policy and Planning Framework

3.2.1.1 National Development Plan 2030 (2012)

The National Development Plan (NDP) 2030 (2012) provides the context for all growth in South Africa, with the overarching aim of eradicating poverty and inequality between people in South Africa through the promotion of development. The NDP provides a broad strategic framework, setting out an overarching approach to confronting poverty and inequality based on the six focused and interlinked priorities. One of the key priorities is “faster and more inclusive economic growth”.

In order to transform the economy and create sustainable expansion for job creation, an average economic growth exceeding 5% per annum is required. One of the approaches to achieve this includes increasing exports by focusing on areas where South Africa already has natural endowments and comparative advantage, such as mining.

Notwithstanding the above, it is also acknowledged that environmental challenges are in conflict with some of these development initiatives. As such, it is emphasised that there is also a need to:

- Protect the natural environment;
- Enhance the resilience of people and the economy to climate change;
- Reduce carbon emissions in line with international commitments;
- Make significant strides toward becoming a zero-waste economy; and
- Reduce greenhouse gas emissions and improve energy efficiency.

The NDP identifies the "minerals and metals cluster" (which encompasses all mining and quarrying activities, supplier industries to the mining sector, and downstream beneficiation of mined minerals) as a sector with substantial potential for growth stimulation and/or employment. It is pointed out that South Africa must exploit its mineral resources to create employment and generate foreign exchange and tax revenue. Thus, in order for mining to continue to be a core contributor to the South African economy and in the pursuance of the sustainable development of the nation's mineral resources, it is necessary to identify new resources through prospecting activities, as is the case of this application.

3.2.1.2 Operation Phakisa (2014)

Operation Phakisa was established in 2014 with the aim to accelerate execution of the NDP. The ultimate goal is to boost economic growth and create jobs in order to address poverty, unemployment and inequality. It also aims operate as a cross-sectoral programme for implementation of the NDP through improved cooperation between government, organised business and organised labour. Two programme areas identified under Operation Phakisa which are of relevance for the proposed project include the Oceans Economy programme and the Mining Phakisa programme. It is noted that offshore mining is not specifically addressed under the Oceans Economy Lab of Operation Phakisa, however, it was included under the Mining Lab of Operation Phakisa (also referred to as the Mining Phakisa). These are discussed in more detail below.

3.2.1.2.1 Oceans Economy programme

Operation Phakisa has identified the oceans economy as a key programme area, on the premise that it has the potential to contribute up to R 177 billion to Gross Domestic Product (GDP) by 2033 (compared to R 54 billion in 2010) and to create up to one million jobs (compared to 316 000 in 2010). The following six growth areas were identified as key priorities for growing the ocean economy:

- Marine Protection Services and Ocean Governance;
- Marine Transport and Manufacturing;
- Offshore Oil and Gas;
- Aquaculture;
- Small Harbours Development; and
- Coastal and Marine Tourism.

Under the Marine Protection Services and Ocean Governance work stream, Government developed an overarching governance plan with the aim to protect the ocean environment from illegal activities and promote its socio-economic benefits. A key output of this workstream is the proclamation of 22 new Marine Protected Areas (MPAs) covering an area of 68 578 km^2 of the EEZ. These areas have been set aside for the long-term protection of marine ecosystems (see Section 4.2).

3.2.1.2.2 Mining Phakisa

The goal of Mining Phakisa is to ensure that (1) the mining industry of South Africa remains economic sustainable during commodity price slumps, and (2) initiatives are put in place to position the mining cluster on a firm foundation to grow, transform, and optimize the contribution of the industry to the economic and social development of mining related communities and the country as a whole.

Five work streams were established as part of Mining Phakisa to address the challenges faced by the mining industry:

- Cluster Employment;
- Win-win Beneficiation;
- Sustainable Communities;
- Reviving Investment and Access to Affordable and Reliable Infrastructure; and
- Advancing the Cluster.

After the Phakisa Lab workshops, the Chamber of Mines South Africa (CoM) adopted an internal strategic framework for modernization - a process of transition and transformation of the mining industry. This process would, amongst others, involve using South Africa's mineral resources in the safest, most efficient, cost-effective, and sustainable manner possible, as well as promoting the conservation of natural resources, preservation and restoration of the environment.

3.2.2 Regional and Local Policy and Planning Framework

This section aims to provide an overview of the regional and local policy and planning context relating to the proposed project. The Constitution assigns Provincial and regional planning as exclusive responsibilities of Provincial Government and each province is required to publish a spatial development framework which coordinates, integrates and aligns provincial plans and development strategies with policies of National Government, Provincial departments and municipalities. The Sea Concession areas are located offshore of the Matzikama and Cederberg Local Municipalities, both located within the West Coast District Municipality of the Western Cape Province.

As pointed out above, the offshore area of activity, as well as the EEZ as a whole, do not fall within the borders of any municipality or province of South Africa as set out in the Constitution. Thus, the related planning documentation, especially at the District and Local Municipality level, typically does not directly address offshore areas and activities in a significant level of detail. Notwithstanding the above, a discussion of the provincial, district and local municipality planning context, where available, for the proposed project is considered below.

3.2.2.1 Western Cape Provincial Spatial Development Framework (PSDF)

The Provincial Spatial Development Framework (PSDF) (2014) sets out a variety of policies to ensure that, amongst others, provincial spatial assets are used sustainably and safeguard them against risks by mitigating and/or adapting to current and looming risks. Of relevance to the proposed project is the "Oceans and coasts" theme. Under this theme, the PSDF sets out various objectives to fulfil "*Policy R2 – Safeguard Inland and Coastal Water Resources, and Manage the Sustainable use of Water*".

Of the objectives set out under the policy, the following is applicable to the offshore environment:

"13. As most productive offshore habitats that support marine biodiversity are not formally protected, extend the current Marine Protected Area (MPA) network on the basis of the strategic geographic priority areas that have been identified."

Subsequent the publication of the PSDF, the national MPA network was extended and various MPAs which were identified under Operation Phakisa were accepted and are now in place. The location of Sea Concession areas in relation to the MPAs is provided in Section 4.2 below.

3.2.2.2 West Coast District Municipality Spatial Development Framework

The West Coast District Spatial Development Framework (SDF) (2020) does not specifically address the offshore environment, however it is noted that conservation and management of the coastline for the District is critically important. In this regard, the SDF sets out the following objectives to be considered in policy and regulatory frameworks:

- Reduce public liability;

- Reduce risk to human life;
- Prevent intensification of development in risk zones, but allow exercising of existing rights;
- Maintain coastal quality;
- Prevent encroachment that will impact on the integrity of the shoreline ecology; and
- Prevent densification of rural areas along the coastline.

Due to the location of the sea concession areas, the coastline would not be directly impacted by the proposed project.

With respect to mining activities, the SDF states that the District has a vast number of mineral resources, of which some are currently not being exploited. It is concluded that mining has the potential to make bigger contribution to the overall economy of the District, when unexploited resources are utilised in future. Nevertheless, it is pointed out that mining activities should be monitored to promote and ensure that the necessary precautionary environmental measures are implemented, activities and operations are properly managed, and ultimately that disturbed area be appropriately rehabilitated post-mining. It is further noted that a lack of adequate monitoring and enforcement of mining activities are currently a problem in the District.

3.2.3 Consistency with Policy and Planning Context

The previous sections have considered the policy and planning context at national and regional level which are relevant to the proposed project. There is a drive from national and provincial Government to stimulate development and grow the economy of South Africa with a strong focus on job creation in all sectors, whilst protecting the environment. Mining has been a long-term driver of economic growth and job creation for the country and still considered to be an important for the national economy.

The proposed prospecting activities would allow for the determination of the extent and economic viability of the mineral reserves in the Sea Concession areas. By gaining a better understanding of the extent, nature and economic feasibility of extracting these potential resources, the viability of undertaking future mining operations within the concession area would be better understood.

However, the promotion of the mining sector could also be considered a contradiction with some other plans and policies, which identify the need to reduce the reliance on the extraction of non-renewable resources as they contribute to Green-House Gas emissions. Nevertheless, due to the limited overall economic growth within the country there is still a need to undertake mineral exploration and mining activities within the country.

3.2.4 DFFE Guideline on Need and Desirability

When considering an application for EA, the competent authority must comply with Section 24O of NEMA and must have regard for any guideline published in terms of Section 24J of the Act and any minimum requirements for the application. This includes the DFFE’s Guideline on Need and Desirability (March 2017). Additionally, the EIA Regulations, 2014, (as amended) require EAPs who undertake environmental assessments, to have knowledge and take into account relevant guidelines. A person applying for an EA must abide by the Regulations, which are binding on the applicant.

The DFFE’s Guideline on Need and Desirability (March 2017) sets out a list of questions which should be addressed when considering need and desirability of a proposed development. These are divided into questions that relate to the aspects of ecological sustainability and justifiable economic and social development of the proposed project. Table 3-2 below sets out the list of questions as per the Guideline.

TABLE 3-2: QUESTIONS TO BE ENGAGED WITH WHEN CONSIDERING NEED AND DESIRABILITY, AS PER THE INTEGRATED ENVIRONMENTAL MANAGEMENT GUIDELINE ON NEED AND DESIRABILITY (MARCH 2017).

QUESTION	LOCATION IN REPORT
1. How will this development (and its separate elements / aspects) impact on the ecological integrity of the area?	
1.1 How were the ecological integrity considerations taken into account? 1.1.1. Threatened Ecosystems, 1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure, 1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), 1.1.4. Conservation targets, 1.1.5 Ecological drivers of the ecosystem, 1.1.6. Environmental Management Framework, 1.1.7. Spatial Development Framework, and 1.1.8. Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)	See Sections 3.2.1, 3.2.2 and 4
1.2 How will this development disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	See Sections 4 and 5.
1.3 How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	See Sections 4 and 5.
1.4 What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	A description of the anticipated types of waste, associated volumes are provided in Section 3.5 The proposed management measures are included in Section 6.2.
1.5 How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Refer to Sections 4.1.4.6 and 5.4.1.
1.6 How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The purpose of the proposed prospecting operations are to determine the extent and economic viability of the mineral reserves in the sea concession area for future exploitation. Thus, the
1.7 How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions,	

QUESTION	LOCATION IN REPORT
limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life) 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?) 1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	proposed project could facilitate the future extraction of non-renewable mineral resources. Notwithstanding the above, due to the high-costs of undertaking prospecting (and possible future mining) operations in the offshore environment, the location and extent of disturbed areas would be limited to only those areas targeted by the planned activities.
1.8 How were a risk-averse and cautious approach applied in terms of ecological impacts? 1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2. What is the level of risk associated with the limits of current knowledge? 1.8.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	See Section 1.2.
1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following: 1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	See Section 5.
1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socioeconomic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	See Sections 4 and 5.
1.11. Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	See Section 5.
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	See Section 3.4.
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	See Section 5.
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?: 2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area, 2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal	See Sections 3.2.2.

QUESTION	LOCATION IN REPORT
settlements, need for densification, etc.), 2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and 2.1.4. Municipal Economic Development Strategy ("LED Strategy").	
2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	See Sections 3.2.2.
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	See Sections 3.2.1, 3.2.2, 4 and 5.
2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	See Section 5.
2.5. In terms of location, describe how the placement of the proposed development will: 2.5.1. Result in the creation of residential and employment opportunities in close proximity to or integrated with each other, 2.5.2. Reduce the need for transport of people and goods, 2.5.3. Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport), 2.5.4. Compliment other uses in the area, 2.5.5. Be in line with the planning for the area, 2.5.6. For urban related development, make use of underutilised land available with the urban edge, 2.5.7. Optimise the use of existing resources and infrastructure, 2.5.8. Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement), 2.5.9. Discourage "urban sprawl" and contribute to compaction/densification, 2.5.10. Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs, 2.5.11. Encourage environmentally sustainable land development practices and processes, 2.5.12. Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), 2.5.13. The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential), 2.5.14. Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and 2.5.15. In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	Due to the offshore nature of the proposed project, these are not applicable.
2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts?: 2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic	See Section 1.2.

QUESTION	LOCATION IN REPORT
vulnerability and sustainability) associated with the limits of current knowledge? 2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
2.7. How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: 2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	See Section 5.
2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	See Section 5.
2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	See Section 5.
2.10. What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Due to the offshore nature of the proposed project, these are not applicable.
2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	Due to the offshore nature of the proposed project no such issues are deemed to be likely to arise as a result of the proposed prospecting operations.
2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	See Section 5.
2.13. What measures were taken to: 2.13.1. Ensure the participation of all interested and affected parties, 2.13.2. Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, 2.13.3. Ensure participation by vulnerable and disadvantaged persons, 2.13.4. Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means, 2.13.5. Ensure openness and transparency, and access to information in terms of the process, 2.13.6. Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and 2.13.7. Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	See Section 2.

QUESTION	LOCATION IN REPORT
2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Due to the offshore nature of the proposed project no such issues are deemed to be likely as a result of the proposed project.
2.15. What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Project activities would comply with the BPT127's internal occupational health and safety policies and/or standards as well as national legislation.
2.16. Describe how the development will impact on job creation in terms of, amongst other aspects: 2.16.1. The number of temporary versus permanent jobs that will be created, 2.16.2. Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area), 2.16.3. The distance from where labourers will have to travel, 2.16.4. The location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and 2.16.5. The opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	See Section 5.4.2.
2.17. What measures were taken to ensure: 2.17.1. That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and 2.17.2. That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	See Section 3.2.3.
2.18. What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	See Section 6.
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	See Section 6.
2.20. What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	See Section 6.
2.21. Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	See Section 6.
2.22. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	See impact assessment included in Section 5.

3.3 CONSIDERATION OF ALTERNATIVES

This section presents the various alternatives considered in this report.

3.3.1 Location and Technology Alternatives

Alternatives, in relation to a proposed activity, are different ways of meeting the general purposes and requirements of the proposed activity, which may include alternatives to:

- The location where it is proposed to undertake the activity; and
- The technology to be used in the activity.
- As the intention of the proposed prospecting operations is to determine the presence of economically viable mineral deposits that occur within Sea Concessions 14B, 15B and 17B, no further location alternatives are considered in the Scoping and EIA process.

The different prospecting activities being considered in the Scoping and EIA process are described in detail in Section 3.4 below.

3.3.2 The No-Go Alternative

- The No-Go alternative is the non-occurrence of the proposed project. The negative implications of not going ahead with the proposed project are as follows:
- Loss of opportunity to establish whether further viable offshore target mineral deposits resources exist;
- Prevention of any socio-economic benefits associated with the continuation of bulk sampling activities; and
- Lost economic opportunities.

The positive implications of the no-go option are that there would be no effects on the biophysical environment in the area proposed for the drill and bulk sampling activities.

3.4 OVERVIEW OF PROSPECTING OPERATIONS

The principal objective of the proposed prospecting activities is to discover and estimate the potential mineral resources within each Sea Concession area for possible future mining. The proposed prospecting activities would entail undertaking geophysical surveys, drill sampling and bulk (trench) sampling. The proposed activities may be divided into stages subject to data reviews and follow-up sampling.

3.4.1 Geophysical Surveys

The geophysical surveying will be undertaken using the group-owned dedicated survey vessel, the *DP Star* (Figure 3-2) which has an overall length of 45.15 m and a gross tonnage of 498 t. The vessel is equipped with:

- a multibeam echosounder designed to produce high resolution digital terrain models of the seafloor (Figure 3-3, left) by transmitting a 30 kHz sounding in a wide swath below the vessel; and
- a parametric sub-bottom profiler (Topas system), which uses shallow (35 to 45 kHz) and medium penetration (1 to 10 kHz) “Chirp” seismic pulses to generate profiles up to 60 m beneath the seafloor (Figure 3-3, right), thereby giving a cross section view of the sediment layers.

Sound levels from the acoustic equipment would range between 190 to 220 dB re 1 µPa at 1 m. The proposed surveys would be undertaken in specific priority areas in each of the concessions, at water depths of between approximately 30 - 70 m. The surveys would have a line spacing of between 100 to 1 000 m apart. The total line kilometres surveyed per concession will be between 600 and 1 200 km. The planned duration for the proposed geophysical surveys would be a total of four days per concession area (12 days in total) per year over a four year period (i.e. the duration of the validity of the prospecting right).

In general terms, sound sources that have high sound pressure and low frequency will travel the greatest distances in the marine environment. Conversely, sources that have high frequency will tend to have greater attenuation over distance due to interference and scattering effects (Anon 2007). It is for this reason that the acoustic footprint of the above-mentioned sonar survey tools is considered to be much lower than that of deeper penetration low frequency seismic surveys and in addition have lower sound pressure levels. It should be noted that a decibel is a logarithmic scale of pressure where each unit of increase represents a tenfold increase in the quantity being measured.

FIGURE 3-2: THE PROPOSED SURVEY VESSEL DP STAR.

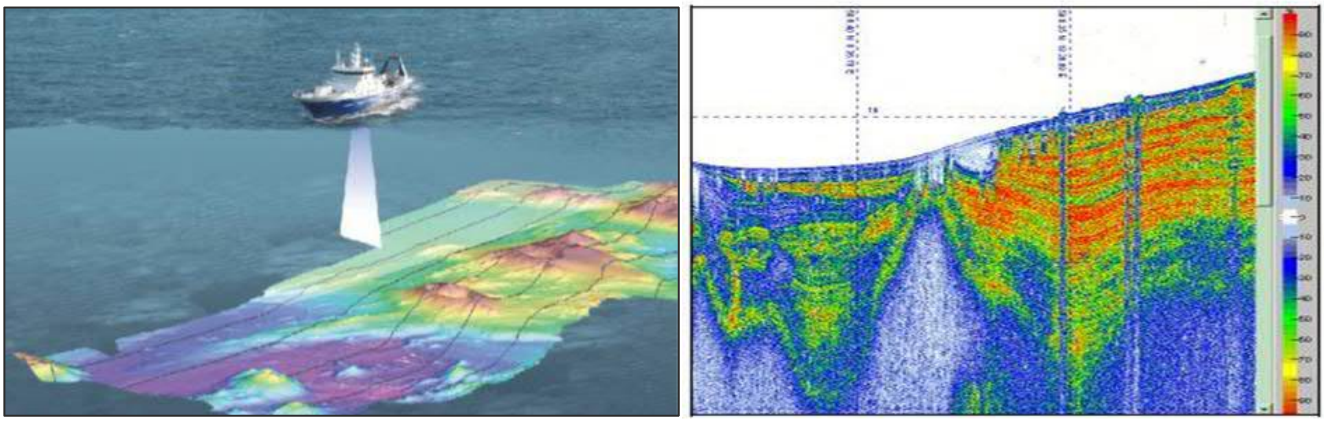

FIGURE 3-3: SWATH BATHYMETRY (LEFT) AND SUB-BOTTOM PROFILING (RIGHT) WILL BE THE GEOPHYSICAL SURVEY TECHNIQUES EMPLOYED DURING THE PROPOSED PROSPECTING OPERATIONS.

3.4.2 Drill Sampling

The proposed drill sampling activities would be undertaken using the group-owned dedicated sampling vessel, the *MV The Explorer* (Figure 3-4). The vessel has an overall length of 114.4 m, a gross tonnage of 4 677 t, and is equipped with a subsea sampling tool (Figure 3-5), which can be operated in water depths up to 200 m. The sampling tool comprises a 2.5 m diameter drill bit operated from a drill frame structure, which is launched through the moon pool of the support vessel and positioned on the seabed.

FIGURE 3-4: THE PROPOSED DRILL SAMPLING VESSEL *MV THE EXPLORER*.

The drill frame structure has a base of 6.5 x 6.5 m, stands 23 m high and weighs 147 tons. The drill bit can penetrate sediments up to 12 m depth above the bedrock. The sediments are fluidised with strong water jets and airlifted to the support vessel where they are treated in the onboard mineral recovery plant. All oversized and undersized tailings are discharged back to the sea on site.

A sample spacing of as little as 20 m can be achieved by the dynamically positioned vessel. Depending on sea and the subseabed geotechnical conditions, up to 60 samples can be successfully taken per day. The samples would be undertaken at intervals of 50 to 500 m. With a planned duration for the proposed drill sampling of four days / year for each concession area, over a four year period, the total number of drill samples that could be obtained during the prospecting right period would be up to a maximum of 2 880. With the drill footprint of 5 m^2, a total area of 1.44 ha would be sampled.

FIGURE 3-5: THE 2.5 M DIAMETER DRILL BIT WITHIN THE DRILL FRAME STRUCTURE.

3.4.3 Bulk Sampling

Using the data collected during the prior exploration activities (i.e. geophysical surveys and drill sampling), the likelihood of potential economically viable mineral deposits being located within the concession areas would be established. A decision to undertake bulk sampling would be undertaken based on the results of this analysis. The bulk trench sampling would be conducted to confirm the economic viability of the resource for future mining.

The proposed bulk sampling activities would be undertaken by a seabed crawler, deployed off the group-owned dedicated mining vessel, the *MV Ya Toivo* (Figure 3-6). Which has an overall length of 150 m and a gross tonnage of 9 111 t. The vessel is equipped with a track-mounted subsea crawler (Figure 3-7) capable of working to depths up to 200 m below sea level. The crawler, which is fitted with highly accurate acoustic seabed navigation and imaging systems, and equipped with an anterior suction system, is lowered to the seabed and is controlled remotely from the surface support vessel through power and signal umbilical cables. Water jets in the crawler's suction loosen seabed sediments, and sorting bars filter out oversize boulders. The sampled sediments are pumped to the surface for shipboard processing. The area of the seabed to be sampled by crawler can only be determined following analysis of drill samples and development of a resource model.

FIGURE 3-6: THE PROPOSED BULK SAMPLING VESSEL *MV YA TOIVO*.

FIGURE 3-7: THE MK2 SEABED CRAWLER.

It is proposed that up to ten trenches, each 180 m long and 20 m wide would be excavated within each concession area. Thus, the area to be disturbed in each concession would be 3.6 ha and 10.8 ha for all three concessions in total. The planned duration of the proposed bulk sampling would be a total of six to seven days per a concession area over a two year period. It is noted that the trenches will not be contiguous, but located in the prospective areas derived from the drill sampling results. The aim of the trench sampling is to determine the geotechnical characteristics of the footwall and overburden which is essential in establishing the optimal approach for possible future mining in these areas.

3.5 VESSEL EMISSIONS AND DISCHARGES

This section provides a brief description of the types of emissions and discharges that are expected from the proposed prospecting operations during normal operations. These would include:

- Discharges such as deck drainage, machinery space wastewater, sewage, etc.;
- Disposal of solid waste such as food waste; and
- Vessel machinery emissions.

These are discussed in more detail below.

3.5.1 Discharges to Sea

3.5.1.1 Vessel machinery spaces (bilges), ballast water and deck drainage

The concentration of oil in discharge water from any vessel (bilge and ballast) would comply with the MARPOL Regulation 21 standard of less than 15 ppm oil in water. Any oily water would be processed through a suitable separation and treatment system to meet the MARPOL Annex I standard before discharge overboard. Drainage from marine (weather) deck spaces would wash directly overboard.

3.5.1.2 Sewage

South Africa is a signatory to MARPOL Annex IV Regulations for the Prevention of Pollution by Sewage from Ships and contracted vessels would be required to comply with the legislated requirements of this Annex.

3.5.1.3 Food (galley) wastes

The disposal into the sea of food waste is permitted in terms of MARPOL Annex V when it has been comminuted or ground and the vessel is located more than 3 nautical miles (approximately 5.5 km) from land. Such comminuted or ground food wastes shall be capable of passing through a screen with openings no greater than 25 mm. Disposal overboard without macerating can occur greater than 12 nautical miles (approximately 22 km) from the coast. The daily discharge from a vessel is typically about 0.15 m^3.

3.5.1.4 Detergents

Detergents used for washing exposed marine deck spaces would be discharged overboard. The toxicity of detergents varies greatly depending on their composition. Water-based detergents are low in toxicity and are preferred for use. Preferentially biodegradable detergents would be used. Detergents used on work deck space would be collected with the deck drainage and treated as described under deck drainage (see above).

3.5.1.5 Other

Vessels used during prospecting activities would have a certified antifouling coating system that is tin free.

3.5.2 Waste disposal to land

A number of other types of wastes generated during the bulk sampling activities would not be discharged at sea but would be transported onshore for ultimate disposal. Waste transported to land would be disposed at a licenced municipal landfill facility or at an alternative approved site. Operators would co-operate with local authorities to ensure that waste disposal is carried out in an environmentally acceptable manner. A summary of these waste types generated by a vessel used during typical prospecting operations is given below.

3.5.2.1 General waste

This includes waste, paper, plastics, wood, glass, etc. Waste would be disposed of at an onshore landfill site in accordance with legal requirements.

3.5.2.2 Scrap Metal

Scrap metal would be stored and recycled / disposed of on land in accordance with legal requirements.

3.5.2.3 Drums and Containers

Empty drums containing residues, which may have adverse environmental effects (solvents, lubricating/gear oil, etc.), would be recycled / disposed of in a licenced landfill site in accordance with legal requirements.

3.5.2.4 Used Oil

This includes used lubricating and gear oil, solvents, hydrocarbon-based detergents and machine oil. Toxicity varies depending on oil type. All non-recycled waste oils would be securely stored, transported to shore and disposed of at a licenced landfill site acceptable to the relevant authorities.

3.5.2.5 Chemicals and hazardous wastes

Disposal of any unexpected chemical and hazardous substance (e.g. fluorescent tubes, toner cartridges, batteries, etc.) would be undertaken on a case-by-case basis and in a manner acceptable to appropriate regulatory authorities.

3.5.2.6 Infectious wastes

Infectious wastes include bandages, dressings, surgical waste, tissues, medical laboratory wastes, needles, and food wastes from persons with infectious diseases. Only minor quantities of medical waste are expected. Prevention of exposure to contaminated materials is essential, requiring co-operation with local medical facilities to ensure proper disposal. All such waste will be incinerated onboard or stored and brought onshore for disposal via a registered medical waste company.

3.5.2.7 Filters and filter media

This includes air, oil and water filters from machinery. Oily residue and used media in oil filters that may contain metal (e.g. copper) fragments, etc. are possibly toxic. Filters and media would be transported onshore and disposed of at a licensed landfill facility.

3.5.3 Discharges to air

Compliance with the requirements of Marpol Annex VI - Prevention of Air Pollution from Ships will be required for all vessel engines and where vessels are fitted with garbage incinerators.

4. BASELINE ENVIRONMENT

This chapter provides a description of the biophysical and socio-economic environment likely to be affected by the proposed project in the study area. The information provided here is based on available baseline information for the area.

4.1 MARINE ENVIRONMENT

This section provides a general overview of the physical and biological oceanography and human utilisation of South African West Coast and, where applicable, detailed descriptions of the marine environment that may be directly affected by the proposed prospecting activities.

4.1.1 Geophysical Characteristics

4.1.1.1 Bathymetry

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

Banks on the continental shelf include the Orange River pro-delta, a shallow (160 - 190 m) zone that reaches maximal widths (180 km) offshore of the Orange River, and Child's Bank, situated approximately 150 km offshore at about 31°S. These features are located well to the east of Sea Concessions 14B, 15B and 17B.

4.1.1.2 Coastal and Inner-shelf Geology and Seabed Geomorphology

The inner shelf is underlain by Precambrian bedrock (Pre-Mesozoic basement), whilst the middle and outer shelf areas are composed of Cretaceous and Tertiary sediments (Dingle 1973; Dingle et al. 1987; Birch et al. 1976; Rogers 1977; Rogers & Bremner 1991). As a result of erosion on the continental shelf, the unconsolidated sediment cover is generally thin, often less than 1 m. Sediments are finer seawards, changing from sand on the inner and outer shelves to muddy sand and sandy mud in deeper water. However, this general pattern has been modified considerably by biological deposition (large areas of shelf sediments contain high levels of calcium carbonate) and localised river input (see Figure 4-1).

An approximately 500 km long mud belt (up to 40 km wide, and of 15 m average thickness) is situated at water depths of between -30 m and -100 m over the innershelf slope between the Orange River and St Helena Bay (Birch et al. 1976). Further offshore, sediment is dominated by muddy sands, sandy muds, mud and some sand. The continental slope, seaward of the shelf break, has a smooth seafloor, underlain by calcareous ooze.

Present day sedimentation is limited to input from the Orange River. This sediment is generally transported northward. Most of the sediment in the area is therefore considered to be relict deposits by now ephemeral rivers active during wetter climates in the past. The Orange River, when in flood, still contributes largely to the mud belt as suspended sediment is carried southward by poleward flow. In this context, the absence of large sediment bodies on the inner shelf reflects on the paucity of terrigenous sediment being introduced by the few rivers that presently drain the South African West Coast coastal plain.

4.1.2 Biophysical Characteristics

4.1.2.1 Wind Patterns

The prevailing winds in the Benguela region are controlled by the South Atlantic subtropical anticyclone, the eastward moving mid-latitude cyclones south of southern Africa, and the seasonal atmospheric pressure field over the subcontinent. The South Atlantic anticyclone is a perennial feature that forms part of a discontinuous belt of high-pressure systems which encircle the subtropical southern hemisphere. This undergoes seasonal variations, being strongest in the austral summer, when it also attains its southernmost extension, lying south west and south of the subcontinent. In winter, the south Atlantic anticyclone weakens and migrates north-westwards.

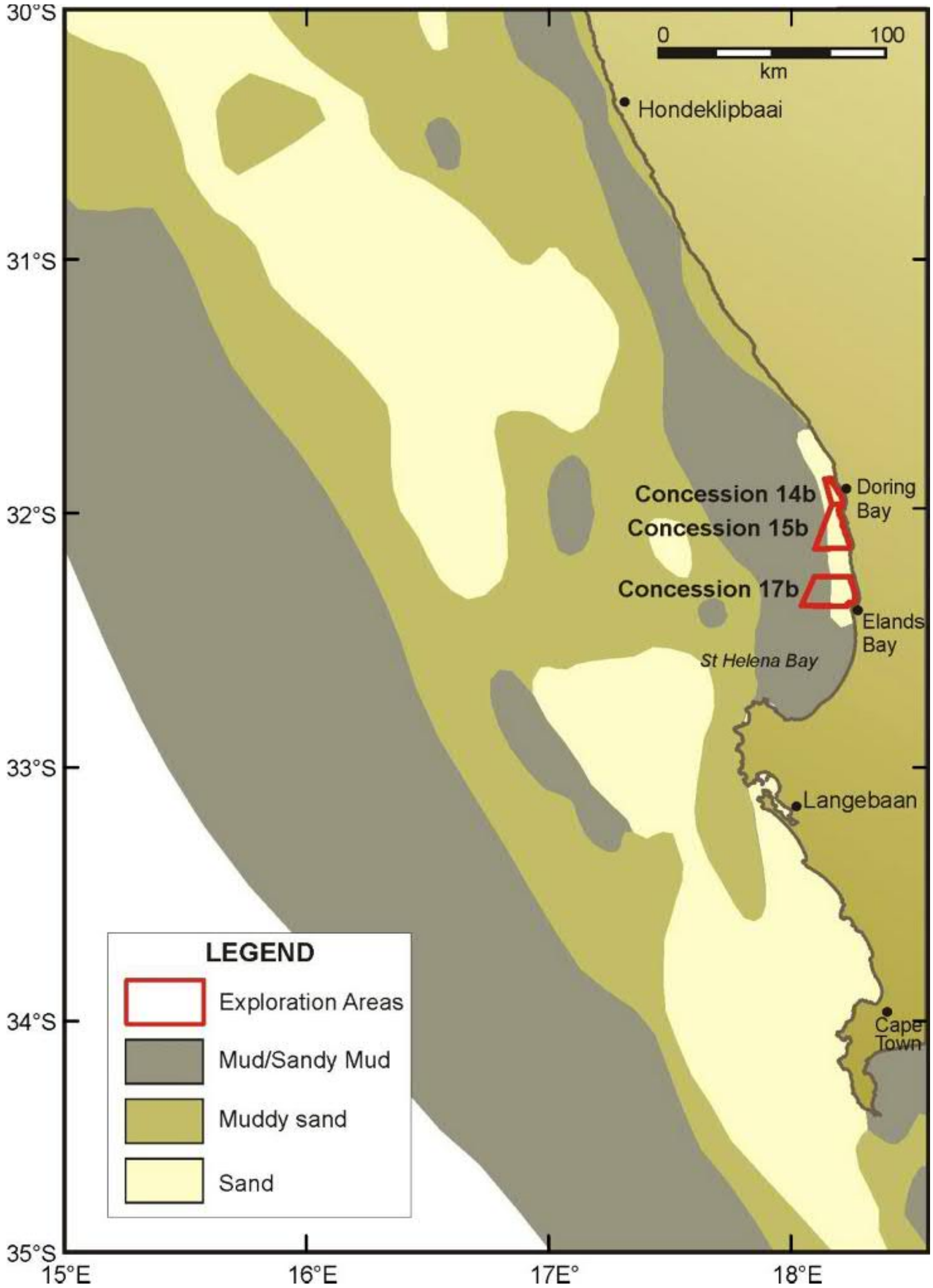

FIGURE 4-1: SEA CONCESSION 14B, 15B AND 17B IN RELATION TO THE REGIONAL BATHYMETRY AND SHOWING PROXIMITY OF PROMINENT SEABED FEATURES.

These seasonal changes result in substantial differences between the typical summer and winter wind patterns in the region, as the southern hemisphere anti-cyclonic high-pressures system, and the associated series of cold fronts, moves northwards in winter, and southwards in summer. The strongest winds occur in summer (October to March), during which winds blow 98% of the time, and gales (winds exceeding 18 m/s or 35 kts) are frequent (CSIR 2006). Virtually all winds in summer come from the south to south-southeast, averaging 20 - 30 kts and reaching speeds in excess of 100 km/h (60 kts) (Figure 4-2). The combination of these southerly/south-easterly winds drives the massive offshore movements of surface water, and the resultant strong upwelling of nutrient-rich bottom waters, which characterise this region in summer.

Winter remains dominated by southerly to south-easterly winds, but the closer proximity of the winter cold-front systems results in a significant south-westerly to north-westerly component (Figure 4-2). This 'reversal' from the summer condition results in cessation of upwelling, movement of warmer mid-Atlantic water shorewards and breakdown of the strong thermoclines which typically develop in summer. There are also more calms in winter, occurring about 4% of the time, and wind speeds generally do not reach the maximum speeds of summer. However, the westerly winds blow in synchrony with the prevailing south-westerly swell direction, resulting in heavier swell conditions in winter.

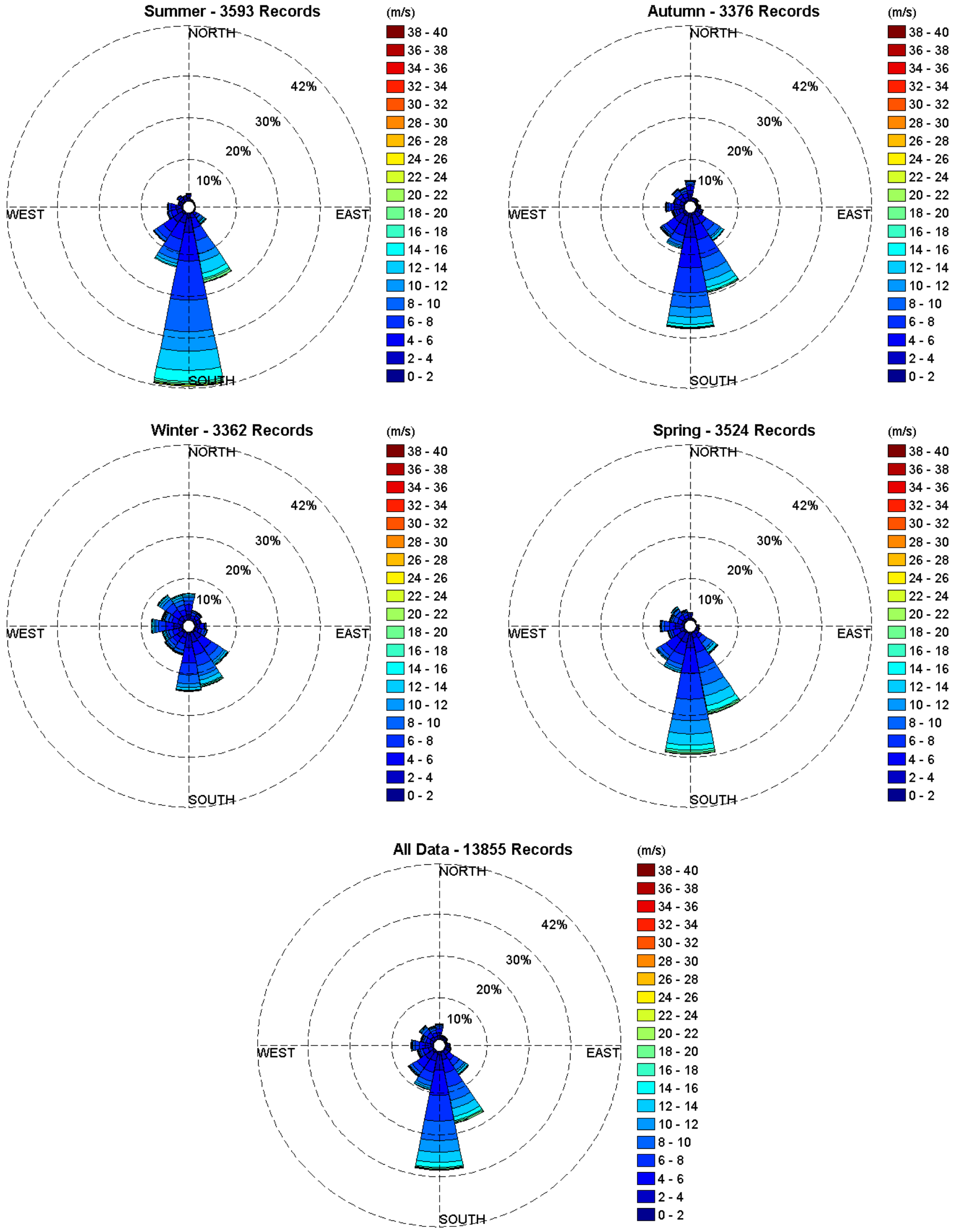

FIGURE 4-2: VOS WIND SPEED VS. WIND DIRECTION DATA FOR THE CAPE COLUMBINE AREA 32.0 TO 32.9 S AND 17.0 TO 17.9 E (1903-11-01 TO 2011-05-24; 13,855 RECORDS) (FROM CSIR).

4.1.2.2 Large-Scale Circulation and Coastal Currents

The southern African West Coast is strongly influenced by the Benguela Current. Current velocities in continental shelf areas generally range between 10 – 30 cm/s (Boyd & Oberholster 1994), although localised flows in excess of 50 cm/s occur associated with eddies. On its western side, flow is more transient and characterised by large eddies shed from the retroflection of the Agulhas Current, resulting in considerable variation in current speed and direction over the domain. In the south, the Benguela current has a width of 200 km, widening rapidly northwards to 750 km.

The surface flows are predominantly wind-forced, barotropic and fluctuate between poleward and equatorward flow (Shillington et al. 1990; Nelson & Hutchings 1983). Current speeds decrease with depth, while directions rotate from predominantly north-westerly at the surface to south-easterly near the seabed. Near bottom shelf flow is mainly poleward with low velocities of typically <5 cm/s (Nelson 1989; Boyd & Oberholster 1994; Shannon & Nelson 1996).

The major feature of the Benguela Current is coastal upwelling (see Section 4.1.2.5). As a consequence, the high nutrient supply to surface waters leads to high primary phytoplankton production, which in turn, serves as the basis for a rich food chain. The prevailing longshore, equatorward winds move nearshore surface water northwards and offshore. To balance the displaced water, cold, nutrient-rich water wells up inshore. Although the rate and intensity of upwelling fluctuates with seasonal variations in wind patterns, the most intense upwelling tends to occur where the shelf is narrowest and the wind strongest.

There are three upwelling centres in the southern Benguela, namely the Namaqua (30°S), Cape Columbine (33°S) and Cape Point (34°S) upwelling cells (Taunton-Clark 1985). Upwelling in these cells is seasonal, with maximum upwelling occurring between September and March. The Sea Concession areas all fall within the Cape Columbine upwelling cell. Upwelling in these cells is seasonal, with maximum upwelling occurring between September and March.

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Where the Agulhas Current passes the southern tip of the Agulhas Bank (Agulhas Retroflection area), it may shed a filament of warm surface water that moves north-westward along the shelf edge towards Cape Point, and Agulhas Rings, which similarly move north-westwards into the South Atlantic Ocean. These rings may extend to the seafloor and west of Cape Town may split, disperse or join with other rings. The surface water of the Agulhas Current is generally >21°C, and its influence west of Cape Agulhas results in average sea surface temperatures in the southern Benguela of 16 - 20°C (Shannon 1985). During the process of ring formation, intrusions of cold sub-Antarctic water moves into the South Atlantic. The contrast in warm (nutrient-poor) and cold (nutrient-rich) water is thought to be reflected in the presence of cetaceans and large migratory pelagic fish species (Best 2007).

