

# Environmental Impact Assessment for Bulk Sampling Activities for Offshore Marine Diamonds, West Coast: Scoping Report

Sea Concession 6C

Prepared for: De Beers Consolidated Mines (Pty) Ltd

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## BASIS OF REPORT

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**NOTE:**

This Scoping Report has deviated from the standard Department of Mineral Resources (DMR) Scoping Report template in order to present a format which has been used for previous Interested & Affected Party interaction.

In order to comply with DMR reporting requirements, the DMR Scoping Report Template has been completed for the proposed project and is attached as Appendix A to this report. The content of the report complies with the requirements of Appendix 2 of the EIA Regulations 2014 (as amended).

## EXECUTIVE SUMMARY

### 1. INTRODUCTION

On 14 June 2018 De Beers Consolidated Mines (Pty) Ltd (De Beers) lodged an application for a Prospecting Right with the Department of Mineral Resources (DMR) to undertake offshore diamond prospecting activities in Sea Concession 6C (see Figure 1). The application was lodged in terms of Section 22 of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA), as amended.

In response to the application, DMR requested that a Basic Assessment Report (BAR) be submitted for the geophysical and sampling activities to be undertaken as part of the proposed prospecting operations. It was also indicated that the planned bulk sampling activities would constitute a listed activity in terms of Listing Notice 2 published in Government Notice (GN) No. 984 of 8 December 2014 (as amended by GN No. 375 of 7 April 2017). Thus, as a Listing Notice 2 activity the proposed bulk sampling activities would require an application for Environmental Authorisation (EA) by means of a Scoping and Environmental Impact Assessment (EIA) process.

De Beers has appointed SLR Consulting (South Africa) (Pty) Ltd (SLR) as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and EIA process for the proposed bulk sampling activities in accordance with the requirements of the MPRDA, National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) and Regulations thereto.

### 2. OPPORTUNITY TO COMMENT

This Scoping Report has been distributed for a 30-day comment period from **14 August to 13 September 2019** in order to provide interested and affected parties (I&APs) with an opportunity to comment on any aspect of the proposed project and the findings of the EIA project to date. Copies of the full report have been made available on the SLR website (at <https://slrconsulting.com/za/slr-documents/de-beers-eia>) and at the offices of SLR.

Any comments should be forwarded to SLR at the address, telephone / fax numbers or e-mail addresses shown below. For comments to be included in the updated Scoping Report, comments should reach SLR by no later than **13 September 2019**.

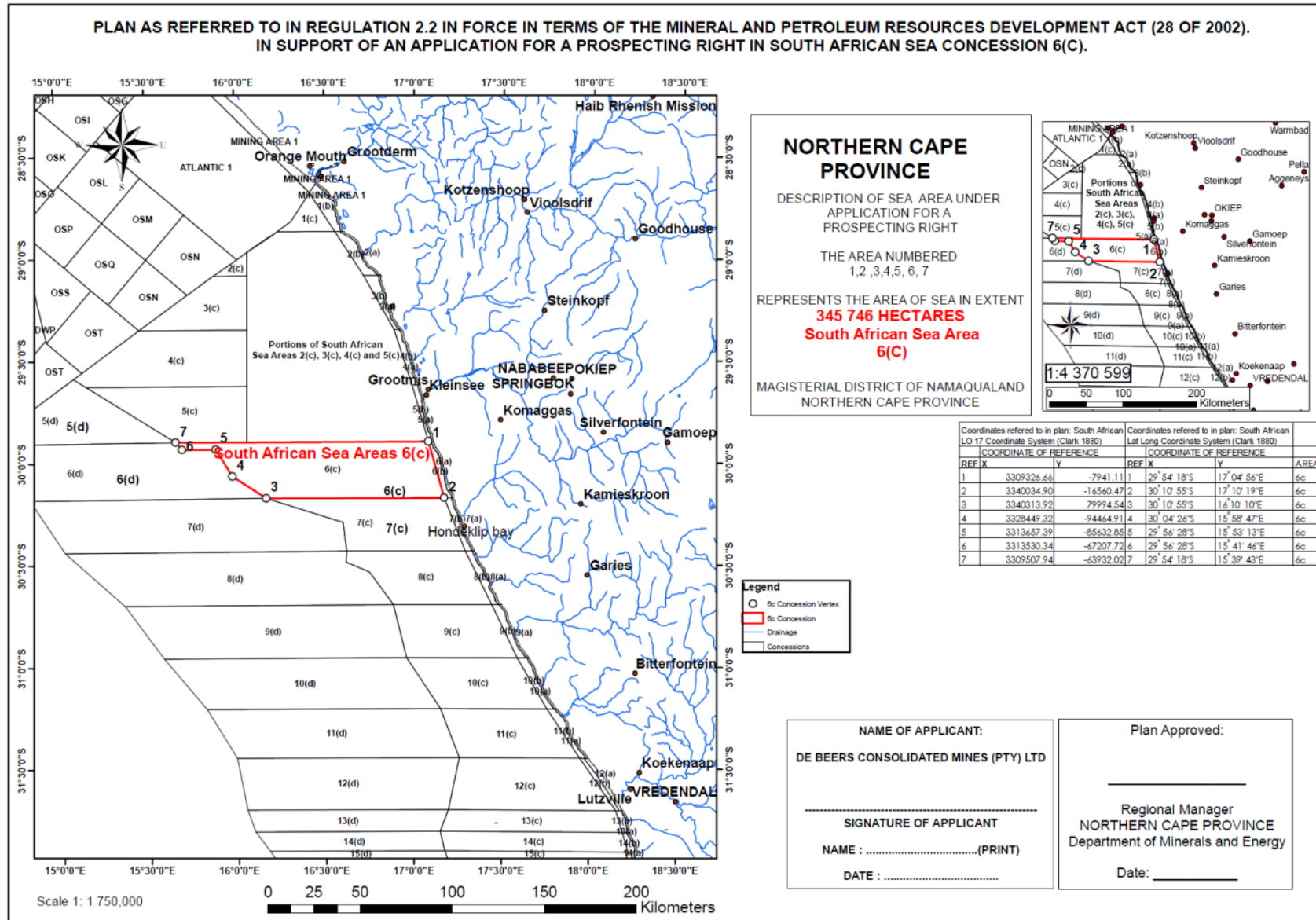
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**FIGURE 1: LOCATION OF THE 6C PROSPECTING RIGHT AREA, OFF THE WEST COAST OF SOUTH AFRICA.**

### **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 DMR at the same time as making this draft version of the Scoping Report available for review and comment.

##### **3.1.2. Compilation and review of the Scoping Report**

This draft version of the Scoping Report has been prepared in compliance with Appendix 2 of the EIA Regulations 2014 (as amended). This report provides an opportunity for I&APs to comment on the proposed project and the scope of work for the next phase of the EIA.

##### **3.1.3. Completion of the Scoping Phase**

After closure of the comment period, the Scoping Report will be updated to incorporate comments received. The updated Scoping Report will be submitted to DMR for acceptance. If the Scoping Report is accepted, the project will proceed onto the EIA Phase.

#### **3.2. EIA PHASE**

##### **3.2.1. Specialist Studies**

Three specialist studies were undertaken as part of the previous Basic Assessment application and also addressed the key issues and detailed assessment of the planned bulk sampling activities. These studies were: (1) an Underwater Heritage Impact Assessment, (2) a Marine Faunal Assessment, and (3) a Fisheries Impact Assessment. The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed geophysical and sampling activities (considered in the above-mentioned Basic Assessment application), as well as the proposed bulk sampling activities (to be assessed as part of the EIA phase). These impacts were assessed according to pre-defined rating scales. The studies also recommended appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits, respectively.

##### **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, will be integrated into an Environmental Impact Report (EIR), which will include an Environmental Management Programme (EMP). The EIR will be released for a 30-day comment period and all I&APs on the project database will be notified of when the EIR is available for comment.

After closure of the comment period, all comments received on the draft report will be incorporated and responded to in a Comments and Responses Report. The draft report will then be updated to a final report, to which the Comments and Responses Report will be appended, and will be submitted to DMR for consideration and decision-making.

The decision taken by DMR will be advertised and 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 bulk sampling activities would be undertaken within Sea Concession 6C, off the West Coast of South Africa. The mineral targeted by the proposed operations would be diamonds. Sea Concession 6C is situated approximately 400 km north of Cape Town; with the inshore boundary located 5 km seaward of the coast between Hondeklip Bay in the south and Kleinsee in the north. The offshore boundary is located between approximately 70 to 100 km offshore (refer to Figure 1). Sea Concession 6C has a total extent of 345 746 hectares (ha).

### 4.2 NEED AND DESIRABILITY

In the recently published DMR Strategic Plan 2014-2019, the foreword by the Minister of Mineral Resources notes that the Department “*will continue to promote mineral value addition to strengthen the interface between extractive industries and national socio-economic developmental objectives*”.

This project aims to identify economically viable diamond deposits on the continental shelf off the coast of the Northern Cape with the intention of deriving value from the identified offshore mineral resources and contributing to the existing diamond mining sector in the Northern Cape.

### 4.3 PROJECT OVERVIEW

The proposed exploration sampling programme would entail sampling (for which EA has already been granted) and bulk sampling activities. The sampling / bulk sampling activities may be divided into stages subject to reviews and follow-up sampling. A decision on the planned sampling / bulk sampling technology appropriate to each target area would be made based on the available data at the time.

The proposed bulk sampling activities would be undertaken using a vessel of opportunity which may include the De Beers Marine (Pty) Ltd (the appointed operator for Beers Consolidated Mines (Pty) Ltd) own vessel, the *mv Coral Sea* or one of the marine diamond vessels operated by Debmarine Namibia (Pty) Ltd or a similar vessel. In this regard, there are two possible basic configurations of vessel available for bulk sampling: (i) the vertical method, utilising a tool mounted on a drill string; and (ii) the horizontal method, using a seabed crawler. The planned bulk sampling operations would have a total footprint of approximately 480 000 m<sup>2</sup> and would be undertaken in up to 60 days over the 5-year licence period. A summary of the proposed operation is provided in the table below.

**TABLE 1: SUMMARY OF PROPOSED BULK SAMPLING OPERATIONS**

| Activity                        | Detail                         |                       |
|---------------------------------|--------------------------------|-----------------------|
| Number of pits/trenches planned | Up to 60                       |                       |
| Dimensions of pits/trenches     | Length                         | Up to 400 m           |
|                                 | Breadth                        | Typically 20 m        |
|                                 | Depth                          | Typically up to 1.5 m |
| Total Volume Overburden (Waste) | Maximum 480 000 m <sup>3</sup> |                       |
| Total Volume Ore                | Maximum 240 000 m <sup>3</sup> |                       |
| Density Overburden              | 1.5 t/m <sup>3</sup>           |                       |

| Activity    | Detail               |
|-------------|----------------------|
| Density Ore | 1.9 t/m <sup>3</sup> |

#### 4.4 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 diamond resources exist;
- Prevention of any socio-economic benefits associated with the continuation of prospecting 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 bulk sampling activities.

### 5. AFFECTED ENVIRONMENT

#### 5.1 PHYSICAL ENVIRONMENT

Sea Concession 6C lies 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 substantial pelagic fisheries. Two geological features of note within the vicinity of Sea Concession 6C include Childs Bank, situated approximately 80 km south and Tripp Seamount, approximately 150 km west.

#### 5.2 BIOLOGICAL OCEANOGRAPHY

Sea Concession 6C falls into one of the nine bioregions, namely the cold temperate Namaqua Bioregion. 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 fish species likely to be encountered comprise primarily the large pelagic species (e.g. tunas, billfish and pelagic sharks), which migrate throughout the southern oceans, between surface and deep waters (>300 m).

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 whales and various baleen and toothed whales known to frequent offshore waters.



### 5.3 HUMAN UTILISATION

The only commercial fisheries sectors that could be affected by the proposed prospecting operations are the demersal long-line, traditional line-fish and tuna pole fisheries. Sea Concession 6C falls outside of all other sectors. The majority of shipping traffic is located on the outer edge of the continental shelf with traffic inshore of the continental shelf along the South-West Coast largely comprising fishing vessels, especially between Kleinsee and Oranjemund. The majority of the shipping traffic would be limited to the western portions of the concession area. Exploration for oil and gas is currently undertaken in a number of licence blocks off the West Coast. There is no current development or production from the South African West Coast offshore. A number of proposed prospecting areas for glauconite and phosphorite / phosphate are located off the South-West Coast, all of which are located south of Sea Concession 6C. A number of marine diamond mining right and prospecting concession areas are also located in proximity to Sea Concession 6C.

## 6. KEY PROJECT ISSUES

Key issues to be addressed in the EIA Phase are summarised below.

### Potential impact on marine fauna:

- Normal ship discharges to the marine environment from a variety of sources, including deck drainage, machinery space drainage, sewage and galley wastes from survey and support vessels;
- Localised disturbance of marine fauna due to noise and lighting from prospecting vessel of opportunity and associated bulk sampling tools;
- Physical damage to the seabed, alteration of sediment structure, alteration in benthic fauna community composition and potential reduction in benthic biodiversity due to bulk sampling activities;
- Impacts on benthic fauna due to the discharge of processed sediments, including direct mortality and 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:

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

### Potential impact on other marine prospecting/mining and exploration operations:

- Disruption of activities as a result of the imposition of a statutory safety zone around the prospecting vessel.