4.1.2.3 Waves and Tides

Most of the west coast of southern Africa is classified as exposed and experiences strong wave action, rated between 13-17 on the 20 point exposure scale (McLachlan 1980). Much of the coastline is therefore impacted by heavy south-westerly swells generated in the roaring forties, as well as significant sea waves generated locally by the prevailing moderate to strong southerly winds characteristic of the region. The peak wave energy periods fall in the range 9.7 – 15.5 seconds.

The wave regime along the southern African West Coast shows only moderate seasonal variation in direction, with virtually all swells throughout the year coming from the south and south-southwest direction (see Figure 4-3). Winter swells are strongly dominated by those from south and south-southwest, which occur almost 80% of the time, and typically exceed 2 m in height, averaging about 3 m, and often attaining over 5 m.

With wind speeds capable of reaching 100 km/h during heavy winter south-westerly storms, winter swell heights can exceed 10 m.

In comparison, summer swells tend to be smaller on average, typically around 2 m, not reaching the maximum swell heights of winter. There is also a slightly more pronounced southerly swell component in summer. These southerly swells tend to be wind-induced, with shorter wave periods (approximately 8 seconds), and are generally steeper than swell waves (CSIR 1996). These wind-induced southerly waves are relatively local and, although less powerful, tend to work together with the strong southerly winds of summer to cause the northward-flowing. In common with the rest of the southern African coast, tides are semi-diurnal, with a total range of some 1.5 m at spring tide, but only 0.6 m during neap tide periods.

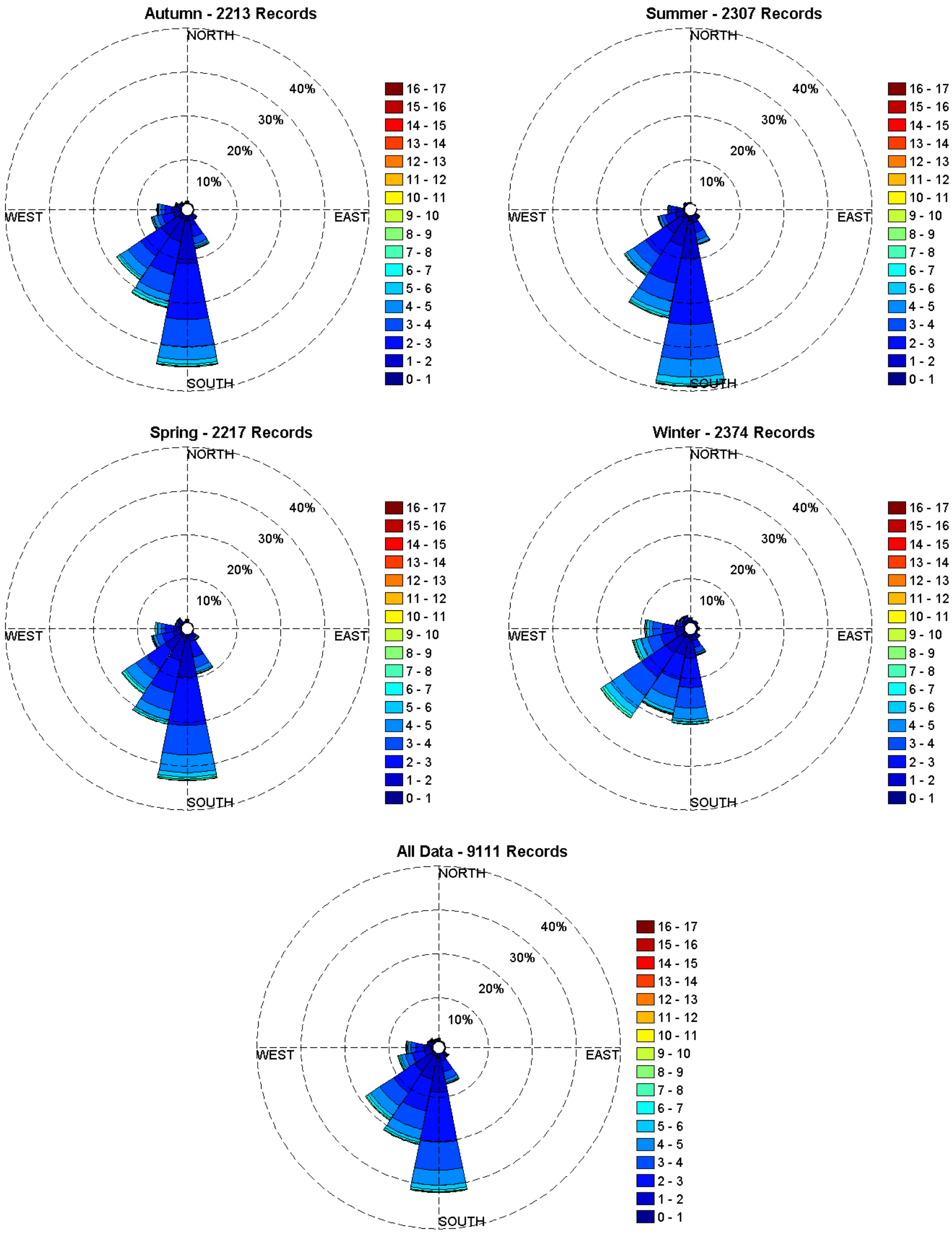

FIGURE 4-3: VOS WAVE HEIGHT VS. WAVE DIRECTION DATA FOR THE CAPE COLUMBINE AREA 32.0 TO 32.9 S AND 17.0 TO 17.9 E (1903-11-01 TO 2011-05-24; 9,111 RECORDS) (FROM CSIR).

4.1.2.4 Water

South Atlantic Central Water (SACW) comprises the bulk of the seawater in the study area, either in its pure form in the deeper regions, or mixed with previously upwelled water of the same origin on the continental shelf (Nelson & Hutchings 1983). Salinities range between 34.5 ‰ and 35.5 ‰ (Shannon 1985).

Seawater temperatures on the continental shelf of the southern Benguela typically vary between 6°C and 16°C. Well-developed thermal fronts exist, demarcating the seaward boundary of the upwelled water. Upwelling filaments are characteristic of these offshore thermal fronts, occurring as surface streamers of cold water, typically 50 km wide and extending beyond the normal offshore extent of the upwelling cell. Such fronts typically have a lifespan of a few days to a few weeks, with the filamentous mixing area extending up to 625 km offshore. The continental shelf waters of the Benguela system are characterised by low oxygen concentrations, especially on the bottom. SACW itself has depressed oxygen concentrations (~80% saturation value), but lower oxygen concentrations (<40% saturation) frequently occur (Bailey et al. 1985; Chapman & Shannon 1985).

4.1.2.5 Upwelling & Plankton Production

During upwelling the comparatively nutrient-poor surface waters are displaced by enriched deep water, supporting substantial seasonal primary phytoplankton production. The cold, upwelled water is rich in inorganic nutrients, the major contributors being various forms of nitrates, phosphates and silicates (Chapman & Shannon 1985). High phytoplankton productivity in the upper layers again depletes the nutrients in these surface waters. This results in a wind-related cycle of plankton production, mortality, sinking of plankton detritus and eventual nutrient re-enrichment occurring below the thermocline as the phytoplankton decays. Biological decay of plankton blooms can in turn lead to “black tide” events, as the available dissolved oxygen is stripped from the water during the decomposition process. Subsequent anoxic decomposition by sulphur reducing bacteria can result in the formation and release of hydrogen sulphide (Pitcher & Calder 2000).

4.1.2.6 Organic Inputs

The Benguela upwelling region is an area of particularly high natural productivity, with extremely high seasonal production of phytoplankton and zooplankton. These plankton blooms in turn serve as the basis for a rich food chain up through pelagic baitfish (anchovy, pilchard, round-herring and others), to predatory fish (snoek), mammals (primarily seals and dolphins) and seabirds (African penguins, cormorants, pelicans, terns and others). All of these species are subject to natural mortality, and a proportion of the annual production of all these trophic levels, particularly the plankton communities, die naturally and sink to the seabed.

Balanced multispecies ecosystem models have estimated that the Benguela region supported biomasses of 76.9 tons/km2 of phytoplankton and 31.5 tons/km2 of zooplankton alone (Shannon et al. 2003). Thirty six percent of the phytoplankton and 5% of the zooplankton are estimated to be lost to the seabed annually. This natural annual input of millions of tons of organic material onto the seabed has a substantial effect on the ecosystems of the Benguela region. It provides most of the food requirements of the particulate and filter-feeding benthic communities that inhabit the sandy-muds of this area, and results in the high organic content of the muds in the region. As most of the organic detritus is not directly consumed, it enters the seabed decomposition cycle, resulting in subsequent depletion of oxygen in deeper waters.

An associated phenomenon ubiquitous to the Benguela system are red tides (dinoflagellate and/or ciliate blooms) (see Shannon & Pillar 1985; Pitcher 1998). Also referred to as Harmful Algal Blooms (HABs), these red tides can reach very large proportions, extending over several square kilometres of ocean. Toxic dinoflagellate species can cause extensive mortalities of fish and shellfish through direct poisoning, while degradation of organic-rich material derived from both toxic and non-toxic blooms results in oxygen depletion of subsurface water.

4.1.2.7 Low Oxygen Events

The continental shelf waters of the Benguela system are characterised by low oxygen concentrations with less than 40% saturation occurring frequently (e.g. Visser 1969; Bailey et al. 1985). The low oxygen concentrations are attributed to nutrient remineralisation in the bottom waters of the system (Chapman & Shannon 1985). The absolute rate of this is dependent upon the net organic material build-up in the sediments, with the carbon rich mud deposits playing an important role. As the mud on the shelf is distributed in discrete patches there are corresponding preferential areas for the formation of oxygen-poor water. The two main areas of low-oxygen water formation in the southern Benguela region are in the Orange River Bight and St Helena Bay (Chapman & Shannon 1985; Bailey 1991; Shannon & O'Toole 1998; Bailey 1999; Fossing *et al.* 2000).

The spatial distribution of oxygen-poor water in each of the areas is subject to short- and medium-term variability in the volume of hypoxic water that develops. De Decker (1970) showed that the occurrence of low oxygen water off Lambert's Bay is seasonal, with highest development in summer/autumn. Bailey & Chapman (1991), on the other hand, demonstrated that in the St Helena Bay area daily variability exists as a result of downward flux of oxygen through thermoclines and short-term variations in upwelling intensity. Subsequent upwelling processes can move this low-oxygen water up onto the inner shelf, and into nearshore waters, often with devastating effects on marine communities.

Periodic low oxygen events in the nearshore region can have catastrophic effects on the marine communities leading to large-scale stranding of rock lobsters, and mass mortalities of marine biota and fish (Newman & Pollock 1974; Matthews & Pitcher 1996; Pitcher 1998; Cockcroft et al. 2000). The development of anoxic conditions as a result of the decomposition of huge amounts of organic matter generated by algal blooms is the main cause for these mortalities and walkouts. The blooms develop over a period of unusually calm wind conditions when sea surface temperatures were high. Algal blooms usually occur during summer-autumn (February to April) but can also develop in winter during the 'berg' wind periods, when similar warm windless conditions occur for extended periods.

4.1.2.8 Turbidity

Turbidity is a measure of the degree to which water loses its transparency due to the presence of suspended particulate matter. Total Suspended Particulate Matter (TSPM) can be divided into Particulate Organic Matter (POM) and Particulate Inorganic Matter (PIM), the ratios between them varying considerably. The POM usually consists of detritus, bacteria, phytoplankton and zooplankton, and serves as a source of food for filter-feeders. Seasonal microphyte production associated with upwelling events will play an important role in determining the concentrations of POM in coastal waters. PIM, on the other hand, is primarily of geological origin consisting of fine sands, silts and clays. Off Namaqualand, the PIM loading in nearshore waters is strongly related to natural inputs from the Orange River or from 'berg' wind events. 'Berg' wind events can potentially contribute the same order of magnitude of sediment input as the annual estimated input of total sediment by the Orange River (Shannon & Anderson 1982; Zoutendyk 1992, 1995; Shannon & O'Toole 1998; Lane & Carter 1999).

Concentrations of suspended particulate matter in shallow coastal waters can vary both spatially and temporally, typically ranging from a few mg/l to several tens of mg/l (Bricelj & Malouf 1984; Berg & Newell 1986; Fegley et al. 1992). Field measurements of TSPM and PIM concentrations in the Benguela current system have indicated that outside of major flood events, background concentrations of coastal and continental shelf suspended sediments are generally < 12 mg/l, showing significant long-shore variation (Zoutendyk 1995). Considerably higher concentrations of PIM have, however, been reported from southern African West Coast waters under stronger wave conditions associated with high tides and storms, or under flood conditions. During storm events, concentrations near the seabed may even reach up to 10 000 mg/l (Miller & Sternberg 1988). In the vicinity of the Orange River mouth, where river outflow strongly influences the turbidity of coastal waters, measured concentrations ranged from 14.3 mg/l at Alexander Bay just south of the mouth (Zoutendyk 1995) to peak values of 7 400 mg/l immediately upstream of the river mouth during the 1988 Orange River flood (Bremner et al. 1990).

The major source of turbidity in the swell-influenced nearshore areas off the West Coast is the redistribution of fine inner shelf sediments by long-period Southern Ocean swells. The current velocities typical of the Benguela (10-30 cm/s) are capable of re-suspending and transporting considerable quantities of sediment equatorwards. Under relatively calm wind conditions, however, much of the suspended fraction (silt and clay) that remains in suspension for longer periods becomes entrained in the slow poleward undercurrent (Shillington et al. 1990; Rogers & Bremner 1991).

Superimposed on the suspended fine fraction, is the northward littoral drift of coarser bedload sediments, parallel to the coastline. This northward, nearshore transport is generated by the predominantly south-westerly swell and wind-induced waves. Longshore sediment transport varies considerably in the shore-perpendicular dimension, being substantially higher in the surf-zone than at depth, due to high turbulence and convective flows associated with breaking waves, which suspend and mobilise sediment (Smith & Mocke 2002).

On the inner and middle continental shelf, the ambient currents are insufficient to transport coarse sediments typical of those depths, and re-suspension and shoreward movement of these by wave-induced currents occur primarily under storm conditions (see also Drake et al. 1985; Ward 1985; De Decker 1986). Data from a Waverider buoy at Port Nolloth have indicated that 2 m waves are capable of re-suspending medium sands (200 µm diameter) at approximately 10 m depth, whilst 6 m waves achieve this at approximately 42 m depth. Low-amplitude, long-period waves will, however, penetrate even deeper. Most of the sediment shallower than 90 m can therefore be subject to re-suspension and transport by heavy swells (Lane & Carter 1999).

Mean sediment deposition is naturally higher near the seafloor due to constant re-suspension of coarse and fine PIM by tides and wind-induced waves. Aggregation or flocculation of small particles into larger aggregates occurs as a result of cohesive properties of some fine sediments in saline waters. The combination of re-suspension of seabed sediments by heavy swells, and the faster settling rates of larger inorganic particles, typically causes higher sediment concentrations near the seabed. Significant re-suspension of sediments can also occur up into the water column under stronger wave conditions associated with high tides and storms. Re-suspension can result in dramatic increases in PIM concentrations within a few hours (Sheng et al. 1994). Wind speed and direction have also been found to influence the amount of material re-suspended (Ward 1985).

Although natural turbidity of seawater is a global phenomenon, there has been a worldwide increase of water turbidity and sediment load in coastal areas as a consequence of anthropogenic activities. These include dredging associated with the construction of harbours and coastal installations, beach replenishment, accelerated runoff of eroded soils as a result of deforestation or poor agricultural practices, discharges from terrestrial, coastal and marine mining operations (Airoldi 2003), and sediment plumes as a result of bottom trawling fishery activities. Such increase of sediment loads has been recognised as a major threat to marine biodiversity at a global scale (UNEP 1995).

4.1.3 Biological Environment

Biogeographically, the Sea Concession areas falls into the cold temperate Namaqua Bioregion, which extends from Sylvia Hill, north of Lüderitz in Namibia to Cape Columbine (Emanuel et al. 1992; Lombard et al. 2004) (see Figure 4-4). The coastal, wind-induced upwelling characterising the Western Cape coastline, is the principle physical process which shapes the marine ecology of the southern Benguela region. The Benguela system is characterised by the presence of cold surface water, high biological productivity, and highly variable physical, chemical and biological conditions. The West Coast is, however, characterized by low marine species richness and low endemicity (Awad et al. 2002).

Communities within marine habitats are largely ubiquitous throughout the southern African West Coast region, being particular only to substrate type or depth zone. These biological communities consist of many hundreds of species, often displaying considerable temporal and spatial variability (even at small scales). The majority of the proposed prospecting right area is located beyond the 50 m depth contour. The near- and offshore marine ecosystems comprise a limited range of habitats, namely unconsolidated seabed sediments, deep water reefs and the water column. The biological communities 'typical' of these habitats are described briefly below, focussing both on dominant, commercially important and conspicuous species, as well as potentially threatened or sensitive species, which may be affected by the proposed mining activities

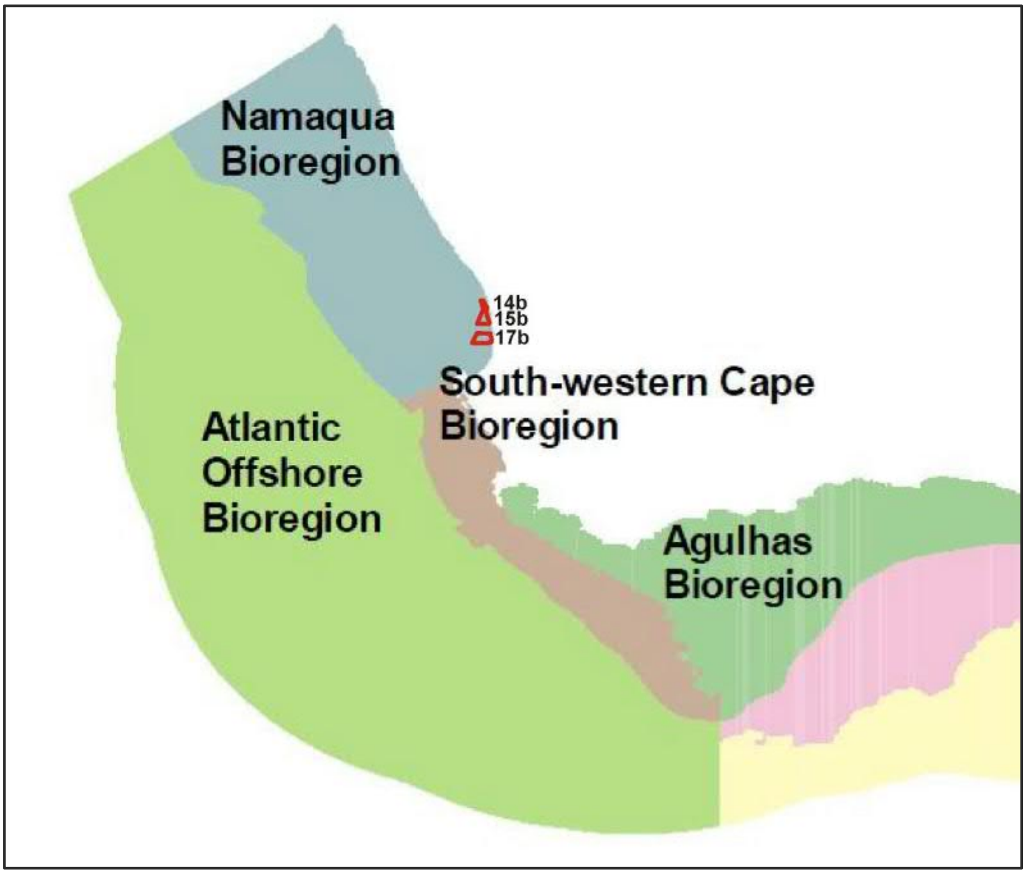

FIGURE 4-4: SEA CONCESSIONS 14B, 15B AND 17B (RED POLYGONS) IN RELATION TO THE SOUTH AFRICAN INSHORE AND OFFSHORE BIOREGIONS (ADAPTED FROM LOMBARD ET AL. 2004).

4.1.3.1 Demersal Communities

4.1.3.1.1 Nearshore and Offshore Unconsolidated Habits

The benthic biota of unconsolidated marine sediments constitute invertebrates that live on (epifauna) or burrow within (infauna) the sediments, and are generally divided into macrofauna (animals >1 mm) and meiofauna (<1 mm).

Three macro-infauna communities have been identified on the inner- (i.e. 0-30 m depth) and midshelf (i.e. 30-150 m depth, Karenyi unpublished data). The inner-shelf community, which is affected by wave action, is characterised by various mobile predators (e.g. the gastropod *Bullia laevissima* and *polychaete Nereis* sp.), sedentary polychaetes and isopods. The mid-shelf community inhabits the mudbelt and is characterised by the mud prawns *Callianassa* sp. and *Calocaris barnardi.* A second mid-shelf sandy community occurring in sandy sediments, is characterised by various polychaetes including deposit-feeding *Spiophanes soederstromi* and *Paraprionospio pinnata.*

Polychaetes, crustaceans and molluscs make up the largest proportion of individuals, biomass and species on the West Coast. The distribution of species within these communities are inherently patchy reflecting the high natural spatial and temporal variability associated with macro-infauna of unconsolidated sediments (e.g. Kenny et al. 1998; Kendall & Widdicombe 1999; van Dalfsen et al. 2000; Zajac et al. 2000; Parry et al. 2003), with evidence of mass mortalities and substantial recruitments recorded on the South African West Coast (Steffani & Pulfrich 2004). Given the state of our current knowledge of South African macro-infauna it is not possible to determine the threat status or endemicity of macro-infauna species on the West Coast, although such research is currently underway (pers. comm. Ms N. Karenyi, South African National Biodiversity Institute (SANBI) and NMMU). However, the marine component of the 2011 National Biodiversity Assessment (Sink et al. 2012), rated portions of the outer continental shelf on the West Coast as 'vulnerable', 'endangered' and 'critically endangered'. These were refined in the 2018 NBA (Sink et al. 2019) to provide substratum types (Figure 4-5). The Southern Benguela Muddy Shelves substratum dominates western portions of the sea concession areas. The Southern Benguela Sandy Shelves substratum extends over the inshore portion of Sea Concession 14B and a smaller part of Sea Concession 15B, while the Southern Benguela Bays substratum covers rest of the inshore portions of 15B and 17B. Only three ecosystem types are represented in the block, these being Namaqua Sandy Inner Shelf, Namaqua Muddy Mid Shelf Mosaic and St Helena Bay (Sink et al. 2019).

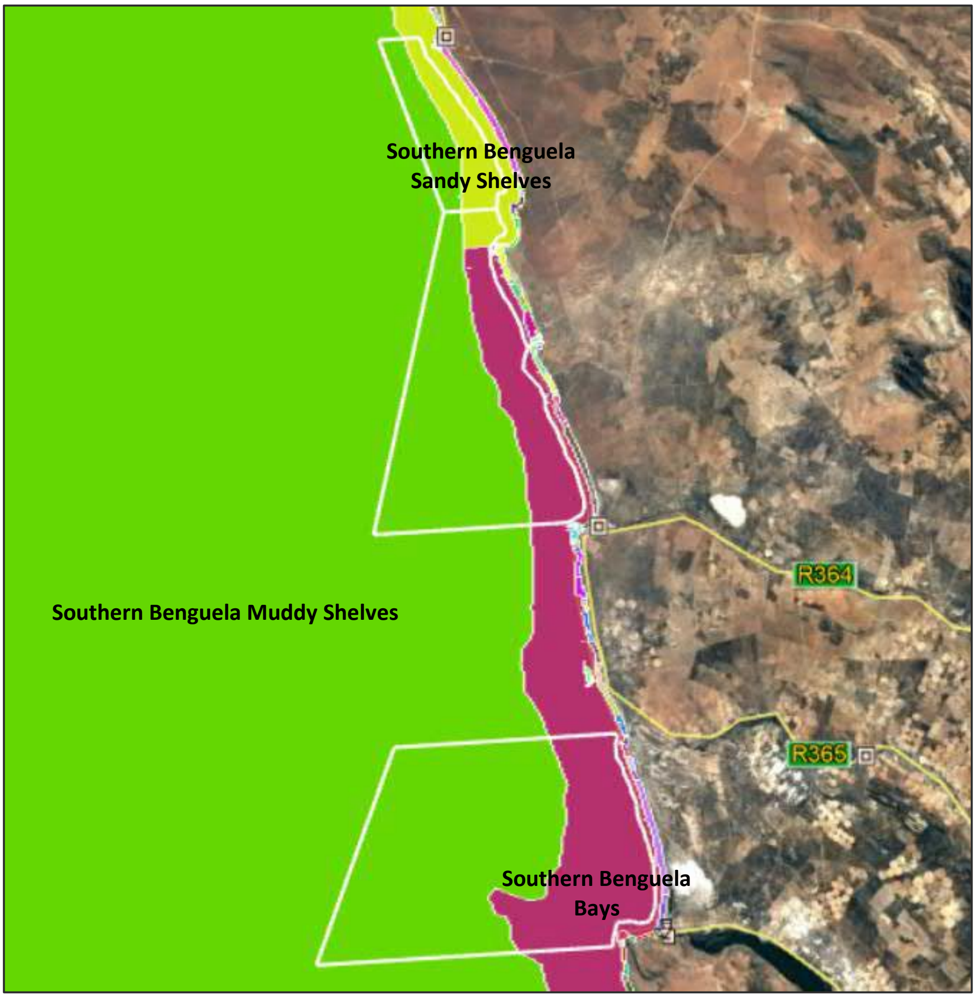

FIGURE 4-5: DISTRIBUTION OF SEABED SUBSTRATUM TYPES ALONG THE WEST COAST. APPROXIMATE LOCATION OF THE SEA CONCESSION AREAS ARE ALSO INDICATED.

Generally species richness increases from the inner shelf across the mid shelf and is influenced by sediment type (Karenyi 2014). The highest total abundance and species diversity was measured in sandy sediments of the mid-shelf. Biomass is highest in the inshore (± 50 g/m^2 wet weight) and decreases across the mid-shelf averaging around 30 g/m^2 wet weight. This is contrary to Christie (1974) who found that biomass was greatest in the mudbelt at 80 m depth off Lamberts Bay (within Sea Concession 15B), where the sediment characteristics and the impact of environmental stressors (such as low oxygen events) are likely to differ from those further offshore.

Benthic communities are structured by the complex interplay of a large array of environmental factors. Water depth and sediment grain size are considered the two major factors that determine benthic community structure and distribution on the South African west coast (Christie 1974, 1976; Steffani & Pulfrich 2004a, 2004b; 2007; Steffani 2007a; 2007b). However, studies have shown that shear bed stress - a measure of the impact of current velocity on sediment – oxygen concentration (Post et al. 2006; Currie et al. 2009; Zettler et al. 2009), productivity (Escaravage et al. 2009), organic carbon and seafloor temperature (Day et al. 1971) may also strongly influence the structure of benthic communities. There are clearly other natural processes operating in the deepwater shelf areas of the West Coast that can override the suitability of sediments in determining benthic community structure, and it is likely that periodic intrusion of low oxygen water masses is a major cause of this variability (Monteiro & van der Plas 2006; Pulfrich et al. 2006). In areas of frequent oxygen deficiency, benthic communities will be characterised either by species able to survive chronic low oxygen conditions, or colonising and fast-growing species able to rapidly recruit into areas that have suffered oxygen depletion. The combination of local, episodic hydrodynamic conditions and patchy settlement of larvae will tend to generate the observed small-scale variability in benthic community structure.

The invertebrate macrofauna are important in the marine benthic environment as they influence major ecological processes (e.g. remineralisation and flux of organic matter deposited on the sea floor, pollutant metabolism, sediment stability) and serve as important food source for commercially valuable fish species and other higher order consumers. As a result of their comparatively limited mobility and permanence over seasons, these animals provide an indication of historical environmental conditions and provide useful indices with which to measure environmental impacts (Gray 1974; Warwick 1993; Salas et al. 2006).

Also associated with soft-bottom substrates are demersal communities that comprise epifauna and bottom-dwelling vertebrate species, many of which are dependent on the invertebrate benthic macrofauna as a food source. According to Lange (2012) a single epifaunal community exists between the depths of 100 m and 250 m characterised by the hermit crabs *Sympagurus dimorphus* and *Parapaguris pilosimanus*, the prawn *Funchalia woodwardi* and the sea urchin *Brisaster capensis*. Atkinson (2009) also reported numerous species of urchins and burrowing anemones beyond 300 m depth off the West Coast.

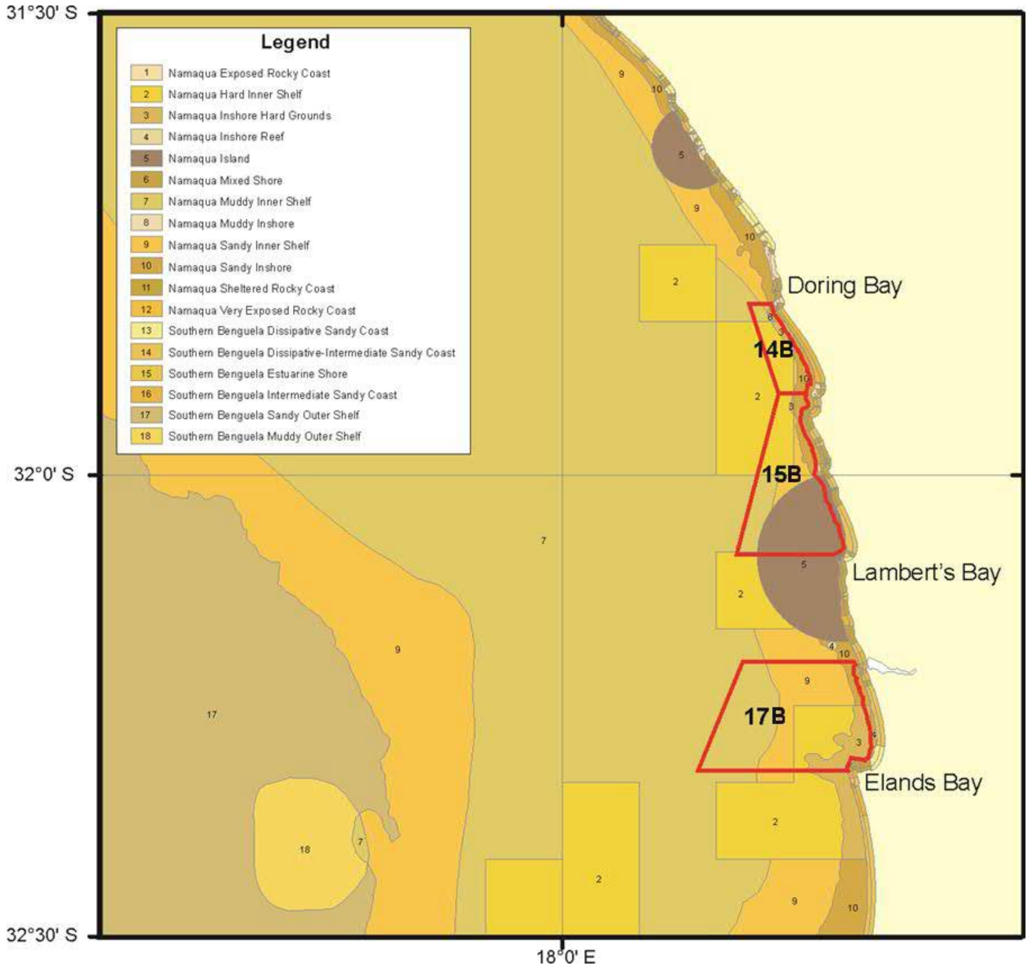

FIGURE 4-6: SEA CONCESSIONS 14B, 15B AND 17B (RED POLYGONS) IN RELATION TO BENTHIC AND COASTAL HABITAT TYPES. ONLY NEARSHORE AND OFFSHORE HABITAT TYPES ARE NUMBERED ACCORDING TO THE LEGEND.

4.1.3.1.2 Rocky Subtidal Habitat and Kelp Beds

Biological communities of the rocky sublittoral can be broadly grouped into an inshore zone from the sublittoral fringe to a depth of about 10 m dominated by flora and an offshore zone below 10 m depth dominated by fauna. From the sublittoral fringe to a depth of between 5 and 10 m, the benthos is largely dominated by algae, in particular two species of kelp. The canopy forming kelp *Ecklonia maxima* extends seawards to a depth of about 10 m. The smaller *Laminaria pallida* forms a sub-canopy to a height of about 2 m underneath *Ecklonia*, but continues its seaward extent to about 30 m depth, although further north up the west coast increasing turbidity limits growth to shallower waters (10-20 m) (Velimirov *et al.* 1977; Jarman & Carter 1981; Branch 2008). *Ecklonia maxima* is the dominant species in the south forming extensive beds from west of Cape Agulhas to north of Cape Columbine, but decreasing in abundance northwards. *Laminaria* becomes the dominant kelp north of Cape Columbine and thus in the project area, extending from Danger Point east of Cape Agulhas to Rocky Point in northern Namibia (Stegenga *et al.* 1997; Rand 2006).

Kelp beds absorb and dissipate much of the typically high wave energy reaching the shore, thereby providing important partially-sheltered habitats for a high diversity of marine flora and fauna, resulting in diverse and typical kelp-forest communities being established. Through a combination of shelter and provision of food, kelp beds support recruitment and complex trophic food webs of numerous species, including commercially important rock lobster stocks (Branch 2008).

Growing beneath the kelp canopy, and epiphytically on the kelps themselves, are a diversity of understorey algae, which provide both food and shelter for predators, grazers and filter-feeders associated with the kelp bed ecosystem. Representative under-storey algae include *Botryocarpa prolifera*, *Neuroglossum binderianum*, *Botryoglossum platycarpum*, *Hymenena venosa* and *Rhodymenia* (=*Epymenia*) *obtusa*, various coralline algae, as well as subtidal extensions of some algae occurring primarily in the intertidal zones (Bolton 1986). Epiphytic species include *Polysiphonia virgata*, *Gelidium vittatum (=Suhria vittata)* and *Carpoblepharis flaccida*. In particular, encrusting coralline algae are important in the under-storey flora as they are known as settlement attractors for a diversity of invertebrate species. The presence of coralline crusts is thought to be a key factor in supporting a rich shallow-water community by providing substrate, refuge, and food to a wide variety of infaunal and epifaunal invertebrates (Chenelot *et al.* 2008).

The sublittoral invertebrate fauna is dominated by suspension and filter-feeders, such as the mussels *Aulacomya ater* and *Choromytilus meriodonalis*, and the Cape reef worm *Gunnarea capensis*, and a variety of sponges and sea cucumbers. Grazers are less common, with most herbivory being restricted to grazing of juvenile algae or debris-feeding on detached macrophytes. The dominant herbivore is the sea urchin *Parechinus angulosus*, with lesser grazing pressure from limpets, the isopod *Paridotea reticulata* and the amphipod *Ampithoe humeralis*. The abalone *Haliotis midae*, an important commercial species present in kelp beds south of Cape Columbine is naturally absent north of Cape Columbine.

Key predators in the sub-littoral include the commercially important West Coast rock lobster (*Jasus lalandii*) and the octopus (*Octopus vulgaris*). The rock lobster acts as a keystone species as it influences community structure via predation on a wide range of benthic organisms (Mayfield *et al.* 2000). Relatively abundant rock lobsters can lead to a reduction in density, or even elimination, of black mussel (*Choromytilus meriodonalis*), the preferred prey of the species, and alter the size structure of populations of ribbed mussels (*Aulacomya ater*), reducing the proportion of selected size-classes (Griffiths & Seiderer 1980). Their role as predator can thus reshape benthic communities, resulting in large reductions in taxa such as black mussels, urchins, whelks and barnacles, and in the dominance of algae (Barkai & Branch 1988; Mayfield 1998).

Of lesser importance as predators, although numerically significant, are various starfish, feather and brittle stars, and gastropods, including the whelks *Nucella* spp. and *Burnupena* spp. Fish species commonly found in kelp beds off the West Coast include hottentot (*Pachymetopon blochii*), two tone finger fin (*Chirodactylus brachydactylus*), red fingers (*Cheilodactylus fasciatus*), galjoen (*Dichistius capensis*), rock suckers (*Chorisochismus dentex*) and the catshark (*Haploblepharus pictus*) (Branch *et al.* 2010).

There is substantial spatial and temporal variability in the density and biomass of kelp beds, as storms can remove large numbers of plants and recruitment appears to be stochastic and unpredictable (Levitt *et al.* 2002;

Rothman *et al.* 2006). Some kelp beds are dense, whilst others are less so due to differences in seabed topography, and the presence or absence of sand and grazers.

4.1.3.1.3 Deep-water coral communities

There has been increasing interest in deep-water corals in recent years because of their likely sensitivity to disturbance and their long generation times. These benthic filter-feeders generally occur deeper than 150 m with some species being recorded from as deep as 3 000 m. Some species form reefs while others are smaller and remain solitary. Corals add structural complexity to otherwise uniform seabed habitats thereby creating areas of high biological diversity (Breeze et al. 1997; MacIssac et al. 2001). Deep water corals establish themselves below the thermocline where there is a continuous and regular supply of concentrated particulate organic matter, caused by the flow of a relatively strong current over special topographical formations which cause eddies to form. Nutrient seepage from the substratum might also promote a location for settlement (Hovland et al. 2002). In the productive Benguela region, substantial areas on the shelf should thus potentially be capable of supporting rich, cold water, benthic, filter-feeding communities.

Deep water corals are known from the iBhubezi Reef to the east of the Gas Field. Furthermore, evidence from video footage taken on hard-substrate habitats in 100 - 120 m depth off southern Namibia and to the south-east of Child's Bank (De Beers Marine, unpublished data) suggest that vulnerable communities including gorgonians, octocorals and reef-building sponges do occur on the continental shelf.

A geological feature of note in the vicinity of the Ibhubezi Gas Field is the carbonate mound (bioherm) Child's Bank (Dingle *et al.* 1987), which is located to the north of the sea concession areas. Composed of sediments and the calcareous deposits from an accumulation of carbonate skeletons of sessile organisms (e.g. cold-water coral, foraminifera or marl), such features typically have topographic relief, forming isolated seabed knolls in otherwise low profile homogenous seabed habitats (Kopaska-Merkel & Haywick 2001; Kenyon *et al*. 2003; Wheeler *et al.* 2005; Colman *et al*. 2005). Features such as banks, knolls and seamounts (referred to collectively here as "seamounts"), which protrude into the water column, are subject to, and interact with, the water currents surrounding them. The effects of such seabed features on the surrounding water masses can include the up-welling of relatively cool, nutrient-rich water into nutrient-poor surface water thereby resulting in higher productivity (Clark *et al.* 1999), which can in turn strongly influences the distribution of organisms on and around seamounts. Evidence of enrichment of bottom-associated communities and high abundances of demersal fishes has been regularly reported over such seabed features.

The enhanced fluxes of detritus and plankton that develop in response to the complex current regimes lead to the development of detritivore-based food-webs, which in turn lead to the presence of seamount scavengers and predators. Seamounts provide an important habitat for commercial deepwater fish stocks such as orange roughy, oreos, alfonsino and Patagonian toothfish, which aggregate around these features for either spawning or feeding (Koslow 1996).

Such complex benthic ecosystems in turn enhance foraging opportunities for many other predators, serving as mid-ocean focal points for a variety of pelagic species with large ranges (turtles, tunas and billfish, pelagic sharks, cetaceans and pelagic seabirds) that may migrate large distances in search of food or may only congregate on seamounts at certain times (Hui 1985; Haney et al. 1995). Seamounts thus serve as feeding grounds, spawning and nursery grounds and possibly navigational markers for a large number of species (SPRFMA 2007).

Enhanced currents, steep slopes and volcanic rocky substrata, in combination with locally generated detritus, favour the development of suspension feeders in the benthic communities characterising seamounts (Rogers 1994). Deep- and cold-water corals (including stony corals, black corals and soft corals) are a prominent component of the suspension-feeding fauna of many seamounts, accompanied by barnacles, bryozoans, polychaetes, molluscs, sponges, sea squirts, basket stars, brittle stars and crinoids (reviewed in Rogers 2004). There is also associated mobile benthic fauna that includes echinoderms (sea urchins and sea cucumbers) and crustaceans (crabs and lobsters) (reviewed by Rogers 1994; Kenyon et al. 2003). Some of the smaller cnidarians species remain solitary while others form reefs thereby adding structural complexity to otherwise uniform seabed habitats. The coral frameworks offer refugia for a great variety of invertebrates and fish (including commercially important species) within, or in association with, the living and dead coral framework thereby creating spatially fragmented areas of high biological diversity.