### Potential impact on marine transport routes:

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

### **Potential socio-economic impacts:**

- Creation of limited employment opportunities; and
- Generation of limited direct revenues associated with operational activities such as refuelling, vessel repair, etc.

### **Potential impacts on underwater cultural heritage material:**

- Disturbance and damage to underwater cultural heritage material located on the seabed, particularly historical shipwrecks and other palaeontological or rare geological objects.

Specialist studies will be undertaken to address those issues that require further investigation and detailed assessment.

The remainder of the issues will be assessed based on experience gained from the environmental assessment of similar operations elsewhere in the region and information from the generic EMP prepared for marine diamond mining off the West Coast of South Africa (Lane and Carter 1999) and desktop analysis. Additional input from a specialist is not deemed necessary.

## **7. SPECIALIST STUDIES**

Three specialist studies have been identified for the EIA phase, namely: (1) the impact on marine fauna, (2) the impact on fisheries and (3) the impact on underwater cultural heritage material. The specific terms of reference for these studies are presented below.

### **7.1 MARINE FAUNA**

The specific terms of reference for the marine faunal assessment are as follows:

- Provide a general description of the local marine fauna (including cetaceans, seals, turtles, seabirds, fish, invertebrates and plankton species) within Sea Concession 6C and greater West Coast. The description to be based on, *inter alia*, a review of existing information and data from the international scientific literature, the Generic EMP prepared for marine diamond mining off the West Coast of South Africa and information sourced from the internet;
- Identify, describe and assess the significance of potential impacts of the proposed operations on the local marine fauna, including but not limited to:
  - physical damage to the seabed, alteration of sediment structure, alteration in benthic fauna community composition and potential reduction in benthic biodiversity due to 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 biochemical effects (e.g. direct toxicity and bioaccumulation);
  - behavioural avoidance of the prospecting area;
  - masking of environmental sounds and communication; and
  - indirect impacts due to effects on prey.
- Identify practicable mitigation measures to avoid/reduce any negative impacts and indicate how these could be implemented in the start-up and management of the proposed project.

## 7.2 FISHERIES

The specific terms of reference for the fisheries assessment are as follows:

- Provide a general description of the fishing activities expected in Sea Concession 6C and along the greater West Coast;
- Undertake a spatial and temporal assessment of expected fishing effort and catch in Sea Concession 6C a for each sector identified;
- Assess the impact of the operations on the different fishing sectors;
- Assess the impact of the proposed exclusion zones around the prospecting vessel and potential disturbance of fish on the fishing activities based on the estimated percentage loss of catch and effort; and
- Make recommendations for mitigation measures that could be implemented to minimise or eliminate negative impacts on and enhance any benefits to the fishing industry.

## 7.3 UNDERWATER CULTURAL HERITAGE MATERIAL

The specific terms of reference for the Underwater Heritage Impact Assessment are as follows:

- Undertake a desktop study of the database of known and suspected wrecks in the area ascertained through the study of available written and oral resources;
- Identify potential Maritime and Underwater Cultural Heritage (MUCH) sites within the designated area; and
- Recommend management measures for sites before and during development.

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## ACRONYMS AND ABBREVIATIONS

| Acronym / Abbreviation | Definition   |
|------------------------|--|
| CITES                  | Convention on International Trade in Endangered Species                        |
| DAFF                   | Department of Agriculture, Forestry and Fisheries                              |
| DMR                    | Department of Mineral Resources  |
| EEZ                    | Exclusive Economic Zone  |
| EIA                    | Environmental Impact Assessment  |
| EMPr                   | Environmental Management Programme   |
| ha                     | Hectares   |
| I&AP                   | Interested and Affected Party  |
| IUCN                   | International Union for Conservation of Nature                                 |
| MARPOL                 | International Convention for the Prevention of Pollution from Ships, 1973/1978 |
| MMO                    | Marine Mammal Observer   |
| MPA                    | Marine Protected Area  |
| MPRDA                  | Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002)         |
| MUCH                   | Maritime and Underwater Cultural Heritage                                      |
| NEMA                   | National Environmental Management Act, 1998 (Act 107 of 1998)                  |
| nm                     | Nautical mile  |
| ROV                    | Remote Operated Vehicle  |
| SAHRA                  | South African Heritage Resources Agency  |
| SAMSA                  | South African Maritime Safety Authority  |
| SAN                    | South African Navy   |
| SANBI                  | South African National Biodiversity Institute                                  |
| TAC                    | Total Allowable Catch  |
| TAE                    | Total Applied Effort   |
| VME                    | Vulnerable Marine Ecosystem  |

# 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 the opportunity for comment.

## 1.1 PURPOSE OF THIS REPORT

This Scoping Report has been compiled and submitted to the Department of Mineral Resources (DMR) for acceptance as part of a Scoping and Environmental Impact Assessment (EIA) process that is being undertaken for the proposal by De Beers Consolidated Mines (Pty) Ltd to undertake offshore bulk sampling activities in Sea Concession 6C off the West Coast of South Africa, as part of a Prospecting Right application.

De Beers Marine (Pty) Ltd (De Beers), the appointed operator for De Beers Consolidated Mines (Pty) Ltd, has appointed SLR Consulting (South Africa) (Pty) Ltd (SLR) as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and EIA process for the proposed bulk sampling 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.

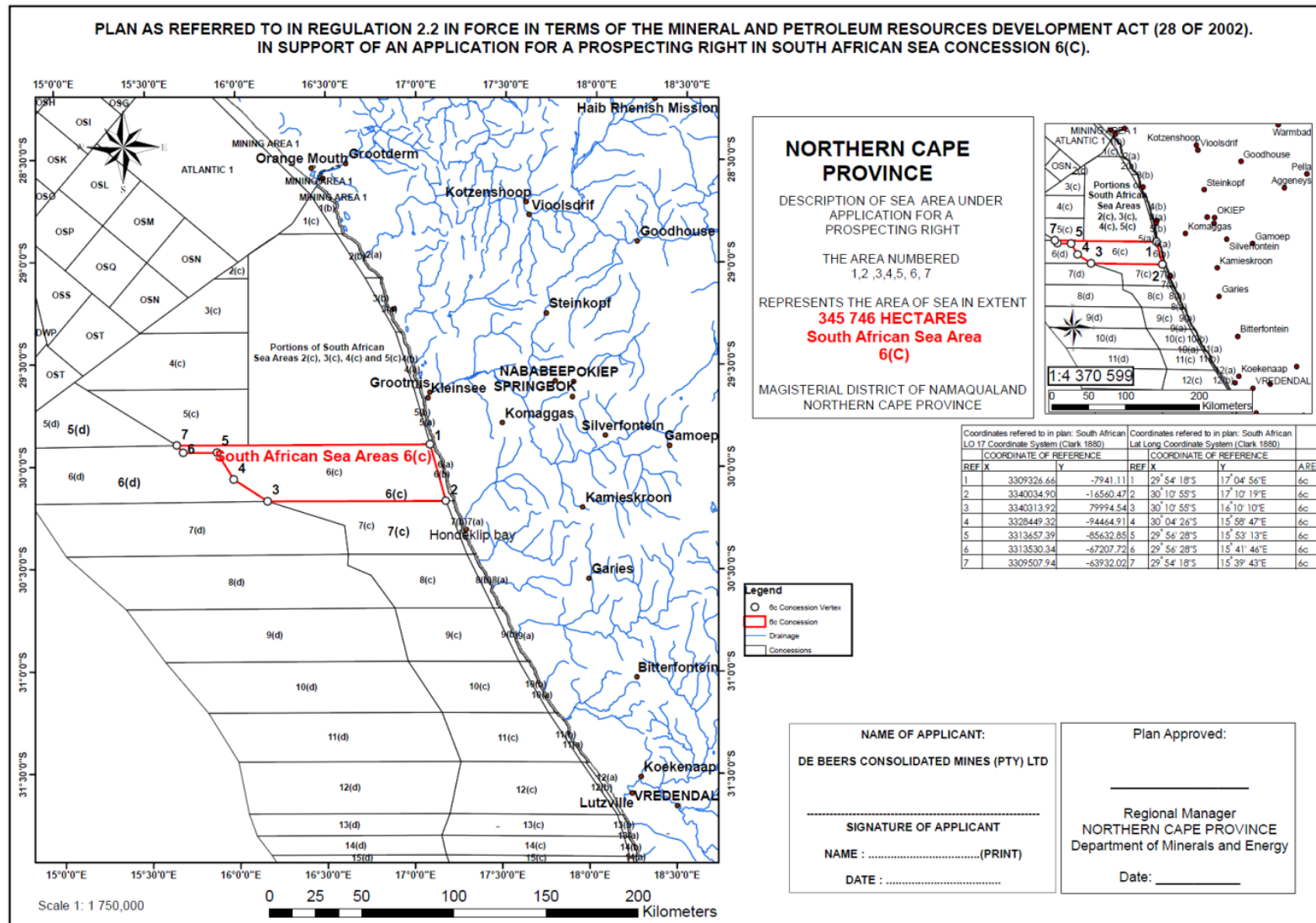
## 1.2 PROJECT BACKGROUND

On 14 June 2018, De Beers lodged an application for a Prospecting Right with the DMR to undertake diamond prospecting activities in Sea Concession 6C off the West Coast of South Africa. The planned activities included regional geophysical surveys, sampling activities and bulk sampling activities. The application was lodged in terms of Section 16 of the MPRDA. 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 the applicant must comply with Chapter 5 of the NEMA with regards to consultation and reporting.

In terms of the EIA Regulations (2014) (as amended), promulgated in terms of Chapter 5 of NEMA, an application for a Prospecting Right requires Environmental Authorisation (EA) from the competent authority, the Minister of Mineral Resources or delegated authority, to carry out the proposed prospecting activities.

In support of the Prospecting Right application, an application for EA by means of a Basic Assessment process was submitted to the DMR. In response to the Basic Assessment application, DMR indicated that the application for EA would be processed without the inclusion of the proposed bulk sampling activities, as bulk sampling would trigger a listed activity in Listing Notice 2 (Government Notice (GN) No. 984 of 4 December 2014, amended by GN No. 325 of 7 April 2017) of the EIA Regulations, 2014 (as amended). Thus, as a Listing Notice 2 activity, a Scoping and EIA (in terms of NEMA, as amended) would have to be undertaken for the planned bulk sampling activities to be undertaken as part of the overall prospecting operations.

On 4 February 2019 the DMR granted EA for the planned geophysical surveys and sampling operations (to be undertaken as part of the overall prospecting operations within Sea Concession 6C). This Scoping and EIA process covers the proposed bulk sampling activities associated with the overall prospecting operations to be undertaken in Sea Concession 6C.



**FIGURE 1-1: LOCATION OF THE 6C PROSPECTING RIGHT AREA, OFF THE WEST COAST OF SOUTH AFRICA.**

### 1.3 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.

### 1.4 STRUCTURE OF THIS REPORT

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

| Section           | Contents  |
|-------------------|---|
| Executive Summary | Provides an overview of the main findings of the Scoping Report.  |
| Section 1         | <b>Introduction</b><br>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 Scoping and EIA, and describes the structure of the report and the opportunity to provide comment. |
| Section 2         | <b>Scoping approach and methodology</b><br>Outlines the key legislative requirements applicable to the proposed bulk sampling activities and outlines the methodology and I&AP consultation process followed in the study.  |
| Section 3         | <b>Project description</b><br>Describes the need and desirability for the proposed project, provides general project information, an overview of the proposed bulk sampling activities and a description of the project alternatives.   |
| Section 4         | <b>Description of the affected environment</b><br>Describes the existing biophysical and social environment that could be affected by the proposed project.   |
| Section 5         | <b>Key project issues and preliminary impact assessment</b><br>Describes key issues associated with the proposed project. It also presents mitigation or optimisation measures that could be used to reduce the significance of any negative impacts or enhance any benefits, respectively.                           |
| Section 6         | <b>Proposed specialist studies</b><br>Identifies the proposed specialist studies that would be undertaken in the next phase of the Scoping and EIA and provides their terms of reference.   |
| Section 7         | <b>References</b><br>Provides a list of the references used in compiling this report.   |

| Section    | Contents   |
|------------|--|
| Appendices | Appendix A: DMR Scoping Report template<br>Appendix B: I&AP Database<br>Appendix C: Undertaking of Environmental Assessment Practitioner |

## 1.5 OPPORTUNITY TO COMMENT

This Scoping Report has been distributed for a 30-day comment period from **14 August to 13 September 2019** in order to provide I&APs with an opportunity to comment on any aspect of the proposed project and the findings of the EIA project to date. Copies of the full report have been made available on the SLR website (at <https://slrconsulting.com/za/slr-documents/de-beers-eia>) and at the Cape Town offices of SLR.

Any comments should be forwarded to SLR at the address, telephone/fax numbers or e-mail addresses shown below. For comments to be included in the updated Scoping Report, comments should reach SLR by no **later than 13 September 2019**.