Compared to the surrounding deep-sea environment, seamounts typically form biological hotspots with a distinct, abundant and diverse fauna, many species of which remain unidentified. Consequently, the fauna of seamounts is usually highly unique and may have a limited distribution restricted to a single geographic region, a seamount chain or even a single seamount location (Rogers et al. 2008). Levels of endemism on seamounts are also relatively high compared to the deep sea. As a result of conservative life histories (i.e. very slow growing, slow to mature, high longevity, low levels of recruitment) and sensitivity to changes in environmental conditions, such biological communities have been identified as Vulnerable Marine Ecosystems (VMEs). They are recognised as being particularly sensitive to anthropogenic disturbance (primarily deep-water trawl fisheries and mining), and once damaged are very slow to recover, or may never recover (FAO 2008).

It is not always the case that seamount habitats are VMEs, as some seamounts may not host communities of fragile animals or be associated with high levels of endemism. South Africa's seamounts and their associated benthic communities have not been extensively sampled by either geologists or biologists (Sink & Samaai 2009).

4.1.3.1.4 Demersal Fish Species

Demersal fish are those species that live and feed on or near the seabed. As many as 110 species of bony and cartilaginous fish have been identified in the demersal communities on the continental shelf of the West Coast (Roel 1987). Changes in fish communities occur with increasing depth (Roel 1987; Smale et al. 1993; Macpherson & Gordoa 1992; Bianchi et al. 2001; Atkinson 2009), with the most substantial change in species composition occurring in the shelf break region between 300 m and 400 m depth (Roel 1987; Atkinson 2009). The shelf community (< 380 m) is dominated by the Cape hake *M. capensis*, and includes jacopever (*Helicolenus dactylopterus*), Izak catshark (*Holohalaelurus regain*), soupfin shark (*Galeorhinus galeus*) and whitespotted houndshark (*Mustelus palumbes*). The more diverse deeper water community is dominated by the deepwater hake (*Merluccius paradoxus*), monkfish (Lophius vomerinus), kingklip (Genypterus capensis), bronze whiptail (*Lucigadus ori*) and hairy conger (*Bassanago albescens*) and various squalid shark species. There is some degree of species overlap between the depth zones.

Roel (1987) showed seasonal variations in the distribution ranges shelf communities, with species such as the pelagic goby (*Sufflogobius bibarbatus*), and West Coast sole (*Austroglossus microlepis*) occurring in shallow water north of Cape Point during summer only. The deep-sea community was found to be homogenous both spatially and temporally. In a more recent study, however, Atkinson (2009) identified two long-term community shifts in demersal fish communities; the first (early to mid-1990s) being associated with an overall increase in density of many species, whilst many species decreased in density during the second shift (mid-2000s). These community shifts correspond temporally with regime shifts detected in environmental forcing variables (sea surface temperatures and upwelling anomalies) (Howard et al. 2007) and with the eastward shifts observed in small pelagic fish species and rock lobster populations (Coetzee et al. 2008, Cockcroft et al. 2008).

The diversity and distribution of demersal cartilagenous fishes on the West Coast is discussed by Compagno et al. (1991). The species that may occur on the continental shelf in the general project area in waters <100 m depth are listed in Table 4-1.

TABLE 4-1: DEMERSAL CARTILAGINOUS SPECIES FOUND ON THE CONTINENTAL SHELF ALONG THE WEST COAST, WITH APPROXIMATE DEPTH RANGE AT WHICH THE SPECIES OCCURS (COMPAGNO *ET AL.* 1991).

Common Name	Scientific name	Depth Range (m)
Bramble shark	*Echinorhinus brucus*	55-285
Shortnose spiny dogfish	*Squalus megalops*	75-460
Sixgill sawshark	*Pliotrema warreni*	60-500
Tigar catshark	*Halaelurus natalensis*	50-100
Soupfin shark/Vaalhaai	*Galeorhinus galeus*	<10-300

Common Name	Scientific name	Depth Range (m)
Houndshark	*Mustelus mustelus*	<100
Thorny skate	*Raja radiata*	50-600
Slime skate	*Raja pullopunctatus*	15-460
Rough-belly skate	*Raja springeri*	85-500
Yellowspot skate	*Raja wallacei*	70-500
Biscuit skate	*Raja clavata*	25-500
Spearnose skate	*Raja alba*	75-260
St Joseph	*Callorhinchus capensis*	30-380

4.1.3.2 Pelagic Communities

In contrast to demersal and benthic biota that are associated with the seabed, pelagic species live and feed in the open water column. The pelagic communities are typically divided into plankton and fish, and their main predators, marine mammals (seals, dolphins and whales), seabirds and turtles. It is pointed out that the marine component of the 2011 National Biodiversity Assessment (Sink et al. 2012), rated the majority of the offshore pelagic habitat types as 'least threatened', with only a narrow band along the shelf break of the West Coast being rated as 'vulnerable', primarily due to its importance as a migration pathway for various resource species (e.g. whales, tuna, billfish, turtles).

4.1.3.2.1 Plankton

Plankton is particularly abundant in the shelf waters off the West Coast, being associated with the upwelling characteristic of the area. Plankton range from single-celled bacteria to jellyfish of 2 m diameter, and include bacterio-plankton, phytoplankton, zooplankton, and ichthyoplankton.

Phytoplankton are the principle primary producers with mean productivity ranging from 2.5 - 3.5 g C/m^2/day for the midshelf region and decreasing to 1 g C/m^2/day inshore of 130 m (Shannon & Field 1985; Mitchell-Innes & Walker 1991; Walker & Peterson 1991). The phytoplankton is dominated by large-celled organisms, which are adapted to the turbulent sea conditions. The most common diatom genera are *Chaetoceros, Nitschia, Thalassiosira, Skeletonema, Rhizosolenia*, *Coscinodiscus* and *Asterionella* (Shannon & Pillar 1985). Diatom blooms occur after upwelling events, whereas dinoflagellates (e.g. *Prorocentrum, Ceratium* and *Peridinium*) are more common in blooms that occur during quiescent periods, since they can grow rapidly at low nutrient concentrations. In the surf zone, diatoms and dinoflagellates are nearly equally important members of the phytoplankton, and some silicoflagellates are also present.

Red-tides are ubiquitous features of the Benguela system (see Shannon & Pillar, 1986). The most common species associated with red tides (dinoflagellate and/or ciliate blooms) are *Noctiluca scintillans*, *Gonyaulax tamarensis, G. polygramma* and the ciliate *Mesodinium rubrum. Gonyaulax* and *Mesodinium* have been linked with toxic red tides. Most of these red-tide events occur quite close inshore although Hutchings *et al.* (1983) have recorded red-tides 30 km offshore. Thus, they are most likely to occur in the inshore regions of the sea concession areas.

The mesozooplankton (≥200 µm) is dominated by copepods, which are overall the most dominant and diverse group in southern African zooplankton. Important species are *Centropages brachiatus, Calanoides carinatus, Metridia lucens, Nannocalanus minor, Clausocalanus arcuicornis, Paracalanus parvus, P. crassirostris* and *Ctenocalanus vanus.* All of the above species typically occur in the phytoplankton rich upper mixed layer of the water column, with the exception of *M. lucens* which undertakes considerable vertical migration.

The macrozooplankton (≥1 600 µm) are dominated by euphausiids of which 18 species occur in the area. The dominant species occurring in the nearshore are *Euphausia lucens* and *Nyctiphanes capensis,* although neither species appears to survive well in waters seaward of oceanic fronts over the continental shelf (Pillar *et al.* 1991). Standing stock estimates of mesozooplankton for the southern Benguela area range from 0.2 - 2.0 g C/m^2, with maximum values recorded during upwelling periods. Macrozooplankton biomass ranges from

0.1 - 1.0 g C/m^2, with production increasing north of Cape Columbine (Pillar 1986). Although it shows no appreciable onshore-offshore gradients, standing stock is highest over the shelf, with accumulation of some mobile zooplanktors (euphausiids) known to occur at oceanographic fronts. Beyond the continental slope biomass decreases markedly. Localised peaks in biomass may, however, occur in the vicinity of Child's Bank and Tripp seamount in response to topographically steered upwelling around such seabed features.

Zooplankton biomass varies with phytoplankton abundance and, accordingly, seasonal minima will exist during non-upwelling periods when primary production is lower (Brown 1984; Brown & Henry 1985), and during winter when predation by recruiting anchovy is high. More intense variation will occur in relation to the upwelling cycle; newly upwelled water supporting low zooplankton biomass due to paucity of food, whilst high biomasses develop in aged upwelled water subsequent to significant development of phytoplankton. Irregular pulsing of the upwelling system, combined with seasonal recruitment of pelagic fish species into West Coast shelf waters during winter, thus results in a highly variable and dynamic balance between plankton replenishment and food availability for pelagic fish species.

Although ichthyoplankton (fish eggs and larvae) comprise a minor component of the overall plankton, it remains significant due to the commercial importance of the overall fishery in the region. Various pelagic and demersal fish species are known to spawn in the inshore regions of the southern Benguela, (including pilchard, round herring, chub mackerel, lanternfish and hakes (Crawford *et al.* 1987) (see Figure 4-7), and their eggs and larvae form an important contribution to the ichthyoplankton in the region. Ichthyoplankton abundance within the Sea Concession areas is thus expected to be high.

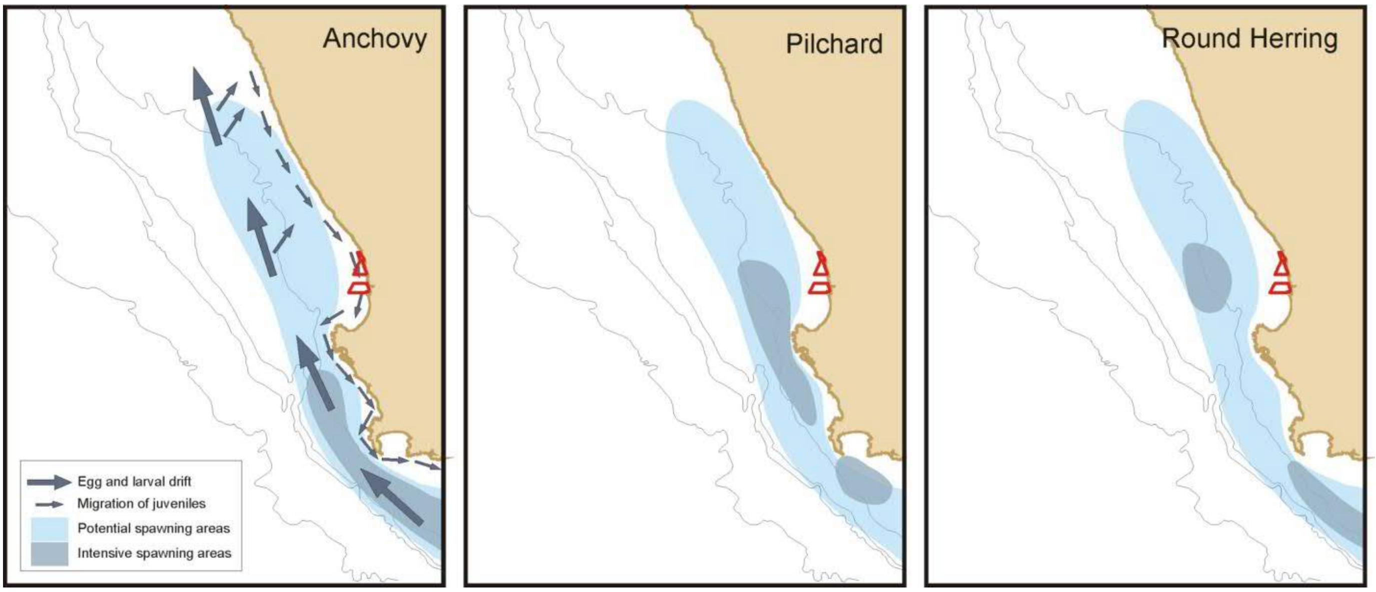

FIGURE 4-7: SEA CONCESSIONS 14B, 15B AND 17B (RED POLYGONS) IN RELATION TO THE MAJOR SPAWNING AREAS IN THE SOUTHERN BENGUELA REGION (ADAPTED FROM CRUIKSHANK 1990).

4.1.3.2.2 Cephalopods

Fourteen species of cephalopds have been recorded in the southern Benguela, the majority of which are sepiods/cuttlefish (Lipinski 1992; Augustyn *et al.* 1995). Most of the cephalopod resource is distributed on the mid-shelf with *Sepia australis* being most abundant at depths between 60-190 m, whereas *S. hieronis* densities were higher at depths between 110-250 m. *Rossia enigmatica* occurs more commonly on the edge of the shelf to depths of 500 m. Biomass of these species was generally higher in the summer than in winter. Cuttlefish are largely epi-benthic and occur on mud and fine sediments in association with their major prey item; mantis shrimps (Augustyn *et al.* 1995). They form an important food item for demersal fish.

4.1.3.2.3 Pelagic Fish

The structure of the nearshore and surf zone fish community varies greatly with the degree of wave exposure. Species richness and abundance is generally high in sheltered and semi-exposed areas but typically very low off the more exposed beaches (Clark 1997a, 1997b).

The surf-zone and outer turbulent zone habitats of sandy beaches are considered to be important nursery habitats for marine fishes, however, composition and abundance of individual assemblages appears heavily dependent on wave exposure (Blaber & Blaber 1980, Potter et al. 1990, Clark 1997a, b). Surf-zone fish communities off the South African West Coast have relatively high biomass, but low species diversity. Typical surf-zone fish include harders (*Liza richardsonii*), white stumpnose (*Rhabdosargus globiceps*), Cape sole (*Heteromycteris capensis*), Cape gurnard (*Chelidonichthys capensis*), False Bay klipfish (*Clinus latipennis*), sandsharks (*Rhinobatos annulatus*), eagle ray (*Myliobatis aquila*), and smooth-hound (*Mustelus mustelus*) (Clark 1997b).

Fish species commonly found in kelp beds off the West Coast include hottentot (*Pachymetopon blochii*), twotone fingerfin (*Chirodactylus brachydactylus*), red fingers (*Cheilodactylus fasciatus*), galjoen (*Dichistius capensis*), rock suckers (*Chorisochismus dentex*), maned blennies (*Scartella emarginata*) and the catshark (*Haploblepharus pictus*) (Sauer *et al.* 1997; Brouwer *et al*. 1997; Branch *et al*. 2010).

Small pelagic species occurring beyond the surfzone and generally within the 200 m contour include the sardine/pilchard (*Sadinops ocellatus*), anchovy (*Engraulis capensis*), chub mackerel (*Scomber japonicus*), horse mackerel (*Trachurus capensis*) and round herring (*Etrumeus whiteheadi*). These species typically occur in mixed shoals of various sizes (Crawford *et al.* 1987), and exhibit similar life history patterns involving seasonal migrations between the west and south coasts. The spawning areas of the major pelagic species are distributed on the continental shelf and along the shelf edge from south of St Helena Bay to Mossel Bay on the South Coast (Shannon & Pillar 1986). They spawn downstream of major upwelling centres in spring and summer, and their eggs and larvae are subsequently carried around Cape Point and up the coast in northward flowing surface waters.

At the start of winter every year, juveniles of most small pelagic shoaling species recruit into coastal waters in large numbers between the Orange River and Cape Columbine. They recruit in the pelagic stage, across broad stretches of the shelf, to utilise the shallow shelf region as nursery grounds before gradually moving southwards in the inshore southerly flowing surface current, towards the major spawning grounds east of Cape Point. Recruitment success relies on the interaction of oceanographic events, and is thus subject to spatial and temporal variability. Consequently, the abundance of adults and juveniles of these small, short-lived (1 - 3 years) pelagic fish is highly variable both within and between species.

Two species that migrate along the West Coast following the shoals of anchovy and pilchards are snoek *Thyrsites atun* and chub mackerel *Scomber japonicas*. Their appearance along the West and South-West coasts are highly seasonal. Snoek migrating along the southern African West Coast reach the area between St Helena Bay and the Cape Peninsula between May and August. They spawn in these waters between July and October before moving offshore and commencing their return northward migration (Payne & Crawford 1989). They are voracious predators occurring throughout the water column, feeding on both demersal and pelagic invertebrates and fish. Chub mackerel similarly migrate along the southern African West Coast reaching South-Western Cape waters between April and August. They move inshore in June and July to spawn before starting the return northwards offshore migration later in the year. Their abundance and seasonal migrations are thought to be related to the availability of their shoaling prey species (Payne & Crawford 1989).

Large pelagic species such as tunas, billfish and pelagic sharks, migrate throughout the southern oceans, between surface and deep waters (> 300 m). Species occurring off western southern Africa include the albacore/longfin tuna (*Thunnus alalunga*), yellowfin (*T. albacares*), bigeye (*T. obesus*), and skipjack (*Katsuwonus pelamis*) tunas, as well as the atlantic blue marlin (*Makaira nigricans*), the white marlin (*Tetrapturus albidus*) and the broadbill swordfish (*Xiphias gladius*) (Payne & Crawford 1989). The distribution of these species is dependent on food availability in the mixed boundary layer between the Benguela and warm central Atlantic waters. Concentrations of large pelagic species are also known to occur associated with underwater feature such as canyons and seamounts as well as meteorologically induced oceanic fronts (Penney et al. 1992).

Many of the large migratory pelagic species are considered threatened by the IUCN, primarily due to overfishing. Tuna and swordfish are targeted by high seas fishing fleets and illegal overfishing has severely damaged the stocks of many of these species. Similarly, pelagic sharks, are either caught as bycatch in the pelagic tuna longline fisheries, or are specifically targeted for their fins, where the fins are removed and the remainder of the body discarded.

4.1.3.2.4 Turtles

Three species of turtle occur along the West Coast, namely the Leatherback (*Dermochelys coriacea*), and occasionally the Loggerhead (*Caretta caretta*) and the Green (*Chelonia mydas*) turtle. Loggerhead and Green turtles are expected to occur only as occasional visitors along the West Coast. The Leatherback is the only turtle likely to be encountered in the offshore waters of west South Africa.

The Benguela ecosystem, especially the northern Benguela where jelly fish numbers are high, is increasingly being recognized as a potentially important feeding area for leatherback turtles from several globally significant nesting populations in the south Atlantic (Gabon, Brazil) and south east Indian Ocean (South Africa) (Lambardi *et al*. 2008, Elwen & Leeney 2011; SASTN 2011[4]). Leatherback turtles from the east South Africa population have been satellite tracked swimming around the west coast of South Africa and remaining in the warmer waters west of the Benguela ecosystem (Lambardi *et al*. 2008).

Leatherback turtles inhabit deeper waters and are considered a pelagic species, travelling the ocean currents in search of their prey (primarily jellyfish). While hunting they may dive to over 600 m and remain submerged for up to 54 minutes (Hays *et al.* 2004). Their abundance in the study area is unknown but expected to be low. Leatherbacks feed on jellyfish and are known to have mistaken plastic marine debris for their natural food. Ingesting this can obstruct the gut, lead to absorption of toxins and reduce the absorption of nutrients from their real food. Leatherback Turtles are listed as “Critically Endangered” worldwide by the IUCN and are in the highest categories in terms of need for conservation in CITES (Convention on International Trade in Endangered Species), and Convention on Migratory Species. Loggerhead and green turtles are listed as “Endangered”. As a signatory of the Convention on Migratory Species, South Africa has endorsed and signed an International Memorandum of Understanding specific to the conservation of marine turtles. South Africa is thus committed to conserve these species at an international level.

4.1.3.2.5 Seabirds

Large numbers of pelagic seabirds exploit the pelagic fish stocks of the Benguela system. Of the 49 species of seabirds that occur in the Benguela region, 14 are defined as resident, 10 are visitors from the northern hemisphere and 25 are migrants from the southern Ocean. The 18 species classified as being common in the southern Benguela are listed in Table 4-2. The area between Cape Point and the Orange River supports 38% and 33% of the overall population of pelagic seabirds in winter and summer, respectively. Most of the species in the region reach highest densities offshore of the shelf break (200 – 500 m depth) with highest population levels during their non-breeding season (winter). Pintado petrels and Prion spp. show the most marked variation here.

[4] *SASTN Meeting - Second meeting of the South Atlantic Sea Turtle Network, Swakopmund, Namibia, 24-30 July 2011.*

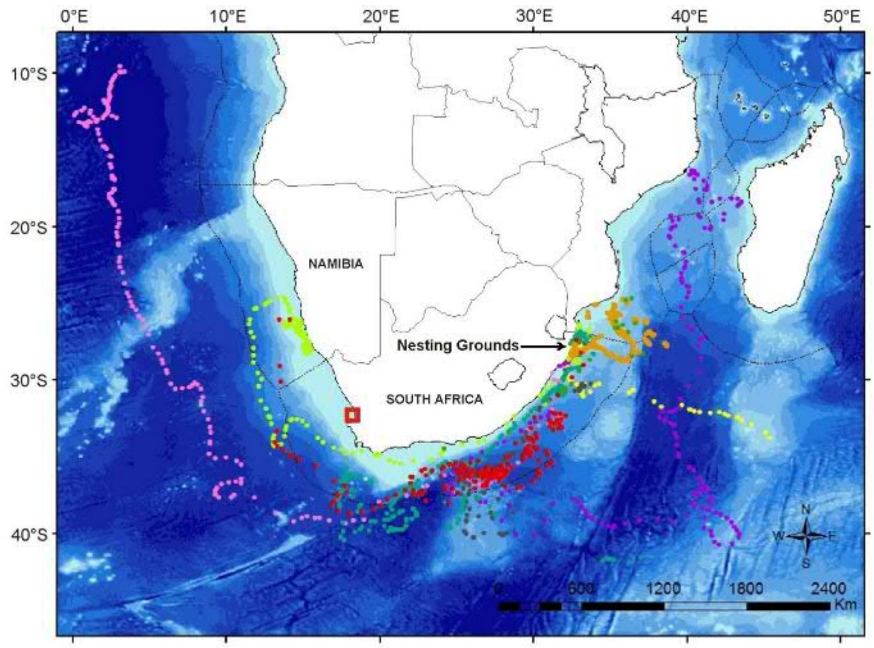

FIGURE 4-8: THE APPROXIMATE THE LOCATION OF CONCESSIONS 14B, 15B AND 17B (RED POLYGON) IN RELATION TO POST-NESTING DISTRIBUTION OF NINE SATELLITE TAGGED LEATHERBACK FEMALES (1996 – 2006; OCEANS AND COAST, UNPUBLISHED DATA).

Fourteen species of seabirds breed in southern Africa; Cape Gannet, African Penguin, four species of Cormorant, White Pelican, three Gull and four Tern species (see Table 4-3). The breeding areas are distributed around the coast with islands being especially important. The number of successfully breeding birds at the particular breeding sites varies with food abundance. Most of the breeding seabird species forage at sea with most birds being found relatively close inshore (10-30 km). Cape Gannets, however, are known to forage up to 140 km offshore (Dundee 2006; Ludynia 2007), and African Penguins have also been recorded as far as 60 km offshore.

Sea Concession area 15B is located less than 1 km from Lambert's Bay Bird Island which hosts the fourth largest breeding colony of Cape Gannet (approximately 8 500 breeding pairs). The mouth of the Verlorenvlei Estuary is located less than 1 km inshore of Sea Concession Area 17B. The Verlorenvlei Estuary is a declared an Important Bird Area.

TABLE 4-2: PELAGIC SEABIRDS COMMON IN THE SOUTHERN BENGUELA REGION (CRAWFORD *ET AL.* 1991).

Common Name	Species name	Global IUCN
Shy albatross	*Thalassarche cauta*	Near Threatened
Black browed albatross	*Thalassarche melanophrys*	Endangered[1]
Yellow nosed albatross	*Thalassarche chlororhynchos*	Endangered
Giant petrel sp.	*Macronectes halli/giganteus*	Near Threatened
Pintado petrel	*Daption capense*	Least concern
Greatwinged petrel	*Pterodroma macroptera*	Least concern
Soft plumaged petrel	*Pterodroma mollis*	Least concern
Prion spp	*Pachyptila spp.*	Least concern
White chinned petrel	*Procellaria aequinoctialis*	Vulnerable
Cory's shearwater	*Calonectris diomedea*	Least concern

Common Name	Species name	Global IUCN
Great shearwater	*Puffinus gravis*	Least concern
Sooty shearwater	*Puffinus griseus*	Near Threatened
European Storm petrel	*Hydrobates pelagicus*	Least concern
Leach's storm petrel	*Oceanodroma leucorhoa*	Least concern
Wilson's storm petrel	*Oceanites oceanicus*	Least concern
Blackbellied storm petrel	*Fregetta tropica*	Least concern
Skua spp.	*Catharacta/Stercorarius spp.*	Least concern
Sabine's gull	*Larus sabini*	Least concern

1. May move to Critically Endangered if mortality from long-lining does not decrease.

TABLE 4-3: BREEDING RESIDENT SEABIRDS PRESENT ALONG THE WEST COAST (CCA & CMS 2001).

Common name	Species name	Global IUCN Status
African Penguin	*Spheniscus demersus*	Endangered
Great Cormorant	*Phalacrocorax carbo*	Least Concern
Cape Cormorant	*Phalacrocorax capensis*	Endangered
Bank Cormorant	*Phalacrocorax neglectus*	Endangered
Crowned Cormorant	*Phalacrocorax coronatus*	Near Threatened
White Pelican	*Pelecanus onocrotalus*	Least Concern
Cape Gannet	*Morus capensis*	Vulnerable
Kelp Gull	*Larus dominicanus*	Least Concern
Greyheaded Gull	*Larus cirrocephalus*	Least Concern
Hartlaub's Gull	*Larus hartlaubii*	Least Concern
Caspian Tern	*Hydroprogne caspia*	Least Concern
Swift Tern	*Sterna bergii*	Least Concern
Roseate Tern	*Sterna dougallii*	Least Concern
Damara Tern	*Sterna balaenarum*	Near Threatened

4.1.3.2.6 Marine Mammals

The marine mammal fauna occurring off the southern African coast includes several species of whales and dolphins and one resident seal species. Thirty-five species of whales and dolphins are known (based on historic sightings or strandings records) or likely (based on habitat projections of known species parameters) to occur in these waters (see Table 4-4). The offshore areas have been particularly poorly studied with almost all available information from deeper waters (>200 m) arising from historic whaling records prior to 1970. Current information on the distribution, population sizes and trends of most cetacean species occurring on the west coast of southern Africa is lacking. Information on smaller cetaceans in deeper waters is particularly poor and the precautionary principal must be used when considering possible encounters with cetaceans in this area.

Records from stranded specimens show that the area between St Helena Bay (~32°S) and Cape Agulhas (~34°S, 20°E) is an area of transition between Atlantic and Indian Ocean species, as well as those more commonly associated with colder waters of the west coast (e.g. dusky dolphins and long finned pilot whales) and those of the warmer east coast (e.g. striped and Risso's dolphins) (Findlay *et al.* 1992). The location of the sea concessions lies north of this transition zone and can be considered to be truly on the 'west coast'.

However, the warmer waters that occur offshore of the Benguela ecosystem (more than approximately 100 km offshore) provide an entirely different habitat, that despite the relatively high latitude may host some species associated with the more tropical and temperate parts of the Atlantic such as rough toothed dolphins, Pan-tropical spotted dolphins and short finned pilot whales. Owing to the uncertainty of species occurrence offshore, species that may occur there have been included here for the sake of completeness.

The distribution of cetaceans can largely be split into those associated with the continental shelf and those that occur in deep, oceanic water. Importantly, species from both environments may be found on the continental slope (200 – 2000 m) making this the most species rich area for cetaceans. Cetacean density on the continental shelf is usually higher than in pelagic waters as species associated with the pelagic environment tend to be wide ranging across thousands of kilometers.

Cetaceans comprise two taxonomic groups, the mysticetes (filter feeders with baleen) and the odontocetes (predatory whales and dolphins with teeth). The term 'whale' is used to describe species in both groups and is taxonomically meaningless (e.g. the killer whale and pilot whale are members of the Odontoceti, family Delphinidae and are thus dolphins). Due to differences in sociality, communication abilities, ranging behaviour and acoustic behaviour, these two groups are considered separately.

The cetaceans likely to be found within the project area, based on data sourced from: Findlay *et al.* (1992), Best (2007), Weir (2011), Dr J-P. Roux, (MFMR pers. comm.) and unpublished records held by the Namibian Dolphin Project are listed in Table 4-4. Of the 35 species listed, one is critically endangered, two are endangered and two are considered vulnerable (South African Red Data list Categories, 2016). Altogether nine species are listed as “data deficient” underlining how little is known about cetaceans, their distributions and population trends. The majority of data available on the seasonality and distribution of large whales in the project area is the result of commercial whaling activities mostly dating from the 1960s. Changes in the timing and distribution of migration may have occurred since these data were collected due to extirpation of populations or behaviours (e.g. migration routes may be learnt behaviours). Some data on species occurrence is available from newer datasets, mainly from marine mammal observers working on earlier seismic surveys, but these are almost all confined to the summer months.

A review of the distribution and seasonality of the key cetacean species likely to be found within the project area is provided below.

(a) Mysticete (Baleen) whales

The majority of mysticetes whales fall into the family Balaenopeteridae. Those occurring in the area include the blue, fin, sei, Antarctic minke, dwarf minke, humpback and Bryde’s whales. The southern right whale (Family Balaenidae) and pygmy right whale (Family Neobalaenidae) are from taxonomically separate groups. The majority of mysticete species occur in pelagic waters with only occasional visits to shelf waters. All of these species show some degree of migration either to or through the latitudes encompassed by the broader project area when en route between higher latitude (Antarctic or Subantarctic) feeding grounds and lower latitude breeding grounds.

TABLE 4-4: CETACEANS OCCURRENCE OFF THE WEST COAST OF SOUTH AFRICA, THEIR SEASONALITY, LIKELY ENCOUNTER FREQUENCY WITH PROPOSED EXPLORATION DRILLING OPERATIONS AND IUCN CONSERVATION STATUS.

Common Name	Species	Shelf	Offshore	Seasonality	Likely encounter frequency	IUCN Conservation Status
Delphinids (14 spp)						
Dusky dolphin	*Lagenorhynchus obscurus*	Yes (0- 800 m)	No	Year round	Monthly	Data Deficient
Heaviside's dolphin	*Cephalorhynchus heavisidii*	Yes (0-200 m)	No	Year round	Very rare	Least Concern
Common bottlenose dolphin	*Tursiops truncatus*	Yes	Yes	Year round	<Weekly	Least Concern
Common dolphin	*Delphinus delphis*	Yes	Yes	Year round	<Weekly	Least Concern
Southern right whale dolphin	*Lissodelphis peronii*	Yes	Yes	Year round	Very rare	Least Concern
Striped dolphin	*Stenella coeruleoalba*	No	?	?	Very rare	Least Concern
Pantropical spotted dolphin	*Stenella attenuata*	Edge	Yes	Year round	Very rare	Least Concern
Long-finned pilot whale	*Globicephala melas*	Edge	Yes	Year round	<Weekly	Least Concern
Short-finned pilot whale	*Globicephala macrorhynchus*	?	?	?	Very rare	Least Concern
Rough-toothed dolphin	*Steno bredanensis*	?	?	?	Very rare	Least Concern
Killer whale	*Orcinus orca*	Occasional	Yes	Year round	Monthly	Least Concern
False killer whale	*Pseudorca crassidens*	Occasional	Yes	Year round	Monthly	Least Concern
Pygmy killer whale	*Feresa attenuata*	?	Yes	?	Rare	Least Concern
Risso's dolphin	*Grampus griseus*	Yes (edge)	Yes	?	Monthly	Least Concern
Sperm whales (3 spp)						
Pygmy sperm whale	*Kogia breviceps*	Edge	Yes	Year round	Rare	Data Deficient
Dwarf sperm whale	*Kogia sima*	Edge	?	?	Very rare	Data Deficient
Sperm whale	*Physeter macrocephalus*	Edge	Yes	Year round	Weekly	Vulnerable
Beaked whales (8 spp)						
Cuvier's	*Ziphius cavirostris*	No	Yes	Year round	Rare	Least Concern
Arnoux's	*Beradius arnouxii*	No	Yes	Year round	Rare	Data Deficient
Shepherd's	*Tasmacetus sheperdi*	No	Yes	Year Round	Rare	Not Assessed
Southern bottlenose	*Hyperoodon planifrons*	No	Yes	Year round	Rare	Least Concern
Layard's	*Mesoplodon layardii*	No	Yes	Year round	Rare	Data Deficient
True's	*M. mirus*	No	Yes	Year round	Rare	Data Deficient
Gray's	*M. grayi*	No	Yes	Year round	Rare	Data Deficient
Blainville's	*M. densirostris*	No	Yes	Year round	Rare	Data Deficient

Common Name	Species	Shelf	Offshore	Seasonality	Likely encounter frequency	IUCN Conservation Status
Baleen whales (10.5 spp)						
Antarctic Minke	*Balaenoptera bonaerensis*	Yes	Yes	>Winter	Monthly	Least Concern
Dwarf minke	*B. acutorostrata*	Yes	Yes	Year round	Occasional	Least Concern
Fin whale	*B. physalus*	Yes	Yes	MJJ & ON, rarely in summer	Monthly	Endangered
Blue whale (Antarctic)	*B. musculus intermedia*	No	Yes	?	Monthly	Critically Endangered
Sei whale	*B. borealis*	Yes	Yes	MJ & ASO	Monthly	Endangered
Bryde's (offshore)	*B. brydei*	Yes	Yes	Summer (JF)	Weekly	Data Deficient
Bryde's (inshore)	*B brydei (subspp)*	Yes	Yes	Year round	Rare	Vulnerable
Pygmy right	*Caperea marginata*	Yes	?	Year round	Very Rare	Least Concern
Humpback sp.	*Megaptera novaeangliae*	Yes	Yes	Year round, higher in SONDJF	Daily	Least Concern
Humpback B2 population	*Megaptera novaeangliae*	Yes	Yes	Spring Summer peak ONDJF	Daily	Vulnerable
Southern right	*Eubalaena australis*	Yes	No	Year round, higher in SONDJF	Daily*	Least Concern

TABLE 4-5: SEASONALITY OF BALEEN WHALES IN THE IMPACT ZONE BASED ON DATA FROM MULTIPLE SOURCES, PREDOMINANTLY COMMERCIAL CATCHES (BEST 2007 AND OTHER SOURCES) AND DATA FROM STRANDING EVENTS (NDP UNPUBL DATA).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bryde's Inshore	L	L	L	L	L	L	L	L	L	L	L	L
Bryde's Offshore	**H**	**H**	**H**	L	L	L	L	L	L	L	L	L
Sei	L	L	L	L	**H**	**H**	L	**H**	**H**	**H**	L	L
Fin	M	M	M	**H**	**H**	**H**	M	**H**	**H**	**H**	M	M
Blue	L	L	L	L	L	**H**	**H**	**H**	L	M	L	L
Minke	M	M	M	**H**	**H**	**H**	M	**H**	**H**	**H**	M	M
Humpback	M	M	L	L	L	**H**	**H**	M	M	L	M	**H**
Southern Right	**H**	M	L	**L**	L	**H**	**H**	**H**	M	M	**H**	**H**
Pygmy right	**H**	**H**	**H**	M	L	L	L	L	L	L	M	M

Values of High (H), Medium (M) and Low (L) of the particular species within each month are relative within each row (species) and not comparable between species. For abundance / likely encounter rate within the broader region (see Table 4-4).

Depending on the ultimate location of these feeding and breeding grounds, seasonality may be either unimodal, usually in winter months, or bimodal (e.g. May to July and October to November), reflecting a northward and southward migration through the area. Northward and southward migrations may take place at different distances from the coast due to whales following geographic or oceanographic features, thereby influencing the seasonality of occurrence at different locations. Because of the complexities of the migration patterns, each species is discussed separately below.

Two genetically and morphologically distinct populations of Bryde's whales live off the coast of southern Africa (Best 2001; Penry 2010). The "offshore population" lives beyond the shelf (>200 m depth) off west Africa and migrates between wintering grounds off equatorial west Africa (Gabon) and summering grounds off western South Africa. Its seasonality on the west coast is thus opposite to the majority of the balaenopterids with abundance likely to be highest in the broaderProject area in January - March. The "inshore population" of Bryde's, which lives on the continental shelf and Agulhas Bank, is unique amongst baleen whales in the region by being non-migratory. It may move further north into the Benguela current areas of the west of coast of South Africa and Namibia, especially in the winter months (Best 2007).

Sei whales migrate through South African waters, where they were historically hunted in relatively high numbers, to unknown breeding grounds further north. Their migration pattern thus shows a bimodal peak with numbers west of Cape Columbine highest in May and June, and again in August, September and October. All whales were caught in waters deeper than 200 m with most deeper than 1 000 m (Best & Lockyer 2002). Almost all information is based on whaling records 1958-1963 and there is no current information on abundance or distribution patterns in the region. Sei whales are unlikely to be sighted in the concession areas due to their distribution further offshore.

Fin whales were historically caught off the West Coast, with a bimodal peak in the catch data suggesting animals were migrating further north during May-June to breed, before returning during August-October *en route* to Antarctic feeding grounds. Some juvenile animals may feed year round in deeper waters off the shelf (Best 2007). There are no recent data on the abundance or distribution of fin whales off the west coast, although a sighting in St Helena Bay in 2011 (Mammal Research Institute, unpubl. data) and several sightings in southern Namibia in 2014 and 2015 as well as a number of strandings and acoustic detections (Thomisch *et al.* 2017) in Namibia, confirm their contemporary occurrence in the region.

Antarctic and pygmy blue whales were historically caught in high numbers during commercial whaling activities, with a single peak in catch rates during July in Walvis Bay, Namibia and Namibe, Angola suggesting that in the eastern South Atlantic these latitudes are close to the northern migration limit for the species (Best 2007). The two sub-species are difficult to differentiate at sea, so are considered as one species here. Evidence of blue whale presence in the South-East Atlantic is rapidly increasing. Recent acoustic detections of blue whales in the Antarctic peak between December and January (Thomisch *et al.* 2016) and in northern Namibia between May and July (Thomisch 2017) supporting observed timing from whaling records. Several recent (2014-2015) sightings of blue whales have occurred during seismic surveys off the southern part of Namibia in water >1 000 m deep confirming their current existence in the area and occurrence in Autumn months. Encounters in the concession areas are unlikely.

Two forms of minke whale occur in the southern Hemisphere, the Antarctic minke whale (*Balaenoptera bonaerensis*) and the dwarf minke whale (*B. acutorostrata* subsp.); both species occur in the Benguela (Best 2007). Antarctic minke whales range from the pack ice of Antarctica to tropical waters and are usually seen more than approximately 50 km offshore. Although adults migrate from the Southern Ocean (summer) to tropical/temperate waters (winter) to breed, some animals, especially juveniles, are known to stay in tropical/temperate waters year round. The dwarf minke whale has a more temperate distribution than the Antarctic minke and they do not range further south than 60-65°S. Dwarf minkes have a similar migration pattern to Antarctic minkes with at least some animals migrating to the Southern Ocean during summer. Dwarf minke whales occur closer to shore than Antarctic minkes. Both species are generally solitary and densities are likely to be low in the project area.

The Pygmy right whale (*Caperea marginata*) is the smallest of the baleen whales reaching only 6 m total length as an adult (Best 2007). The species is typically associated with cool temperate waters between 30°S and 55°S and records in Namibia are the northern most for the species with no confirmed records north of Walvis Bay. Its preference for cooler waters, suggests that it is likely to be restricted to the continental shelf areas within the Benguela system, and is may occur in the deeper portions of the concession areas.

The most abundant baleen whales in the Benguela are Southern Right whales and Humpback whales. In the last decade, both species have been increasingly observed to remain on the west coast of South Africa well after the 'traditional' South African whale season (June – November) into spring and early summer (October – February) where they have been observed feeding in upwelling zones, especially off Saldanha and St Helena Bay (Barendse *et al.* 2011; Mate *et al.* 2011).

Humpback whales (*Megaptera novaeangliae*) are likely to be the most abundant whale occurring in the subregion (although good comparative data for most other species is lacking). The majority of humpback whales passing through the eastern South Atlantic are migrating to breeding grounds off tropical west Africa, between Angola and the Gulf of Guinea (Rosenbaum et al. 2009; Barendse et al. 2010). Those breeding in this area are defined as Breeding Stock B1 (BSB1) by the International Whaling Commission (IWC) and were estimated at 9 000 individuals in 2005 (IWC 2012). Animals feeding in the southern Benguela are defined as population BSB2 by the IWC and are genetically distinct from BSB1, although there are resightings of individuals between the areas and it remains unclear exactly how animals in BSB1 and BSB2 relate to each other. BSB2 was estimated as only 500 individuals in 2001-2002 (Barendse et al. 2011) and both populations have increased since this time at least 5 % per annum (IWC 2012). Humpback whales in the South-East Atlantic migrate north during early winter (June), meet and then follow the coast at varying places, so there is no clear migration 'corridor' on the west coast of South Africa.