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## 2 LEGISLATIVE REQUIREMENTS AND EIA PROCESS

This chapter outlines the key legislative requirements applicable to the proposed bulk sampling 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 in Section 1.2, in June 2018, De Beers lodged an application with DMR for a Prospecting Right in terms of the MPRDA and an Application for EA in terms of NEMA. In response to the EA application, DMR indicated that the planned bulk sampling activities would, in accordance with Section 20(2) of the MPRDA, require written permission from the Minister of Mineral Resources for the removal and/or disposal of diamonds found in the course of prospecting operations.

In light of the above, the removal and disposal of minerals contemplated in terms of Section 20 of the MPRDA triggers listed activity 19 of Listing Notice 2 (GN R984, as amended by GN No. 325 of 7 April 2017). This is discussed in more detail below.

#### 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 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 remains responsible for the granting of an EA for the proposed bulk sampling 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 an 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.

As noted in Section 2.1.1 above, the proposed project triggers, amongst others, Activity 19 contained in Listing Notice 2, thus a full Scoping and EIA process must be undertaken in order for DMR 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   |
|--------------------------------------|---|---|
| <b>GN No. R983: Listing Notice 1</b> |   |   |
| 22                                   | <p><i>“The decommissioning of any activity requiring-</i></p> <p><i>(i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or</i></p> <p><i>(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.”</i></p>  | <p>On completion of the proposed prospecting operation, De Beers would be required to apply to the DMR for a closure certificate. The process of applying for a Closure Certificate would trigger this listed activity.</p> |
| <b>GN No. R984: Listing Notice 2</b> |   |   |
| 19                                   | <p><i>“The removal and disposal of minerals contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly 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.”</i></p> | <p>The proposed bulk sampling would involve the removal and disposal of marine diamonds and would include extraction, screening and washing during the bulk sampling operations.</p>  |



### **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) does 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.

DEA 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, De Beers 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);
- Dumping at Sea Control Act, 1980(No. 73 of 1980);
- 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-Shore Act, 1935 (No. 21 of 1935);
- 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 SCOPING 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 2.1.2  |
| EIA Regulations 2014, as amended (GN No. R982), Listing Notice 1 (GN No. R983), Listing Notice 2 (GN No. R984). | Refer to 2.1.2 and Table 2-1. 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  |
|---|----------------|--|
| Guideline on need and desirability in terms of the EIA Regulations (2014)                                       | DEA            | This guideline informed the consideration of the need and desirability aspects of the proposed project.                    |
| Specialist Studies, Integrated Environmental Management, Information Series 4 (2002)                            | DEA            | This guideline was consulted to ensure adequate development of terms of reference for specialist studies.                  |
| Impact significance, Integrated Environmental Management, Information Series 5 (2002)                           | DEA            | 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)                 | DEA            | 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) | DEA            | This guideline was consulted to inform the consideration of alternatives.  |
| Environmental Management Plans, Integrated Environmental Management, Information Series 12 (2004)               | DEA            | 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)               | DEA            | This guideline was consulted to inform the approach to impact reporting.   |

## 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 bulk sampling activities. The details of the EIA project team that were involved in the preparation of this Scoping Report are provided in Table 2-4.

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).

**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  |                                |                    |   |
| Name              | Qualifications  | Professional registrations     | Experience (Years) | Tasks and roles   |
| Jonathan Crowther | M.Sc. (Env. Sci.).<br>University of<br>Cape Town              | Pr.Sci.Nat.,<br>Member IAIAAsa | 30                 | Report review   |
| Nicholas Arnott   | Hons. (Earth &<br>Geog. Sci.),<br>University of<br>Cape Town  | Pr.Sci.Nat.,<br>Member IAIAAsa | 12                 | Management of the EIA process,<br>including process review, specialist<br>study review and report compilation |
| Rizqah Baker      | Hons. (Envir. &<br>Geog. Sci.),<br>University of<br>Cape Town | Member IAIAAsa                 | 2                  | Project assistant   |

### 2.4.2 Qualifications and Experience of the EAPs

Jonathan Crowther has been involved in environmental consulting since 1988 and is currently the EMPA Operations Manager of SLR Consulting (South Africa) (Pty) Ltd. He has expertise in a wide range of environmental disciplines, including Environmental Impact Assessments (EIA), Environmental Management Plans / Programmes, Environmental Planning & Review, Environmental Control Officer services, and Public Consultation & Facilitation. He has project managed a number of offshore oil and gas EIAs for various exploration and production activities in South Africa and Namibia. He also has extensive experience in projects related to roads, property developments and landfill sites.

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, infrastructure projects (e.g. roads), housing and industrial developments.

Rizqah Baker has been working in the environmental field for two years. 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 brings with her strong report writing skills and practical experience in the review and implementation of Environmental Management Programmes.

### 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 bulk sampling 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 process.

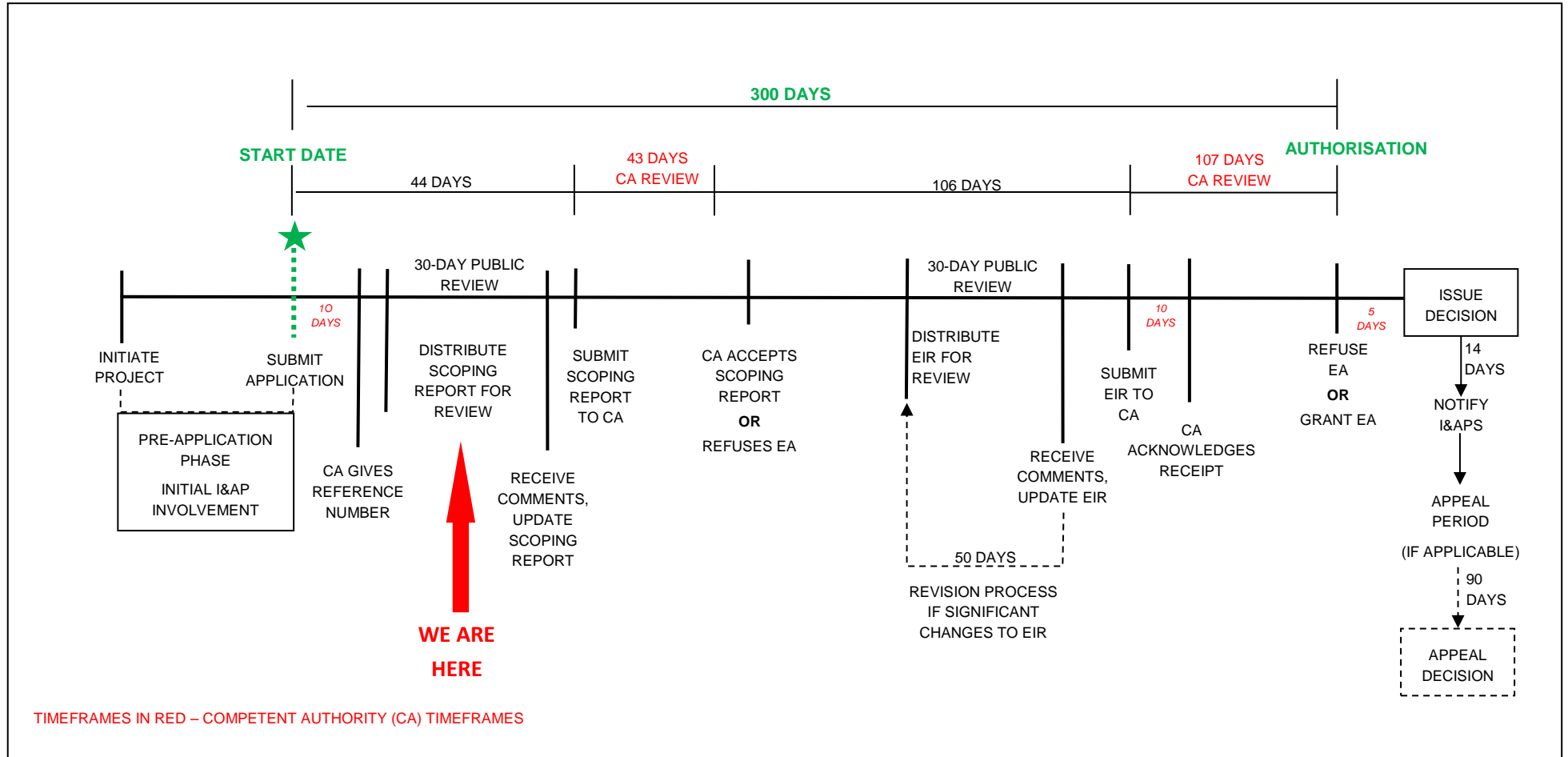
## 2.5 SCOPING PHASE

### 2.5.1 Objectives

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

- 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 consists 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) (see Table 2-5). The process involves an open, participatory approach to ensure to ensure that all impacts are identified and that decision-making takes place in an informed, transparent and accountable manner. A flowchart indicating the Scoping and EIA process is presented in Figure 2-1.



**FIGURE 2-1: FLOW DIAGRAM SHOWING THE SCOPING AND 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 pre-application public participation process are summarised in Box 2-1 and all supporting information is presented in appendices to this report.

### **BOX 2-1: TASKS UNDERTAKEN DURING THE PRE-APPLICATION PUBLIC PARTICIPATION 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 69 I&APs have been registered on the project database (see Appendix B).

- **I&AP Notification Letters**

All identified I&APs were 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 I&APs to register 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 22 June to 22 July 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 August 2019.

## 2.5.3 Application for Environmental Authorisation

An "Application Form for Environmental Authorisation" form was submitted to DMR at the same time as making this draft version of the Scoping Report available for review and comment.

## 2.5.4 Compilation and Review of Scoping Report

This draft version of the Scoping Report has been prepared in compliance with Appendix 2 of the EIA Regulations 2014. This report provides an opportunity for I&APs to comment on the proposed project, findings of the scoping process and the scope of work for the next phase of the EIA.

## 2.5.5 Completion of the Scoping Phase

After closure of the comment period, the Scoping Report will be updated to incorporate the comments received. The updated Scoping Report will be submitted to DMR for acceptance. If the updated Scoping Report is accepted, the project will proceed onto the EIA Phase.

**TABLE 2-5: REQUIREMENTS OF A SCOPING REPORT IN TERMS OF THE EIA REGULATIONS 2014 (AS AMENDED).**

| No.  | Content of Scoping Report  | Completed (Y/N or N/A) | Location in report                            |
|------|--|------------------------|---|
| 2(a) | <i>(i &amp; ii) Details and expertise of the Environmental Assessment Practitioner (EAP) who prepared the report.</i>  | Y                      | Table 2-4                                     |
| (b)  | <i>The location of the activity, including:</i>  | Y                      | Section 3.1.2                                 |
|      | <i>(i) the 21 digit Surveyor General code of each cadastral land parcel; or</i>  | N/A                    |   |
|      | <i>(ii) where available, the physical address and farm name</i>  | N/A                    |   |
|      | <i>(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;</i>   | Y                      |   |
| (c)  | <i>A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is:</i>   | Y                      | Figure 1-1                                    |
|      | <i>(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or</i>   | N/A                    |   |
|      | <i>(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.</i>  | N/A                    |   |
| (d)  | <i>A description of the scope of the proposed activity, including:</i>   | Y                      | Table 2-2                                     |
|      | <i>(i) all listed and specified activities triggered;</i>  | Y                      | Section 3                                     |
| (e)  | <i>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.</i> | Y                      | Section 2                                     |
| (f)  | <i>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.</i>   | Y                      | Section 3.2                                   |
| (h)  | <i>A full description of the process followed to reach the proposed preferred activity, site and location within the site, including:</i>  | Y                      | Section 3.3                                   |
|      | <i>(i) details of all the alternatives considered;</i>   |                        |   |
|      | <i>(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;</i>  | N                      | Section 2.5.2                                 |
|      | <i>(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;</i>  | Y                      | This will be presented in the updated Scoping |



| No.        | Content of Scoping Report  | Completed<br>(Y/N or<br>N/A) | Location<br>in report |
|------------|--|------------------------------|-----------------------|
|            |  |                              | Report.               |
|            | <i>(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;</i>   | Y                            | Section 4             |
|            | <i>(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<br/>(aa) can be reversed;<br/>(bb) may cause irreplaceable loss of resources; and<br/>(cc) can be avoided, managed or mitigated.</i> | Y                            | Section 5             |
|            | <i>(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;</i>  | Y                            | Section 6.3           |
|            | <i>(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;</i>   | Y                            | Section 5             |
|            | <i>(viii) the possible mitigation measures that could be applied and level of residual risk;</i>   | Y                            | Section 5             |
|            | <i>(ix) the outcome of the site selection matrix;</i>  | N/A                          |                       |
|            | <i>(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and</i>  | Y                            | Section 3.3           |
|            | <i>(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.</i>  | Y                            |                       |
| <i>(i)</i> | <i>a plan of study for undertaking the environmental impact assessment process to be undertaken, including:</i>  | Y                            | Section 6             |
|            | <i>(i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity;</i>  |                              |                       |
|            | <i>(ii) a description of the aspects to be assessed as part of the environmental impact assessment process;</i>  |                              |                       |
|            | <i>(iii) aspects to be assessed by specialists;</i>  |                              |                       |
|            | <i>(iv) a description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists;</i>  |                              |                       |
|            | <i>(v) a description of the proposed method of assessing duration and significance;</i>  |                              |                       |
|            | <i>(vi) an indication of the stages at which the competent authority will be consulted;</i>  |                              |                       |

| No.        | Content of Scoping Report   | Completed (Y/N or N/A) | Location in report |
|------------|---|------------------------|--------------------|
|            | <i>(vii) particulars of the public participation process that will be conducted during the environmental impact assessment process; and</i>   |                        |                    |
|            | <i>(viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process;</i>  |                        |                    |
|            | <i>(ix) identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.</i>                                      |                        |                    |
| <i>(i)</i> | <i>An undertaking under oath or affirmation by the EAP in relation:</i>   |                        |                    |
|            | <i>(i) the correctness of the information provided in the report;</i>   |                        |                    |
|            | <i>(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and</i>   | Y                      | Appendix C         |
|            | <i>(iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;</i>  |                        |                    |
| <i>(k)</i> | <i>an undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment</i> | Y                      | Appendix C         |
| <i>(l)</i> | <i>Where applicable, any specific information required by the competent authority.</i>  | N/A                    |                    |
| <i>(m)</i> | <i>Any other matter required in terms of section 24(4)(a) and (b) of the Act.</i>   | N/A                    |                    |