On the southward migration, returning from tropical West Africa, many humpbacks follow the Walvis Ridge offshore after leaving Angola then head directly to high latitude feeding grounds, while others follow a more coastal route (including the majority of mother-calf pairs), lingering in the feeding grounds off west South Africa in summer (Elwen *et al.* 2014; Rosenbaum *et al.* in 2014, Findlay *et al*. 2017). The number of humpback whales feeding in the southern Benguela has increased substantially since estimates made in the early 2000's (Barendse et al. 2011). Since 2011, 'supergroups' of up to 200 individual whales have been observed feeding within 10 km from shore (Findlay *et al.* 2017) with many hundred more passing through and whales are now seen in all months of the year around Cape Town. In the first half of 2017 (when numbers are expected to be at their lowest) more than 10 humpback whales were reported stranded along the Namibian and west South African coasts. The cause of these deaths is not known, but a similar event off Brazil in 2010 was linked to possible infectious disease or malnutrition (Siciliano et al. 2013), which suggests the West African population may be undergoing similar stresses and caution should be taken in increasing stress through human activities. Humpback whales are thus likely to be the most frequently encountered baleen whale in the offshore portions of the concession areas with year-round presence but numbers peaking in July for the northwards migration and October to February during the southward migration and when animals from the BSB2 population are feeding in the Benguela Ecosystem.

The southern African population of Southern Right whales historically extended from southern Mozambique (Maputo Bay) to southern Angola (Baie dos Tigres) and is considered to be a single population within this range (Roux *et al.* 2011). The most recent abundance estimate for this population is available for 2017 which estimated the population at approximately 6 100 individuals including all age and sex classes, and still growing at 6.5% per annum (Brandaõ *et al.* 2018). Although the population is likely to have continued growing at this rate overall, there have been observations of major changes in the numbers of different classes of right whales seen; notably there has been a significant decrease in the number of adults without calves seen in near-shore waters since 2009 (Roux et al. 2015; Vinding et al. 2015). A large resurgence in numbers of right whales along the SA coast in 2018 and analysis of calving intervals suggests that these 'missing whales' are largely a result of many animals shifting from a 3 year to 4 year calving intervals (Brandaõ *et al*. 2018).

The reasons for this are not yet clear but may be related to broadscale shifts in prey availability in the Southern Ocean, as there has been a large El Nino during some of this period. Importantly, many right whales also feed in summer months in the Southern Benguela, notably St Helena Bay (Mate et al. 2011). Several animals fitted with satellite tags which fed in St Helena Bay took an almost directly south-west path from there when leaving the coast. There are no current data available on the numbers of right whales feeding in the St Helena Bay area but mark-recapture data from 2003-2007 estimated roughly one third of the South African right whale population at that time were using St Helena Bay for feeding (Peters et al. 2005). Pelagic concentrations of right whales were recorded in historic whaling records, in a band between 30°S and 40°S between Cape Town and Tristan da Cunha (Best 2007), well offshore of the concession areas. These aggregations may be a result of animals feeding in this band, or those migrating south west from the Cape. Given this high proportion of the population known to feed in the southern Benguela, and the historical records, it is highly likely that large numbers of right whales may pass through the concession areas between November and January.

(b) Odontocetes (toothed) whales

The Odontoceti are a varied group of animals including the dolphins, porpoises, beaked whales and sperm whales. Species occurring within the broader project area display a diversity of features, for example their ranging patterns vary from extremely coastal and highly site specific to oceanic and wide ranging. Those in the region can range in size from 1.6 m long (Heaviside's dolphin) to 17 m (bull sperm whale).

All information about sperm whales in the southern African sub-region results from data collected during commercial whaling activities prior to 1985 (Best 2007). Sperm whales are the largest of the toothed whales and have a complex, structured social system with adult males behaving differently to younger males and female groups. They live in deep ocean waters, usually greater than 1000 m depth, although they occasionally come onto the shelf in water 500 - 200 m deep (Best 2007). They are considered to be relatively abundant globally (Whitehead 2002), although no estimates are available for South African waters. Seasonality of catches suggests that medium and large sized males are more abundant in winter months while female groups are more abundant in autumn (March - April), although animals occur year round (Best 2007). Sperm whales are thus likely to be encountered in relatively high numbers in deeper waters (> 500 m), beyond the 14B, 15B and 17B concessions, predominantly in the winter months (April - October). Sperm whales feed at great depths during dives in excess of 30 minutes making them difficult to detect visually, however the regular echolocation clicks made by the species when diving make them relatively easy to detect acoustically using monitoring equipment such as Passive Acoustic Monitoring (PAM).

There are almost no data available on the abundance, distribution or seasonality of the smaller odontocetes (including the beaked whales and dolphins) known to occur in oceanic waters (>200 m) off the shelf of the southern African West Coast. Beaked whales are all considered to be true deep water species usually being seen in waters in excess of 1000 - 2000 m deep (see various species accounts in Best 2007). Presence in the concession areas may fluctuate seasonally, but insufficient data exist to define this clearly.

The genus *Kogia* currently contains two recognised species, the pygmy (*K. breviceps*) and dwarf (*K. sima*) sperm whales, both of which most frequently occur in pelagic and shelf edge waters, although their seasonality is unknown. The majority of what is known about Kogiidae whales in the southern African subregion results from studies of stranded specimens (e.g. Ross 1979; Findlay *et al.* 1992; Plön 2004; Elwen *et al.* 2013). Dwarf sperm whales are associated with the warmer waters south and west of St Helena Bay. They are recorded from both the Benguela and Agulhas ecosystem (Best 2007) in waters deeper than 1 000 m, and are thus unlikely to occur in the concession areas.

Killer whales have a circum-global distribution being found in all oceans from the equator to the ice edge (Best 2007). Killer whales occur year round in low densities off western South Africa (Best *et al.* 2010), Namibia (Elwen & Leeney 2011) and in the Eastern Tropical Atlantic (Weir *et al.* 2010). Killer whales are found in all depths from the coast to deep open ocean environments and may thus be encountered in the concession areas at low levels.

The false killer whale has a tropical to temperate distribution and most sightings off southern Africa have occurred in water deeper than 1 000 m, but with a few recorded close to shore (Findlay *et al.* 1992). They usually occur in groups ranging in size from 1 - 100 animals (Best 2007). The strong bonds and matrilineal social structure of this species makes it vulnerable to mass stranding (8 instances of 4 or more animals stranding together have occurred in the Western Cape, all between St Helena Bay and Cape Agulhas). There is no information on population numbers or conservation status and no evidence of seasonality in the region (Best 2007).

Long-finned pilot whales display a preference for temperate waters and are usually associated with the continental shelf or deep water adjacent to it (Mate *et al.* 2005; Findlay *et al.* 1992; Weir 2011). They are regularly seen associated with the shelf edge by marine mammal observers (MMOs) and fisheries observers and researchers. The distinction between long-finned and short-finned pilot whales is difficult to make at sea. As the latter are regarded as more tropical species (Best 2007), it is likely that the vast majority of pilot whales encountered in the concession areas will be long-finned.

The common dolphin is known to occur offshore in West Coast waters (Findlay *et al.* 1992; Best 2007), although the extent to which they occur in the project area is unknown, but likely to be low. Group sizes of common dolphins can be large, averaging 267 (± SD 287) for the South Africa region (Findlay *et al.* 1992). They are more frequently seen in the warmer waters offshore and to the north of the country, seasonality is not known.

In water <500 m deep, dusky dolphins are likely to be the most frequently encountered small cetacean as they are very “boat friendly” and often approach vessels to bowride. The species is resident year round throughout the Benguela ecosystem in waters from the coast to at least 500 m deep (Findlay *et al.* 1992). Although no information is available on the size of the population, they are regularly encountered in near shore waters between Cape Town and Lamberts Bay (Elwen *et al.* 2010a; NDP unpubl. data) with group sizes of up to 800 having been reported (Findlay *et al.* 1992). A hiatus in sightings (or low density area) is reported between approximately 27°S and 30°S, associated with the Lüderitz upwelling cell (Findlay *et al.* 1992).

Heaviside’s dolphins are relatively abundant in the Benguela ecosystem region with 10 000 animals estimated to live in the 400 km of coast between Cape Town and Lamberts Bay (Elwen *et al.* 2009). This species occupies waters from the coast to at least 200 m depth, (Elwen *et al.* 2006; Best 2007), and may show a diurnal onshore-offshore movement pattern (Elwen *et al.* 2010b), but this varies throughout the species range. Heaviside’s dolphins are resident year round and likely to be frequently encountered in the concession areas.

Several other species of dolphins that might occur in deeper waters at low levels include the pygmy killer whale, Risso’s dolphin, rough toothed dolphin, pan tropical spotted dolphin and striped dolphin (Findlay *et al.* 1992; Best 2007). Nothing is known about the population size or density of these species in the project area but encounters are likely to be rare.

Beaked whales were never targeted commercially and their pelagic distribution makes them the most poorly studied group of cetaceans. With recorded dives of well over an hour and in excess of 2 km deep, beaked whales are amongst the most extreme divers of any air breathing animals (Tyack *et al.* 2011). They also appear to be particularly vulnerable to certain types of anthropogenic noise, although reasons are not yet fully understood. All the beaked whales that may be encountered in the project area are pelagic species that tend to occur in small groups usually less than five, although larger aggregations of some species are known (MacLeod& D’Amico 2006; Best 2007).

(c) Pinnepeds

The Cape fur seal (*Arctocephalus pusillus pusillus*) is the only species of seal resident along the west coast of Africa, occurring at numerous breeding and non-breeding sites on the mainland and on nearshore islands and reefs. Vagrant records from four other species of seal more usually associated with the subantarctic environment have also been recorded: southern elephant seal (*Mirounga leoninas*), subantarctic fur seal (*Arctocephalus tropicalis*), crabeater (*Lobodon carcinophagus*) and leopard seals (*Hydrurga leptonyx*) (David 1989).

There are a number of Cape fur seal colonies within the broader area: at Strandfontein Point (south of Hondeklipbaai), Elephant Rocks, Paternoster Rocks and Jacobs Reef at Cape Columbine, Robbesteen near Koeberg, and Seal Island in False Bay. Non-breeding colonies occur south of Hondeklip Bay at Strandfontein Point, on Bird Island at Lambert’s Bay, at Paternoster Point at Cape Columbine and Duikerklip in Hout Bay. Sea Concessions 14B, 15B and 17B are offshore and located to the north or south of all these colonies.

All have important conservation value since they are largely undisturbed at present. The timing of the annual breeding cycle is very regular, occurring between November and January. Breeding success is highly dependent on the local abundance of food, territorial bulls and lactating females being most vulnerable to local fluctuations as they feed in the vicinity of the colonies prior to and after the pupping season (Oosthuizen 1991). Seals are highly mobile animals with a general foraging area covering the continental shelf up to 120 nautical miles offshore (Shaughnessy 1979), with bulls ranging further out to sea than females. They are therefore likely to be encountered during prospecting activities in the sea concession areas.

4.1.4 Human Utilisation

4.1.4.1 Fisheries and Other Harvesting

The South African fishing industry consists of approximately 14 commercial sectors operating within the 200 nautical mile Exclusive Economic Zone (EEZ). The western coastal shelf is a highly productive upwelling ecosystem (Benguela current) and supports a number of fisheries.

Primary fisheries in terms of economic value and overall tonnage of landings are the demersal (bottom) trawl and long-line fisheries targeting the cape hakes *Merluccius paradoxus* and *M. capensis*, and the pelagic purse-seine fishery targeting pilchard (*Sardinops sagax*), anchovy (*Engraulis encrasicolus*) and red-eye round herring (*Etrumeus whitheadii*). Secondary commercial species in the hake-directed fisheries include an assemblage of demersal (bottom-dwelling) fish of which monk fish (*Lophius vomerinus*) and snoek (*Thyrsites atun*) are the most important commercial species. Other fisheries active on the West Coast are the pelagic long-line fishery for tunas and swordfish and the tuna pole and traditional line-fish sectors. West Coast rock lobster (*Jasus lalandi*) is an important trap fishery exploited close to the shoreline (waters shallower than 100 m) including the intertidal zone and kelp beds off the West Coast.

On the West Coast of South Africa, major fishing grounds tend to be centred along the shelf break which is located approximately along the 500 m isobath. Historically and currently the bulk of the main commercial fish stocks caught on the northern West Coast of South Africa have been landed and processed at the Western Cape ports of Cape Town and Saldanha (less than 1% of the South African commercial allowable catch is landed in the Northern Cape Province). The main reasons for this include lack of local infrastructure, distance to market and relatively low volumes of fish landings. The main commercial sectors operating in the vicinity of the study area are discussed below:

4.1.4.1.1 Small Pelagic Purse-Seine

The South African small pelagic purse seine fishery is the largest fishery by volume and the second most important in terms of value. The pelagic purse-seine fishery targets small mid-water and surface-shoaling species such as sardine, anchovy, juvenile horse mackerel and round herring using purse-seine fishing techniques. Annual landings have fluctuated between 300 000 and 600 000 tons over the last decade, with landings of 391 000 tons recorded per annum between 2008 and 2012.

Once a shoal has been located the vessel steams around it and encircle it with a large net. The depth of the net is usually between 60 m and 90 m. Netting walls surround aggregated fish both from the sides and from underneath, thus preventing them from escaping by diving downwards. These are surface nets framed by lines: a float line on top and lead line at the bottom (see Figure 4-9). once the shoal has been encircled the net is pursed and hauled in and the fish are pumped on board into the hold of the vessel. After the net is deployed the vessel has no ability to manoeuvre until the net has been fully recovered on board, which may take up to 1.5 hours. Vessels usually operate overnight and return to offload their catch the following day.

The South African fishery, consisting of approximately 101 vessels, is active all year round with a short break from mid-December to mid-January (to reduce impact on juvenile sardine), with seasonal trends in the specific species targeted. The geographical distribution and intensity of the fishery is largely dependent on the seasonal fluctuation and geographical distribution of the targeted species. Fishing grounds occur primarily along the Western Cape and Eastern Cape coast up to a distance of 100 km offshore, but usually closer inshore. The sardine-directed fishery tends to concentrate effort in a broad area extending from St Helena Bay, southwards past Cape Town towards Cape Point and then eastwards along the coast to Mossel Bay and Port Elizabeth. The anchovy-directed fishery takes place predominantly on the South-West Coast from St Helena Bay to Cape Point and is most active in the period from March to September. Round herring (non-quota species) is targeted when available and specifically in the early part of the year (January to March) and is distributed South of Cape Point to St Helena Bay. The spatial extent of the fishing grounds in relation to the sea concession areas are shown in Figure 4-10.

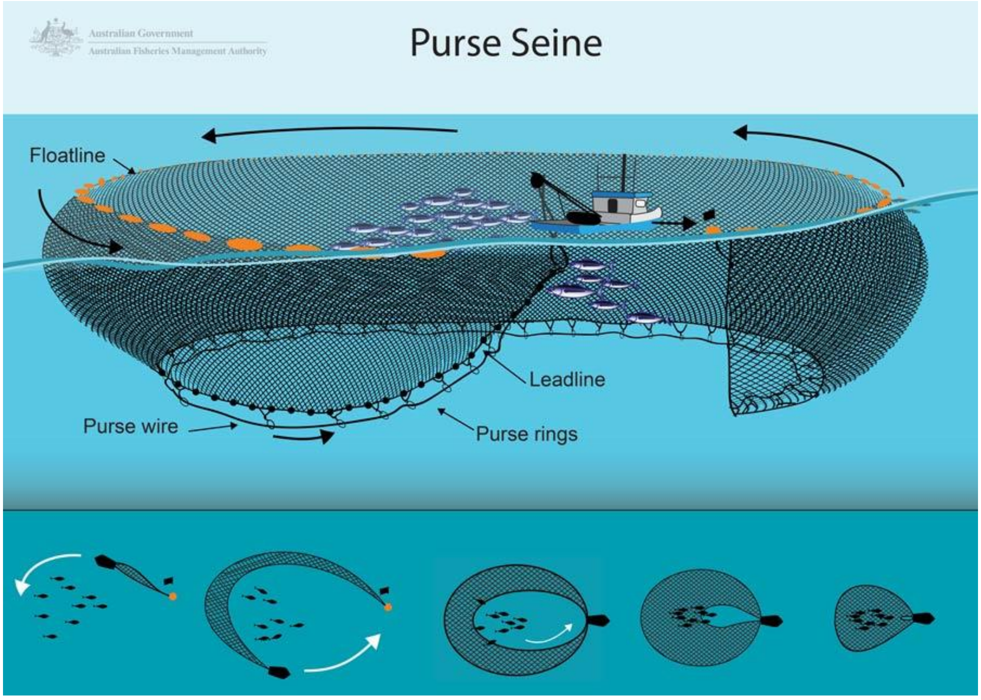

FIGURE 4-9: SCHEMATIC OF TYPICAL PURSE-SEINE GEAR DEPLOYED IN THE "SMALL" PELAGIC FISHERY. (SOURCE: HTTP://WWW.AFMA.GOV.AU/PORTFOLIO-ITEM/PURSE-SEINE).

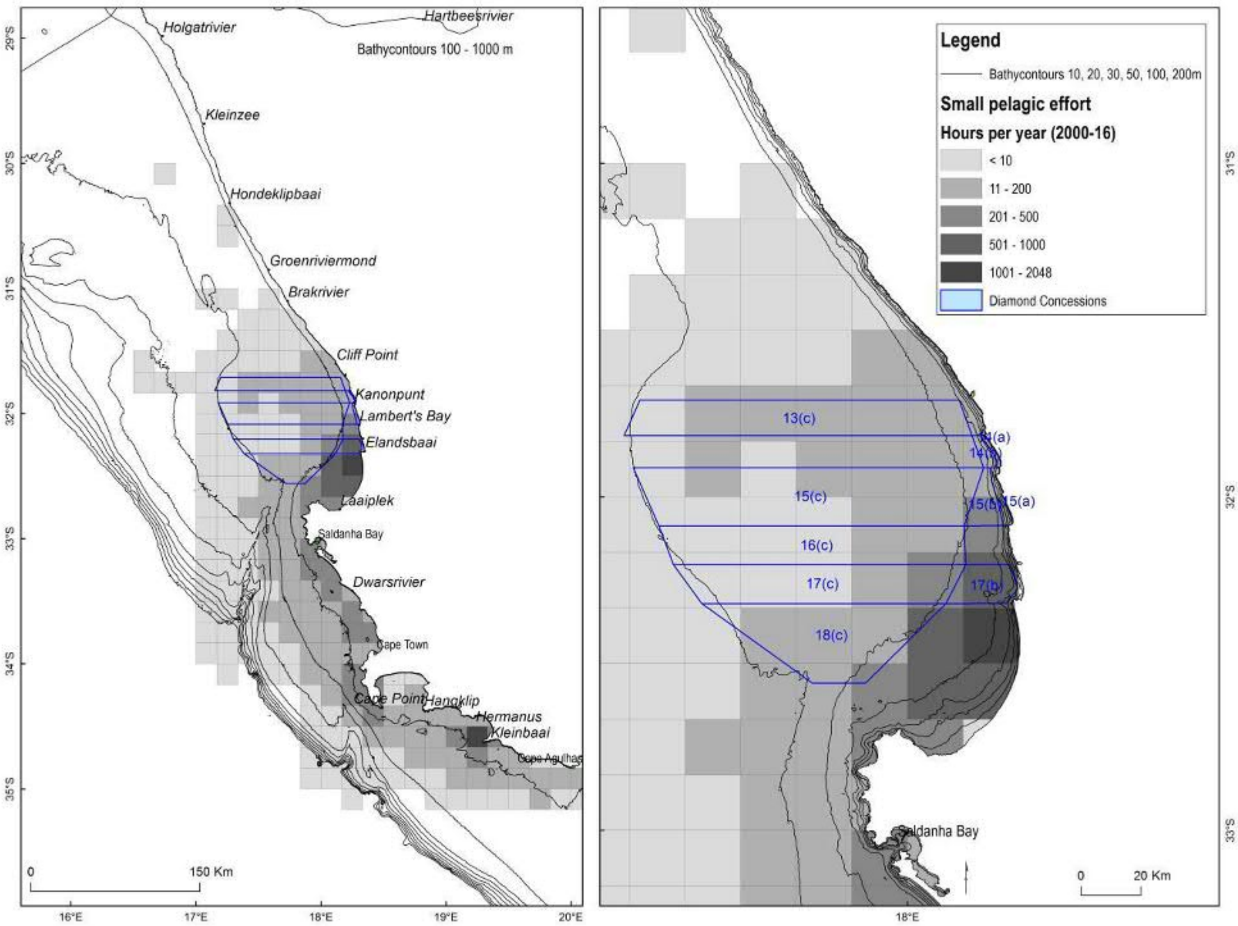

FIGURE 4-10: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO THE SPATIAL DISTRIBUTION OF EFFORT REPORTED BY THE SOUTH AFRICAN SMALL PELAGIC PURSE-SEINE FISHERY (2000 – 2016).

4.1.4.1.2 Demersal Trawl

The hake-directed trawl fishery is the most valuable sector of the South African fishing industry and is split into two sub-sectors: the offshore ("deep-sea") sector which is active off both the South and West Coasts, and the much smaller inshore trawl sector which is active off the South Coast. A fleet of 45 trawlers operate within the offshore sector targeting the Cape hakes (*Merluccius capensis* and *M. paradoxus*). Main by-catch species include monkfish (*Lophius vomerinus*), kingklip (*Genypterus capensis*) and snoek (*Thyrsites atun*).

Trawls are usually conducted along specific trawling lanes on "trawl friendly" substrate (flat, soft ground). On the West Coast, these grounds extend in a continuous band along the shelf edge between the 300 m and 1 000 m bathymetric contours. Monk-directed trawlers tend to fish shallower waters than hake-directed vessels on mostly muddy substrates. Trawl nets are generally towed along depth contours (thereby maintaining a relatively constant depth) running parallel to the depth contours in a north-westerly or south-easterly direction. Trawlers also target fish aggregations around bathymetric features, in particular seamounts and canyons (i.e. Cape Columbine and Cape Canyon), where there is an increase in seafloor slope and in these cases the direction of trawls follow the depth contours. Trawlers are prohibited from operating within five nautical miles of the coastline.

The offshore fleet is segregated into wetfish and freezer vessels which differ in terms of the capacity for the processing of fish at sea and in terms of vessel size and capacity. While freezer vessels may work in an area for up to a month at a time, wetfish vessels may only remain in an area for about a week before returning to port. Wetfish vessels range between 24 m and 56 m in length while freezer vessels are usually larger, ranging up to 80 m in length. The gear configurations are similar for both freezer and wet fish vessels. Trawl gear is deployed astern of the vessel.

The towed gear typically consists of trawl warps, bridles and trawl doors, a footrope, headrope, net and codend (see Figure 4-11). The monk-directed trawlers use slightly heavier trawl gear, trawl at slower speeds and for longer periods (up to eight hours) compared to the hake-directed trawlers (60 minutes to four hours). Monk gear includes the use of "tickler" chains positioned ahead of the footrope to chase the monk off the substrate and into the net.

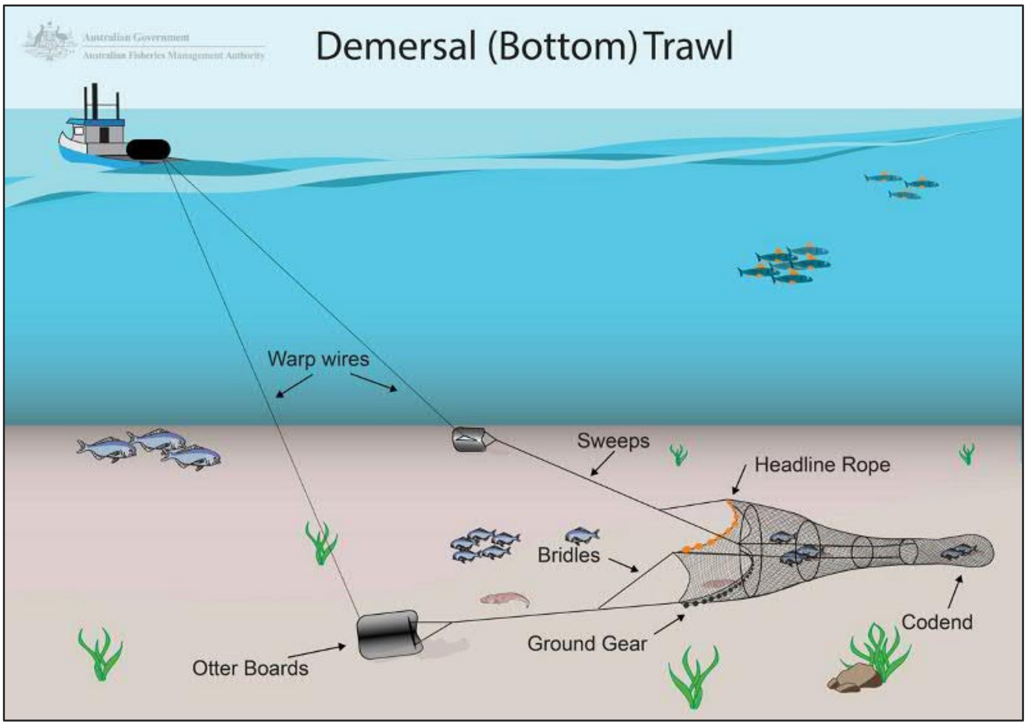

FIGURE 4-11: TYPICAL GEAR CONFIGURATION USED BY DEMERSAL TRAWLERS (OFFSHORE) TARGETING HAKE (SOURCE: HTTPS://WWW.AFMA.GOV.AU/FISHERIES-MANAGEMENT/METHODS-AND-GEAR/TRAWLING).

The demersal trawl effort and catch between 2008 and 2016 in relation to the area of interest is shown in Figure 4-12. The South African Deepsea Trawling Industry Association (SADSTIA) has implemented a self-imposed restriction which confines fishing effort to a designated area ("the historical footprint of the fishery"). This spatial restriction is also written into the permit conditions for the fishery. There is no direct overlap between trawling grounds and the sea concession areas, which is situated well inshore of the trawling grounds. The concession areas do, however, coincide with spawning and recruitment areas for hake and other demersal species.

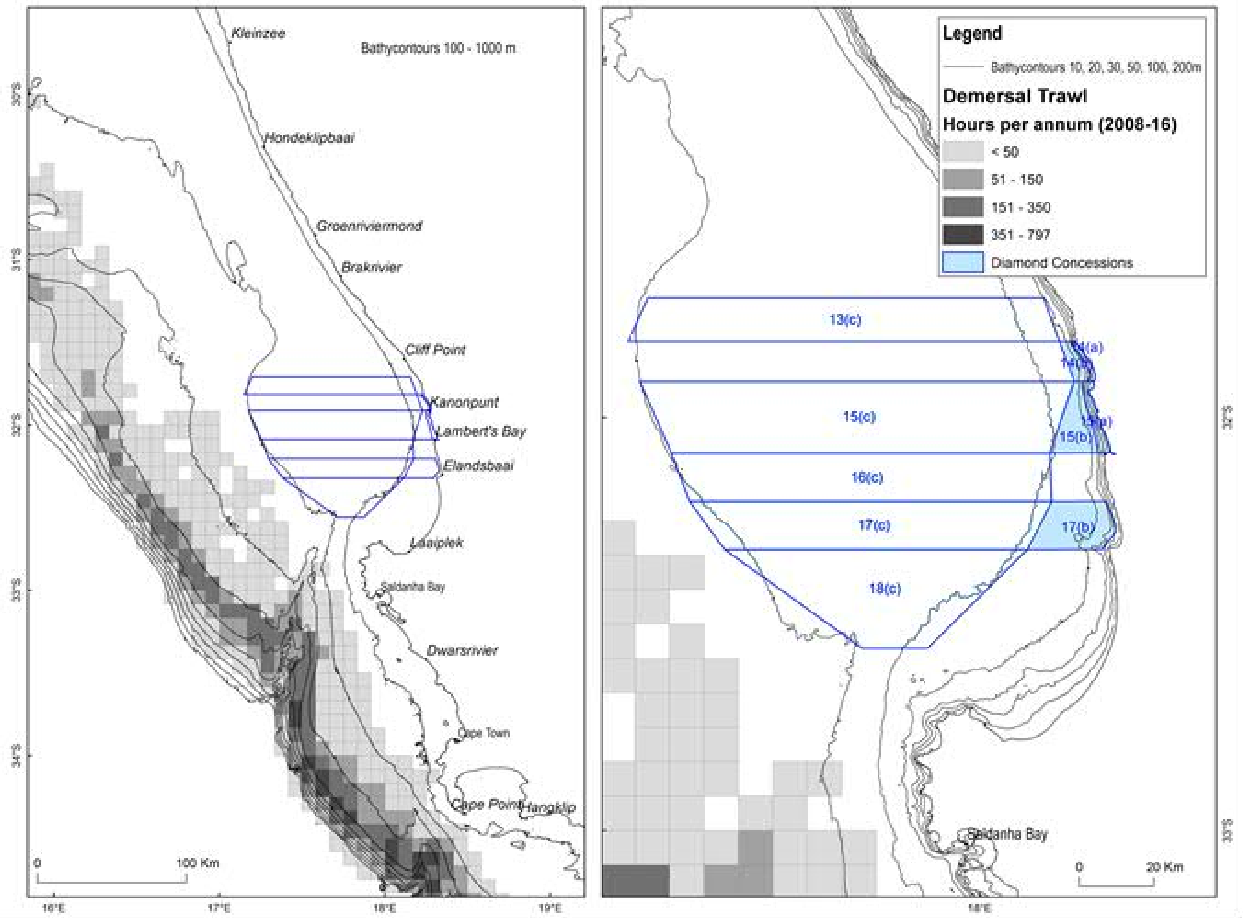

FIGURE 4-12: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO THE SPATIAL DISTRIBUTION OF TRAWLING EFFORT EXPENDED BY THE DEMERSAL TRAWL SECTOR (2008 TO 2016).

4.1.4.1.3 Demersal Long-Line

The demersal long-line fishing technique is used to target bottom-dwelling species of fish. Like the demersal trawl fishery, the target species of the longline fishery is the Cape hakes, with a small amount of non-targeted commercial by-catch.

A demersal long-line vessel may deploy either a double or single line which is weighted along its length to keep it close to the seafloor (see Figure 4-13). Steel anchors, of 40 kg to 60 kg, are placed at the ends of each line to anchor it, and are marked with an array of floats. If a double line system is used, top and bottom lines are connected by means of dropper lines. Lines are typically between 10 km and 20 km in length, carrying between 6 900 and 15 600 hooks each. Baited hooks are attached to the bottom line at regular intervals (1 to 1.5 m) by means of a snood. Gear is usually set at night at a speed of between five and nine knots. Once deployed the line is left to soak for up to eight hours before it is retrieved. A line hauler is used to retrieve gear (at a speed of approximately one knot) and can take six to ten hours to complete. During hauling operations a demersal long-line vessel would be severely restricted in manoeuvrability. Currently 64 hake-directed vessels are active within the fishery, most of which operate from the harbours of Cape Town and Hout Bay.

The target fishing grounds are similar to those targeted by the hake-directed trawl fleet. Off the West Coast, vessels target fish along the shelf break from Port Nolloth (15°E, 29°S) to the Agulhas Bank (21°E, 37°S). Off the West Coast (westward of 20°E) the fishery is prohibited from operating within five nautical miles of the coastline and effort is concentrated at about 300 m depth on areas of rough ground. Thus, the sea concession areas do not overlap with the fishing grounds. However, as noted above, that the concession area overlaps spawning and recruitment areas for hake and other demersal species.

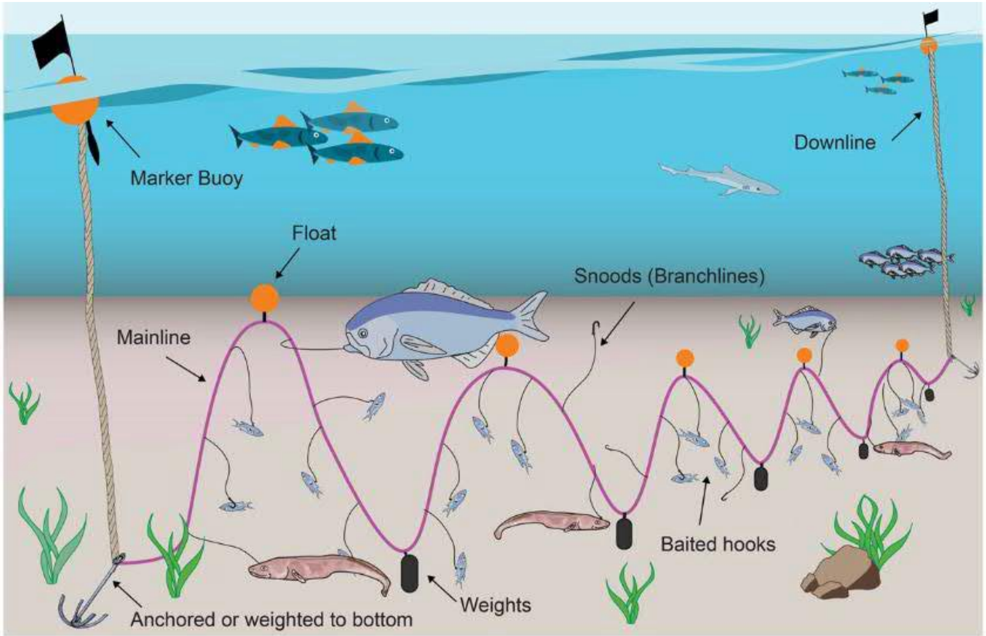

FIGURE 4-13: TYPICAL CONFIGURATION OF DEMERSAL (BOTTOM-SET) HAKE LONG-LINE GEAR USED IN SOUTH AFRICAN WATERS (SOURCE: HTTP://WWW.AFMA.GOV.AU/PORTFOLIO-ITEM/LONGLINING).

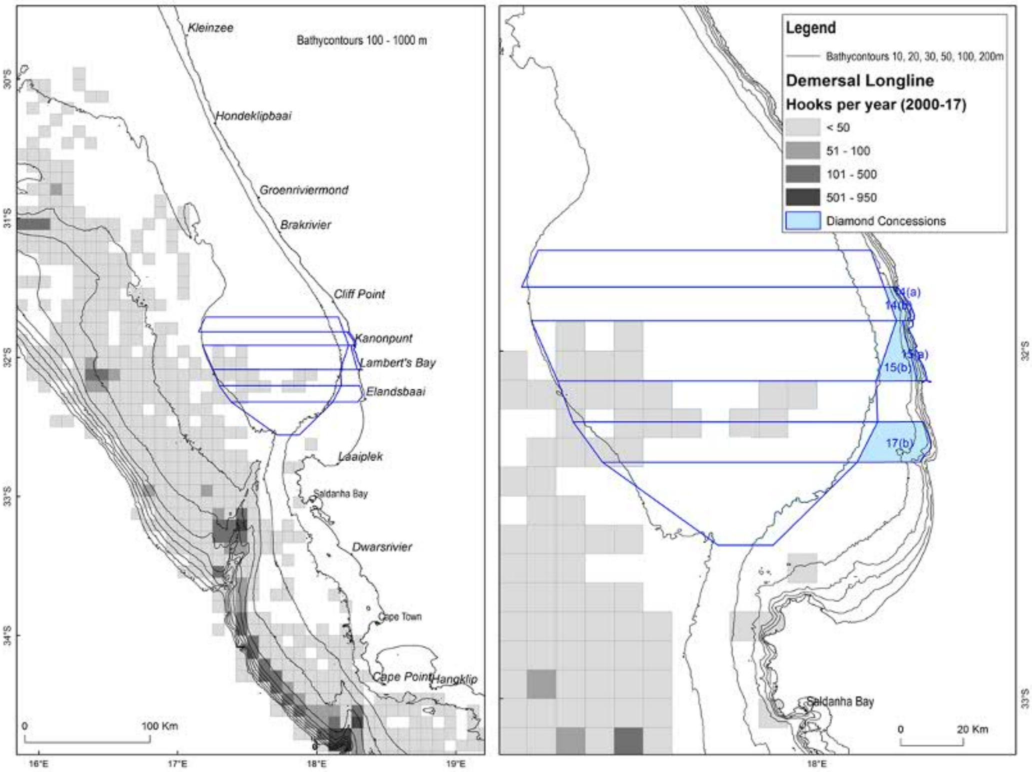

FIGURE 4-14: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO THE SPATIAL DISTRIBUTION OF EFFORT EXPENDED BY DEMERSAL LONG-LINE FISHERY (2000 – 2017).

4.1.4.1.4 Large Pelagic Long-Line

The large pelagic long-line fishery operates year-round, extensively within the South African EEZ targeting primarily tuna and swordfish. Due to the highly migratory nature of these species, stocks straddle the EEZ of a number of countries and international waters. As such they are managed as a "shared resource" amongst various countries. There are currently 30 commercial large pelagic fishing rights issued for South African waters and there are 21 vessels active in the fishery.

Pelagic long-line vessels set a drifting mainline, which can be up to 100 km in length. The mainline is kept near the surface or at a certain depth (20 m below) by means of buoys connected via "buoy-lines", which are spaced approximately 500 m apart along the length of the mainline (see Figure 4-15). Hooks are attached to the mainline via 20 m long trace lines, which are clipped to the mainline at intervals of approximately 50 m. There can be up to 3 500 hooks per line. A single main line consists of twisted rope (6 to 8 mm diameter) or a thick nylon monofilament (5 to 7.5 mm diameter). Various types of buoys are used in combinations to keep the mainline near the surface and locate it should the line be cut or break for any reason. Each end of the line is marked by a Dahn Buoy and Radar reflector, which marks its position for later retrieval by the fishing vessel. A line may be left drifting for up to 18 hours before retrieval by means of a powered hauler at a speed of approximately 1 knot. During hauling a vessel's manoeuvrability is severely restricted and, in the event of an emergency, the line may be dropped to be hauled in at a later stage.

As vessels are prohibited from operating within 12 nm of the coastline, the sea concession areas do not overlap with the fishing grounds.

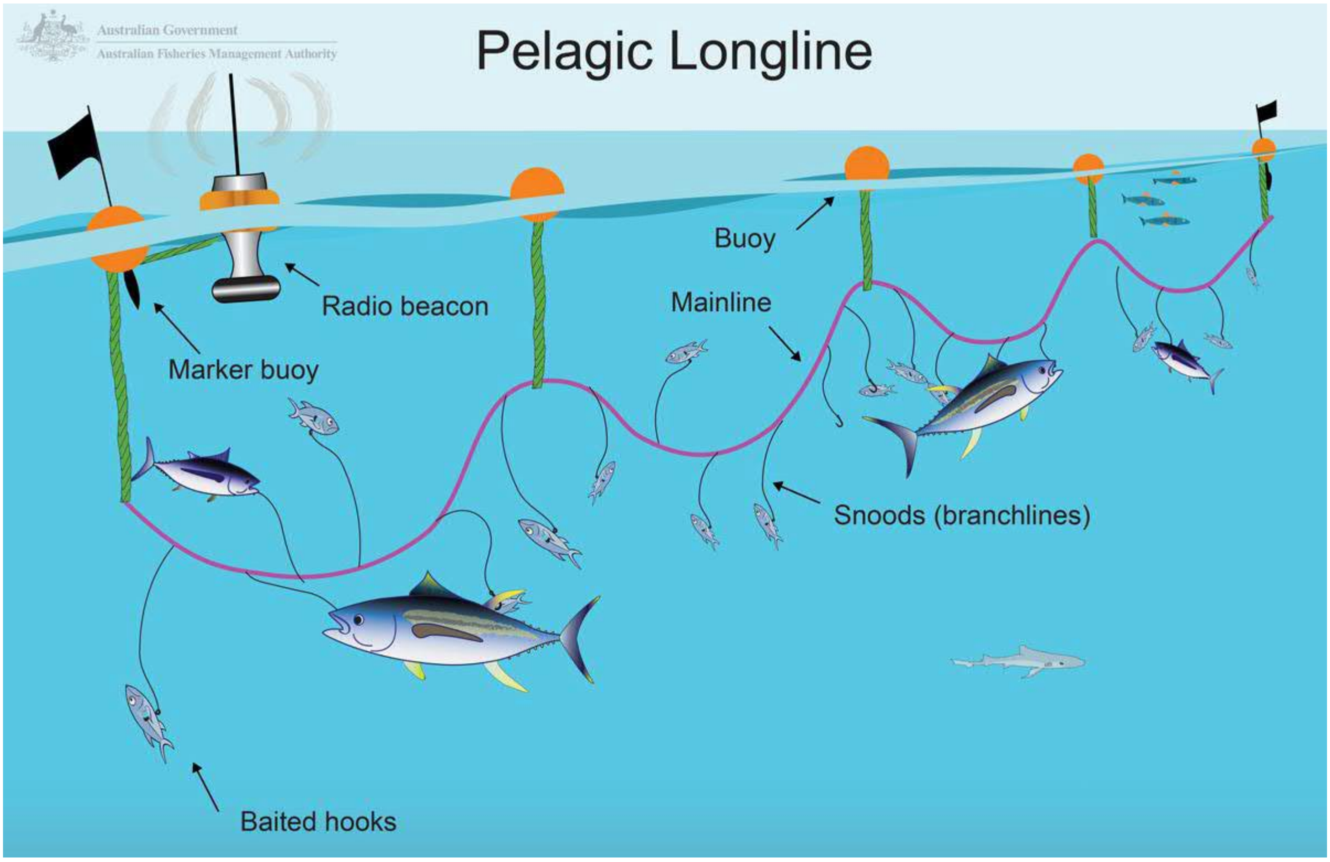

FIGURE 4-15: TYPICAL PELAGIC LONG-LINE CONFIGURATION TARGETING TUNA, SWORDFISH AND SHARK SPECIES (SOURCE: HTTPS://WWW.AFMA.GOV.AU/FISHERIES-MANAGEMENT/METHODS-AND-GEAR/LONGLINING).

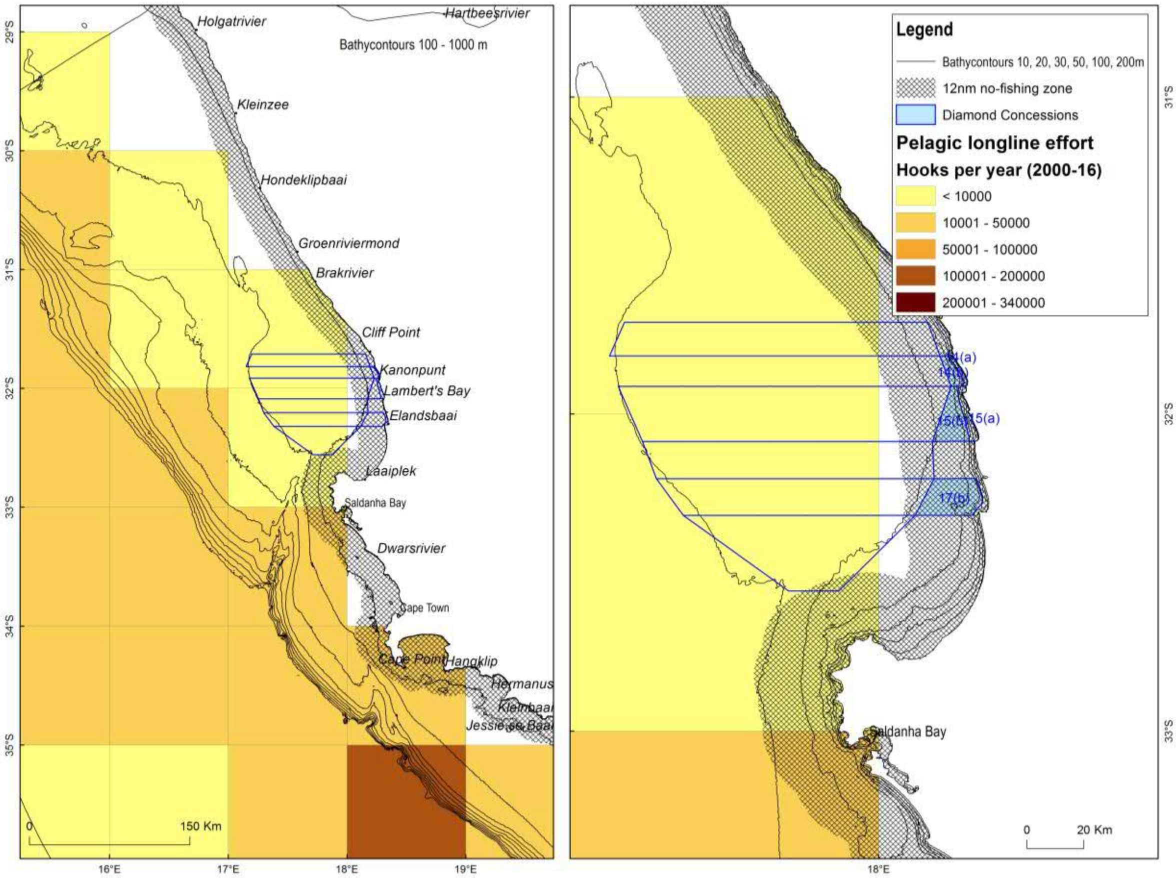

FIGURE 4-16: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO THE SPATIAL DISTRIBUTION OF EFFORT EXPENDED BY PELAGIC LONG-LINE FISHERY (2000 – 2016).

4.1.4.1.5 Tuna Pole

The tuna pole fishery is based on migratory species of tuna, predominantly Atlantic longfin tuna stock and a very small amount of skipjack tuna, yellowfin tuna and bigeye tuna. The South African fleet consists of approximately 128 pole-and-line vessels, which are based at the ports of Cape Town, Hout Bay and Saldanha Bay. The fishery is seasonal with vessel activity mostly between December and May and peak catches in February and March.

Vessels drift whilst attracting and catching shoals of pelagic tunas. Sonars and echo sounders are used to locate schools of tuna. Once a school is located, water is sprayed outwards from high-pressure nozzles to simulate small baitfish aggregating near the water surface. Live bait is then used to entice the tuna to the surface (chumming). Tuna swimming near the surface are caught with hand-held fishing poles. The ends of the 2 to 3 m poles are fitted with a short length of fishing line leading to a hook. In order to land heavier fish, lines may be strung from the ends of the poles to overhead blocks to increase lifting power (see Figure 4-17). Vessels are relatively small (less than 25 m in length) and store catch on ice, thus staying at sea for short periods (approximately five days).

The nature of the fishery and communication between vessels often results in a large number of vessels operating in close proximity to each other at a time. The vessels fish predominantly during daylight hours and are highly manoeuvrable. However, at night in fair weather conditions the fleet of vessels may drift or deploy drogues to remain within an area and would be less responsive during these periods.

Fishing activity occurs along the entire West Coast beyond the 200 m bathymetric contour. Activity would be expected to occur along the shelf break with favoured fishing grounds including areas north of Cape Columbine and between 60 km and 120 km offshore from Saldanha Bay. The tuna pole effort and catch between 2007 and 2016 in relation to the area of interest is shown in Figure 4-18. The main targeted fishing grounds off the West Coast are situated further offshore of the concession areas, however, there are records of fishing activity which coincide with the Sea Concessions 15B and 17B. Nevertheless, it is noted that, for Tuna pole specifically, the target species (longfin tuna) is reported to move systematically northwards from the southern Benguela into the northern Benguela into the waters of southern Namibia. This annual movement of albacore tuna is typical of this and other species of tuna. There is no evidence however to suggest that in the nearshore environment in the concession area that these tuna migrations occur or that if they do there will be a disruption of the tuna pole fishing operations. There is therefore no expected overlap of the concession areas with spawning and recruitment areas of large pelagic species.

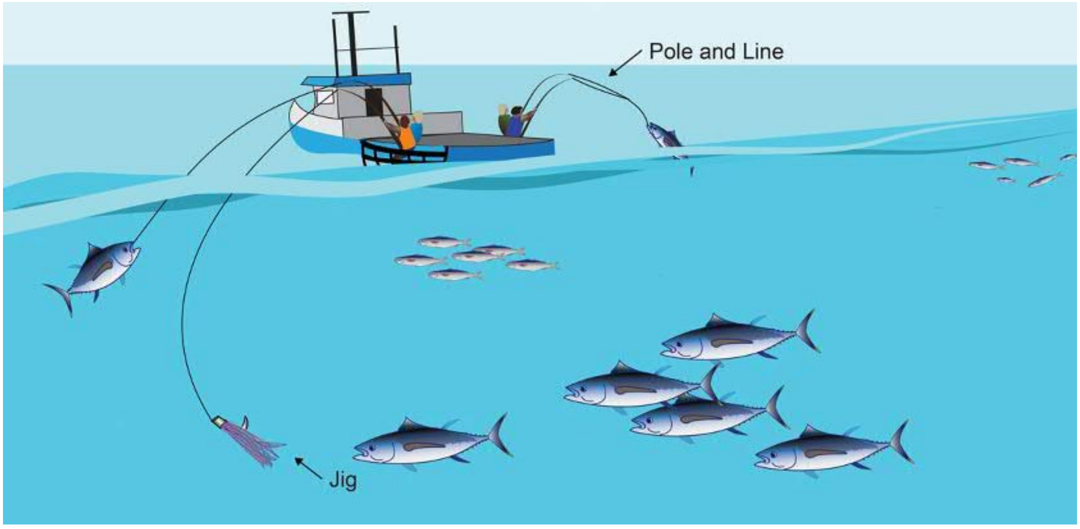

FIGURE 4-17: SCHEMATIC DIAGRAM OF POLE AND LINE OPERATION. (SOURCE: HTTP://WWW.AFMA.GOV.AU /PORTFOLIO-ITEM/MINOR-LINES/).

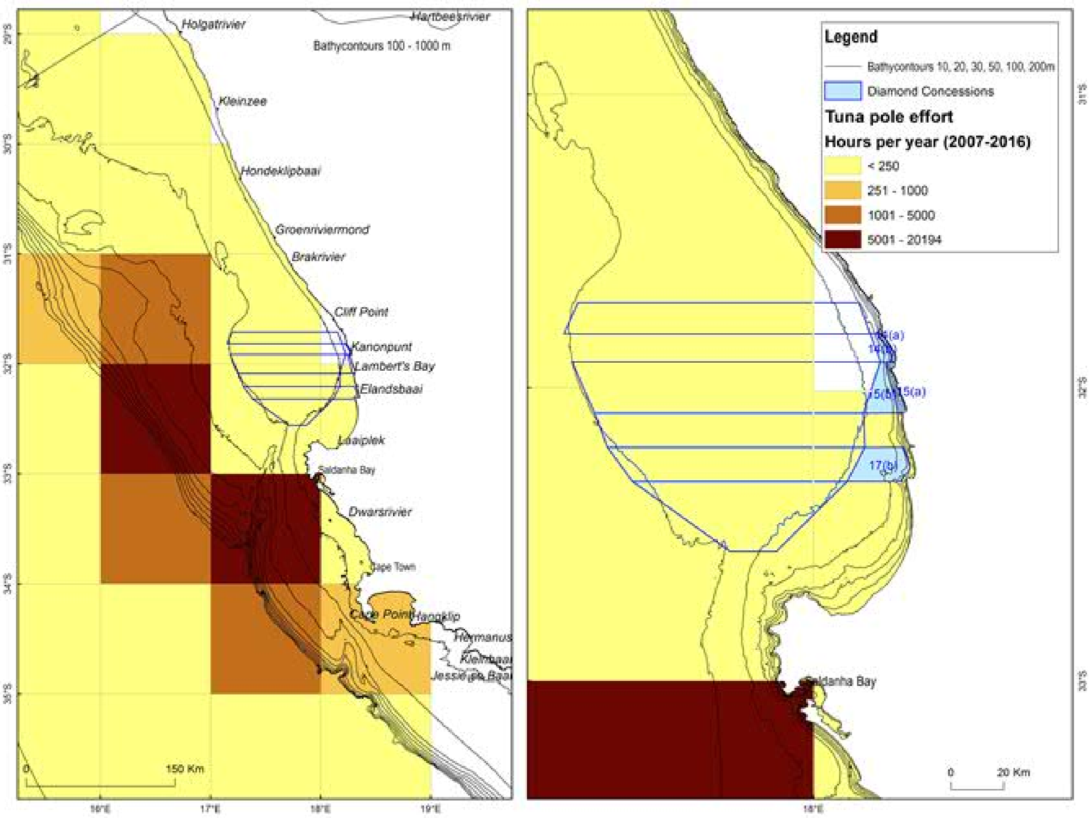

FIGURE 4-18: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO THE SPATIAL DISTRIBUTION OF TUNA POLE CATCH (2007 TO 2016).

4.1.4.1.6 Traditional Line-Fish

The line-fishery is divided into the commercial and recreational sectors, with the subsistence sector now falling under the classification of small-scale fishing. The commercial (or traditional) line fishery is the country's third most important fishery in terms of total tons landed and economic value. The bulk of the fishery catch is made up of about 35 different species of reef fish as well as pelagic and demersal species which are mostly marketed locally as "fresh fish". In South Africa effort is managed geographically with the spatial effort of the fishery divided into three zones. The majority of the catch (up to 95%) is landed by the Cape commercial fishery, which operates on the continental shelf mostly up to a depth of 200 m from the Namibian border on the West Coast to the Kei River in the Eastern Cape.

The traditional line fishery is defined by the use of a simple hook-and-line fishing system (excluding the use of longlines and drumlines), with a limit of 10 hooks per line (DAFF 2017). There are 450 vessels operating in the fishery, making it the largest fishing fleet in South Africa. Vessels are monitored by Vessel Monitoring System (VMS) and permit conditions require that catch be reported for each fishing trip; however, logbook data are unverified and may underestimate total landings (da Silva et al., 2015).

The recreational line fishery includes shore- and boat-based fishing with the predominant use of rod and line. An estimated 500 000 participants are active in the recreational sector (Griffiths and Lamberth, 2002). Community-based fishing of line-fish species for subsistence purposes is now managed under South Africa's small-scale fishery policy which was implemented in 2016 (DAFF 2016). The reporting of fishing positions is not specific, but generally reported according to reference positions for different areas. It is assumed that fishing could take place across the extent of the sea concession areas.

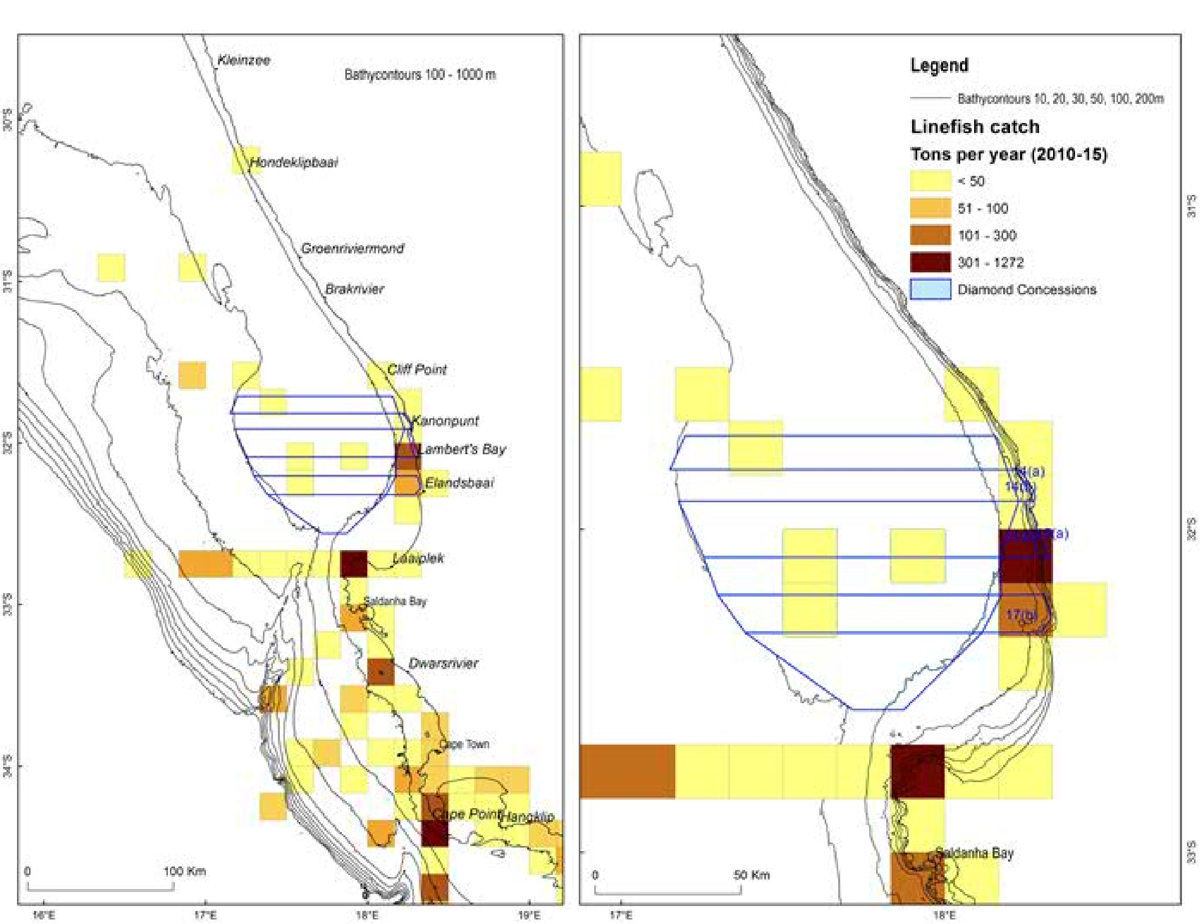

FIGURE 4-19: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO SPATIAL DISTRIBUTION OF CATCH LANDED BY THE SOUTH AFRICAN TRADITIONAL LINE-FISH SECTOR (2000 – 2016).

4.1.4.1.7 West Coast Rock Lobster

The West Coast rock lobster occurs inside the 200 m depth contour along the West Coast from Namibia to East London on the East Coast of South Africa. In South Africa the fishery is divided into the offshore fishery and the near-shore fishery, both directed inshore of the 100 m bathymetric contour. The offshore sector operates in a water depth range of 30 m to 100 m whilst the inshore fishery is restricted by the type of gear used to waters shallower than 30 m in depth.

Fishing grounds are divided into Zones stretching from the Orange River mouth to east of Cape Hangklip in the South-Eastern Cape. Effort is seasonal with boats operating from the shore and coastal harbours. Catch is managed using a TAC set annually for different management areas. The fishery operates seasonally, with closed seasons applicable to different management zones. There is a direct overlap with the proposed prospecting activities and the offshore sector (Figure 4-20).

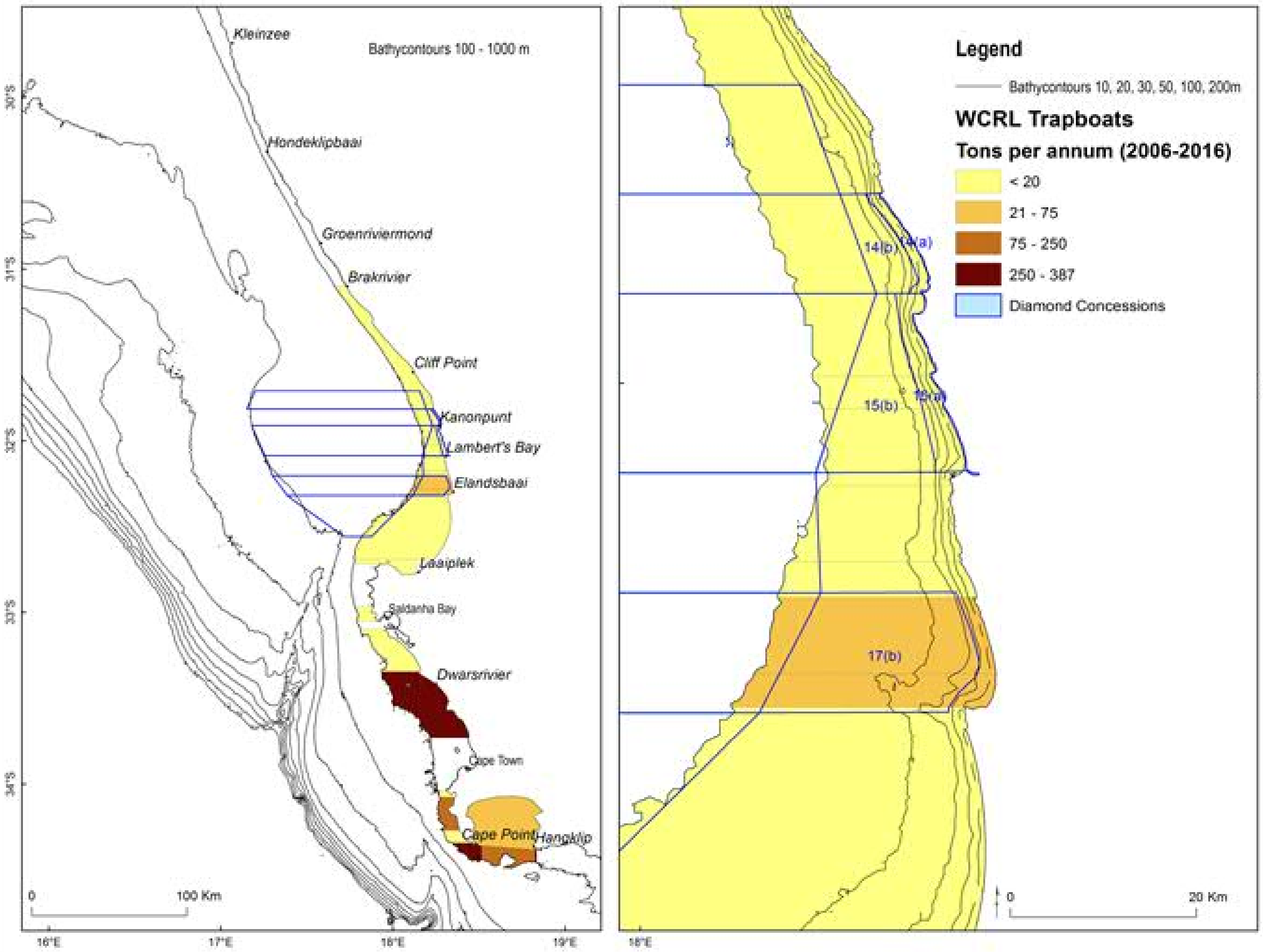

FIGURE 4-20: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO THE AVERAGE CATCH PER SEASON (TONS WHOLE WEIGHT) BY THE OFFSHORE (TRAPBOATS) SECTOR OF THE WEST COAST ROCK LOBSTER FISHERY (2006 TO 2016).

4.1.4.1.8 Abalone Ranching

The Abalone (*Haliotus midae*), is endemic to South Africa with the natural population extending east from St Helena Bay in the Western Cape to Port St Johns on the east coast (Branch et al. 2010; Troell et al 2006). Seeding of abalone in designated areas (ranching) has led to the establishment of abalone outside this natural range, including sites along approximately 50 km of the Namaqualand coast in the Northern Cape. The potential to increase this seeded area to 175 km has been made possible through the issuing of “Abalone Ranching Rights”

(Government Gazette No. 729 of 20 August 2010) in four concession zones between Alexander Bay and Hondeklipbaai (Diamond Coast Abalone 2016).

Kelp forests are a key habitat for abalone, as they provide a key food source for abalone as well as an ideal ecosystem for abalone's life cycle (Branch et al., 2010). Light is a limiting factor for kelp beds, which are therefore limited to depths of 10 m on the Namaqualand coast (Anchor Environmental, 2012). In the wild, abalone may take 30 years to reach full size of 200 mm, but farmed abalone attain 100 mm in only 5 years, which is the maximum harvest size (Sales & Britz, 2001).

Abalone ranching was pioneered by Port Nolloth Sea Farms who were experimentally seeding kelp beds in Port Nolloth by 2000. Abalone ranching expanded in the area in 2013 when DFFE (then, the Department of Agriculture, Forestry and Fisheries - DAFF) issued rights for each of four Concession Area Zones. Two hatcheries exist in Port Nolloth producing up to 250 000 spat. To date, there has been no seeding in Zones 1 or 2. However, seeding has taken place in Zones 3 and 4, both of which are situated to the north of the sea concession areas (see Figure 4-21).

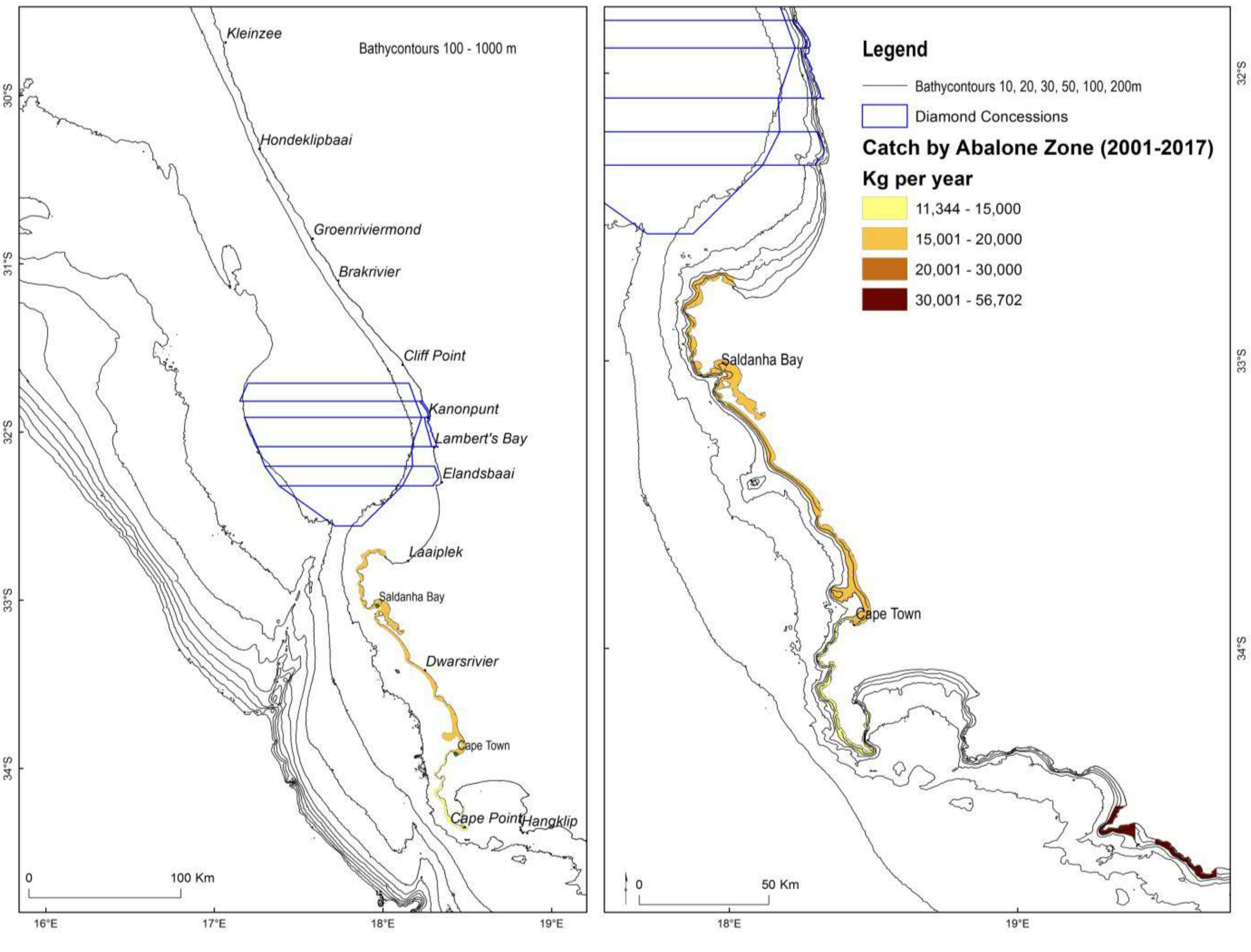

FIGURE 4-21: LOCATION OF SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO ABALONE RANCHING ZONES.

4.1.4.1.9 Small-scale fisheries

South Africa is implementing a small-scale fisheries policy (SSF) – to manage fish stocks sustainably by regulating access to baskets of species through the allocation of rights co-operative groups. The small-scale fishery policy implementation plan was initiated in 2016 (DFFE 2016).

Small-scale fishers fish to meet food and basic livelihood needs, and may be directly involved in harvesting, processing and distribution of fish for commercial purposes. These fishers traditionally operate on nearshore fishing grounds, using traditional low technology or passive fishing gear to harvest marine living resources on a full-time, part-time or seasonal basis. Fishing trips are usually a single day in duration and fishing/harvesting techniques are labour intensive. The equipment used by small-scale fishers includes rowing boats in some areas, motorized boats on the South and West Coast and simple fishing gear including hands, feet, screw drivers, hand lines, prawn pumps, rods with reels, gaffs, hoop nets, gill nets, seine/trek nets and semi-permanently fixed kraal traps. Distances fished from the shore are constrained by boat size and maritime safety requirements and as a general rule are not expected to be more than 3 nm from the coastline. Small-scale fishers are an integral part of the rural and coastal communities in which they reside and this is reflected in the socio-economic profile of such communities.

The small-scale fisheries policy proposes that certain areas on the coast be prioritized and demarcated as small-scale fishing areas. In some areas access rights could be reserved exclusively for use by small-scale fishers. The community, once they are registered as a community-based legal entity, could apply for the demarcation of these areas and should conflict arise, it should be referred to conflict resolution under the Policy. The policy also requires a multi-species approach to allocating rights, which will entail allocation of rights for a basket of species that may be harvested or caught within particular designated areas. DFFE recommends five basket areas:

- Basket Area A – The Namibian border to Cape of Good Hope – 57 different resources
- Basket Area B – Cape of Good Hope to Cape Infanta – 109 different resources
- Basket Area C – Cape Infanta to Tsitsikamma – 107 different resources
- Basket Area D – Tsitsikamma to the Pondoland MPA – 138 different resources
- Basket Area E – Pondoland MPA to the Mozambican border – 127 different resources.

Sea Concession 14B, 15B and 17B fals within the area demarcated as Basket Area A, with 623 fishers registered with the relevant local municipalities of Berg River, Saldanha Bay, Cederberg and Matzikama. These are the closest access points for participants in the small-scale fishing sector. While, the small-scale fisheries are defined as a fishery, specific operations and dynamics are not yet fully defined as they are subject to an ongoing process by DFFE. Thus, the degree of overlap, if any, with this fishery and the sea concession areas cannot be confirmed.

4.1.4.1.10 Beach-Seine and Gillnet Fisheries

There are a number of active beach-seine and gillnet operators throughout South Africa (collectively referred to as the “netfish” sector). Initial estimates indicate that there are at least 7 000 fishermen active in fisheries using beach-seine and gillnets, mostly (86%) along the West and South coasts. These fishermen utilise 1 373 registered nets and report an average catch of about 1 600 tons annually, constituting 60% harders (also known as mullet, *Liza richardsonii*), 10% St Joseph shark (*Callorhinchus capensis*) and 30% "bycatch" species such as galjoen (*Dichistius capensis*), yellowtail (*Seriola lalandii*) and white steenbras (*Lithognathus lithognathus*).
The fishery is managed on a Total Allowable Effort (TAE) basis with a fixed number of operators in each of 15 defined areas. The number of Rights Holders for 2014 was listed as 28 for beach-seine and 162 for gill-net (DAFF, 2014a). Permits are issued solely for the capture of harders, St Joseph and species that appear on the ‘bait list’. The exception is False Bay, where Right Holders are allowed to target line-fish species that they traditionally exploited.

The beach-seine fishery operates primarily on the West Coast of South Africa between False Bay and Port Nolloth (Lamberth 2006) with a few permit holders in KwaZulu-Natal targeting mixed shoaling fish during the annual winter migration of sardine (Fréon et al. 2010). Beach-seining is an active form of fishing in which woven nylon nets are rowed out into the surf zone to encircle a shoal of fish. They are then hauled shorewards by a crew of 6–

30 persons, depending on the size of the net and length of the haul. Nets range in length from 120 m to 275 m. Fishing effort is coastal and net depth may not exceed 10 m (DAFF 2014b).

The gillnet fishery operates from Yzerfontein to Port Nolloth on the West Coast. Surface-set gillnets (targeting mullet) are restricted in size to 75 m x 5 m and bottom-set gillnets (targeting St Joseph shark) are restricted to 75 m x 2.5 m (da Silva et al. 2015) and are set in waters shallower than 50 m. The spatial distribution of effort is represented as the annual number of nets per kilometre of coastline and ranges up to a maximum of 15 off St Helena Bay. Of a total of 162 right holders, two operate within Area B (Hondeklipbaai).

Due to the range of beach-seine activities (20 m), there would be no overlap with the sea concession areas (Figure 4-22), however, it is expected that the concession areas do overlap with gillnet fishing areas (Figure 4-23).

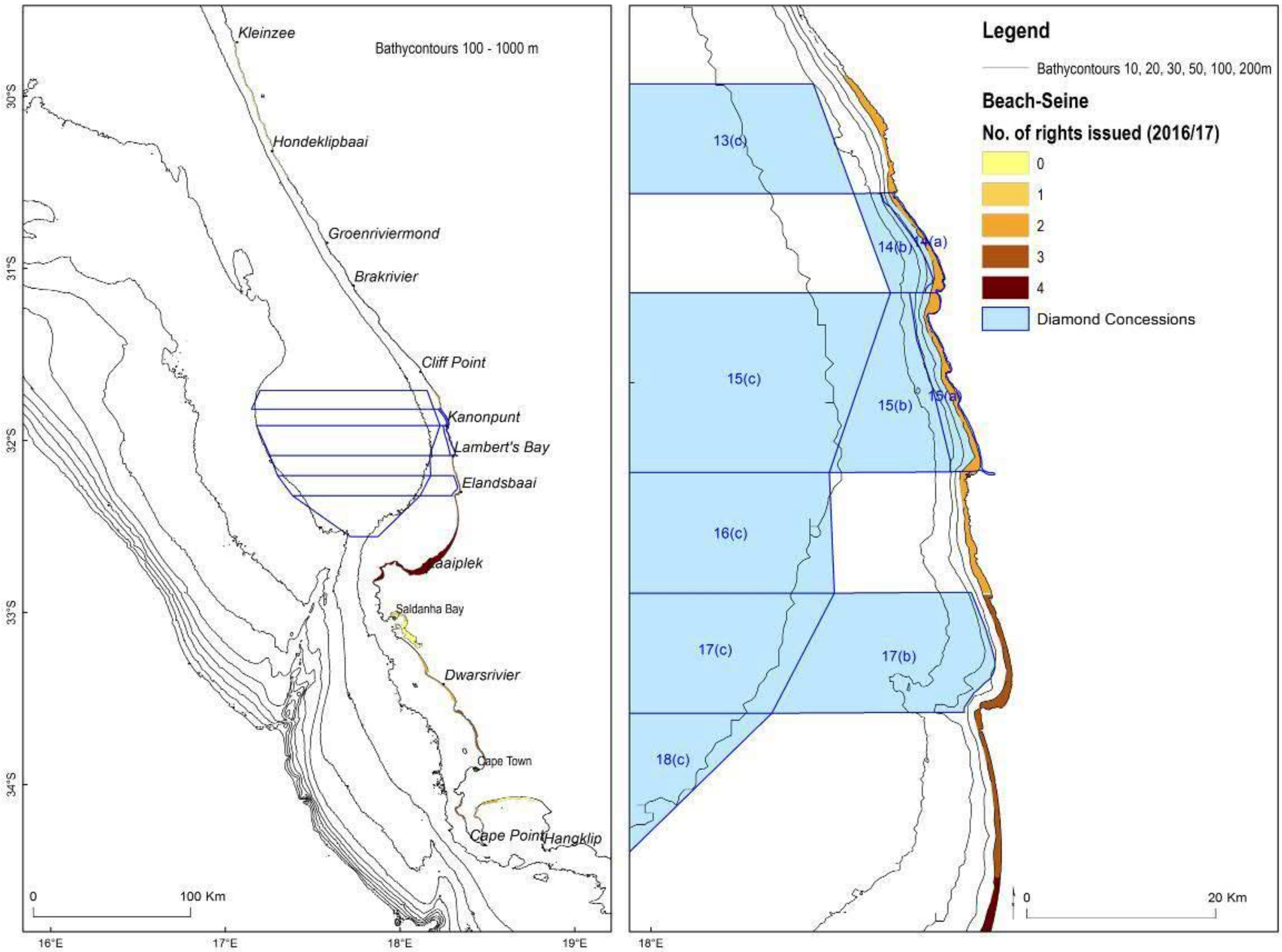

FIGURE 4-22: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO BEACH-SEINE FISHING AREAS.

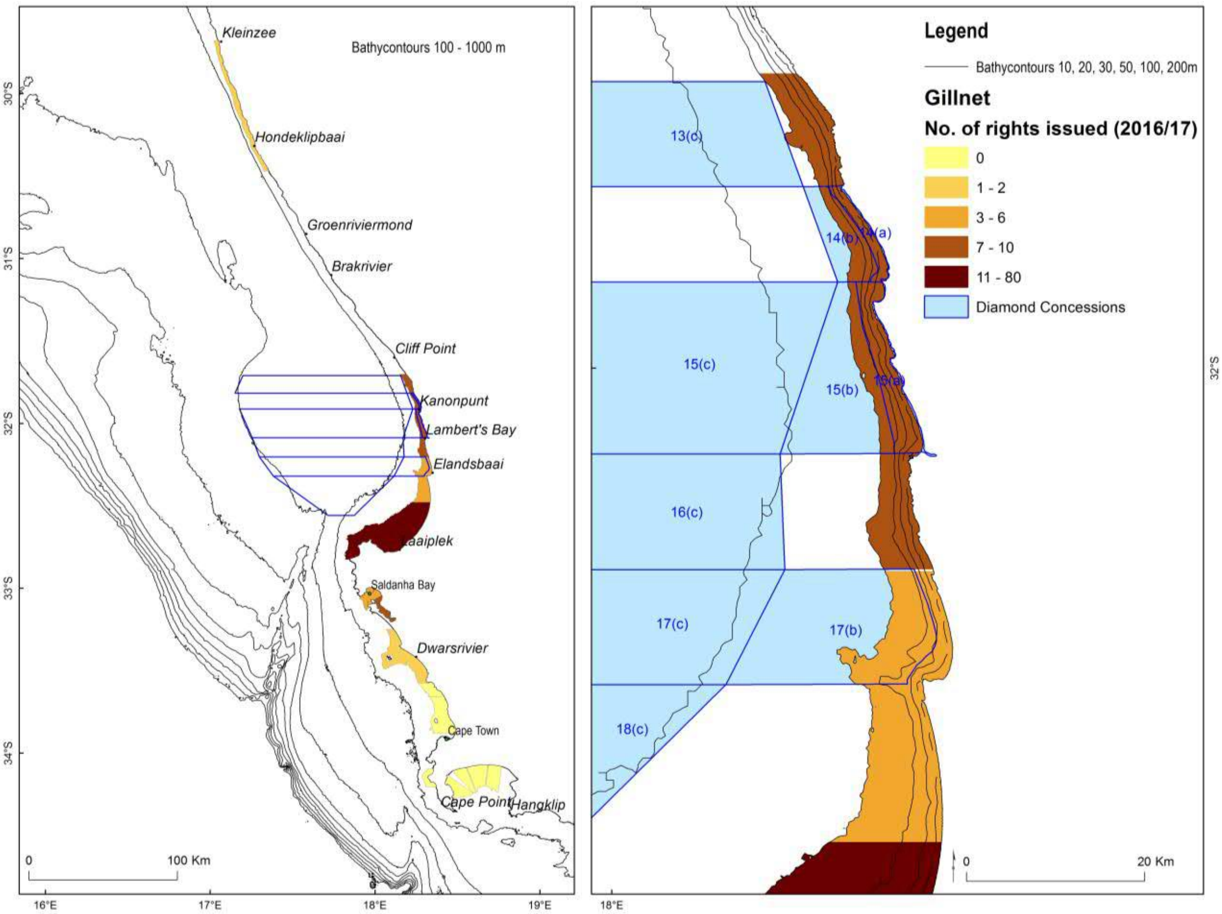

FIGURE 4-23: SEA CONCESSION AREAS 14B, 15B AND 17B IN RELATION TO GILLNET FISHING AREAS.

4.1.4.1.11 Fisheries Research

Surveys of demersal fish resources are carried out in January (West Coast survey encompassing the area between the Namibian border and Cape Agulhas) and April/May (South Coast survey encompassing the area between Cape Agulhas and Port Alfred) each year by DAFF in order to set the annual TACs for demersal fisheries. Stratified, bottom trawls are conducted to assess the biomass, abundance and distribution of hake, horse mackerel, squid and other demersal trawl species on the shelf and upper slope of the South African coast. The gear configuration is similar to that of commercial demersal trawlers; however, nets are towed for a shorter duration of generally 30 minutes per tow. Trawl positions are randomly selected to cover specific depth strata that range from the coast to the 1 000 m bathymetric contour. Approximately 120 trawls are conducted during each survey over a period of approximately one month.