## 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 were undertaken as part of the previous Basic Assessment application and also addressed the key issues and detailed assessment of the planned bulk sampling activities. These studies were: (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 2-6

The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed geophysical and sampling activities (considered in the above-mentioned Basic Assessment application), as well as the proposed bulk sampling activities (to be assessed as part of the EIA phase). These impacts were assessed according to pre-defined rating scales (see Section 6.3). Specialists also recommended appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits, respectively. The terms of reference for these studies are presented in Sections 6.2.1 to 6.2.4.

**TABLE 2-6: LIST OF SPECIALIST STUDIES AND SPECIALISTS**

| No. | Specialist study                      | Specialist/s        | Qualifications  | Company                                  | Terms of Reference |
|-----|---------------------------------------|---------------------|---|--|--------------------|
| 1   | Marine Fauna                          | Dr Andrea Pulfrich  | PhD, (Fisheries Biology), Christian-Albrechts University, Kiel, Germany | Pisces Environmental Services (Pty) Ltd  | Section 6.2.2      |
| 2   | Fisheries                             | Mr Dave Japp        | MSc (Ichthyology and Fisheries Science), Rhodes University              | Capricorn Marine Environmental (Pty) Ltd | Section 6.2.3      |
|     |                                       | Ms Sarah Wilkinson  | BSc (Hons), (Botany), University of Cape Town                           |  |                    |
| 3   | Underwater Cultural Heritage Material | Ms Vanessa Maitland | MSc (Maritime Archaeology), University of South Africa                  | -  | Section 6.2.4      |

### 2.6.3 Integration and Assessment

The specialist information and other relevant information will be integrated into an EIR, which will include an Environmental Managements Programme (EMP). The specialist studies will be included as appendices to the EIR. The EIR will be released for a 30-day comment period and all I&APs on the project database will be notified when the EIR is available for comment.

After closure of the comment period, all comments received on the draft report will be incorporated and responded to in a Comments and Responses Report. The draft report will then be updated, to which the Comments and Responses Report will be appended, and submitted to DMR for consideration and decision-making.

The decision taken by the DMR will be advertised and distributed to all I&APs on the project database as part of the statutory appeal period.

### 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 bulk sampling activities.

#### 3.1 GENERAL PROJECT INFORMATION

##### 3.1.1 Applicant

De Beers Consolidated Mines (Pty) Ltd is the applicant.

|                             |  |                           |
|-----------------------------|--|---------------------------|
| <b>Address:</b>             | <b>De Beers Consolidated Mines (Pty) Ltd</b> |                           |
|                             | Corner Crownwood Road and Diamond Drive      |                           |
|                             | Theta Ext 4                                  |                           |
|                             | Johannesburg                                 |                           |
|                             | 2013   |                           |
| <b>Responsible Persons:</b> | <b>Nompumelelo Dessederia Zikalala</b>       | <b>Michelle Bossenger</b> |
| Telephone:                  | +27 (0) 11 374 7000                          | +27 (0) 11 374 7203       |
| Facsimile:                  | +27 (0) 11 309 3284                          | +27 (0) 11 309 3284       |

##### 3.1.2 Details of the Sea Concession Area

The proposed bulk sampling activities would be undertaken within Sea Concession 6C, located off the West Coast of South Africa (see Figure 1-1). The co-ordinates of the boundary points of Sea Concession 6C are provided in Table 3-1 below.

**TABLE 3-1: CO-ORDINATES OF THE BOUNDARY POINTS OF SEA CONCESSION 6C**

| Point | Latitude      | Longitude     | Total Area (km <sup>2</sup> ) |
|-------|---------------|---------------|-------------------------------|
| 1     | 29° 54' 18" S | 17° 04' 56" E | 3 457.46 km <sup>2</sup>      |
| 2     | 30° 10' 55" S | 17° 10' 19" E |                               |
| 3     | 30° 10' 55" S | 16° 10' 10" E |                               |
| 4     | 30° 04' 26" S | 15° 58' 47" E |                               |
| 5     | 29° 56' 28" S | 15° 53' 13" E |                               |
| 6     | 29° 56' 28" S | 15° 41' 46" E |                               |
| 7     | 29° 54' 18" S | 15° 39' 43" E |                               |

##### 3.1.3 Financial Provision

In terms of Section 24 of NEMA, an application for EA for a Prospecting Right must comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.

De Beers has financial provisioning in place for this rights area and would discuss and conclude the nature and quantum of the financial provision required for the management and remediation of environmental damage with DMR prior to any bulk sampling activities being undertaken.

### 3.1.4 Proposed Work Programme

The target mineral for the bulk sampling activities is marine diamonds. In addition to the proposed bulk sampling activities, the proposed prospecting operations would also entail regional scale and high-resolution geophysical surveys and sampling. As noted previously, EA for the planned geophysical surveys and sampling activities has already been granted.

Due to the dynamic nature of prospecting, the work programme may have to be modified, extended or curtailed as data and analyses become available (e.g. in some locations within Sea Concession 6C, the proposed bulk sampling activities could be undertaken without having first undertaken geophysical surveys or sampling). The overall prospecting programme would run over a five-year period.

## 3.2 NEED AND DESIRABILITY

### 3.2.1 Background

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, such as bulk sampling in the case of this application. A key intent of the Minerals and Mining Policy of South Africa states that Government will: "promote exploration and investment leading to increased mining output and employment" (Minerals and Mining Policy of South Africa, 1998). The Policy states further that:

- "The South African mining industry, one of the country's few world-class industries, has the capacity to continue to generate wealth and employment opportunities on a large scale;
- Mining is an international business and South Africa has to compete against developed and developing countries to attract both foreign and local investment. Many mining projects in South Africa have tended to be unusually large and long term, requiring massive capital and entailing a high degree of risk; and
- South Africa has an exceptional minerals endowment, and in several major commodities has the potential to supply far more than the world markets can consume."

In the more recently published Department of Minerals Resources Strategic Plan 2014 – 2019, the foreword by the Minister of Mineral Resources notes that the Department "*will continue to promote mineral value addition to strengthen the interface between extractive industries and national socio-economic developmental objectives*" and "*contribute towards decent employment, inclusive growth and industrialisation of South Africa*".

The Northern Cape Provincial Spatial Development Framework 2012 (PSDF) also notes that "*the greatest value from marine and coastal resources is generated through the mining and fishing sectors*" and that the "*Northern Cape has an abundance of diamond deposits both onshore and in marine deposits. This has led to the development of a large diamond mining sector, which has become the dominant activity of the coastal zone*".

In terms of the above, it is evident that the proposed bulk sampling activities are deemed to be a key component of the current national and provincial economies and future mining projects are a means to assist Government in meeting broader societal needs.

### **3.2.2 Rationale for Proposed Project**

This project aims to undertake the bulk sampling within Sea Concession 6C in order to identify economically viable diamond deposits on the continental shelf off the coast of the Northern Cape. The intention is to derive value from the identified offshore mineral resources in the future and to contribute to the existing diamond mining sector in the Northern Cape.

## **3.3 CONSIDERATION OF ALTERNATIVES**

This section presents the various alternatives considered in this Scoping 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 diamond deposits that occur within Sea Concession 6C, no further location alternatives are considered in the Scoping and EIA process.

The different bulk sampling methodologies 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 diamond 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 bulk sampling activities.

## **3.4 EXPLORATION SAMPLING OVERVIEW**

The proposed exploration sampling programme would entail geophysical survey and sampling (for which EA has already been granted) and bulk sampling activities. The sampling / bulk sampling activities may be divided into stages subject to reviews and follow-up sampling. A decision on the planned sampling / bulk sampling technology appropriate to each target area would be made based on the available data at the time.

The proposed bulk sampling activities would be undertaken using a vessel of opportunity, which may include the De Beers Marine (Pty) Ltd (of the appointed operator for Beers Consolidated Mines (Pty) Ltd) *mv Coral Sea* or one of the marine diamond vessels operated by Debmarine Namibia (Pty) Ltd or a similar vessel (see Figure 3-1). In this regard, there are two possible basic configurations of vessel available for sampling: (i) the vertical method, utilising a vertically mounted tool / tool mounted on a drill string; and (ii) the horizontal method, using a seabed crawler.

A description of these bulk sampling methodologies as well as information pertaining to the number of samples and total project footprint are provided below.



**FIGURE 3-1: POSSIBLE VESSELS OF OPPORTUNITY THAT COULD BE UTILISED DURING SAMPLING - MV CORAL SEA (LEFT) AND MV MAFUTA (RIGHT).**

### 3.4.1 Vertical Method

The vertical method utilises an ADS (Alternative Drill System) deployed at the end of a drill string which is suspended from a derrick mounted mid-ships and deployed through a moon pool. The drill stem is suspended in a state of constant tension by means of a compensation system that absorbs the motion of the ship, enabling the ADS to remain in contact with the seabed. The tool agitates the unconsolidated sediments and airlifts all sediment particles of up to 250 mm in diameter to the vessel for processing. The material from the seabed is pumped onto multi-decked screens to separate the boulders and sandy silt from the size fraction of interest - the 'plantfeed' (approx. 1.5 mm – 19 mm in diameter). All material except the plantfeed is returned overboard immediately after having passed over the screens. The plant feed is then separated using a dense medium separation system and the diamonds are extracted using an X-ray sorter.

Sediments are recovered to a depth of typically between 0.5 m and 4 m.

### 3.4.2 Horizontal Method

The horizontal method makes use of a seabed crawler. The seabed crawler is lowered to the seabed by a hoist winch and heave compensator via a large, fixed A-frame over the stern of the vessel (see Figure 3-2). The seabed crawler is fitted with acoustic seabed navigation and imaging systems that allow for the remote operation of the crawler from the surface support vessel through power and signal umbilical cables. The seabed crawler is track-driven and is equipped with a dredge pump system, hydraulic power pack and a jet-



water system to facilitate the agitation and suction of unconsolidated surficial sediments (up to 250 mm in diameter) to the vessel (see Figure 3-3). Onboard processing of the sediments takes place in the same way as described in section 3.4.1. The seabed crawler would remove the seabed sediments to a depth of typically between 0.5 m to 4 m in a set path within the target area identified for bulk-sampling activities.



**FIGURE 3-2: DEPLOYMENT OF THE SEABED CRAWLER**



**FIGURE 3-3: SCHEMATIC DIAGRAM SHOWING OPERATION OF A SEABED CRAWLER AND PHOTOGRAPH OF SEABED CRAWLER.**

### 3.4.3 Summary of operations

The planned bulk sampling operations would have a total footprint of approximately 480 000 m<sup>2</sup> and would be undertaken in a total of 60 days over the duration of the 5-year licence period. The bulk prospecting operation could consist of up to 60 pits and / or trenches. These would typically each be up to approximately 8 000 m<sup>2</sup> in extent and typically up to 1.5 m in depth. Specific details are provided in Table 3-2 below.

**TABLE 3-2: SUMMARY OF PROPOSED BULK SAMPLING OPERATIONS**

| Activity                        |         | Detail                         |
|---------------------------------|---------|--------------------------------|
| Number of pits/trenches planned |         | Up to 60                       |
| Dimensions of pits/trenches     | Length  | Up to 400 m                    |
|                                 | Breadth | Typically 20 m                 |
|                                 | Depth   | Typically up to 1.5 m          |
| Total Volume Overburden (Waste) |         | Maximum 480 000 m <sup>3</sup> |
| Total Volume Ore                |         | Maximum 240 000 m <sup>3</sup> |
| Density Overburden              |         | 1.5 t/m <sup>3</sup>           |
| Density Ore                     |         | 1.9 t/m <sup>3</sup>           |

### 3.5 REHABILITATION

The immediate impact on the seabed entails the localised removal of the seabed habitat, with the fine sediment surface layers replaced with coarse sediments (boulders and gravels). The majority of the material that is pumped to the surface is returned directly to the sea after the primary screening process. Operations are designed such that the coarse tailings, and to some extent the finer sediments, discharged from the vessel land back into disturbed areas as far as possible. This avoids reprocessing the same sediments, minimises the disturbance footprint and provides material for re-establishment of habitat. Sediments typically settle rapidly, with most of the silt sinking within minutes. Mixing with descending seawater then results in dilution of the finer sediment, with the remaining particulate matter settling over a period of hours. Seabed research programs have demonstrated the re-establishment of the ecological functioning of the seabed after removal of the diamonds. Seabed recovery rates are linked to fine sediment infill, the rate of which is influenced by a range of factors including resuspension and settlement of sediments from adjacent areas by near-seabed currents, Orange River flooding etc. Recolonisation takes place by passive translocation of animals during storms or sediment slumping from nearby unaffected areas, active immigration of mobile species, and immigration and settlement of pelagic larvae and juveniles.

### 3.6 VESSEL EMISSIONS AND DISCHARGES

This section provides a brief description of the types of emissions and discharges that are expected from the bulk sampling and related activities. 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.

#### 3.6.1 Discharges to Sea

##### 3.6.1.1 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.

### **3.6.1.2 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.

### **3.6.1.3 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. Although De Beers vessels macerate food regardless of the distance, this may not be the case for all contracted vessels, although best practice is encouraged. The daily discharge from a vessel is typically about 0.15 m<sup>3</sup>.

### **3.6.1.4 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 Section 3.6.1.1 above).

### **3.6.1.5 Other**

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

## **3.6.2 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 a typical bulk sampling operation is given below.

### **3.6.2.1 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.

### **3.6.2.2 Scrap Metal**

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

### **3.6.2.3 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.

#### **3.6.2.4 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.

#### **3.6.2.5 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.

#### **3.6.2.6 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.

#### **3.6.2.7 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.

#### **3.6.3 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 THE AFFECTED 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 previous information compiled 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 bulk sampling activities.

The study area lies within the southern zone of the Benguela Current region and is characterised by the cool Benguela upwelling system (Shillington 1998; Shannon 1985). A conceptual model of the Benguela system is shown in Figure 4-1.

#### 4.1.1 Meteorology

The meteorological processes of the South African West Coast have been described by numerous authors, including Andrews and Hutchings (1980), Heydorn and Tinley (1980), Nelson and Hutchings (1983), Shannon (1985), Shannon and Nelson (1996), and Shillington (1998).

Wind and weather patterns along the West Coast are primarily due to the South Atlantic high-pressure cell and the eastward movement of mid-latitude cyclones (which originate within the westerly wind belt between 35° to 45°S), south of the subcontinent.

The South Atlantic high-pressure cell is perennial, but strongest during austral summer when it attains its southernmost extension to the south and south-west (approximately 30°S, 05°E) of the subcontinent. Linked to this high-pressure in summer is a low-pressure cell that forms over the subcontinent due to strong heating over land. The pressure differential of these two systems induces moderate to strong south-easterly (SE) winds near the shore during summer. Furthermore, the southern location of the South Atlantic high-pressure cell limits the impact that mid-latitude cyclones have on summer weather patterns so that, at best, the mid-latitude cyclones cause a slackening of the SE winds. During the austral winter both the weakening and north-ward migration of the South Atlantic high-pressure cell (to approximately 26°S, 10°E) and the increase in atmospheric pressure over the subcontinent result in the eastward moving mid-latitude cyclones advancing closer to the coast.

Strong north-westerly (NW) to south-westerly (SW) winds result from mid-latitude cyclones passing the southern Cape at a frequency of 3 to 6 days. Associated with the approach of mid-latitude cyclones is the appearance of low-pressure cells, which originate from near Lüderitz on the Namibian coast and quickly travel around the subcontinent (Reason and Jury 1990; Jury, Macarthur and Reason 1990).

A second important wind type that occurs along the West Coast are katabatic 'berg' winds during the formation of a high-pressure system (lasting a few days) over, or just south of, the south-eastern part of the subcontinent. This results in the movement of dry adiabatically heated air offshore (typically at 15 m/s). At times, such winds may blow along a large proportion of the West Coast north of Cape Point and can be intensified by local topography. Aeolian transport of fine sand and dust may occur up to 150 km offshore.

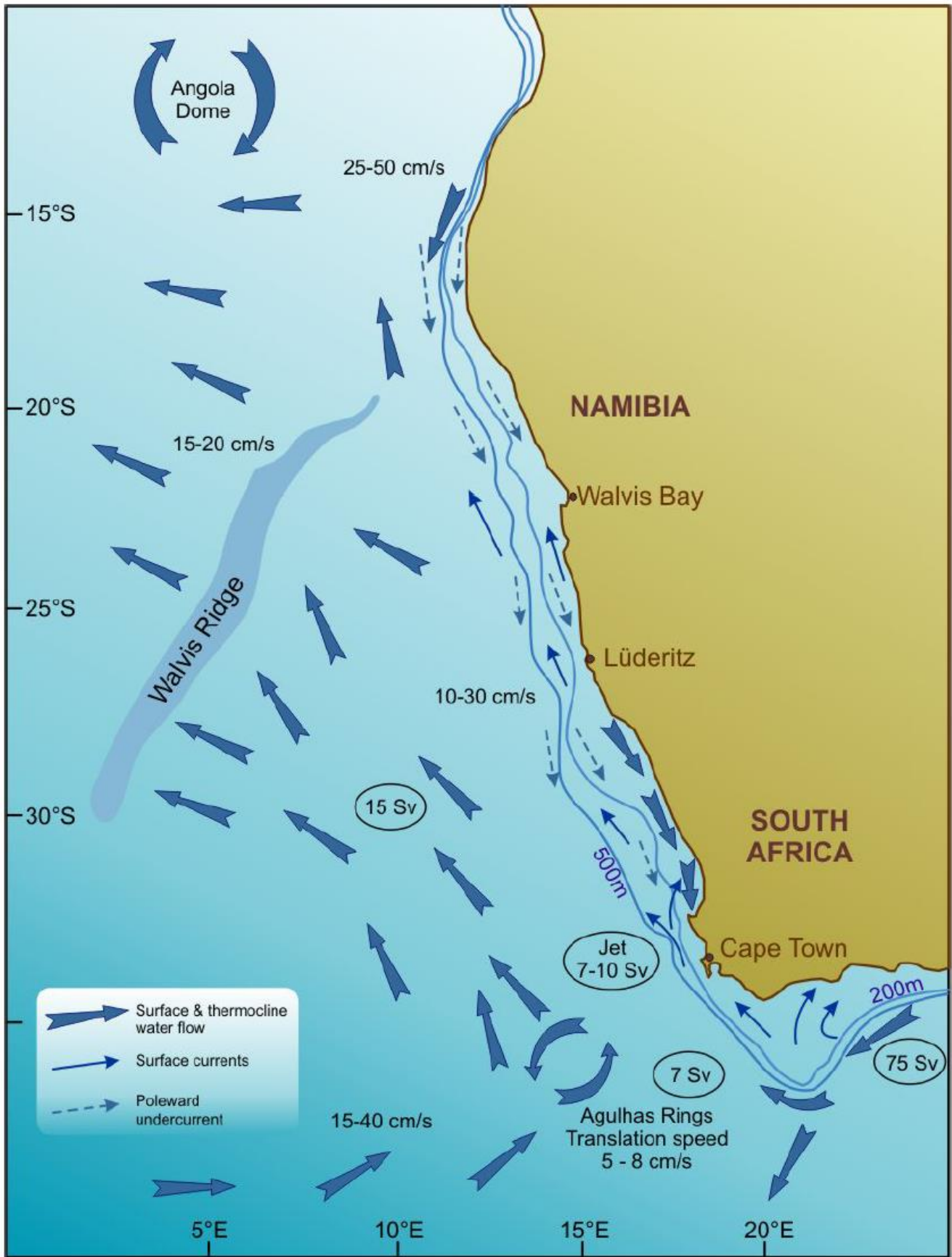


FIGURE 4-1: CIRCULATION AND VOLUME FLOWS OF THE BENGUELA CURRENT (AFTER SHANNON & NELSON, 1996).

## **4.1.2 Physical Oceanography**

### **4.1.2.1 Waves**

Most of the west coast of southern Africa is classified as exposed, experiencing strong wave action, rating 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 southerly winds. 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-west - south direction. Winter swells are strongly dominated by those from the south-west – south-south-west 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.

### **4.1.2.2 Tides**

Tides along the West Coast are subject to a simple semi-diurnal tidal regime with a mean tidal range along the Namaqualand coast of about 1.57 m (at least 50% of the time in the nearshore area), with spring tides as much as 2.24 m and neap tides in the order of 1 m. Tides arrive almost simultaneously (within 5 to 10 minutes) along the whole of the West Coast. Other than in the presence of constrictive topography, e.g. an entrance to enclosed bay or estuary, tidal currents are weak.

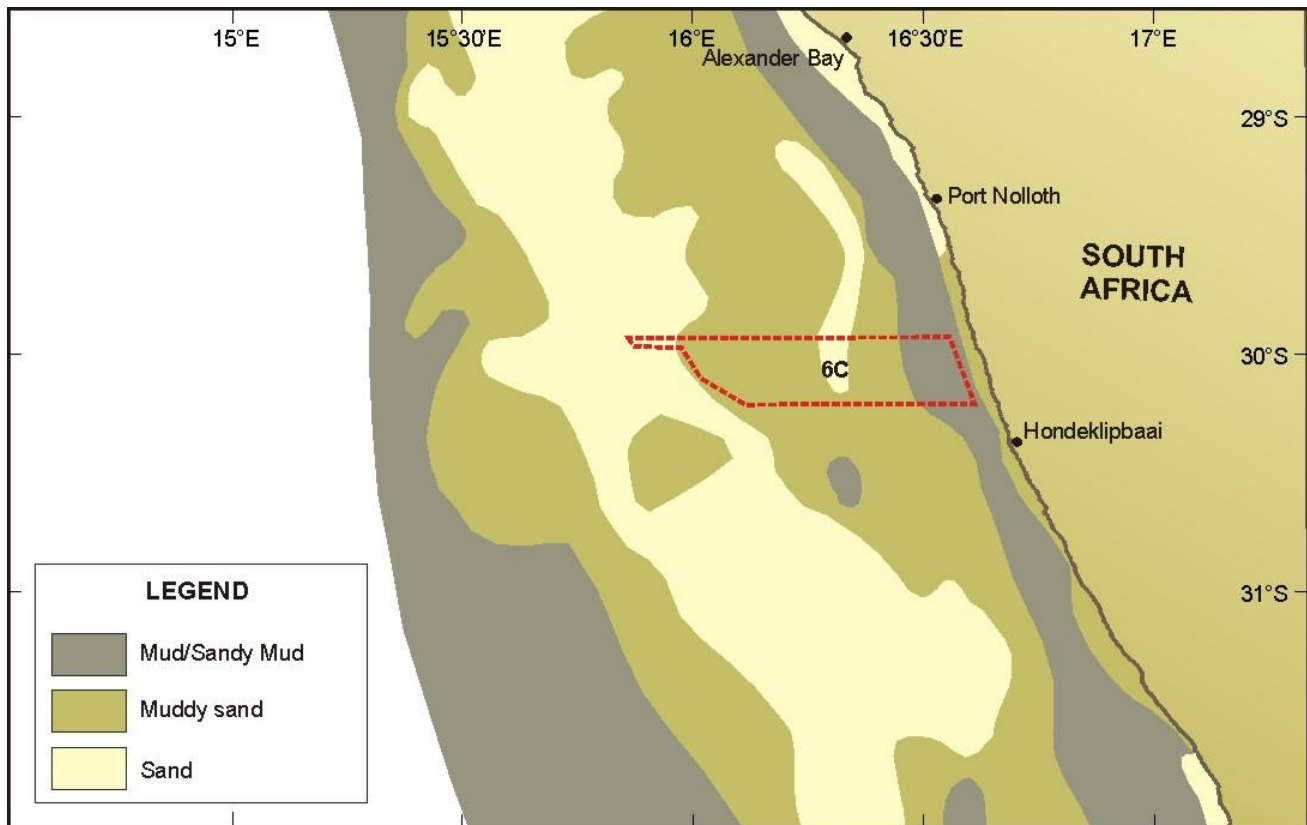
### **4.1.2.3 Topography**

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). Between Cape Columbine and the Orange River, there is usually a double shelf break, with the distinct inner and outer slopes, separated by a gently sloping ledge, the middle shelf. The immediate nearshore area consists mainly of a narrow (about 8 km wide) rugged rocky zone, sloping steeply seawards to a depth of around 80 m. The middle and outer shelf typically lacks relief, sloping gently seawards before reaching the shelf break at a depth of approximately 300 m.