The biomass of small pelagic species is also assessed bi-annually by an acoustic survey. During these surveys the survey vessel travels pre-determined transects (perpendicular to bathymetric contours) running offshore from the coastline to approximately the 200 m bathymetric contour. The survey is designed to cover an extensive area from the Orange River on the West Coast to Port Alfred on the East Coast.

4.1.4.2 Shipping Transport

The majority of shipping traffic is located on the outer edge of the continental shelf with traffic inshore of the continental shelf along the West Coast largely comprising fishing and mining vessels, especially between Kleinsee and Oranjemund (see Figure 4 24). The main shipping lanes are located further offshore of Sea Concession areas 14 B and 15B. However, higher density shipping traffic does occur offshore of Elands Bay, thus shipping traffic can be expected within Sea Concession 17B.

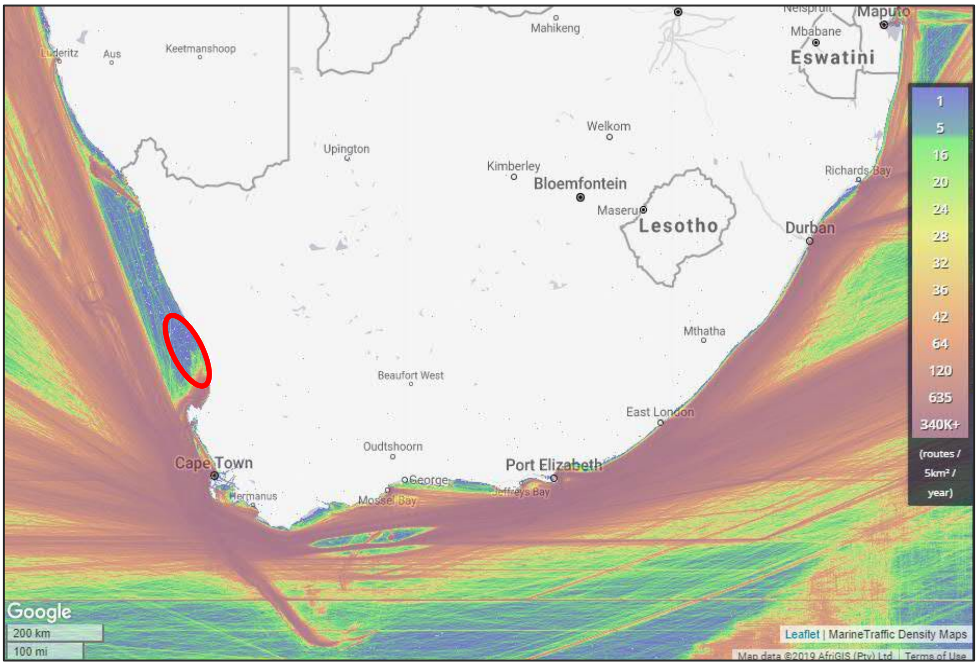

FIGURE 4-24: MAJOR SHIPPING ROUTES ALONG THE WEST COAST OF SOUTH AFRICA. APPROXIMATE LOCATION OF THE SEA CONCESSION AREAS IS ALSO SHOWN.

While ship traffic around South Africa is not high in global terms compared to say the Panama or Suez Canal, ship traffic is considerable (Gründlingh *et al.* 2006). Approximately 120 million tonnes of oil and substantial volumes of bunker fuel are estimated to pass through South African waters every year which indicates that South Africa has one of the highest concentrations of oil tankers and cargo ships in the world (IMO, 2005). Although the majority of vessel traffic, including commercial and fishing vessels, remains relatively close inshore North- and south-bound cargo vessels usually remain over the mid-shelf (100 m isobath), while tankers and bulk carriers usually remain further offshore. The latter do, however, move closer inshore to escape extremely rough conditions that develop within the Agulhas Current. Some offshore commercial traffic departs east off the East Coast. Charted Traffic Separation Schemes, which are International Maritime Organisation (IMO) adapted and other relevant information are listed in the South African Annual Notice to Mariners No 5, of 2010. The safe shipping routes along the South African coast are shown in Figure 4-25.

4.1.4.3 Oil and Gas Exploration and Production

Oil and gas exploration and production is currently undertaken in a number of licence blocks off the West, South and East coasts of South Africa (see Figure 4-26).

4.1.4.3.1 Exploration

The South African continental shelf and economic exclusion zone (EEZ) have similarly been partitioned into Licence blocks for petroleum exploration and production activities. Oil and gas exploration in the South African offshore commenced with seismic surveys in 1967. Since then numerous 2D and 3D seismic surveys have been undertaken in the West Coast offshore.

Approximately 40 exploration wells have been drilled since the 1960's. Prior to 1983, reliable technology was not available for removing wellheads from the seafloor. Since then, however, on completion of drilling operations, the well casing has been severed 3 m below the sea floor and removed from the seafloor together with the permanent and temporary guide bases. Of the approximately 40 wells drilled, 35 wellheads remain on the seafloor. Location and wellhead details are available from the Hydrographic office of the South African Navy (which issues the details to the public in a notice to mariners) or directly from PASA.

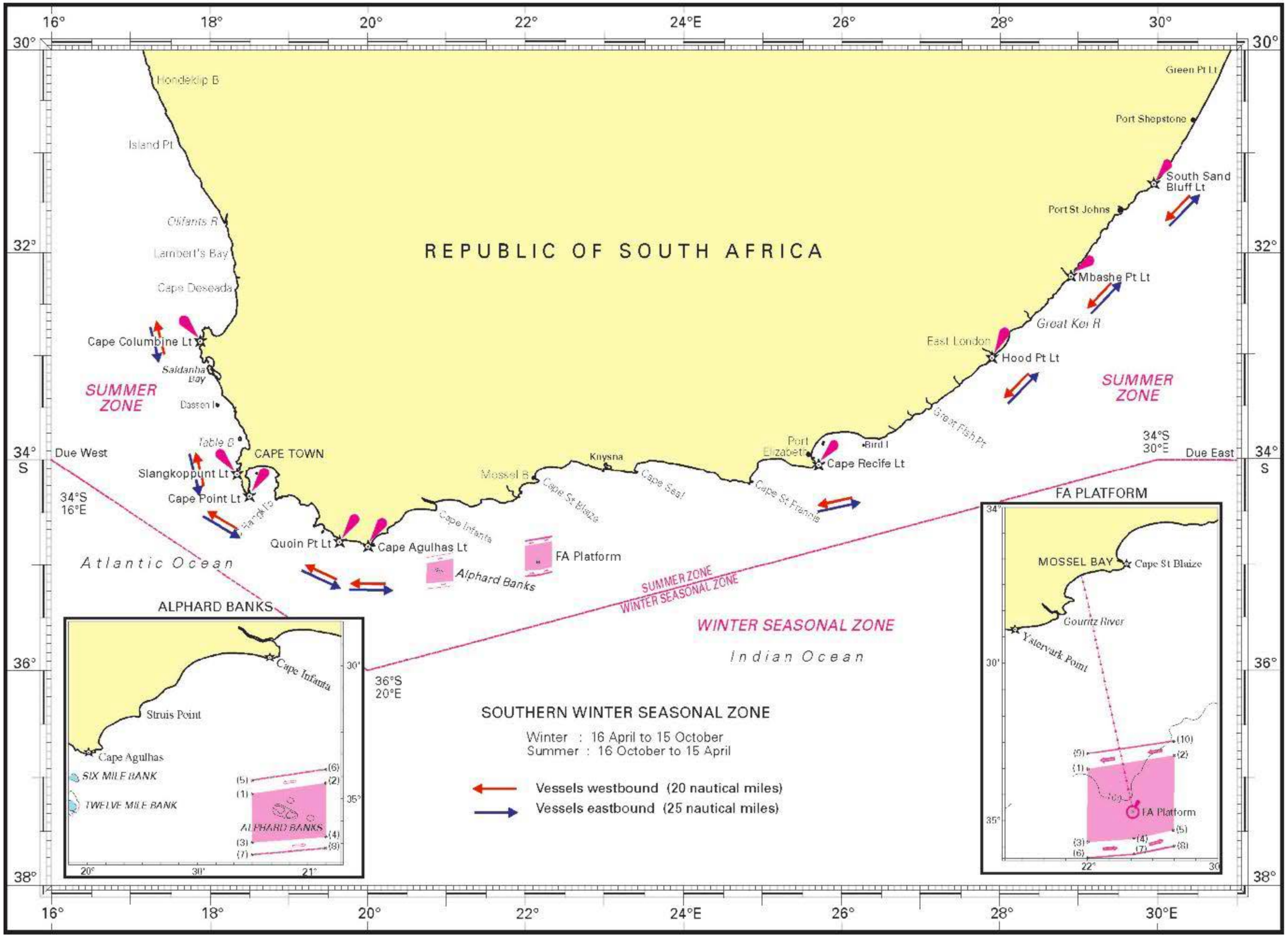

FIGURE 4-25: SAFE SHIPPING ROUTES AROUND THE COAST OF SOUTH AFRICA

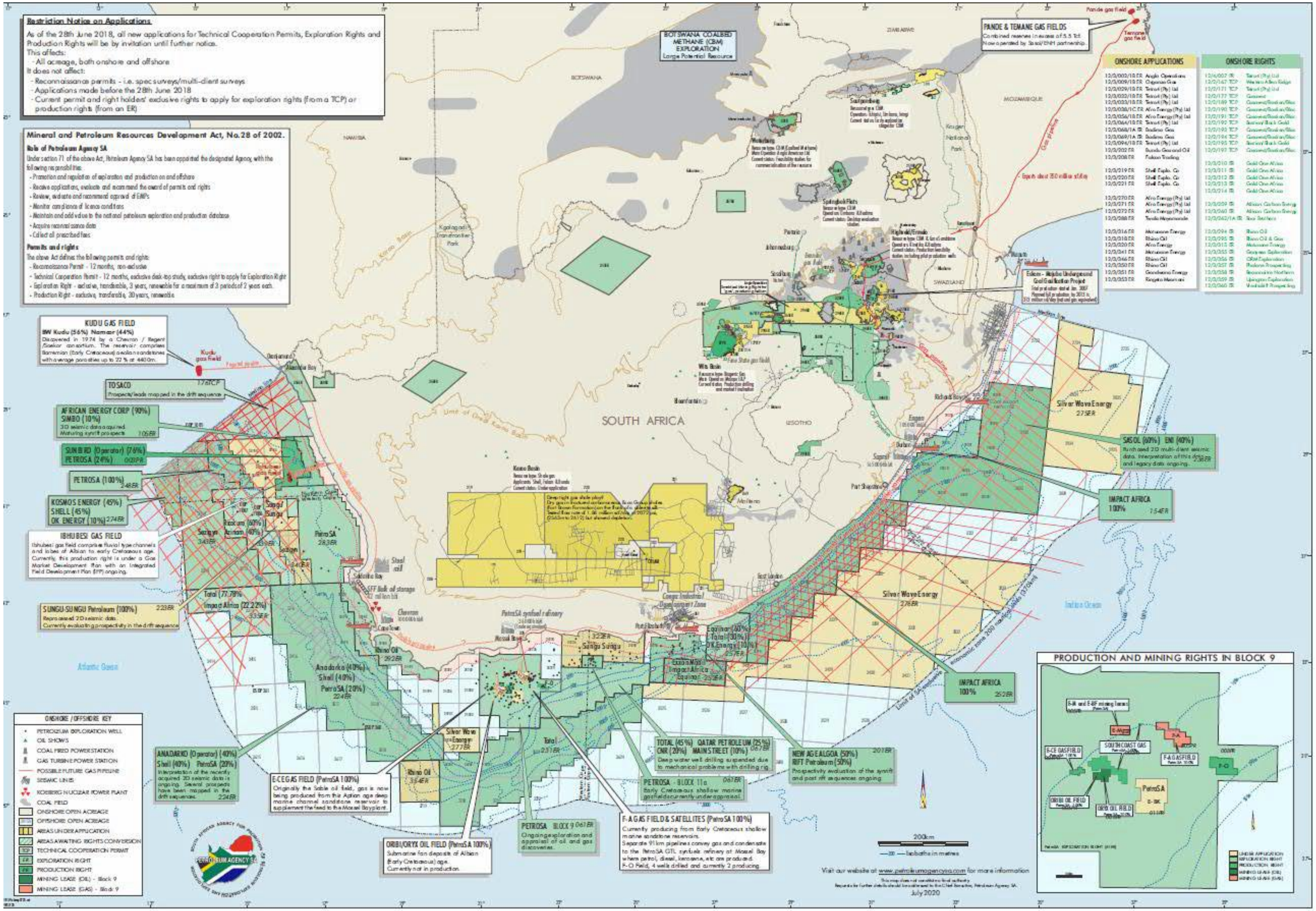

FIGURE 4-26: PETROLEUM LICENCE BLOCKS OFF THE WEST, SOUTH AND EAST COASTS OF SOUTH AFRICA (AFTER PASA, 2020).

4.1.4.3.2 Development and Production

There is no current development or production from the South African west coast offshore. The Ibhubesi Gas Field (Block 2A) and Kudu Gas Field (which lies several hundred kilometres to the north-west off the coast of southern Namibia) have been identified for development. In this regard, a subsea pipeline to export gas from the iBhubesi field to a location either on the Cape Columbine peninsula or to Ankerlig approximately 25 km north of Cape Town is currently being proposed by Sunbird SA. The proposed pipeline lies further offshore of Sea Concessions 14B, 15B and 17B.

4.1.4.4 Diamond Prospecting and Mining

The concession areas lie adjacent to a number of marine diamond concession areas. The marine diamond concession areas are split into four or five zones (Surf zone and (a) to (c) or (d)-concessions), which together extend from the high water mark out to approximately 500 m depth (see Figure 4-27).

On the Namaqualand coast marine diamond prospecting and mining activity is primarily restricted to the surf-zone and (a)-concessions. Nearshore shallow-water mining is typically conducted by divers using small-scale suction hoses operating either directly from the shore or from converted fishing vessels out to approximately 20 m depth. Diver-assisted mining is largely exploratory and highly opportunistic in nature, being dependent on suitable, calm sea conditions. The typically exposed and wave-dominated nature of the Namaqualand coast effectively limits the periods in which mining can take place to a few days per month. As shore-based divers cannot excavate a gravel depth much more than 0.5 m, mining rates are low, approximately 35 m^2 worked by each contractor per year. Because of the tidal cycle and limitations imposed by sea conditions, such classifiers usually operate for less than 4 hours per day for an average of 5-6 days per month, although longer periods may be feasible in certain protected areas.

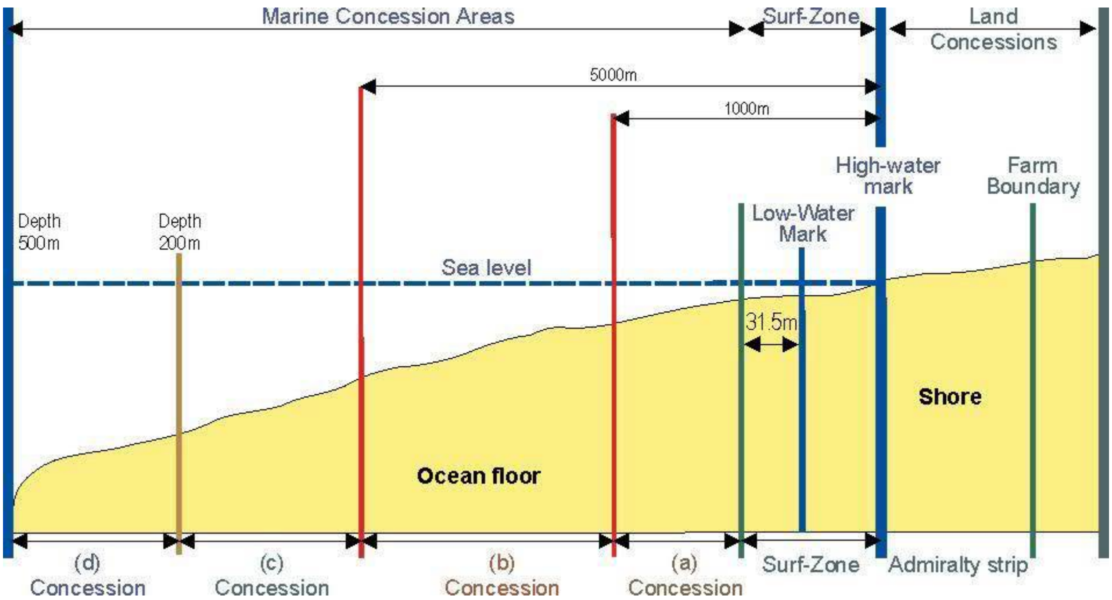

FIGURE 4-27: DIAGRAM OF THE ONSHORE AND OFFSHORE BOUNDARIES OF THE SOUTH AFRICAN (A) TO (D) MARINE DIAMOND CONCESSION AREAS.

Vessel-based diver-Appointed contractors usually work in the depth range immediately seaward of that exploited by shore-based divers, targeting gullies and potholes in the sub-tidal area just behind the surf-zone. A typical boat-based operation consists of a 10 - 15 m vessel, with the duration of their activities limited to daylight hours for 3 - 10 diving days per month. Estimated mining rates for vessel-based operations range from 300 m^2 – 1 000 m^2/year. However, over the past few years there has been a substantial decline in small-scale diamond mining operations due to the global recession and depressed diamond prices, although some vessels do still operate out of Alexander Bay and Port Nolloth.

Offshore diamond mining and prospecting in the "C" Concession areas is currently limited to operations by BPT127 in concessions 2C and 3C for mining and De Beers Marine (Pty) Ltd for prospecting in Sea Concessions 4C, 5C and 6C.

These prospecting and mining operations are typically conducted in water depths of 70 m to 160 m from fully self-contained vessels with onboard sediment processing facilities, using either vertically mounted tools or seabed crawler technology. The vessels operate as semi-mobile platforms, anchored by a four anchor spread or held on station with a dynamic positioning system (DP). Computer-controlled positioning using DP or winches enable the vessels to locate themselves precisely over a prospecting or mining block of up to 400 m x 400 m. These vessels have limited manoeuvrability whilst in position and other vessels should remain at a safe distance.

Trans Hex undertake shallow water operations in Sea Concessions 8A, 9A and 8B, using contracted sea vessels, shallow water shore-units and beach-mining units. The majority of these contractors are derived from the surrounding local communities, with the vessels based at Lamberts Bay, Doring Bay, Hondeklip Bay and Kleinzee.

4.1.4.5 Prospecting and Mining of Other Minerals

4.1.4.5.1 Heavy Minerals

Heavy mineral sands containing, amongst other minerals, zircon, ilmenite, garnet and rutile may be found offshore of the West Coast. Although a literature search has not identified any published studies that detail the distribution of heavy minerals offshore, concentrations are known to exist onshore. Tronox's Namakwa Sands is currently exploiting heavy minerals from onshore deposits near Brand-se-Baai (approximately 385 km north of Cape Town).

4.1.4.5.2 Glauconite and Phosphate

Glauconite pellets (an iron and magnesium rich clay mineral) and bedded and peletal phosphorite occur on the seafloor over large areas of the continental shelf on the West Coast. These represent potentially commercial resources that could be considered for mining as a source of agricultural phosphate and potassium (Birch 1979a & b; Dingle et al. 1987; Rogers and Bremner 1991).

A number of prospecting areas for glauconite and phosphorite / phosphate are located off the West Coast (see Figure 4-28), although the Sea Concession areas are located to the east of these. Green Flash Trading received their prospecting rights for Areas 251 and 257 in 2012/2013.

4.1.4.5.3 Manganese Nodules in Ultra-Deep Water

Rogers (1995) and Rogers and Bremner (1991) report that manganese nodules enriched in valuable metals occur in deep water areas (>3 000 m) off the West Coast. The nickel, copper and cobalt contents of the nodules fall below the current mining economic cut-off grade of 2% over most of the area, but the possibility exists for mineral grade nodules in the areas north of 33°S in the Cape Basin and off northern Namaqualand.

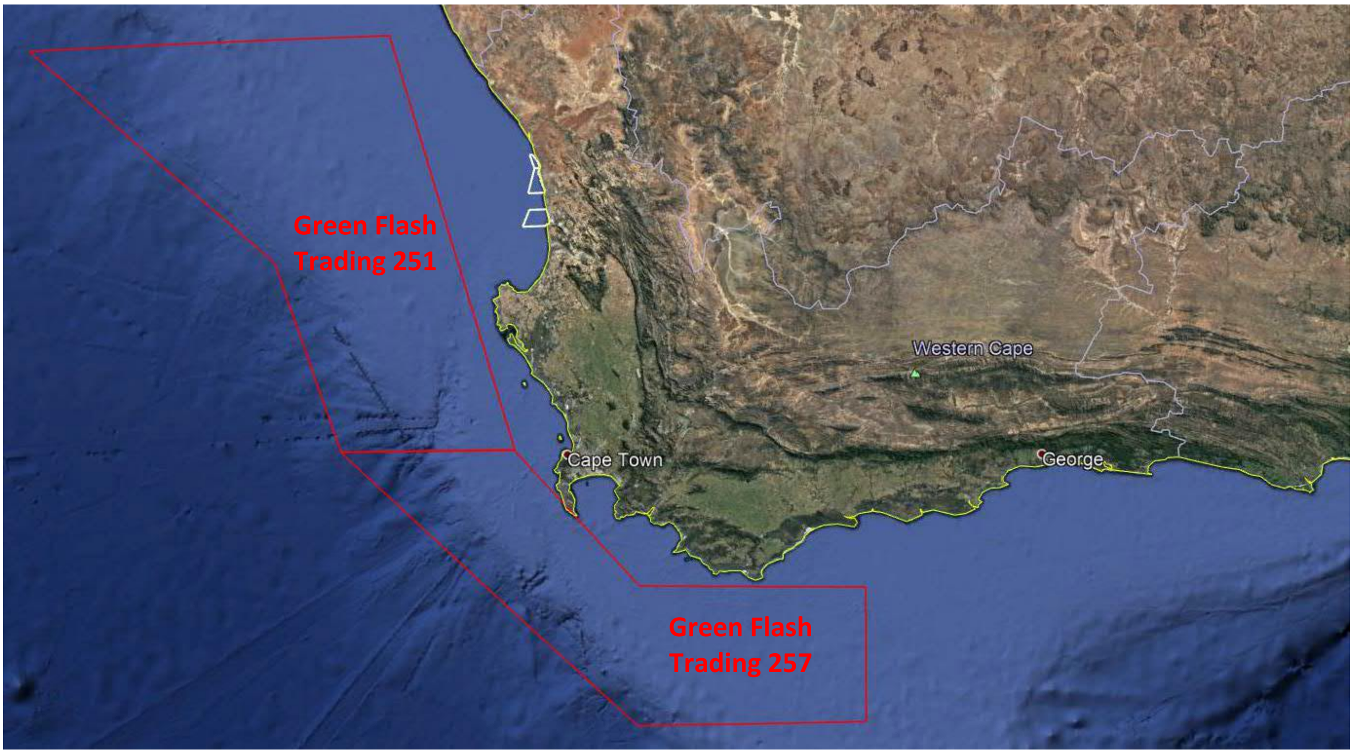

FIGURE 4-28: APPROXIMATE LOCATION OF SEA CONCESSIONS 14B, 15B AND 17B (RED) IN RELATION TO PHOSPHATE PROSPECTING AREAS.

4.1.4.5.4 Undersea Cables

There are a number of submarine telecommunications cable systems across the Atlantic and the Indian Ocean (see Figure 4-29), including *inter alia*:

- South Atlantic Telecommunications cable No.3 / West African Submarine Cable / South Africa Far East (SAT3/WASC/SAFE): This cable system is divided into two sub-systems, SAT3/WASC in the Atlantic Ocean and SAFE in the Indian Ocean. The SAT3/WASC sub-system connects Portugal (Sesimbra) with South Africa (Melkbosstrand). From Melkbosstrand the SAT-3/WASC sub-system is extended via the SAFE sub-system to Malaysia (Penang) and has intermediate landing points at Mtunzini South Africa, Saint Paul Reunion, Bale Jacot Mauritius and Cochin India (www.safe-sat3.co.za).
- Eastern Africa Submarine Cable System (EASSy): This is a high bandwidth fibre optic cable system, which connects countries of eastern Africa to the rest of the world. EASSy runs from Mtunzini (off the East Coast) in South Africa to Port Sudan in Sudan, with landing points in nine countries, and connected to at least ten landlocked countries.
- West Africa Cable System (WACS): WACS is 14 530 km in length, linking South Africa (Yzerfontein) and the United Kingdom (London). It has 14 landing points, 12 along the western coast of Africa (including Cape Verde and Canary Islands) and 2 in Europe (Portugal and England) completed on land by a cable termination station in London.
- African Coast to Europe (ACE): The ACE submarine communications cable is a 17 000 km cable system along the West Coast of Africa between France and South Africa (Yzerfontein).

There is an exclusion zone applicable to the telecommunication cables 1 nm (approximately 1.9 km) each side of the cable in which no anchoring is permitted.

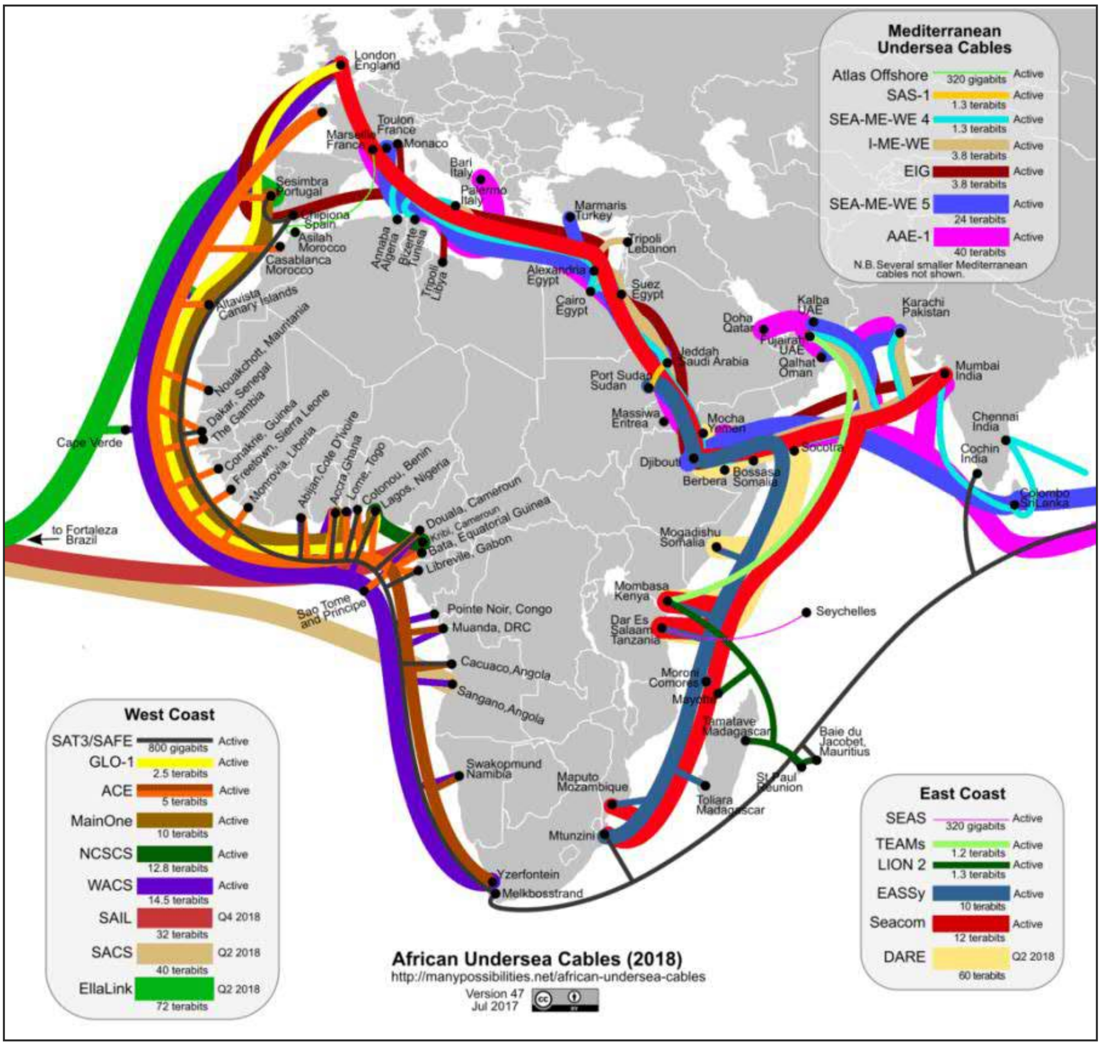

FIGURE 4-29: CONFIGURATION OF THE CURRENT AFRICAN UNDERSEA CABLE SYSTEMS, JULY 2018 (FROM HTTP://WWW.MANYPOSSIBILITIES.NET).

4.1.4.6 Maritime Archaeology

Submerged Prehistory

During the last 900 000 years, global sea levels have fluctuated substantially on at least three occasions, with the most extreme recent sea level drop occurred between 17 000 – 20 000 years ago when at the height of the last glaciation, where the sea was more than 120 m lower than it is today (Waelbroeck *et al.*, 2002; Rohling *et al.*, 2009). The lowering of the sea level would have added a large coastal plain to the South African land mass where parts of the continental shelf were exposed as dry land (see Cawthra *et al.*, 2016). This exposed continental shelf was quickly populated by terrestrial flora and fauna, and also by our human ancestors who were dependant on these resources (Compton, 2011). As a result, for periods numbering in the tens of thousands of years, on at least three occasions during the last 500 000 years, our ancestors inhabited areas of what is now seabed around the South African coast. This means that a large part of the archaeological record of the later Earlier, Middle and early Late Stone Age is likely to be located on the continental shelf.

Until relatively recently there was little or no access to the submerged prehistoric landscapes and sites on the continental shelf. In 1995 and 1996 during the excavation of two Dutch East India Company shipwrecks in Table Bay, the Oosterland and Waddinxveen, divers recovered three Early Stone Age hand axes from the seabed under the wrecks. The stone tools, which are between 300 000 and 1.4 million years old, were found at a depth of 7-8 m below mean sea level and were associated with Pleistocene sediments from an ancient submerged and infilled river channel. Their unrolled and unworn condition indicate that they had not been carried to their current position by the ancient river and suggests that they were found more or less where they were dropped by Early Stone Age hominins more than 300 000 years ago, when the sea level was at least 10 m lower than it is today (Werz and Flemming, 2001; Werz *et al.,* 2014).

While there have been no specific studies of the submerged prehistory of the West Coast, the archaeological evidence for a hominin presence along the coast in the vicinity of the study area in the Earlier, Middle and Later Stone Age is plentiful. For example, Diepkloof Rock Shelter, inland of Elands Bay contains evidence of a nearly continuous human occupation for nearly 85 000 years, while Elands Bay Cave, on the coast at the mouth of the Verloren Vlei, preserves archaeological evidence of the Pleistocene / Holocene transition during the Later Stone Age (Parkington 1988).

Later Stone Age coastal shell middens are ubiquitous along the West Coast, as are numerous Middle Stone Age shell middens; the latter being some of the earliest evidence in the world for the exploitation by our ancestors of marine resources. Older, Earlier Stone Age lithics are also commonly found along on the West Coast (David Halkett pers. comm.). As noted above, the maximum sea level lowstand during the Quaternary, when hominins would have been present in and on the South African landscape, was -120 m. Thus, any areas of South Africa's current seabed shallower than -120 m have the potential to have been used by our ancestors and to preserve the archaeological evidence of that use.

Although no recent geophysical data are available for the B-Concession areas, seabed sediment mapping by O'Shea (1971) further up the coast at Kleinsee indicates that a channel cut by the palaeo-Buffels River extends offshore to the west of Klienzee. This channel has the potential for associated, now submerged, archaeological material and paleoenvironmental evidence, and is illustrative of the likely situation with many of the other major rivers that feed into the Atlantic along the West Coast have submerged paleo-channels extending offshore. These channels are an important mining target, particularly for diamond mining as they are the source of and contain diamondiferous gravel.

During times of lower sea level in the past, these rivers would have flowed across the exposed continental shelf and these ancient river courses, whose channels are today buried under modern seabed sediment, would have been an important focus for hominin activity on the exposed continental shelf in the past. As demonstrated in Table Bay, there is the potential for the occurrence of ancient, submerged archaeological material in association with paleo-river channels. Where alluvial sediment within these channels has survived post-glacial marine transgressions there is also the potential to recover paleoenvironmental data (pollens, foraminifera and diatoms, for example) which can contribute contextual information to our understanding of the ancient human occupation of South Africa.

<u>Maritime History</u>

The southern tip of the African continent has played a vital role in global economic and maritime affairs, and until the opening of the Suez Canal in 1869, represented the most viable route between Europe and the markets of the East (Axelson, 1973; Turner, 1988; Gribble, 2002; Gribble and Sharfman, 2013). The challenging physical conditions mariners encounter in these waters have, in the last five centuries, been responsible for the large number of maritime casualties which today form the bulk of South Africa's maritime and underwater cultural heritage (Gribble, 2002).

At least 2500 vessels are known to have sunk, grounded, or been wrecked, abandoned or scuttled in South African waters since the early 1500s. More than 1 900 of these wrecks are more than 60 years old and are thus protected by the NHRA as archaeological resources. This list is by no means complete and does not include the as yet unproven potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions along the South African east coast.

The earliest known South African wrecks are Portuguese, dating to the sixteenth century. Due to the later, more prolonged ascendancy of first the Dutch and then the British in European trade with the East and control at the Cape, the majority of wrecks along the South African coast are Dutch and British. However, at least 36 other nationalities are represented amongst the other wrecks that litter the South African coast.

According to SAHRA's Maritime and Underwater Cultural Heritage database, there are at least 89 shipping casualties on the West Coast recorded between the Berg and Orange Rivers, many of which were vessels involved in coastal trade and fishing. Nine of these maritime casualties took place within or close to concession areas 14B, 15B and 17B (see Figure 4-30).

Two of the nine wrecks within the study area, the Girl Devon (1971) and Boy Donald (1983) are currently less than 60 years of age and are thus not protected by the NHRA as heritage resources. That being said, if such wrecks lie within the concession areas they can pose a risk to prospecting machinery and for that reason have been retained in the overall count of sites that may lie within the concession areas. Of the remaining wrecks the following is noted:

- The position on the seabed of the wreck of *HMS Sybille* (1901) at Steenboksfontein south of Lamberts Bay is accurately recorded. This site is located outside of the Sea Concession areas;
- *Rosebud* (1859) was wrecked at Lamberts Bay. This implies that the vessel came ashore on the coast and the wreck is thus likely to lie landward of and outside Sea Concession area 15B;
- *Lamberts Bay Packet* (1859) and *Shamrock* (1959) are both recorded as having grounded in Lamberts Bay, which usually implies that they were subsequently refloated and didn't become wrecks. Thus, it is unlikely that the remains of either vessel will be located in Sea Concession area 15B;
- *Eros* (1918) foundered at sea near Lamberts Bay while en route from Cape Town to Port Nolloth, which implies that the wreck could be present in any of the three concession areas; and
- Because there is no indication in the available records of how or where *Antoinette* (1854) and *Blue Bird* (1960) were lost, it must therefore be assumed that either or both could potentially lie within concession areas 14B, 15B or 17B.

From the above, it should be assumed that the remains of *Eros, Antoinette* and *Blue Bird* could be present on the seabed in the Sea Concession areas. While *Blue Bird* is only just 60 years old and of limited, current archaeological or historical interest, *Eros* and *Antoinette* are older wrecks and hold greater potential archaeological interest. Furthermore, it is pointed out that the remains of currently unknown wrecks could also be present in the sea concession areas.

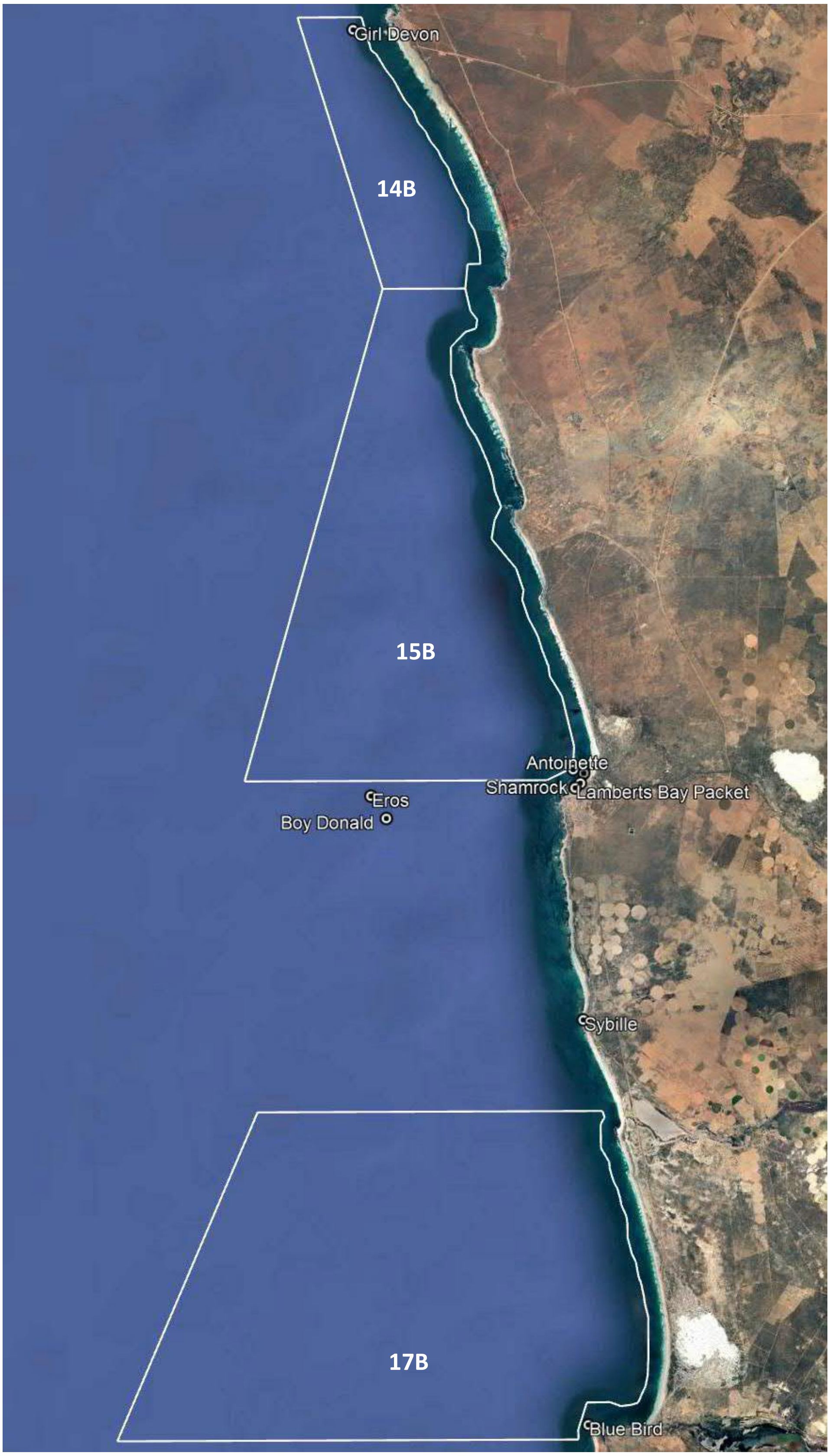

FIGURE 4-30: SHIPWRECKS POTENTIALLY LOCATED WITHIN THE BROADER PROJECT AREA.

4.1.4.7 Ammunition Dump Sites

Details of ammunition dumped at the ammunition dumpsites on the West Coast are given on the respective SAN charts. No ammunition dumps are located within the extent of the Sea Concession areas.

4.2 MARINE PROTECTED AREAS

4.2.1 Conservation Areas and Marine Protected Areas

Numerous conservation areas and a marine protected area (MPA) exist along the coastline of the Western Cape, although the majority of these located to the south of concessions 14B, 15B and 17B (see Figure 4-33).

Lambert's Bay Bird Island is located approximately 1 km in shore of Sea Concesssion 15B and is a declared Nature Reserve under the National Environmental Management: Protected Areas Act, 2003 (No. 57 of 2003). It is one of only six Cape Gannet breeding sites world-wide.

Sea Concession 17B is located approximately 1 km offshore of the estuary mouth of Verlorenvlei, a partially closed coastal estuarine lake and marsh system located at Elands Bay. Verlorenvlei is one of the largest natural wetlands along the West Coast and is a proclaimed RAMSAR site and Important Bird Area.