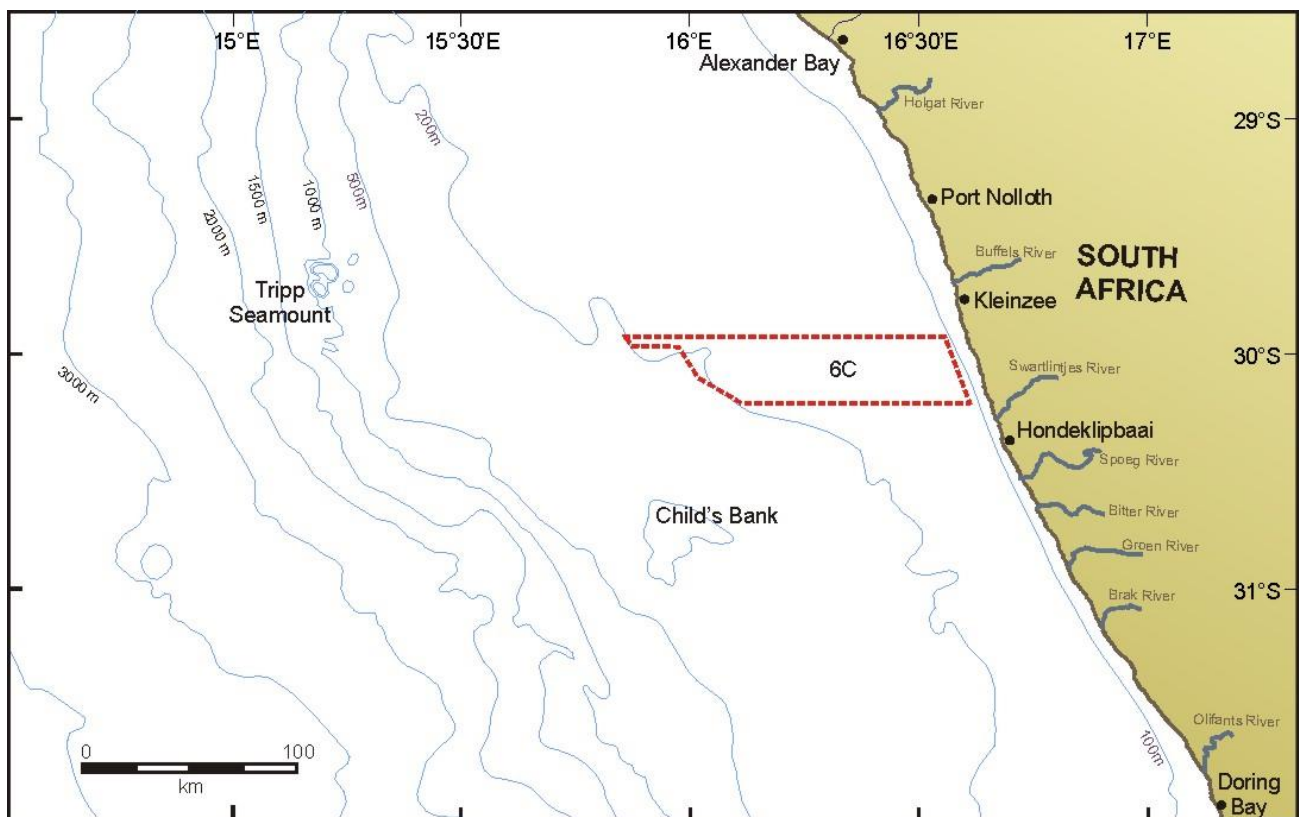
Banks on the continental shelf include the Orange River pro-delta, a shallow (160 - 190 m) zone that reaches maximal widths (180 km) offshore of the Orange River, and Child's Bank, situated approximately 150 km offshore at about 31°S. Tripp Seamount is a geological feature located to the west-northwest of the western extent of Sea Concession 6C (see Figure 4-2) which rises from approximately 1 000 m to a depth of 150 m.

### **4.1.2.4 Coastal and Continental Shelf Geology and Seabed Geomorphology**

The inner shelf is underlain by Precambrian bedrock (also referred to as Pre-Mesozoic basement), whilst the middle and outer shelf areas are composed of Cretaceous and Tertiary sediments (Dingle 1973; Birch et al. 1976; Rogers 1977; Rogers & Bremner 1991). As a result of erosion on the continental shelf, the unconsolidated surface sediment cover is generally thin, often less than 1 m. Sediments are finer seawards, changing from sand on the inner and middle 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 4-3).



**FIGURE 4-2: SEA CONCESSION 6C IN RELATION TO THE REGIONAL BATHYMETRY AND SHOWING PROXIMITY OF PROMINENT SEABED FEATURES.**



**FIGURE 4-3: SEA CONCESSION 6C IN RELATION TO SEDIMENT DISTRIBUTION ON THE CONTINENTAL SHELF (ADAPTED FROM ROGERS 1977).**



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 mainly from the Orange River and minor contributions from other rivers like the Buffels and the Olifants Rivers. As the coarser sand and gravel sediment fractions are generally transported northward, most of the sediment containing the diamond mineralisation in the project area is considered to be relict deposits of ephemeral rivers active during wetter climates in the geological past. The Orange River, when in flood, still contributes largely to the mudbelt 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 and hinterland.

#### **4.1.2.5 Upwelling and Plankton Production**

The cold, upwelled water is rich in inorganic nutrients, the major contributors being various forms of nitrates, phosphates and silicates (Chapman & Shannon 1985). During upwelling the comparatively nutrient-poor surface waters are displaced by enriched deep water, supporting substantial seasonal primary phytoplankton production. This, in turn, serves as the basis for a rich food chain up through zooplankton, pelagic baitfish (anchovy, pilchard, round-herring and others), to predatory fish (hake and snoek), mammals (primarily seals and dolphins) and seabirds (African penguins, cormorants, pelicans, terns and others). 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.

##### **4.1.2.1 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/km<sup>2</sup> of phytoplankton and 31.5 tons/km<sup>2</sup> 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.

#### **4.1.2.2 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 (see Figure 4-3) 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.

#### **4.1.2.3 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).

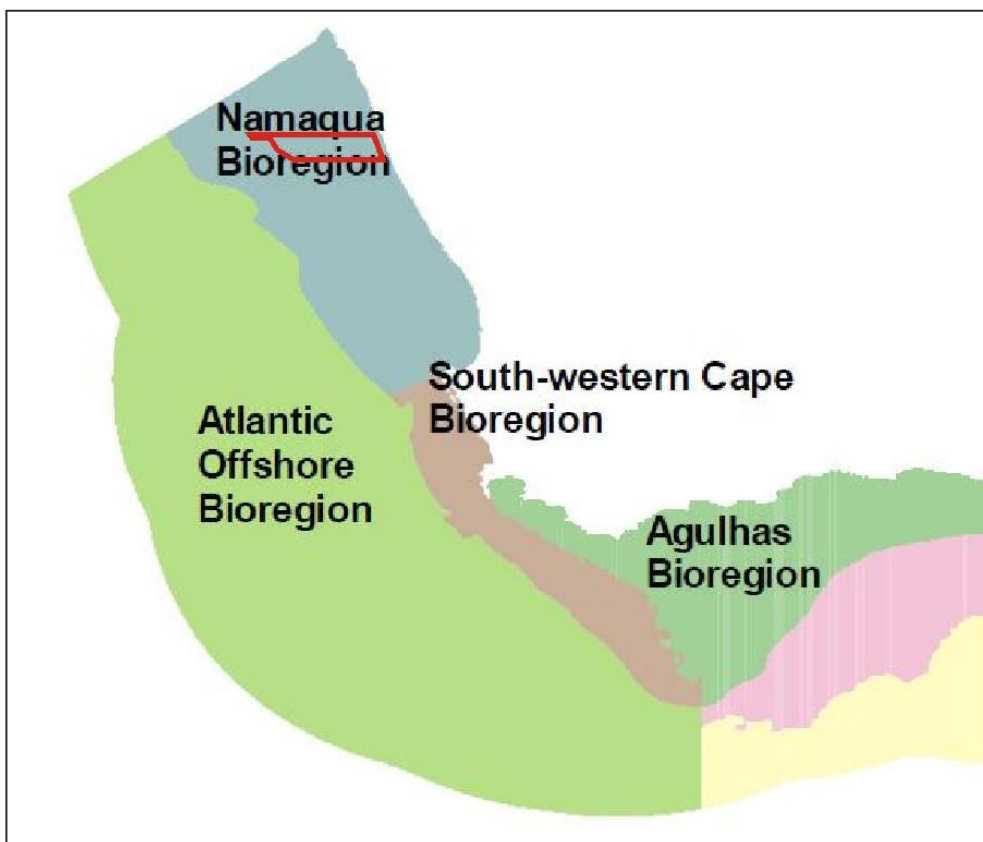
Although natural turbidity of seawater is a global phenomenon, there has been a worldwide increase of water turbidity and sediment load in coastal areas as a consequence of anthropogenic activities. These include dredging associated with the construction of harbours and coastal installations, beach replenishment, 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 Oceanography

Biogeographically, Sea Concession 6C 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 endemism (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 bulk sampling area is located beyond the 80 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 bulk sampling activities.



**FIGURE 4-4: SEA CONCESSION 6C (RED POLYGON) 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).

Sea Concession 6C includes three macro-infauna communities 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 *Callinassa* 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 Dalssen 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 endemism of macro-infauna species on the West Coast, although such research is currently underway (pers. comm. Ms N. Karenyi, 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' and 'critically endangered'. Sea Concession 6C does not fall within these areas.

Generally, species richness increases from the inner shelf across the mid shelf and is influenced by sediment type (Karenyi unpublished data). The highest total abundance and species diversity was measured in sandy sediments of the mid-shelf. Biomass is highest in the inshore ( $\pm 50 \text{ g/m}^2$  wet weight) and decreases across the mid-shelf averaging around  $30 \text{ g/m}^2$  wet weight. This is contrary to Christie (1974) who found that biomass was greatest in the mudbelt at 80 m depth off Lamberts Bay, south of Sea Concession 6C, where the sediment characteristics and the impact of environmental stressors (such as low oxygen events) are likely to differ from those in the concession area.

Surveys conducted between 180 m and 480 m depth in the vicinity of Sea Concession 6C revealed high proportions of hard ground rather than unconsolidated sediment on the outer shelf, although this requires further verification (Karenyi unpublished data). The benthic fauna of the outer shelf and continental slope (beyond approximately 450 m depth) are very poorly known largely due to limited opportunities for sampling as well as the lack of access to Remote Operated Vehicles (ROVs) for visual sampling of hard substrata. To date very few areas of the continental slope off the West Coast have been biologically surveyed.

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.

#### 4.1.3.1.2 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; MacIlsac 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.

In the vicinity of Sea Concession 6C there are two geological features of note, namely Child's Bank, situated 150 km offshore at 31°S and approximately 60 km due south of the Sea Concession 6C, and Tripp Seamount situated 250 km offshore at approximately 29°40'S and 150 km to the west-northwest of the concession area. Child's Bank was described by Dingle et al. (1987) to be a carbonate mound (bioherm). 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 lowprofile 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). Deep water corals are known from Child's Bank as well as the iBhubezi Reef to the south-east of Child's Bank. Furthermore, evidence from video footage taken on hard-substrate habitats in 100 - 120 m depth off the West Coast of South Africa (De Beers Marine (Pty) Ltd, unpublished data) suggest that sensitive communities

including gorgonians, octocorals and reef-building sponges do occur on the continental shelf, and similar communities may thus be expected in Sea Concession 6C.