4.2.2 Ecologically or Biologically Significant Areas (EBSAs)

As part of a regional Marine Spatial Management and Governance Programme (MARISMA) the Benguela Current Commission (BCC) and its member states have identified a number of Ecologically and Biologically Significant Areas (EBSAs) both spanning the border between Namibia and South Africa and along the South African West, South and East Coasts, with the intention of implementing improved conservation and protection measures within these sites. South Africa currently has 11 EBSAs solely within its national jurisdiction with a further four having recently been proposed. It also shares five trans-boundary EBSAs with Namibia (3) and Mozambique (2). The principal objective of these EBSAs is identification of features of higher ecological value that may require enhanced conservation and management measures. They currently carry no legal status. Although no specific management actions have as yet been formulated for the EBSAs, they have been considered as part of the National Coastal and Marine Spatial Biodiversity Plan and the development of the Critical Biodiversity Map (CBA) which is addressed in the next section.

There is direct overlap between Sea Concession 17B and the Conservation Zone of the Cape Canyon and Associated Islands, Bays and Lagoon ESBA (see Figure 4-31). This EBSA includes Cape Canyon (one of two submarine canyons off the west coast of South Africa) and a broader area, including St Helena Bay, which has been recognized as important in three systematic conservation plans. Both benthic and pelagic features are included, and the area is important for pelagic fish, foraging marine mammals and several threatened seabird species. The area is also important for threatened ecosystem types; there are nine Endangered and 12 Vulnerable ecosystem types, and two that are Near Threatened. There is evidence that the submarine canyon hosts fragile habitat-forming species, and there are other unique and potentially vulnerable benthic communities in the area. There are several small coastal MPAs within the EBSA.

FIGURE 4-31: THE CAPE CANYON AND ASSOCIATED ISLANDS, BAYS AND LAGOON ESBA (GREEN AREA INSHORE) ON THE WEST COAST IN RELATION TO THE SEA CONCESSION AREAS (WHITE OUTLINE)[2].

4.2.3 Biodiversity Priority Areas

The latest version of National Coastal and Marine Spatial Biodiversity Plan (v1.0 (Beta 2) was released on 26th February 2021) (Harris *et al.* (2020)). This National Coastal and Marine Spatial Biodiversity Plan is intended to be used by managers and decision-makers in those national government departments whose activities occur in the coastal and marine space, e.g., environment, fishing, transport (shipping), petroleum, mining, and others. It is relevant for the Marine Spatial Planning Working Group where many of these departments are participating in developing South Africa's emerging marine spatial plans. It is also intended for use by relevant managers and decision-makers in the coastal provinces and coastal municipalities, EIA practitioners, organisations working in the coast and ocean, civil society, and the private sector.

The biodiversity priority areas and management objectives of each category have been defined and mapped as part of the marine spatial planning process. CBA Map categories are as follows: Protected Area, Critical

Biodiversity Area 1 (CBA 1), Critical Biodiversity Area 2 (CBA 2), and Ecological Support Area (ESA). Sea-use guidelines are then proposed, with the Conservation Zones likely to comprise a Strict Biodiversity Conservation Zone (including Marine Protected Areas, and Other Effective Area-Based Conservation Measures (OECMs) as two separate types), and an Environmental Impact Management Zone. Protected areas will be managed according to their gazetted regulations. The intention is that the CBA Map (CBAs and ESAs) and sea-use guidelines inform the MSP Conservation Zones and management regulations, respectively.

Activities within these management zones are classified into those that are compatible (Y for Yes), those that are incompatible (N for No), and those that may be compatible subject to certain conditions (C for Conditional).

Non-destructive prospecting activities are compatible in ESAs and may be compatible, subject to certain conditions, in CBAs. Destructive prospecting activities with localised impact, e.g. bulk sampling, may be compatible, subject to certain conditions, in CBAs and ESAs. Mining construction and operations are classified as incompatible in CBAs but may be compatible, subject to certain conditions, in ESAs (Harris et.al., 2020).

These zones have been incorporated into the most recent iteration of the national Coastal and Marine Critical Biodiversity Area (CBA) Map (v1.0 (Beta 2) released 26th February 2021) (Harris *et al.* (2020)) (see Figure 4-32). This indicates that there is overlap between mapped CBA 1 (red) and CBA 2 (orange) and Sea Concession Areas 15B and 17B. CBA 1 indicates irreplaceable or near-irreplaceable sites that are required to meet biodiversity targets with limited, if any, option to meet targets elsewhere, whereas CBA 2 indicates optimal sites that generally can be adjusted to meet targets in other areas. Ecological Support Areas (ESAs) represent EBSAs outside of MPAs and not already selected as CBAs. Sea-use within the CBAs and ESAs reflect those specified by the EBSA biodiversity conservation and management zones described above.

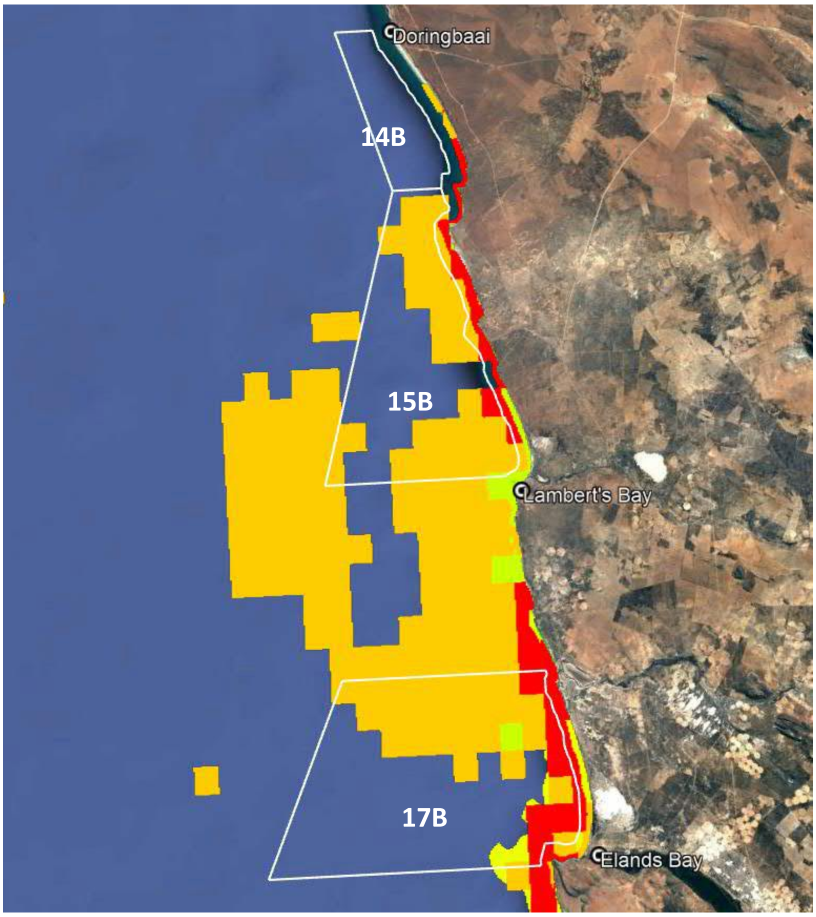

FIGURE 4-32: THE NATIONAL COSTAL AND MARINE CBAS (VERSION 1.0 (BETA 2)) IN RELATION TO THE SEA CONCESSION AREAS (ADAPTED FROM HARRIS *ET AL.* 2020).

4.2.4 Threat Status and Vulnerable Marine Ecosystems

Rocky shore and sandy beach habitats are generally not particularly sensitive to disturbance and natural recovery occurs within 2-5 years. However, much of the Namaqualand coastline has been subjected to decades of disturbance by shore-based diamond mining operations (Penney *et al*. 2007). These cumulative impacts and the lack of biodiversity protection has resulted in most of the coastal habitat types in Namaqualand being assigned a threat status of 'critically endangered' (Lombard *et al*. 2004; Sink *et al*. 2012). Using the SANBI benthic and coastal habitat type GIS database, the threat status of the benthic habitats in the general area, and those potentially affected by proposed prospecting activities in Sea Concessions 14B, 15B and 17B, were identified (see

Table 4-6).

TABLE 4-6: ECOSYSTEM THREAT STATUS FOR MARINE AND COASTAL HABITAT TYPES IN CONCESSIONS 14B, 15B AND 17B (ADAPTED FROM SINK *ET AL.* 2011). THOSE HABITATS POTENTIALLY AFFECTED BY THE PROPOSED PROSPECTING ACTIVITIES ARE SHADED.

Habitat Type	Total Size (km^2)	Threat Status
Southern Benguela Sandy Outer Shelf	56 235	Least Threatened
Southern Benguela Muddy Outer Shelf	6054.24	Least Threatened
Southern Benguela Dissipative Sandy Coast	68.89	Least Threatened
Southern Benguela Dissipative-Intermediate Sandy Coast	120.25	Least Threatened
Southern Benguela Intermediate Sandy Coast	123.8	Least Threatened
Southern Benguela Estuarine Shore	12.07	Least Threatened
Namaqua Sandy Inner Shelf	5 394.52	Least Threatened
Namaqua Muddy Inner Shelf	11 165.61	Least Threatened
Namaqua Hard Inner Shelf	2 656.36	Least Threatened
Namaqua Sandy Inshore	823.95	Critically Endangered
Namaqua Inshore Hard Grounds	233.02	Critically Endangered
Namaqua Island	280.02	Critically Endangered
Namaqua Exposed Rocky Coast	146.3	Least Threatened
Namaqua Inshore Reef	3.44	Critically Endangered
Namaqua Mixed Shore	241.19	Endangered
Namaqua Muddy Inshore	164.41	Vulnerable
Namaqua Sheltered Rocky Coast	9.35	Critically Endangered
Namaqua Very Exposed Rocky Coast	12.01	Vulnerable

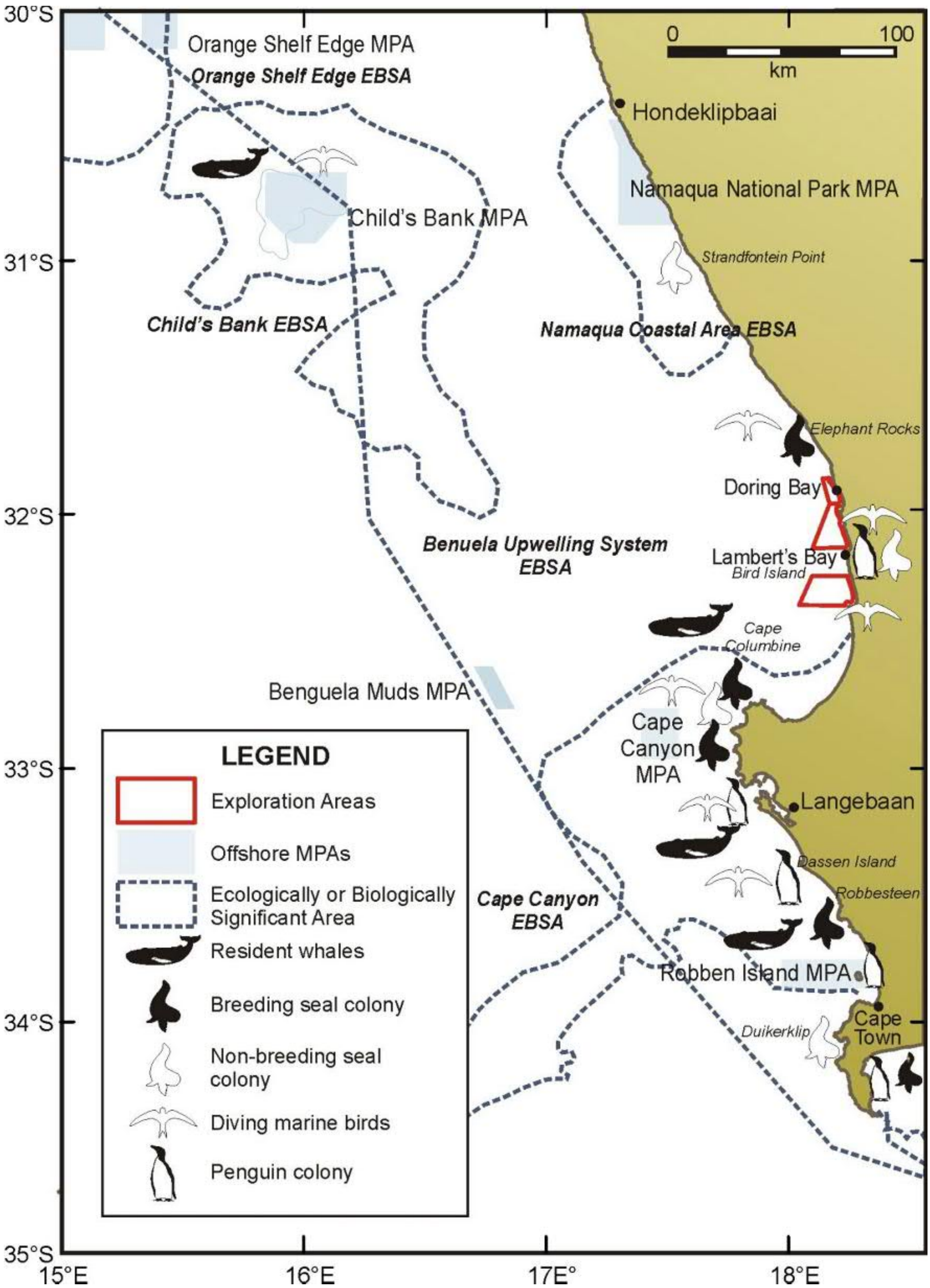

FIGURE 4-33: PROJECT - ENVIRONMENT INTERACTION POINTS ON THE WEST COAST, ILLUSTRATING THE LOCATION OF SEABIRD AND SEAL COLONIES AND RESIDENT WHALE POPULATIONS IN RELATION TO THE 14B, 15B AND 17B SEA CONCESSION AREAS. OFFSHORE MARINE PROTECTED AREAS AND EBSAS (AS OF 30 AUGUST 2019) ARE ALSO SHOWN.

5. IMPACT DESCRIPTION AND ASSESSMENT

This chapter describes and assesses the significance of potential impacts related to the proposed offshore prospecting activities in the Sea Concession areas. All impacts are systematically assessed and presented according to predefined rating scales (see Appendix 4.1). Mitigation or optimisation measures are proposed which could ameliorate the negative impacts or enhance potential benefits, respectively. The status of all impacts should be considered to be negative unless otherwise indicated. The significance of impacts with and without mitigation is also assessed.

Specialist input was provided in order to address the likely effect of the proposed prospecting activities on fisheries (Appendix 4.2), marine fauna (Appendix 4.3) and underwater cultural and heritage resources (Appendix 4.4). In addition, this assessment used as a basis the issues identified in the Generic EMP prepared for marine diamond mining off the West Coast of South Africa (Lane and Carter 1999) and similar studies.

Sections 5.1 to 5.3 assess impacts related to the proposed project and associated alternatives on the benthic environment, marine fauna and other users of the sea. The identified potential socio-economic impacts of the project are described in Section 5.4. The implications of not going ahead with the proposed project (i.e. the No-Go Alternative) are assessed in Section 5.5.

5.1 IMPACT OF THE PROSPECTING VESSELS

5.1.1 Discharges/Disposal to the Sea

Description of impact

Discharges to the marine environment include deck drainage, machinery space drainage, sewage, galley wastes and solid wastes from the geophysical survey and sediment sampling vessels. These discharges would result in the local reduction in water quality, which could impact marine fauna in a number of different ways:

- Physiological effects: Ingestion of hydrocarbons, detergents and other waste could have adverse effects on marine fauna, which could ultimately result in mortality;
- Increased food source: The discharge of galley waste and sewage would result in an additional food source for opportunistic feeders, speciality pelagic fish species; and
- Increased predator - prey interactions: Predatory species, such as sharks and pelagic seabirds, may be attracted to the aggregation of pelagic fish attracted by the increased food source.

Assessment

The geophysical survey and sediment sampling vessels would have the necessary sewage treatment systems, oil/water separators and food waste macerators to ensure compliance with MARPOL 73/78 standards. Compliance with MARPOL 73/78 means that discharges introduce relatively small amounts of nutrients and organic material to oxygenated surface waters, which would result in only a minor contribution to local marine productivity and possibly of attracting some opportunistic feeders. The intermittent discharge of sewage is likely to contain a low level of residual chlorine following treatment, but this is expected to have a minimal effect on seawater quality given the relatively low total discharge and taking into account dilution in the surface waters.

Based on the relatively small discharge volumes, high energy sea conditions and compliance with MARPOL 73/78 requirements, the potential impact of normal discharges from the vessels would remain of low intensity across the prospecting area over the short-term, and is considered to be of **VERY LOW** significance with or without mitigation.

Although the majority of solid waste would be transported to shore for disposal, certain non-toxic combustible wastes (e.g. galley waste) may be incinerated on the vessels, creating smoke (particulate matter) emissions. The volumes of solid waste that may be incinerated on board, and hence also the volumes of atmospheric emissions, would be minimal. The remainder of solid waste would be stored on board and then transported onshore for disposal on land, and consequently would have **no impact** on the marine environment. Waste containers would be transported to work boats for onward handling in port and removed by a waste contractor for disposal at a permitted landfill site. Recycling would occur on board and the solid waste would be sorted in separate containers before being taken to an appropriate onshore recycling facility. Specialist waste disposal contractors would dispose of hazardous waste.

Mitigation

Assuming compliance with the MARPOL 73/78 standards, the following additional mitigation is considered necessary:

- Undertake training and awareness of crew in spill management to minimise contamination.
- Low-toxicity biodegradable detergents and reusable absorbent cloths should be used in cleaning of all deck spillage.
- All hydraulic systems should be adequately maintained.
- Minimise the discharge of waste material should obvious attraction of marine fauna be observed.

TABLE 5-1: IMPACT OF NORMAL DISCHARGES ON MARINE FAUNA.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low	Low
Probability	Highly Probable	Highly Probable
Confidence	High	High
Consequence	Very Low	Very Low
Significance	**Very Low**	**VERY LOW**
Cumulative impact	None	None
Nature of cumulative impact	The nominal quantity of deck drainage that would enter the sea would not result in a cumulative impact.	
Degree to which impact can be reversed	Fully reversible - discharges would be quickly dispersed and diluted by the high wind and wave energy of the offshore sea environment.	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Very Low	

5.1.2 Noise from Survey/Sampling Vessel and Support Vessels

Impact description

The noise from the survey/sampling and/or support vessel(s) could result in localised disturbance of marine fauna (note: noise from the actual survey and sampling activities is assessed in Section 5.2).

Impact assessment

Noise from the prospecting vessels and/or support vessel(s) is likely to be no higher than those from other shipping vessels in the region. Underwater noise from these vessels is not considered to be of sufficient amplitude to cause direct harm to marine life.

The potential impact of noise generated by the vessels on marine fauna is considered to remain localised, of low intensity for the duration of the proposed prospecting operations (short-term). This impact therefore remains of **VERY LOW** significance with and without mitigation (see Table 5-2).

Mitigation measures

No measures are deemed necessary to mitigate noise impacts from survey/sampling and/or support vessel(s).

TABLE 5-2: IMPACT OF NOISE FROM SURVEY/SAMPLING AND SUPPORT VESSEL OPERATIONS.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low	Low
Probability	Probable	Probable
Confidence	Medium	Medium
Consequence	Very Low	Very Low
Significance	**Very Low**	**VERY LOW**
Cumulative impact	None	None
Nature of cumulative impact	Other vessels operating in the same area at the same time would result in a cumulative increased of noise. The associated cumulative impact is considered to be of LOW significance.	
Degree to which impact can be reversed	Fully reversible.	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Very Low	

5.2 IMPACT ON MARINE FAUNA

5.2.1 NOISE ASSOCIATED WITH GEOPHYSICAL SURVEYS AND SAMPLING ACTIVITIES

Description of impact

Potential impacts associated with the proposed geophysical surveys on marine fauna (mainly cetaceans) could include physiological injury and behavioural avoidance of the survey area. During sampling operations, the sampling tool of choice could generate underwater noise, which may have an impact on macrobenthic communities, fish and marine mammals in the area.

Impact assessment

The various geophysical survey techniques considered for prospecting are outlined in Section 3.4.1. The acoustic equipment to be utilised during the proposed geophysical surveys falls within the hearing range of most fish and marine mammals and, at sound levels of between 190 to 230 dB re 1 μPa at 1 m, will be audible for considerable distances (in the order of tens of km) before attenuating to below threshold levels of marine fauna.

Unlike the noise generated by deeper penetration low frequency airguns during seismic surveys, underwater noise emitted during the proposed geophysical surveys is not considered to be of sufficient amplitude to cause auditory or non-auditory trauma in marine fauna. It is anticipated that only within meters of the source (i.e. directly below the acoustic equipment) the sound pressure would be in the 230 dB range where exposure would result in trauma.

Similarly, the sound level generated by drilling and seabed crawler operations fall within the 120-190 dB re 1 μPa range at the sampling unit, with main frequencies between 3 – 10 Hz. Underwater noise from sampling operations may induce localised behavioural changes in some marine mammals, it is unlikely that such behavioural changes would impact on the wider ecosystem.

Noise sources from sampling activities would largely be stationary for the duration of the operations. As most pelagic species likely to be encountered are highly mobile, they would be expected to flee and move away from the either sound sources (geophysical survey vessel or sampling tool) before trauma could occur.

In light of the above, the impact of noise emissions from the proposed geophysical surveys on marine fauna is considered to be localised, short-term (for duration of survey i.e. weeks) and of medium intensity. The significance of the impact is considered of **VERY LOW** significance both without and with mitigation.

The impact of underwater noise generated during sampling operations is considered to be of low intensity in the target area and for the duration of the sampling campaign. Thus, the significance of the impact of underwater noise is considered of **VERY LOW** significance without and with mitigation.

Mitigation

No mitigation measures are possible, or considered necessary for the generation of noise by the sampling tools and vessels.

Despite the very low significance of potential impacts, the following mitigation measures, which been adapted from the Joint Nature Conservation Committee (JNCC) guidelines (2017) to be more applicable to the southern African situation, are recommended for the proposed geophysical surveys:

- A designated onboard Marine Mammal Observer (MMO) must ensure compliance with mitigation measures during geophysical surveying.
- The MMO should conduct visual scans for the presence of cetaceans around the survey vessel prior to the initiation of any acoustic impulses.
- Pre-survey scans should be of at least a 15-minute duration prior to the start of survey equipment.

- Where equipment permits, "soft starts" should be carried out for equipment with source levels greater than 210 dB re 1 µPa at 1 m over a period of 20 minutes to give adequate time for marine mammals to leave the vicinity. Where this is not possible, the equipment should be turned on and off over a 20 minute period to act as a warning signal and allow cetaceans to move away from the sound source.
- Terminate the survey if any marine mammals show affected behaviour within 500 m of the survey vessel or equipment until the mammal has vacated the area.
- Avoid planning geophysical surveys during the movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (beginning of June to end of November), and ensure that migration paths are not blocked by sonar operations.
- For the months of June and November ensure that Passive Acoustic Monitoring (PAM) is incorporated into any survey programme.

TABLE 5-3: IMPACT OF NOISE ASSOCIATED WITH THE GEOPHYSICAL SURVEYS

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Medium	Low
Duration	Short-term	Short-term
Intensity	Local	Local
Probability	Very Low	Very Low
Confidence	Probable	Probable
Consequence	**Very Low**	**VERY LOW**
Significance	Negative	Negative
Cumulative impact	Medium	Medium
Nature of cumulative impact	As seismic survey activities have recently been conducted in the area, some cumulative impacts could be anticipated. However, any direct impact is likely to be at individual level rather than at species level.	
Degree to which impact can be reversed	Fully reversible.	
Degree to which impact may cause irreplaceable loss of resources	Negligible	
Degree to which impact can be mitigated	Very Low	

TABLE 5-4: IMPACT OF NOISE ASSOCIATED WITH THE SAMPLING

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Low	Low
Duration	Short-term	Short-term
Intensity	Local	Local
Probability	Very Low	Very Low
Confidence	Definite	Definite
Consequence	**Very Low**	**VERY LOW**
Significance	Negative	Negative
Cumulative impact	High	High

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Nature of cumulative impact	None.	
Degree to which impact can be reversed	Fully reversible.	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	None.	

5.2.2 Crushing of Benthic Fauna and Sediment Removal

Description of impact

The proposed drill and bulk sampling operations are expected to result in the disturbance and loss of benthic fauna within the sampling footprint due to crushing (as a result of the drill frame structure or weight of the seabed crawler) and the removal of seafloor sediments (by the drill bit and crawler suction head).

Following the disturbance, the rate of ecological recovery would depend on the magnitude of the disturbance, the type of community that inhabits the sediments, the extent to which the community is naturally adapted to disturbance, the sediment character (grain size) that remains following the disturbance, and physical factors such as depth and exposure (waves, currents) of the habitat.

Assessment

The crushing and removal of sediment from the seafloor is anticipated to result in the mortality of a large proportion of the benthic infaunal and epifaunal biota within the sampling footprint. Information from previous mining operations has demonstrated that on the southern African continental shelf, natural rehabilitation of the seabed takes place subsequent to disturbances through a process involving influx of sediments and recruitment of invertebrates into previously disturbed areas. Recovery rates of impacted communities were observed to be variable and dependent on the approach, sediment influx rates and the influence of natural disturbances on succession communities. It is pointed out that the proposed drill and bulk sampling operations would takes place on a significantly smaller scale that the above-mentioned historic mining operations.

Results of on-going research (Parkins & Field 1998; Pulfrich & Penney 1999; Steffani 2012) on the southern African West Coast suggest that differences in biomass, biodiversity or community composition following mining below the wave base may endure beyond the medium term (6-15 years). However, other research suggests that the physical disturbance resulting from mining may be no more stressful than the regular naturally occurring anoxic events typical of the West Coast continental shelf area.

As the proposed sampling activities would be undertaken in depths beyond the wave base (>40 m), near-bottom sediment transport is expected to be less than in shallower waters affected by swell. Thus, the excavations may persist for extended periods (years) due to slow infill rates. Long-term or permanent changes in grain size characteristics of sediments in these areas may occur which could potentially result in a shift in benthic fauna community structure if the original community is unable to adapt to the new conditions. However, slumping of adjacent unconsolidated sediments into the excavations could occur over the very short-term. Although this may result in localised disturbance of macrofauna associated with these sediments and alteration of sediment structure, it also serves as a means of natural recovery of the sampled areas. It is further noted that the sampling footprints would be much smaller than that of the mining operations for which natural rehabilitation of the seabed has been demonstrated (as indicated above).

Furthermore, many of the macrofaunal species serve as a food source for demersal and epibenthic fish, cascade effects on higher order consumers may result. However, considering the available area of similar habitat on the continental shelf of the West Coast, this reduction in benthic biodiversity can be considered negligible and impacts on higher order consumers are thus unlikely.

The impact on the offshore benthos as a result of the removal of sediments during the sampling activities is considered to be of medium intensity within the sampling target areas. Recovery within the sampling footprints is expected to take place within the medium term, as the excavations would have slow infill rates and may persist for extended periods (years). Furthermore, biomass often remains reduced for several years as long-lived species like molluscs and echinoderms need longer to re-establish the natural age and size structure of the population. While the impact on the associated communities is unavoidable within the sampling footprints, it would be extremely localised with a total footprint of approximately 0.014 km^2, assuming all the anticipated samples are taken (which constitutes approximately 0.004% of the overall area of Sea Concession 14B, 15B and 17B). This impact is assessed to be of **LOW** significance with and without mitigation (see Table 5-5).

<u>Mitigation</u>

No direct mitigation measures are possible, or considered necessary for the indirect loss of benthic macrofauna due to crushing by the drill-frame structure and/or crawler. However, it is the following is recommended:

- Sampling activities of any kind should avoid rocky outcrop areas or other identified sensitive habitats in the concession areas; and
- Where possible, dynamically positioned sampling vessels are implemented in preference to vessels requiring anchorage.

TABLE 5-5: IMPACT OF CRUSHING AND SEDIMENT REMOVAL ON OFFSHORE BENTHIC COMMUNITIES

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Medium-term	Medium-term
Intensity	Medium	Medium
Probability	Definite	Definite
Confidence	High	High
Consequence	Low	Low
Significance	**Low**	**LOW**
Cumulative impact	Yes	Yes
Nature of cumulative impact	Previous sampling and mining activities have been undertaken by various companies of the West Coast of South Africa. However, as the cumulative area of disturbance is very small in relation to the total area of the Namaqua Bioregion (222 240 km^2), the cumulative impact of such sampling activities is considered to be of VERY LOW significance.	
Degree to which impact can be reversed	Partially reversible – The recovery of excavations through sediment influx and recolonisation will occur over the medium term.	
Degree to which impact may cause irreplaceable loss of resources	Negligible considering the total surface area of seabed affected.	
Degree to which impact can be mitigated	No possible mitigation identified.	

5.2.3 Generation of Sediment Plumes

Description of impact

As part of the sampling operations, the seabed sediments are pumped to the surface and discharged onto sorting screens on the sampling vessel for screening. The unwanted material is discarded overboard from where the heavy portion settles on the seafloor in the excavated areas and the finer portion forms a suspended sediment plume in the water column which dissipates with time. The remaining material is mixed with a high density ferrosilicon (FeSi) slurry and pumped under pressure into a Dense Medium Separation (DMS) plant resulting in a high density concentrate. The majority of the ferrosilicon is magnetically recovered for re-use in the DMS plant and the fine tailings (2 mm) from the DMS process are similarly deposited overboard. This finer material would also generate suspended sediment plumes in the water column.

The main effect of sediment plumes is an increase in water column turbidity, leading to a reduction in light penetration with potential adverse effects on the photosynthetic capability of phytoplankton. Other potential impacts include inhibiting pelagic visual predators due to poor visibility, egg and/or larval development impairment and reduction of benthic bivalve filter-feeding efficiencies. Negative impacts may also occur when heavy metals or contaminants associated with fine sediments are remobilised.

Assessment

As set out in Section 4.1.2.8, the total suspended Particulate Inorganic Matter (PIM) off Namaqualand (particularly in nearshore waters) is strongly related to natural inputs from the Orange River or from 'berg' wind events. These natural concentrations are naturally increased under stronger wave conditions associated with high tides and storms, or under flood conditions. Mean sediment deposition is naturally higher near the seafloor due to constant re-suspension of coarse and fine PIM by tides and wind-induced waves. Thus, there is a natural variation in turbidity and sediment load within the waters off the West Coast.

From previous offshore sampling operations, it has been observed that the suspended sediments in plumes settle fairly rapidly (within hours) and results from water sampling confirmed that contaminant levels in the plumes are well below water quality guideline levels (Carter 2008).

Given that the marine environment within the Sea Concession areas is naturally exposed to large variations in turbidity and sediment load and that possible contaminant levels of the plumes are below water quality guideline levels, the impact of suspended sediment plumes in the water column are deemed to be of low intensity, persist only over the short-term, and would be extremely localised around the sampling vessel. This impact is assessed to be of **VERY LOW** significance (see Table 5-6).

Mitigation

No mitigation measures are possible, or considered necessary for the discharge of material from the sampling vessel.

TABLE 5-6: IMPACT OF THE GENERATION OF SUSPENDED SEDIMENT PLUMES

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	No mitigation is proposed for this impact.
Duration	Short-term	
Intensity	Low	
Probability	Definite	
Confidence	High	
Consequence	Very Low	
Significance	**Very Low**	

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Cumulative impact	Yes	
Nature of cumulative impact	Other activities that may result in the generation of sediment plumes and contribute to the cumulative impact on the marine environment include other prospecting, mining, production projects, and other fishing activities. As sediment plumes are very localised and persist for short durations for such activities, the cumulative impact over the large Namaqua bioregion is considered to be VERY LOW.	
Degree to which impact can be reversed	Fully Reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Very Low	

5.2.4 Smothering of Benthos by Redepositing Sediments

Description of impact

As mentioned above, the over-sized material and processed sediments are discarded overboard and settle back onto the seabed largely beneath the vessel within the previously excavated area. However, some of the material could fall onto areas outside of the sampling footprints, where they could result in smothering of benthic communities on the seafloor.

Assessment

Smothering-related impacts on benthic communities involve physical crushing, a reduction in nutrients and oxygen, clogging of feeding apparatus, as well as affecting choice of settlement site, and post-settlement survival. Generally, rapid deposition of coarser material is likely to have more of an impact on the soft-bottom benthic community than gradual sedimentation of fine sediments to which benthic organisms are adapted and able to respond. In contrast, sedentary communities may be adversely affected by both rapid and gradual deposition of sediment.

Of greater concern is that sediments discarded during sampling operations may impact rocky-outcrop communities potentially located adjacent to sampling target areas and potentially hosting sensitive deep-water coral communities. Within the sampling target areas, such communities would be expected in the Namaqua Inshore Hard Ground habitat (see Figure 4-6). As deep-water corals tend to occur in areas with low sedimentation rates, these benthic suspension-feeders and their associated faunal communities are likely to show particular sensitivity to increased turbidity and sediment deposition associated with tailings discharges.

Discarding of excess sediment may result in limited smothering effects on the seabed. However, considering the available area of unconsolidated seabed habitat, the reduction in biodiversity of macrofauna can be considered negligible. The impacts would be of low intensity but highly localised and short-term, as recolonization would occur rapidly. The potential impact of smothering on communities in unconsolidated habitats is consequently deemed to be of **VERY LOW** significance (see Table 5-7).

In the case of rocky-outcrop communities, impacts would be of medium intensity and highly localised, but potentially enduring over the medium-term due to the slow recovery rates of these communities. The potential impact of smothering on rocky-outcrop communities is consequently deemed to be of **Medium** significance without mitigation. If the rocky-outcrop areas are avoided during sampling, there would be no direct impact, however the tailings plume may still result in possible smothering impacts should any such communities be located in proximity to sampling areas. This is deemed to be of **LOW** significance (see Table 5-8).

Mitigation

No mitigation measures are possible, or considered necessary for the loss of macrobenthos due to smothering of unconsolidated seabed habitats. However, the following is recommended:

- Sampling activities of any kind should avoid rocky outcrop areas or other identified sensitive habitats in the concession area;
- Use should be made of geophysical data to conduct a pre-sampling geohazard analysis of the seabed, and near-surface substratum to map potentially vulnerable habitats and prevent potential conflict with the sampling targets; and
- A buffer zone of 150 m will be established around any identified sensitive communities or rocky-outcrop areas.

TABLE 5-7: SMOTHERING OF SOFT-SEDIMENT MACROFAUNA

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low	Low
Probability	Probable	Probable
Confidence	High	High
Consequence	Very Low	Very Low
Significance	**Very Low**	**VERY LOW**
Cumulative impact	Yes	Yes
Nature of cumulative impact	Activities that may contribute to the cumulative impact of smothering soft-sediment macrofauna largely include prospecting, mining, exploration and/or production projects. As these activities would have a localised low intensity impact and as such effects are expected to be small in comparison to natural infill resulting from the deposition of sediment discharged by the Orange River, the cumulative impact is considered to be of LOW significance.	
Degree to which impact can be reversed	Fully Reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Very Low	

TABLE 5-8: SMOTHERING OF ROCKY-OUTCROP COMMUNITIES

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Medium-term	Medium-term

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Intensity	High	Medium
Probability	Probable	Possible
Confidence	High	High
Consequence	Medium	Low
Significance	**Medium**	**LOW**
Cumulative impact	Yes	Yes
Nature of cumulative impact	As mentioned above, other activities may contribute to the cumulative impact of smothering. However, as the effects are anticipated to be small in comparison to the natural infill of sediment discharged by the Orange River, the cumulative impact is considered to be of LOW significance.	
Degree to which impact can be reversed	Partially Reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Medium	

5.3 IMPACT ON OTHER USERS OF THE SEA

5.3.1 Potential Impact on Fishing Industry

5.3.1.1 Exclusion of Fishing and Research Operations

<u>Description of impact</u>

While the sampling vessels are operational at a given location, a temporary 500 m operational safety zone around the unit would be in force, i.e. no other vessels (except the support vessels) may enter this area. A vessel conducting sampling operations would typically operate on a 3 or 4 anchor spread with unlit anchor mooring buoys. For the duration of sampling operations a coastal navigational warning would be issued by the South African Navy Hydrographic Office (SANHO) requesting a 2 nautical mile clearance from the sampling vessel.

The safety zones aim to ensure the safety both of navigation and of the sampling vessel, avoiding or reducing the probability of accidents caused by the interaction of fishing boats and gears and the vessel. The exclusion of vessels from entering the safety zone around the sampling vessel would pose a direct impact to fishing operations in the form of loss of access to fishing grounds where overlap occurs.

<u>Assessment</u>

The extent of commercial fishing in and around the Sea Concession areas is described in detail in Section 4.1.4.1. Based on the assessment undertaken by the fisheries specialist, the proposed prospecting operations are expected to have **NO IMPACT** on the following sectors:

- *<u>Demersal trawl</u>*: There is no spatial overlap of the Sea Concession Areas with fishing grounds of the demersal trawl sector.
- *<u>Large pelagic (Tuna longline)</u>:* The typical fishing areas (located approximately 80 km offshore of the sea concession areas) of the Large pelagic (Tuna longline) sector.

- *Demersal longline:* The Sea Concession areas are not located in priority fishing areas for hake. Fishing activity reported between 2000 and 2017 shows minimal amounts of fishing activity within the Sea Concessions amounting to 23 000 hooks (or two set lines) per year resulting in 5.1 tons of hake catch. This is equivalent to 0.06% of the overall national catch landed by the sector. Given the limited fishing activity within the Sea Concession areas, as well the very short-term duration of the proposed prospecting activities there is unlikely to be any temporal overlap between the prospecting and demersal longline fishing in the Sea Concession areas. However, it is noted that the Sea Concession areas do overlap with spawning and recruitment areas for hake and other demersal species.

The potential impacts on the remaining fisheries are described and assessed below.

Small pelagic purse-seine

This fishery is a highly variable fishery centred in the Saldanha Bay, St Helena Bay and Lamberts Bay areas. The Sea Concession areas are adjacent to the main landing points of the fishery from which a significant fleet of purse seine vessels operate. Further, the seasonal nature of the fishery means that fishing in the St Helena Bay area and northwards will occur and interaction / avoidance of the fishery with the prospecting operation can be expected.

The Sea Concessions overlap fishing grids 2902, 3912 and 3922 where, over the period 2000 to 2016, an average of 1 267 hours of fishing activity (613 fishing events) per year were recorded. Catch within the area amounted to an average of 24 242 t per year and comprised predominantly anchovy (92%). The remainder of the catch species included sardine (5%), redeye round herring (2%) and juvenile horse mackerel (1%). Catch and effort figures within the Sea Concessions were equivalent to 5.6% and 6.1%, respectively, of the overall figures reported for the small pelagic purse-seine fishery at a national level.

Traditional linefish (which might include elements of the Small Scale Fisheries)

Lambert's Bay is the closest landing point and fishing activity could be expected in waters shallower than 100 m across all three concession areas. Records over the period 2017 to 2019 indicate that fishing activity within the area occurs year-round and that catches are primarily snoek and hottentot with minimal amounts of yellowtail. Over the period 2017 to 2019, an average catch of 25.2 t per year was reported for the landing points adjacent to the concession areas, namely Eland's Bay, Steenbokfontein/Vaalklip, Deurspring, Rooiduin Point/Donkin Bay, Groot Hoek Bay and Doring Bay. This is equivalent to ~ 0.5% of the overall national landings of the sector.

Tuna pole

Although fishing grounds for albacore occur primarily offshore of the concession areas, approximately 100 km south-west of concession 17B, snoek-directed fishing takes place within all three concession areas. Over the period 2017 to 2019, an average of 8 fishing events per year were reported within the concession areas with a catch of 13.3 t of snoek and 1.7 t of albacore. This is equivalent to 0.1% and 1.9% of the total landings of albacore and snoek, respectively, by the sector (nationally) over this period. Fishing activity within the area was only reported over the months April and May and there is therefore a strong seasonal pattern to the inshore snoek-directed fishing activity within the area.

West Coast rock lobster

The commercial offshore sector operates at a depth range of approximately 30 m to 100 m whereas the nearshore nearshore sector targets lobster at discrete suitable reef areas along the shore at a water depth of up to 15 – 30 m. The concession areas fall within Zone B and include Management Area 3 (Doring/Lamberts Bay), Subareas 1-3 and Management Area 4 (Eland's Bay), Subareas 1-2. Over the period 2006 to 2017 the offshore sector set an average of 10706 traps per year within the area, yielding 82 t of lobster. The near-shore sector set 7220 traps per year in the area yielding 59 t of lobster. Fishing activity for both nearshore and offshore sectors within Management areas 3 and 4 is restricted to the period 15 November to 15 March.

Netfish

The gillnet fishery targets mullet using surface-set nets and bottom-set gillnets are used to target St Joseph shark in waters shallower than 50 m. Beach-seining is an active form of fishing in which woven nylon nets are rowed out into the surf zone to encircle a shoal of fish. Sea Areas 14B and 15B fall within Netfish Management Area C and Sea Area 17B coincides with Netfish Management Area D. Of a total of 162 right holders, 5 beach-seine and 14 gill-net rights holders operate within Management Areas C and D. The range of gillnets (50 m) and that of beach-seine activity (20 m) may overlap with that of the concession areas.

Seaweed

Although the concession areas are adjacent to the Kelp collection areas 12 and 13, currently only beach-cast kelp has been collected within these areas. Since there has been no dive-based harvesting of kelp over the period 2000 to 2017, disruption to the collection of kelp is considered unlikely.

Fisheries research

Both demersal research trawls and acoustic surveys could be affected by exclusion from Sea Concession 14B, 15B and 17B. Demersal surveys are random depth-stratified and adaptable and occasionally trawls have been recorded within the concession areas at a depth range of between 50 m and 95 m; however this area is not regularly surveyed with, at most, one trawl per year. The nature of the random selection of survey trawl sites is such that if a selected sampling station coincided with an exclusion area, an alternative survey area could be randomly selected. Acoustic transects are pre-determined and liaison between DFFE and the client would be necessary in order to avoid disruption to acoustic survey activity which does regularly pass through the concession areas with an average of six transects per research cruise.

The potential impact of the proposed sampling activities on the above-mentioned fisheries would be of local extent, short-term and of medium intensity. The significance of impact is thus considered to be **VERY LOW** with and without mitigation (see Table 5-9).

Mitigation

The mitigation measures listed below are unlikely to reduce the significance of potential impacts, but they would minimise disruptions to prospecting and fishing / research operations.

- The most effective means of mitigation would be to ensure that the proposed activities do not coincide with peak fishing periods of the small pelagic purse-seine sector. It is recommended that survey and sampling activities be carried out between November and February at a time when the small pelagic sector normally stops operations. Linefish operations also have a seasonal signal mostly driven by the availability of snoek in the winter period. Therefore the mitigation of possible impacts to the linefish fishery by undertaking the surveys in the November to February periods coincides with the small pelagic mitigation option. The lobster fishery operates within the area over the catch period 15 November to 15 March therefore timing survey operations outside this catch period would reduce the impact on the sector.
- It is recommended that prior to the commencement of the proposed activities, BPT127 consult with the small pelagic fishing sector on fishery operational status to minimise potential operational impacts to the fishery.
- Prior to the commencement of the proposed prospecting activities the following key stakeholders should be notified of the proposed activities (including navigational co-ordinates of the survey/sampling areas, timing and duration of proposed activities) and the likely implications thereof:
  - Fishing industry / associations (these include South African Small Pelagic Fishing Industry Association, South African Tuna Association, Fresh Tuna Exporters Association, South African Commercial Linefish Association, South African Hake Longline Association, South African Deepsea Trawling Industry Association, FishSA the West Coast Rock Lobster Association and the National SMME Fishing Forum);

  - Other: DFFE, South African Maritime Safety Authority (SAMSA), South African Navy (SAN) Hydrographic office, overlapping and neighbouring exploration right holders and applicants, and Transnet National Ports Authority (ports of Cape Town and Saldanha Bay); and
  - Representatives of small-scale local fishing co-operatives.
- The required safety zones around the prospecting vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office;
- The SAN Hydrographic office should be notified when the programme is complete so that the Navigational Warning can be cancelled;
- Any fishing vessel targets at a radar range of 12 nautical miles from the sampling vessel should be called via radio and informed of the navigational safety requirements; and
- Affected parties should be notified through fishing industry bodies when the programme is complete.

TABLE 5-9: ASSESSMENT OF THE POTENTIAL IMPACT RELATING TO FISHERIES.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Medium	Low
Probability	Probable	Probable
Confidence	Medium	Medium
Consequence	Very Low	Very Low
Significance	**Very Low**	**VERY LOW**
Cumulative impact	No	No
Nature of cumulative impact	N/A	
Degree to which impact can be reversed	Fully reversible	
Degree to which impact may cause irreplaceable loss of resources	Negligible	
Degree to which impact can be mitigated	Medium Very Low (Traditional Line-Fish and Small-scale fisheries)	

5.3.1.2 Impact of Sediment Plume on Fish Stock Recruitment

Description of impact

The proposed bulk sampling operations would entail the excavation of trenches, which would not be contiguous, but located in the prospective areas derived from the drill sampling results. The overall disturbance footprint in each concession would be 3.6 ha and 18 ha for all the concessions.

The sampled seabed sediments are pumped to the surface and discharged onto sorting screens on the sampling vessel. The screens separate the fine sandy silt and large gravel, cobbles and boulders from the size fraction of interest, the ‘plantfeed’ (usually 2 - 20 mm). The fine sediments are immediately discarded overboard where they form a suspended sediment plume in the water column which dissipates with time. The ‘plantfeed’ is mixed with high density ferrosilicon (FeSi) slurry and pumped under pressure into a Dense Medium Separation (DMS) plant resulting in a high density concentrate. The majority of the ferrosilicon is magnetically recovered for re-use in the DMS plant and the fine tailings (-2 mm) from the DMS process are similarly deposited overboard. Furthermore, fine sediment re-suspension by the sampling tools will generate suspended sediment plumes near the seabed. The main effect of plumes is an increase in water column turbidity. The relevance of this in terms of effects on fisheries is the potential impairment of egg and/or larval development through high sediment loading in the water column. This in turn could have an impact on fish stock recruitment.

Assessment

Typically fisheries stock recruitment is highly variable spatially and temporally. Spawning and recruitment of small pelagic species, as well as of many demersal species, occurs primarily well to the south of the Sea Concession areas.

The spawn products from these fisheries typically drift northwards with the prevailing Benguela Current and larval development mainly occurs nearshore and in bays along the West Coast of South Africa, referred to as nursery areas. These areas provide a suitable niche for development of juveniles of these species. Most of the species potentially impacted are broadcast spawners, with large volumes of spawn products being dispersed over large areas. This would apply equally, for example, to west coast rock lobster, hake, anchovy and sardine.

Sea Concession 14B, 15B and 17B is situated inshore of the 100 m depth contour. Relative to the location of the nursery areas, the sediment plumes generated during benthic sampling would be predominantly dispersed northwards of the nursery areas. Whereas sediment plumes would result in a negative impact on stock recruitment, the impact on fish recruitment is considered to be of very low consequence and of overall **VERY LOW** significance due to the localised nature of the proposed sampling events in relation to fish nursery areas (see Table 5-10).

TABLE 5-10: ASSESSMENT OF THE POTENTIAL IMPACT ON FISH STOCK RECRUITMENT DUE TO SEDIMENT PLUMES.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Medium	Medium
Probability	Improbable	Improbable
Confidence	Medium	Medium
Consequence	Very Low	Very Low
Significance	**Very Low**	**VERY LOW**
Cumulative impact	No	No
Nature of cumulative impact	None.	
Degree to which impact can be reversed	Fully reversible	
Degree to which impact may cause irreplaceable loss of resources	Negligible	
Degree to which impact can be mitigated	None	

5.3.2 Acoustic Impacts of Geophysical Surveying on Fisheries

Description of impact

The ocean is a naturally noisy place and marine animals are continually subjected to both physically produced sounds from sources such as wind, rainfall and breaking waves or biologically produced sounds generated during reproductive displays, territorial defence, feeding, or in echolocation. Such acoustic cues are thought to be important to many marine animals in the perception of their environment as well as for navigation purposes, predator avoidance, and in mediating social and reproductive behaviour.

Anthropogenic sound sources in the ocean may thus interfere directly or indirectly with such activities. Of all human-generated sound sources, the most persistent in the ocean is the noise of shipping. Depending on size and speed, the sound levels radiating from vessels range from 160 to 220 dB re 1 µPa at 1 m.

As most pelagic species likely to be encountered within the concessions are highly mobile, they would be expected to flee and move away from the sound source before trauma could occur. This in turn could affect the overall catch rates of fisheries operating within the Sea Concession areas.

Assessment

No mitigation measures are possible, or considered necessary for the generation of noise by the geophysical surveys and vessels. The effects of geophysical surveys on catchability of fish is considered to be localised, short-term (for duration of survey i.e. weeks) and of medium intensity. The significance of the impact is considered to be **VERY LOW** (see Table 5-11).

Mitigation

No mitigation measures are possible, or considered necessary for this impact.

TABLE 5-11: ASSESSMENT OF THE IMPACTS OF MULTI-BEAM AND SUB-BOTTOM PROFILING SONAR ON CATCHABILITY OF FISH

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low	Low
Probability	Probable	Improbable
Confidence	High	High
Consequence	Very Low	Very Low
Significance	**Very Low**	**VERY LOW**
Cumulative impact	Yes	Yes
Nature of cumulative impact	N/A	
Degree to which impact can be reversed	Fully reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Very Low	

5.3.3 Potential Impact on Other Marine Prospecting / Mining Operations

Description of impact

The presence of the sampling vessel(s) could interfere with other marine mining or prospecting operations in the neighbouring concession areas.

Assessment

Offshore mining/prospecting operations are predominately active to the north of Sea Concessions 14B, 15B & 17B. Diver-assisted diamond mining is concentrated around Port Nolloth and Alexander Bay and typically confined to the inshore areas in the A-concession areas, in depths less than 20 m. Further offshore, BPT 127 are undertaking mining operations in Sea Concessions 2C and 3C, respectively, while De Beers hold a prospecting rights for Sea Concessions 4C – 6C. Trans Hex undertake shallow water operations based at De Punt and Port Nolloth using contracted sea vessels, shallow water shore-units and beach-mining units. The majority of these contractors are derived from the surrounding local communities, with the vessels based at Lamberts Bay, Doring Bay, Hondeklip Bay and Kleinzee.

No activities are currently taking place in the 'D' concession areas, located to the west of the study area.

As the Sea Concession areas do not overlap with any other marine mining operations, the impact of the planned prospecting operations on other mining activities would be localised, in the short term and of low intensity. The significance of impact is consequently **INSIGNIFICANT** with or without mitigation (see Table 5-12).

Mitigation

- Contact any companies undertaking marine prospecting or mining activities within the study area prior to prospecting in order to notify them of the planned activities.

TABLE 5-12: ASSESSMENT OF THE POTENTIAL IMPACT ON MARINE PROSPECTING / MINING.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low	Low
Probability	Improbable	Improbable
Confidence	High	High
Consequence	Very Low	Very Low
Significance	**Insignificant**	**INSIGNIFICANT**
Cumulative impact	None	None
Nature of cumulative impact	No cumulative impacts are anticipated	
Degree to which impact can be reversed	Fully reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Very Low	

5.3.4 Potential Impact on Petroleum Exploration and Production

Description of impact

The proposed prospecting activities could affect petroleum exploration and future production activities, that overlap with the concession areas, and vice versa.

Assessment

The Sea Concession areas overlaps with Block 3A/4A held by the Petroleum Oil and Gas Corporation of South Africa (Pty) Ltd (PetroSA) (refer to Figure 4-26 in Section 4). The proposed sampling activities could affect and disrupt activities in this block if the activities occur coincidentally in the same area. However, the likelihood of this happening is low.

The impact on petroleum exploration would be localised, short term and of low to medium intensity. The significance of impact is consequently very low to low, without mitigation and **VERY LOW** with mitigation (see Table 5-13).

Mitigation

- Notify PetroSA and their contractors, as well as any other neighbouring petroleum exploration rights holders, prior to the commencement of activities; and
- Liaise with PetroSA and any overlapping mineral prospecting rights holders to ensure that there is no overlapping of activities in the same area over the same time period.

TABLE 5-13: ASSESSMENT OF THE POTENTIAL IMPACT ON PETROLEUM EXPLORATION ACTIVITIES.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low to Medium	Low
Probability	Probable	Probable
Confidence	High	High
Consequence	Very Low to Low	Very Low
Significance	**Very Low to Low**	**VERY LOW**
Cumulative impact	No	No
Nature of cumulative impact	No cumulative impacts are expected.	
Degree to which impact can be reversed	Fully reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Low	

5.3.5 Potential Impact on Marine Transport Routes

Description of impact

The presence of the sampling vessel(s) could interfere with shipping in the area.

Assessment

The majority of shipping traffic is located on the outer edge of the continental shelf, to the west of the concession areas. However there is also a high density of vessel traffic traversing the coast between Lamberts Bay and St Helena Bay. This partially overlaps with Sea Concessions 15B and 17B. The inshore traffic of the continental shelf along the West Coast is largely comprised of fishing and mining vessels. (see Figure 4-24).

While it is unlikely that shipping transport routes would be affected by the proposed prospecting activities, interaction with other vessels is possible. The impact on shipping traffic is considered to be localised, of low intensity in the short-term. The significance of this impact is therefore assessed to be **INSIGNIFICANT** with and without mitigation (Table 5-14).

Mitigation

- Prior to the commencement of activities, the vessel operator must notify relevant bodies including: DMRE, DEFF, SAMSA, the SAN Hydrographic Office and relevant Port Captains, providing the navigational coordinates of the prospecting areas;
- The prospecting vessel(s) must be certified for seaworthiness through an appropriate internationally recognised marine certification programme (e.g. Lloyds Register, Det Norske Veritas). The certification, as well as existing safety standards, requires that safety precautions should be taken to minimise the possibility of an offshore accident. Collision prevention equipment should include radar, multi-frequency radio, foghorns, etc. Safety equipment and training of personnel to ensure the safety and survival of the crew in the event of an accident is a further legal requirement; and
- A Notice to Mariners should provide the co-ordinates of the prospecting areas.

TABLE 5-14: ASSESSMENT OF INTERFERENCE WITH MARINE TRANSPORT ROUTES

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low	Low
Probability	Improbable	Improbable
Confidence	High	High
Consequence	Very Low	Very Low
Significance	**Insignificant**	**INSIGNIFICANT**
Cumulative impact	No	No
Nature of cumulative impact	No cumulative impacts are expected.	
Degree to which impact can be reversed	Fully reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	Very Low	

5.4 SOCIO-ECONOMIC IMPACT

5.4.1 Impact on Cultural Heritage Material

Description of impact

The proposed drill and bulk sampling activities could disturb cultural heritage material on the seabed, such as palaeontological and historical shipwrecks.

Assessment

As noted in Section 4.1.4.6, there is potential for archaeological material to be located on palaeo-landsurfaces within seabed sediments and in association with now submerged palaeo-channels. Although no geophysical data for the concession areas are available it is also likely that the rivers that presently debouch into the sea along the stretch of coastline adjacent to the concession areas will have palaeo-channels which extend offshore across the present seabed of the concession areas. The relatively small footprint of the proposed sampling activities means that the potential for interaction with or impact on submerged prehistoric archaeological material in the concession areas will be small.

The likelihood of disturbing a shipwreck is expected to be very small considering the vast size of the South African offshore area. In the area under consideration, there are at least three vessels that could possibly have been wrecked in the vicinity of the concession area (see Section 4.1.4.6). However, the precise location of these wrecks is unknown. In the event that a shipwreck site is disturbed during sampling activities, the impact would be at the national level, permanent and of high intensity. The significance of impact is consequently **Medium**, without mitigation. With the implementation of mitigation, shipwreck sites can be largely avoided and if sampling is terminated in the unlikely event of encountering a shipwreck, the impact is regarded as **INSIGNIFICANT** (see Table 5-15).

Mitigation

- Areas where shipwreck sites are identified during geophysical surveys must be excluded prior to undertaking sampling activities.
- It is recommended that the onboard BPT127 representative must undergo a short induction on archaeological site and artefact recognition, as well as the procedure to follow should archaeological material be encountered during sampling.
- The contractor must be notified that archaeological sites could be exposed during drill and bulk sampling activities, as well as the procedure to follow should archaeological material be encountered.
- If shipwreck material is encountered during the course of bulk sampling in the concession area, the following mitigation measure should be applied:
  - Cease work in the directly affected area to avoid damage to the wreck until the South African Heritage Resources Agency (SAHRA) has been notified and the contractor/BPT127 has complied with any additional mitigation as specified by SAHRA; and
  - Where possible, take photographs of them, noting the date, time, location and types of artefacts found. Under no circumstances may any artefacts be removed, destroyed or interfered on the site, unless under permit from SAHRA.
- The possibility of realising core log information and samples of the coarser fraction (i.e. gravel and stone between 20 mm and 150 mm) of sorted seabed sediment for assessment by an archaeologist for the presence of prehistoric lithic material should be considered by BPT127.

TABLE 5-15: ASSESSMENT OF POTENTIAL IMPACT ON PALAEONTOLOGICAL MATERIAL AND SHIPWRECKS

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	National	National
Duration	Short-term	Short-term
Intensity	Medium	Low
Probability	Improbable	Improbable
Confidence	High	High
Consequence	Medium	Low
Significance	**Medium**	**INSIGNIFICANT**
Cumulative impact	No	No
Nature of cumulative impact	No cumulative impacts are expected.	
Degree to which impact can be reversed	Irreversible	
Degree to which impact may cause irreplaceable loss of resources	Medium	
Degree to which impact can be mitigated	High	

5.4.2 Impact Related to Job Creation and Business Opportunities

Description of impact

The proposed project would create a small number of local employment and business opportunities. Direct revenues would be generated as a result of the proposed prospecting activities. Revenue generating activities are related to the actual prospecting operations and include refuelling, vessel / gear repair, port dues, hire of support vessel(s).

Assessment

Offshore prospecting is highly technical and requires specialised vessels and crews. Thus job opportunities during the activities would be limited. There would, however, be opportunities for local companies to provide support services during the course of operations, e.g. vessel supplies, support vessels, etc.

The overall positive impact of job creation and the generation of direct revenues are considered to be local in extent and of low intensity over the short-term. Thus the potential impact of job creation is considered to be ***LOW (positive)*** with and without mitigation (see Table 5-16). Should the prospecting operations be successful, future job creation and business opportunities would arise where the operations advance to mining (which would require a separate application for environmental authorisation).

Mitigation

The use of local companies for support services should be promoted as far as possible.

TABLE 5-16: IMPACT OF JOB CREATION AND THE GENERATION OF DIRECT REVENUES.

RATING SCALES	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Short-term	Short-term
Intensity	Low	Low

RATING SCALES	WITHOUT MITIGATION	WITH MITIGATION
Consequence	Very Low	Very Low
Significance	***Very Low***	***VERY LOW***
Status	Positive	Positive
Probability	Probable	Probable
Confidence	Medium	Medium
Cumulative impact	Yes	Yes
Nature of cumulative impact	Other activities that may contribute to the cumulative impact of job creation and the generation of direct revenues include other exploration and mining activities off the coast of South Africa. As there are relatively few of these other activities currently being undertaken off the West Coast, the cumulative impact is considered to be of LOW (positive) significance.	
Degree to which impact can be reversed	Fully reversible	
Degree to which impact may cause irreplaceable loss of resources	N/A	
Degree to which impact can be mitigated	None	

5.5 NO-GO ALTERNATIVE

Description of impact

The implications of not going ahead with the proposed prospecting operations are as follows:

- Loss of opportunity to establish whether or not a viable offshore diamond resource exists off the West Coast of South Africa;
- Prevention of any socio-economic benefits associated with the continuation of prospecting activities; and
- Lost economic opportunities.

Assessment

The potential impact related to the lost opportunity to further delineate the offshore diamond resource on the west coast and maximise the use of South Africa's own resources is considered to be of **LOW** significance (see Table 5-17). The positive implications on the no-go option are that there would be no effects on the biophysical environment in the area proposed for the prospecting activities.

TABLE 5-17: ASSESSMENT OF IMPACT RELATED TO NO-GO ALTERNATIVE.

CRITERIA	WITHOUT MITIGATION
Extent	Regional
Duration	Permanent
Intensity	Low
Probability	Improbable
Confidence	Low
Consequence	Medium
Significance	**LOW**
Cumulative impact	Yes
Nature of cumulative impact	Potential loss of opportunity to expand South Africa's own mineral resources.

CRITERIA	WITHOUT MITIGATION
Degree to which impact can be reversed	Reversible
Degree to which impact may cause irreplaceable loss of resources	N/A
Degree to which impact can be mitigated	N/A

5.6 CUMULATIVE IMPACTS

Description of impact

Historical and future prospecting/mining activities, together with trawl fisheries and hydrocarbon exploration activities in the West Coast offshore has had and will continue to have an impact on benthic faunal communities. Impacts on benthic faunal communities include physical disturbance of the seabed and discharges to the benthic environment.

Assessment

The primary impacts associated with the geophysical surveying and sediment sampling in the Namaqua Bioregion on the West Coast of South Africa, relate to cumulative anthropogenic noise, physical disturbance of the seabed, discharges of tailings to the benthic environment, and associated vessel presence.

In addition to the proposed prospecting operations in Sea Concessions 14B, 15B and 17B, BPT127 have also submitted applications for Prospecting Rights to undertake the same offshore prospecting activities (i.e. geophysical surveys, drill sampling and bulk sampling) in Sea Concessions 13C, 15C, 16C, 17C and 18C. A separate EIA process has been conducted for the activities in these Sea Concession areas.

With respect to noise emissions from the proposed geophysical surveys, as the same vessel would be used for the planned geophysical surveys in the above-mentioned B- and C-Concession areas, the surveys would only take place in any one location at a time. Nevertheless, considering the number of seismic surveys recently conducted in the general project area, some cumulative impacts could be anticipated. Should there be surveys that overlap temporally, the intensity of the associated noise impacts would likely be of higher intensity, for the duration of the surveys over the combined extent of the survey areas. As pointed out in Section 5.2.1, the noise generated during the proposed geophysical surveys is only likely to cause auditory or non-auditory trauma in marine fauna within a few meters of the source (i.e. directly below the acoustic equipment). Thus, any direct noise impact on marine fauna is likely to be at individual level rather than at species level.

With respect to the sampling operations, the cumulative footprint of all the prospecting operations proposed by BPT127 would be approximately <0.34 km^2 in the Namaqua Bioregion, which can be considered an insignificant percentage of the Southern Benguela Shelf ecoregion as a whole. It is pointed out that the decision to undertake bulk sampling would be determined following analysis of the drill samples and development of the inferred resource model (i.e. bulk sampling may not take place should the results not be favourable).

The disturbance footprint associated with BPT127 operations would be in addition to, amongst other disturbances, the development of hydrocarbon wells and other existing prospecting and mining operations located in the vicinity of the Sea Concession areas. Detailed information regarding the total cumulative disturbance footprints of these existing prospecting and mining operations are not available to inform this assessment.

As noted in Section 5.3.1, the commercial fishing sectors which could be impacted upon by the proposed prospecting operations are small pelagic purse-seine, traditional linefish and small-scale fisheries. In addition, the concession areas fall within 'Basket A' as set out in the Small-Scale Fishery policy. For the duration of sampling operations a coastal navigational warning would be issued by the South African Navy Hydrographic Office (SANHO) requesting a 2 nautical mile clearance from the prospecting vessel. The exclusion of fishing vessels from entering the safety zone around the prospecting vessel would pose a direct impact to fishing operations in the form of loss of access to fishing grounds where overlap occurs spatially, as well as temporarily (i.e. where the fishing activity takes place at the same time as the proposed prospecting operations). However, as fishing vessels would be able to undertake fishing activities at the same time as the prospecting operations anywhere else within the Sea Concession area outside of the above-mentioned safety zone the likelihood of such spatial and temporal overlaps is considered to be very low. Especially in light of the very short duration of the proposed prospecting operations.

With respect to the development of hydrocarbon wells approximately 40 wells have been drilled in the Namaqua Bioregion since 1976. The majority of these occur in the iBhubesi Gas field in Block 2A well to the north and offshore of concession 14B, 15B and 17B. Prior to 1983, technology was not available to remove wellheads from the seafloor. Of the approximately 40 wells drilled on the West Coast, 35 wellheads remain on the seabed. The total area impacted by 40 petroleum exploration wells is estimated at around 10 km^2, or 0.038% of the Namaqua bioregion. Cumulative impacts from other hydrocarbon ventures in the area are likely to increase in future, particularly with the planned development of the iBhubesi Gas Field. Further exploratory drilling has also been proposed in Block 2B.

When considering the above collectively, and the fact that the proposed bulk sampling activities would be highly localised and of short-term duration, the cumulative impact as a result of the proposed prospecting activities is, thus considered to be **LOW**.

6. CONCLUSIONS AND RECOMMENDATIONS

BPT127 is proposing to undertake prospecting activities within Sea Concessions 14B, 15B and 17B, off the West Coast of South Africa. SLR was appointed to act as the independent environmental consultant to undertake the necessary EIA process and associated public consultation process for the proposed project. The EIA has been undertaken so as to comply with the requirements of the EIA Regulations 2014 (as amended), NEMA and the MPRDA.

Specialists were appointed to address the three key issues that required further investigation, namely (1) the impact on commercial fishing, (2) the impact on marine fauna, and (3) the impact on underwater cultural heritage material. The findings of the specialist input and other relevant information have been integrated and synthesised into this draft EIR. The two main objectives of this draft EIR are, firstly, to assess the environmental significance of impacts resulting from the proposed prospecting activities and to suggest ways of mitigating negative impacts and enhancing benefits, and secondly to provide I&APs with an opportunity to comment on the proposed project.

This chapter summarises the key findings of the study and presents the recommendations in terms of mitigation measures that should be implemented if the proposed prospecting activities are authorised.

6.1 CONCLUSIONS

6.1.1 GENERAL CONCLUSIONS

A summary of the assessment of potential environmental impacts associated with the proposed prospecting activities and No-Go Alternative is provided in Table 6-1.

The impacts associated with the vessel operations would be of short-term duration and limited to the immediate areas where the prospecting activities are being undertaken. As a result, the impacts associated with the vessels are considered to be of **VERY LOW** significance after mitigation. Key mitigation includes ensuring that the vessels used comply with MARPOL 73/78 standards; prior notification is provided to key stakeholders (including fishing industry and adjacent rights holders); and Radio Navigation Warnings and Notices to Mariners are released prior to undertaking the prospecting activities.

Potential impacts on marine fauna as a result of the proposed prospecting activities would be of medium- to short-term duration and limited to the immediate area. As a result, the impacts on marine fauna associated with the sampling activities are considered to be of **VERY LOW** to **LOW** significance after mitigation. Key mitigation includes ensuring that a designated onboard Marine Mammal Observer (MMO) is aboard the survey vessel to ensure compliance with mitigation measures during geophysical surveying; terminating the survey if any marine mammals show affected behaviour within 500 m of the survey vessel or equipment; and avoiding undertaking sampling in rocky outcrop areas or other identified sensitive habitats in the concession areas.

Commercial fishing sectors could potentially be affected by the proposed prospecting activities are the West Coast rock lobster nearshore and offshore sub-sectors, small pelagic purse-seine sector, tuna pole and linefish sectors. In addition they fall within the designated management areas of the netfish and seaweed sectors. Given the localised nature of the prospecting operations over the short-term, the potential impact on these fisheries would be of **VERY LOW** significance with or without mitigation.

The likelihood of disturbing a shipwreck is expected to be very low considering the vast size of the South African offshore area. In the event that any cultural heritage material is disturbed during sampling operations, the impact would be at the national level, and of high intensity. Without mitigation this is of **Medium** significance. However, with the implementation of mitigation, cultural heritage sites can largely be avoided and if sampling is terminated in the unlikely event of encountering a shipwreck, the impact is regarded as **INSIGNIFICANT**.

The implications of not going ahead with the proposed prospecting operations relate to the lost opportunity to establish whether or not a viable offshore diamond resource exists off the West Coast and the lost economic opportunities. This potential impact of the No-Go Alternative is considered to be of **LOW** significance. The positive implications on the no-go option are that there would be no effects on the biophysical environment in the area proposed for the prospecting activities.

TABLE 6-1: SUMMARY OF THE SIGNIFICANCE OF THE POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED PROSPECTING ACTIVITIES AND NO-GO ALTERNATIVE.

Potential impact		Significance	
		Without mitigation	With mitigation
Vessel operations:			
Discharges/Disposal to the Sea		VL	**VL**
Noise from Survey/Sampling Vessel and Support Vessels		VL	**VL**
Impact on marine fauna:			
Noise associated with sampling operations		VL	**VL**
Noise associated with sampling operations		VL	**VL**
Crushing of benthic fauna and sediment removal		L	**L**
Generation of sediment plumes		VL	**VL**
Smothering of benthos by redepositing tailings		VL - M	**VL - L**
Impact on other users of the sea:			
Fishing industry	Exclusion of the small pelagic purse-seine, traditional line-fish and small-scale fisheries	VL	**VL**

	Sediment plume impact on fish stock recruitment	Insig	**INSIG**
	Impacts of multi-beam and sub-bottom profiling sonar on catchability of fish	VL	**VL**
Marine mining and prospecting		Insig	**INSIG**
Petroleum exploration		VL	**VL**
Marine transport routes		Insig	**INSIG**
Impact on cultural heritage material:			
Impact on historical shipwrecks		M	**INSIG**
Socio-Economic Impacts:			
Job creation and business opportunities		*VL+*	***VL+***
No-Go Alternative:			
Lost opportunity to establish whether or not a viable offshore diamond resources exists off the West Coast and the lost economic opportunities.		L	**-**
Cumulative Impact:			
Benthic environment		L	**L**

VH=Very High	H=High	M=Medium	L=Low	VL=Very low	Insig = insignificant	N/A= Not applicable

6.1.2 COMPARATIVE ASSESSMENT OF PROJECTS ALTERNATIVES

6.1.2.1 Site alternatives

BPT127 have applied for Prospecting Rights in Sea Concessions 14B, 15B and 17B and is applying for Environmental Authorisation to undertake prospecting activities within the Concession Areas in order to obtain an understanding of the geology of the seafloor. Based on the review of the results of geophysical and drill sampling activities, BPT127 would make a decision as to whether bulk sampling would also be undertaken and which specific target areas would be sampled within the overall concession area. Thus, the sites for the proposed prospecting activities are more or less fixed by the location of the economic resources within each of the concession areas.

This EIA has assessed the potential impacts associated with proposed prospecting activities within Sea Concessions 14B, 15B and 17B. The potential impact on the marine benthic environment and significance thereof would be dependent on whether any vulnerable or sensitive benthic communities occur within the vicinity of the planned sampling footprints. Through the implementation of the recommended mitigation measures, known sensitive habitats and high-profile, rocky-outcrop areas would be avoided.

Similarly, the potential impact on cultural heritage material is dependent on whether any wrecks or palaeontological material is located near or would be affected by the proposed prospecting activities. In order to minimise the significance of these potential impacts, it is recommended that the final sampling areas would be adjusted, as needed, to avoid any significant vulnerable habitats / species or wrecks.

6.1.2.2 No-go alternative

The no-go alternative is the option of not undertaking the proposed prospecting operations. This would result in a decrease in commercial interest in South Africa's offshore mining sector, and the loss of potential economic benefits including government revenues, taxes and employment.

Logically if the planned prospecting operations do not proceed, the residual impacts (i.e. impacts after implementation of mitigation measures) of the proposed activities would not occur.

The implications of not going ahead with the proposed prospecting operations in the Sea Concession areas relate to the lost opportunity to maximise the use of South Africa's own mineral resources. This potential impact of the No-Go Alternative is considered to be of **LOW** significance.

6.1.3 RECOMMENDATION / OPINION OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

The key principles of sustainability, including ecological integrity, economic efficiency, and equity and social justice, are integrated below as part of the supporting rationale for recommending an opinion on whether the proposed project should or should not be approved.

- Ecological integrity[5]

The disturbance of benthic fauna and associated biodiversity is considered to be of high intensity as the benthic biota within the sampling footprints would be lost or disturbed. However, the area of disturbance (0.1224 km^2) is considered to be relatively small in comparison to the total available area of similar habitat in the Namaqua bioregion, and full recovery of benthic biodiversity within the disturbed footprints would take place within the medium term due to natural sedimentation processes and recolonization by benthic communities.

In summary, the proposed project would result in the loss of some ecological integrity in the study area, but it is considered to be a localised and medium-term under normal operating conditions.

- Economic efficiency

As noted in Section 3.2, various national and provincial policy and planning documents have identified the mining sector as one with substantial potential for growth stimulation and/or employment. The National Development Plan 2030 (2012) notes that South Africa must exploit its mineral resources to create employment and generate foreign exchange and tax revenue. In order to achieve this, it is necessary to identify new resources through prospecting activities.

With respect to current economic activities being undertaken within the sea concession areas, the proposed prospecting activities could result in impacts on fishing as a result of the 500 m safety zones around the survey vessels (i.e. loss of access to fishing grounds), as well as fish avoidance of the prospecting areas. However, the small-pelagic purse seine, traditional linefish and small-scale fisheries are the only fisheries that could potentially be affected by the proposed project and given the very short-term duration of prospecting and the highly localised nature of the activities within each Sea Concession area, the impact of the proposed project on fisheries is considered to be limited.

Although offshore prospecting is highly technical and requires specialised vessels and crews, there would be a few opportunities for local companies to provide support services during the proposed operations, e.g. vessel supplies, support vessels, etc. As opportunities would be limited, the economic benefits (job creation and generation of direct revenues) associated with the project are considered to be only of ***LOW (positive)*** significance.

On the basis of the above, the proposed project is considered to be economically efficient, as it provides an opportunity to maximise the use of South Africa's own natural resources off the West Coast of South Africa while at the same time only having a negligible impact on one fishing sector.

- Equity and social justice

[5] Ecological integrity is the abundance and diversity of organisms at all levels, and the ecological patterns, processes and structural attributes responsible for that biological diversity and for ecosystem resilience.

Due to the extent and offshore location of the proposed project, it would not unfairly discriminate, directly or indirectly, against any one party nor result in an unequal distribution of negative impacts.

With the implementation of the proposed mitigation measures, the nature and extent of the proposed prospecting activities are anticipated to have generally **VERY LOW to LOW** significant impacts. While the impact of crushing, sediment removal and generation of suspended sediment plumes on benthic macrofauna is assessed to be of **VERY LOW to LOW** significance, it is noted above that full recovery within the sampling footprints is expected to take place within the medium term due to natural sedimentation process and recolonisation by benthic communities. Given this, as well as the sustainability criteria described above, and the findings of the specialist studies, it is the opinion of SLR that a positive decision being made by the Minister of Mineral Resources (or delegated authority) regarding the approval of the proposed project can be supported.

6.2 RECOMMENDATIONS FOR MITIGATION

6.2.1 GENERAL MITIGATION RECOMMENDATIONS FOR THE PROSPECTING OPERATIONS

6.2.1.1 Compliance with Environmental Management Programme and MARPOL 73/78 standards

- All phases of the proposed project must comply with the Environmental Management Programme presented in Chapter 7; and
- The vessels used during prospecting (including any required support vessels) must ensure compliance with MARPOL 73/78 standards.

6.2.1.2 Notification and communication with key stakeholders

- Prior to the commencement of the proposed activities, BPT127 should consult with the managers of the DEFF research survey programmes to discuss their respective programmes and the possibility of altering the prospecting programme in order to minimise or avoid disruptions to both parties, where required.
- Notify PetroSA and their contractors, as well as any other neighbouring petroleum exploration rights holders, as well as any companies undertaking marine prospecting or mining activities in the study area, prior to the commencement of activities.
- Liaise with PetroSA and any overlapping mineral prospecting rights holders to ensure that there is no overlapping of activities in the same area over the same time period.
- Ensure, if possible, that the proposed prospecting activities do not coincide with peak fishing periods of the small pelagic purse-seine sector by carrying out survey and sampling activities between mid-November and mid-January at a time when the small pelagic sector normally stops operations. Linefish operations also have a seasonal signal mostly driven by the availability of snoek in the winter period. Therefore the mitigation of possible impacts to the linefish fishery by undertaking the surveys in the November to January periods coincides with the small pelagic mitigation option.
- It is recommended that prior to the commencement of the proposed activities, BPT127 consult with the small pelagic fishing sector on fishery operational status to minimise potential operational impacts to the fishery.
- Prior to the commencement of the proposed prospecting activities the following key stakeholders should be notified of the proposed activities (including navigational co-ordinates of the survey/sampling areas, timing and duration of proposed activities) and the likely implications thereof:
  - Fishing industry / associations (these include South African Small Pelagic Fishing Industry Association, South African Tuna Association, South African Commercial Linefish Association, South African Hake Longline Association, South African Deepsea Trawling Industry Association, FishSA the West Coast Rock Lobster Association and the National SMME Fishing Forum);

  - Other: DEFF, South African Maritime Safety Authority (SAMSA), South African Navy (SAN) Hydrographic office, overlapping and neighbouring exploration right holders and applicants, and Transnet National Ports Authority (ports of Cape Town and Saldanha Bay); and
  - Representatives of small-scale local fishing co-operatives.
- The required safety zones around the prospecting vessels should be communicated via the issuing of Daily Navigational Warnings for the duration of the sampling operations through the South African Naval Hydrographic Office.
- The SAN Hydrographic office should be notified when prospecting activities are complete so that the Navigational Warning can be cancelled.

6.2.1.3 Discharges

- Undertake training and awareness of crew in spill management to minimise contamination.
- Low-toxicity biodegradable detergents and reusable absorbent cloths should be used in cleaning of all deck spillage.
- All hydraulic systems should be adequately maintained.
- Minimise the discharge of galley waste material should obvious attraction of marine fauna be observed.

6.2.1.4 Vessel seaworthiness and safety

- Vessels used during prospecting must be certified for seaworthiness through an appropriate internationally recognised marine certification programme (e.g. Lloyds Register, Det Norske Veritas).
- Collision prevention equipment should include radar, multi-frequency radio, foghorns, etc. Safety equipment and training of personnel to ensure the safety and survival of the crew in the event of an accident is a further legal requirement.
- A Notice to Mariners should provide the co-ordinates of the location of the planned areas in which prospecting is to take place.

6.2.1.5 Geophysical Activities

- A designated onboard Marine Mammal Observer (MMO) must ensure compliance with mitigation measures during geophysical surveying.
- The MMO should conduct visual scans for the presence of cetaceans around the survey vessel prior to the initiation of any acoustic impulses.
- Pre-survey scans should be of at least a 15-minute duration prior to the start of survey equipment.
- Where equipment permits, “soft starts” should be carried out for equipment with source levels greater than 210 dB re 1 µPa at 1 m over a period of 20 minutes to give adequate time for marine mammals to leave the vicinity. Where this is not possible, the equipment should be turned on and off over a 20 minute period to act as a warning signal and allow cetaceans to move away from the sound source.
- Terminate the survey if any marine mammals show affected behaviour within 500 m of the survey vessel or equipment until the mammal has vacated the area.
- Avoid planning geophysical surveys during the movement of migratory cetaceans (particularly baleen whales) from their southern feeding grounds into low latitude waters (beginning of June to end of November), and ensure that migration paths are not blocked by sonar operations.
- For the months of June and November ensure that Passive Acoustic Monitoring (PAM) is incorporated into any survey programme.

6.2.1.6 Sampling Activities

- Sampling activities of any kind should avoid rocky outcrop areas or other identified sensitive habitats in the concession area.
- Use should be made of geophysical data to conduct a pre-sampling geohazard analysis of the seabed, and near-surface substratum to map potentially vulnerable habitats and prevent potential conflict with the sampling targets.
- A buffer zone of 150 m will be established around any identified sensitive communities or rocky-outcrop areas.

6.2.1.7 Cultural Heritage Material

- Areas where shipwreck sites are identified during geophysical surveys must be excluded prior to undertaking sampling activities.
- It is recommended that the onboard BPT127 representative must undergo a short induction on archaeological site and artefact recognition, as well as the procedure to follow should archaeological material be encountered during sampling.
- The contractor must be notified that archaeological sites could be exposed during drill and bulk sampling activities, as well as the procedure to follow should archaeological material be encountered.
- If shipwreck material is encountered during the course of bulk sampling in the concession area, the following mitigation measure should be applied:
  - Cease work in the directly affected area to avoid damage to the wreck until the South African Heritage Resources Agency (SAHRA) has been notified and the contractor/BPT127 has complied with any additional mitigation as specified by SAHRA; and
  - Where possible, take photographs of them, noting the date, time, location and types of artefacts found. Under no circumstances may any artefacts be removed, destroyed or interfered on the site, unless under permit from SAHRA.
- The possibility of realising core log information and samples of the coarser fraction (i.e. gravel and stone between 20 mm and 150 mm) of sorted seabed sediment for assessment by an archaeologist for the presence of prehistoric lithic material should be considered by BPT127.

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