#### 4.1.3.1.3 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 jacobever (*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 likely to occur in the licence area, and their approximate depth range, 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 |
|-------------------------|-----------------------------------|-------------|
| Frilled shark           | <i>Chlamydoselachus anguineus</i> | 200 - 1 000 |
| Six gill cowshark       | <i>Hexanchus griseus</i>          | 150 - 600   |
| Gulper shark            | <i>Centrophorus granulosus</i>    | 480         |
| Leafscale gulper shark  | <i>Centrophorus squamosus</i>     | 370 - 800   |
| Bramble shark           | <i>Echinorhinus brucus</i>        | 55 - 285    |
| Black dogfish           | <i>Centroscyllium fabricii</i>    | > 700       |
| Portuguese shark        | <i>Centroscymnus coelolepis</i>   | > 700       |
| Longnose velvet dogfish | <i>Centroscymnus crepidater</i>   | 400 - 700   |



| Common Name                   | Scientific name                | Depth Range   |
|-------------------------------|--------------------------------|---------------|
| Birdbeak dogfish              | <i>Deania calcea</i>           | 400 - 800     |
| Arrowhead dogfish             | <i>Deania profundorum</i>      | 200 - 500     |
| Longsnout dogfish             | <i>Deania quadrispinosum</i>   | 200 - 650     |
| Sculpted lanternshark         | <i>Etmopterus brachyurus</i>   | 450 - 900     |
| Brown lanternshark            | <i>Etmopterus compagnoi</i>    | 450 - 925     |
| Giant lanternshark            | <i>Etmopterus granulosus</i>   | > 700         |
| Smooth lanternshark           | <i>Etmopterus pusillus</i>     | 400 - 500     |
| Spotted spiny dogfish         | <i>Squalus acanthias</i>       | 100 - 400     |
| Shortnose spiny dogfish       | <i>Squalus megalops</i>        | 75 - 460      |
| Shortspine spiny dogfish      | <i>Squalus mitsukurii</i>      | 150 - 600     |
| Sixgill sawshark              | <i>Pliotrema warreni</i>       | 60 - 500      |
| Goblin shark                  | <i>Mitsukurina owstoni</i>     | 270 - 960     |
| Smalleye catshark             | <i>Apristurus microps</i>      | 700 - 1 000   |
| Saldanha catshark             | <i>Apristurus saldanha</i>     | 450 - 765     |
| "grey/black wonder" catsharks | <i>Apristurus spp.</i>         | 670 - 1 005   |
| Tigar catshark                | <i>Halaelurus natalensis</i>   | 50 - 100      |
| Izak catshark                 | <i>Holohalaelurus regani</i>   | 100 - 500     |
| Yellowspotted catshark        | <i>Scyliorhinus capensis</i>   | 150 - 500     |
| Soupfin shark/Vaalhaai        | <i>Galeorhinus galeus</i>      | < 10 - 300    |
| Houndshark                    | <i>Mustelus mustelus</i>       | < 100         |
| Whitespotted houndshark       | <i>Mustelus palumbes</i>       | > 350         |
| Little guitarfish             | <i>Rhinobatos annulatus</i>    | > 100         |
| Atlantic electric ray         | <i>Torpedo nobiliana</i>       | 120 - 450     |
| African softnose skate        | <i>Bathyraja smithii</i>       | 400 - 1 020   |
| Smoothnose legskate           | <i>Cruriraja durbanensis</i>   | > 1 000       |
| Roughnose legskate            | <i>Crurirajaparcomaculata</i>  | 150 - 620     |
| African dwarf skate           | <i>Neoraja stehmanni</i>       | 290 - 1 025   |
| Thorny skate                  | <i>Raja radiata</i>            | 50 - 600      |
| Bigmouth skate                | <i>Raja robertsi</i>           | > 1 000       |
| Slime skate                   | <i>Raja pullopunctatus</i>     | 15 - 460      |
| Rough-belly skate             | <i>Raja springeri</i>          | 85 - 500      |
| Yellowspot skate              | <i>Raja wallacei</i>           | 70 - 500      |
| Roughskin skate               | <i>Raja spinacidermis</i>      | 1 000 - 1 350 |
| Biscuit skate                 | <i>Raja clavata</i>            | 25 - 500      |
| Munchkin skate                | <i>Raja caudaspinosa</i>       | 300 - 520     |
| Bigthorn skate                | <i>Raja confundens</i>         | 100 - 800     |
| Ghost skate                   | <i>Raja dissimilis</i>         | 420 - 1 005   |
| Leopard skate                 | <i>Raja leopardus</i>          | 300 - 1 000   |
| Smoothback skate              | <i>Raja ravidula</i>           | 500 - 1 000   |
| Spearnose skate               | <i>Raja alba</i>               | 75 - 260      |
| St Joseph                     | <i>Callorhynchus capensis</i>  | 30 - 380      |
| Cape chimaera                 | <i>Chimaera sp.</i>            | 680 - 1 000   |
| Brown chimaera                | <i>Hydrolagus sp.</i>          | 420 - 850     |
| Spearnose chimaera            | <i>Rhinochimaera atlantica</i> | 650 - 960     |

### 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.

#### 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<sup>2</sup>/day for the midshelf region and decreasing to 1 g C/m<sup>2</sup>/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*, *Nitzschia*, *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. They are unlikely to occur in the offshore regions of Sea Concession 6C.

The mesozooplankton ( $\geq 200 \mu\text{m}$ ) 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 ( $\geq 1\ 600 \mu\text{m}$ ) 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<sup>2</sup>, with maximum values recorded during upwelling periods. Macrozooplankton biomass ranges from 0.1 - 1.0 g C/m<sup>2</sup>, 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.

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.

Sea Concession 6C lies within the influence of the Namaqua upwelling cell, and seasonally high phytoplankton abundance can be expected, providing favourable feeding conditions for micro-, meso- and macrozooplankton, and for ichthyoplankton. Immediately to the north of the upwelling cell, high turbulence and deep mixing in the water column result in diminished phytoplankton biomass and consequently the area is considered to be an environmental barrier to the transport of ichthyoplankton from the southern to the northern Benguela upwelling ecosystems. Important pelagic fish species, including anchovy, redeye round herring, horse mackerel and shallow-water hake, are reported as spawning on either side of the Orange River Banks area, but not within it (see Table 4-5). Phytoplankton, zooplankton and ichthyoplankton abundances in the Sea Concession area are thus expected to be comparatively high relative to the Orange River Banks area. In the offshore portions of the Sea Concession 6C area plankton abundance is also expected to be low, with the major fish spawning and migration routes occurring further inshore on the shelf.

#### 4.1.3.2.2 Cephalopods

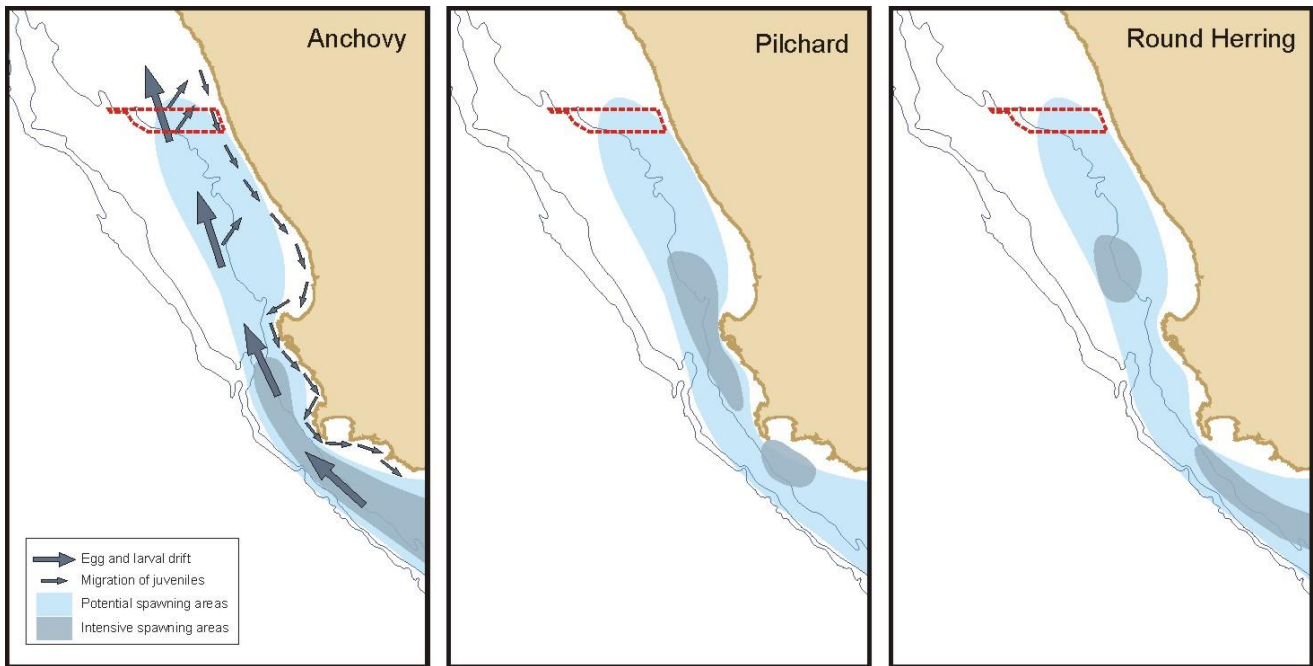
The major cephalopod resource in the southern Benguela are sepheids/cuttlefish (Lipinski 1992; Augustyn *et al.* 1995). Most of the cephalopod resource is distributed on the mid-shelf with *Sepia australis* being most abundant at depths between 60-190 m, whereas *S. hieronis* densities were higher at 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

Small pelagic species occurring beyond the surfzone and generally within the 200 m contour include the sardine/pilchard (*Sardinops 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.



**FIGURE 4-5: SEA CONCESSION 6C (RED POLYGON) IN RELATION TO MAJOR SPAWNING AREAS IN THE SOUTHERN BENGUELA REGION (ADAPTED FROM CRUIKSHANK 1990).**

Two species that migrate along the West Coast following the shoals of anchovy and pilchards are snoek *Thysites 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 include tunas, billfish and pelagic sharks, which migrate throughout the southern oceans, between surface and deep waters (>300 m) and have a highly seasonal abundance in the Benguela. 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).

A number of species of pelagic sharks are also known to occur on the West Coast, including blue (*Prionace glauca*), short-fin mako (*Isurus oxyrinchus*) and oceanic whitetip sharks (*Carcharhinus longimanus*). Occurring throughout the world in warm temperate waters, these species are usually found further offshore on the West Coast. Great whites (*Carcharodon carcharias*) may also be encountered in coastal and offshore areas. This species is a significant apex predator along the southern African coast, particularly in the vicinity of the seal colonies. Although not necessarily threatened with extinction, great whites are listed in Appendix II (species in which trade must be controlled in order to avoid utilization incompatible with their survival) of CITES (Convention on International Trade in Endangered Species) and is described as “vulnerable” in the International Union for Conservation of Nature (IUCN) Red listing. In response to global declines in abundance, white sharks were legislatively protected in South Africa in 1991.

Many of the large migratory pelagic species are considered threatened by the IUCN, primarily due to overfishing (see Table 4-2). 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.

**TABLE 4-2: SOME OF THE MORE IMPORTANT LARGE MIGRATORY PELAGIC FISH LIKELY TO OCCUR IN THE OFFSHORE REGIONS OF THE SOUTH COAST.**

| Common Name            | Species                        | IUCN Conservation Status |
|------------------------|--------------------------------|--------------------------|
| <b>Tunas</b>           |                                |                          |
| Southern Bluefin Tuna  | <i>Thunnus maccoyii</i>        | Critically Endangered    |
| Bigeye Tuna            | <i>Thunnus obesus</i>          | Vulnerable               |
| Longfin Tuna/Albacore  | <i>Thunnus alalunga</i>        | Near Threatened          |
| Yellowfin Tuna         | <i>Thunnus albacares</i>       | Near Threatened          |
| Frigate Tuna           | <i>Auxis thazard</i>           | Least concern            |
| Skipjack Tuna          | <i>Katsuwonus pelamis</i>      | Least concern            |
| <b>Billfish</b>        |                                |                          |
| Blue Marlin            | <i>Makaira nigricans</i>       | Vulnerable               |
| Sailfish               | <i>Istiophorus platypterus</i> | Least concern            |
| Swordfish              | <i>Xiphias gladius</i>         | Least concern            |
| Black Marlin           | <i>Istiompax indica</i>        | Data deficient           |
| <b>Pelagic Sharks</b>  |                                |                          |
| Pelagic Thresher Shark | <i>Alopias pelagicus</i>       | Vulnerable               |
| Common Thresher Shark  | <i>Alopias vulpinus</i>        | Vulnerable               |
| Great White Shark      | <i>Carcharodon carcharias</i>  | Vulnerable               |
| Shortfin Mako          | <i>Isurus oxyrinchus</i>       | Vulnerable               |
| Longfin Mako           | <i>Isurus paucus</i>           | Vulnerable               |
| Blue Shark             | <i>Prionace glauca</i>         | Near Threatened          |
| Oceanic Whitetip Shark | <i>Carcharhinus longimanus</i> | Vulnerable               |

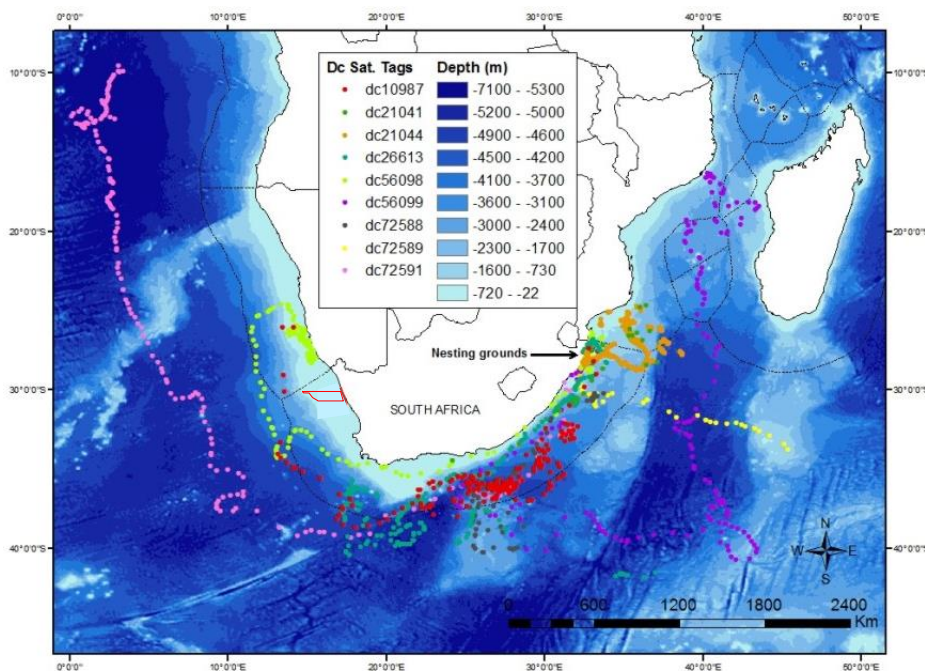
#### 4.1.3.2.4 Turtles

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 jellyfish 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). 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.



**FIGURE 4-6: THE POST-NESTING DISTRIBUTION OF NINE SATELLITE TAGGED LEATHERBACK FEMALES (1996 – 2006; OCEANS AND COAST, UNPUBLISHED DATA). THE APPROXIMATE LOCATION OF CONCESSION 6C IS INDICATED (RED POLYGON).**

#### 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 4-3. 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.

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 4-4). 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.

**TABLE 4-3: PELAGIC SEABIRDS COMMON IN THE SOUTHERN BENGUELA REGION (CRAWFORD ET AL. 1991).**

| Common Name               | Species name                        | Global IUCN             |
|---------------------------|-------------------------------------|-------------------------|
| Shy albatross             | <i>Thalassarche cauta</i>           | Near Threatened         |
| Black browed albatross    | <i>Thalassarche melanophrys</i>     | Endangered <sup>1</sup> |
| Yellow nosed albatross    | <i>Thalassarche chlororhynchos</i>  | Endangered              |
| Giant petrel sp.          | <i>Macronectes halli/giganteus</i>  | Near Threatened         |
| Pintado petrel            | <i>Daption capense</i>              | Least concern           |
| Greatwinged petrel        | <i>Pterodroma macroptera</i>        | Least concern           |
| Soft plumaged petrel      | <i>Pterodroma mollis</i>            | Least concern           |
| Prion spp                 | <i>Pachyptila spp.</i>              | Least concern           |
| White chinned petrel      | <i>Procellaria aequinoctialis</i>   | Vulnerable              |
| Cory's shearwater         | <i>Calonectris diomedea</i>         | Least concern           |
| Great shearwater          | <i>Puffinus gravis</i>              | Least concern           |
| Sooty shearwater          | <i>Puffinus griseus</i>             | Near Threatened         |
| European Storm petrel     | <i>Hydrobates pelagicus</i>         | Least concern           |
| Leach's storm petrel      | <i>Oceanodroma leucorhoa</i>        | Least concern           |
| Wilson's storm petrel     | <i>Oceanites oceanicus</i>          | Least concern           |
| Blackbellied storm petrel | <i>Fregetta tropica</i>             | Least concern           |
| Skua spp.                 | <i>Catharacta/Stercorarius spp.</i> | Least concern           |
| Sabine's gull             | <i>Larus sabini</i>                 | Least concern           |

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

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

| Common name     | Species name                  | Global IUCN Status |
|-----------------|-------------------------------|--------------------|
| African Penguin | <i>Spheniscus demersus</i>    | Endangered         |
| Great Cormorant | <i>Phalacrocorax carbo</i>    | Least Concern      |
| Cape Cormorant  | <i>Phalacrocorax capensis</i> | Endangered         |

|                   |                                |                 |
|-------------------|--------------------------------|-----------------|
| Bank Cormorant    | <i>Phalacrocorax neglectus</i> | Endangered      |
| Crowned Cormorant | <i>Phalacrocorax coronatus</i> | Near Threatened |
| White Pelican     | <i>Pelecanus onocrotalus</i>   | Least Concern   |
| Cape Gannet       | <i>Morus capensis</i>          | Vulnerable      |
| Kelp Gull         | <i>Larus dominicanus</i>       | Least Concern   |
| Greyheaded Gull   | <i>Larus cirrocephalus</i>     | Least Concern   |
| Hartlaub's Gull   | <i>Larus hartlaubii</i>        | Least Concern   |
| Caspian Tern      | <i>Hydroprogne caspia</i>      | Least Concern   |
| Swift Tern        | <i>Sterna bergii</i>           | Least Concern   |
| Roseate Tern      | <i>Sterna dougallii</i>        | Least Concern   |
| Damara Tern       | <i>Sterna balaenarum</i>       | 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-four 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 4-5). 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, 18° E) 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 project area 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. As the bulk sampling area is located on the continental shelf, cetacean diversity in the area can be expected to be high. In the offshore portions of Sea Concession 6C abundances will, however, be low compared to further inshore. The most common species within the project area (in terms of likely encounter rate not total population sizes) are likely to be the long-finned pilot whale and humpback whale.



**TABLE 4-5: 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 |
|-------------------------------|-----------------------------------|----------------|----------|-------------|----------------------------|--------------------------|
| <b>Delphinids</b>             |                                   |                |          |             |                            |                          |
| Dusky dolphin                 | <i>Lagenorhynchus obscurus</i>    | Yes (0- 800 m) | No       | Year round  | Daily                      | Data Deficient           |
| Heaviside's dolphin           | <i>Cephalorhynchus heavisidii</i> | Yes (0-200 m)  | No       | Year round  | Daily                      | Least Concern            |
| Common bottlenose dolphin     | <i>Tursiops truncatus</i>         | Yes            | Yes      | Year round  | Monthly                    | Least Concern            |
| Common (short beaked) dolphin | <i>Delphinus delphis</i>          | Yes            | Yes      | Year round  | Monthly                    | Least Concern            |
| Southern right whale dolphin  | <i>Lissodelphis peronii</i>       | Yes            | Yes      | Year round  | Occasional                 | Least Concern            |
| Striped dolphin               | <i>Stenella coeruleoalba</i>      | No             | ?        | ?           | Very rare                  | Least Concern            |
| Pantropical spotted dolphin   | <i>Stenella attenuata</i>         | Edge           | Yes      | Year round  | Very rare                  | Least Concern            |
| Long-finned pilot whale       | <i>Globicephala melas</i>         | Edge           | Yes      | Year round  | <Weekly                    | Least Concern            |
| Short-finned pilot whale      | <i>Globicephala macrorhynchus</i> | ?              | ?        | ?           | Very rare                  | Least Concern            |
| Rough-toothed dolphin         | <i>Steno bredanensis</i>          | ?              | ?        | ?           | Very rare                  | Least Concern            |
| Killer whale                  | <i>Orcinus orca</i>               | Occasional     | Yes      | Year round  | Occasional                 | Data Deficient           |
| False killer whale            | <i>Pseudorca crassidens</i>       | Occasional     | Yes      | Year round  | Monthly                    | Least Concern            |
| Pygmy killer whale            | <i>Feresa attenuata</i>           | ?              | Yes      | ?           | Occasional                 | Least Concern            |
| Risso's dolphin               | <i>Grampus griseus</i>            | Yes (edge)     | Yes      | ?           | Occasional                 | Least Concern            |
| <b>Sperm whales</b>           |                                   |                |          |             |                            |                          |
| Pygmy sperm whale             | <i>Kogia breviceps</i>            | Edge           | Yes      | Year round  | Occasional                 | Data Deficient           |
| Dwarf sperm whale             | <i>Kogia sima</i>                 | Edge           | ?        | ?           | Very rare                  | Data Deficient           |
| Sperm whale                   | <i>Physeter macrocephalus</i>     | Edge           | Yes      | Year round  | Occasional                 | Vulnerable               |

| Common Name          | Species                         | Shelf | Offshore | Seasonality                   | Likely encounter frequency | IUCN Conservation Status |
|----------------------|---------------------------------|-------|----------|-------------------------------|----------------------------|--------------------------|
| <b>Beaked whales</b> |                                 |       |          |                               |                            |                          |
| Cuvier's             | <i>Ziphius cavirostris</i>      | No    | Yes      | Year round                    | Occasional                 | Data Deficient           |
| Arnoux's             | <i>Beradius arnouxii</i>        | No    | Yes      | Year round                    | Occasional                 | Data Deficient           |
| Southern bottlenose  | <i>Hyperoodon planifrons</i>    | No    | Yes      | Year round                    | Occasional                 | Least Concern            |
| Layard's             | <i>Mesoplodon layardii</i>      | No    | Yes      | Year round                    | Occasional                 | Data Deficient           |
| True's               | <i>M. mirus</i>                 | No    | Yes      | Year round                    | ?                          | Data Deficient           |
| Gray's               | <i>M. grayi</i>                 | No    | Yes      | Year round                    | Occasional                 | Data Deficient           |
| Blainville's         | <i>M. densirostris</i>          | No    | Yes      | Year round                    | ?                          | Data Deficient           |
| <b>Baleen whales</b> |                                 |       |          |                               |                            |                          |
| Antarctic Minke      | <i>Balaenoptera bonaerensis</i> | Yes   | Yes      | >Winter                       | Monthly                    | Least Concern            |
| Dwarf minke          | <i>B. acutorostrata</i>         | Yes   | Yes      | Year round                    | Occasional                 | Least Concern            |
| Fin whale            | <i>B. physalus</i>              | Yes   | Yes      | MJJ & ON, rarely in summer    | Occasional                 | Endangered               |
| Blue whale           | <i>B. musculus</i>              | No    | Yes      | ?                             | Occasional                 | Critically Endangered    |
| Sei whale            | <i>B. borealis</i>              | Yes   | Yes      | MJ & ASO                      | Occasional                 | Endangered               |
| Bryde's (offshore)   | <i>B. brydei</i>                | Yes   | Yes      | Summer (JF)                   | Occasional                 | Not assessed             |
| Bryde's (inshore)    | <i>B. brydei (subsp)</i>        | Yes   | Yes      | Year round                    | Occasional                 | Vulnerable               |
| Pygmy right          | <i>Caperea marginata</i>        | Yes   | ?        | Year round                    | Occasional                 | Least Concern            |
| Humpback             | <i>Megaptera novaeangliae</i>   | Yes   | Yes      | Year round, higher in SONDJF  | Daily*                     | Vulnerable               |
| Southern right       | <i>Eubalaena australis</i>      | Yes   | No       | Year round, higher in JFASOND | Daily*                     | Least Concern            |

Cetaceans are comprised of 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 4-5. Of the 34 species listed, one is critically endangered, two are endangered and two are considered vulnerable (South African Red Data list Categories, 2016). Altogether 10 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 Balaenopteridae. 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.

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 broader project 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 1000 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.

Fin whales were historically caught off the West Coast of South Africa, 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 abundance or distribution of fin whales off western South Africa.

Although blue whales were historically caught in high numbers off the South African West Coast, with a single peak in catch rates during June to July in Walvis Bay, Namibia and at Namibe, Angola suggesting that in the eastern South Atlantic these latitudes are close to the northern migration limit for the species (Best 2007). 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. The chance of encountering the species in the Sea Concession area is considered low.

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 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).

The majority of Humpback whales passing through the Benguela are migrating to breeding grounds off tropical west Africa, between Angola and the Gulf of Guinea (Rosenbaum *et al.* 2009; Barendse *et al.* 2010). In coastal waters, the northward migration stream is larger than the southward peak (Best & Allison 2010; Elwen *et al.* 2013), suggesting that animals migrating north strike the coast at varying places north of St Helena Bay, resulting in increasing whale density on shelf waters and into deeper pelagic waters as one moves northwards, but no clear migration 'corridor'. On the southward migration, many humpbacks follow the Walvis Ridge offshore then head directly to high latitude feeding grounds, while others follow a more coastal route (including the majority of mother-calf pairs) possibly lingering in the feeding grounds off west South Africa in summer (Elwen *et al.* 2013, Rosenbaum *et al.* in press). Recent abundance estimates put the number of animals in the west African breeding population to be in excess of 9 000 individuals in 2005 (IWC 2012) and it is likely to have increased since this time at about 5% per annum (IWC 2012). Humpback whales are thus likely to be the most frequently encountered baleen whale in the project area, ranging from the coast out beyond the

shelf, with year round presence but numbers peaking in July – February associated with the breeding migration and subsequent feeding in the Benguela.

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.* 2017). When the population numbers crashed, the range contracted down to just the south coast of South Africa, but as the population recovers, it is repopulating its historic grounds including Namibia (Roux *et al.* 2001, 2015; de Rock *et al.*, in review) and Mozambique (Banks *et al.* 2011). Southern right whales are seen regularly in the nearshore waters of the West Coast (<3 km from shore), extending north into southern Namibia (Roux *et al.* 2001, 2011). Southern Right whales have been recorded off the West Coast in all months of the year, but with numbers peaking in winter (June - September). Notably, all available records have been very close to shore with only a few out to 100 m depth, so they are unlikely to be encountered in the concession area.

In the last decade, deviations from the predictable and seasonal migration patterns of these two species have been reported from the Cape Columbine – Yzerfontein area (Best 2007; Barendse *et al.* 2010). High abundances of both Southern Right and Humpback whales in this area during spring and summer (September-February), indicates that the upwelling zones off Saldanha and St Helena Bay may serve as an important summer feeding area (Barendse *et al.* 2011, Mate *et al.* 2011). It was previously thought that whales feed only rarely while migrating (Best *et al.* 1995), but these localised summer concentrations suggest that these whales may in fact have more flexible foraging habits.

(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), 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 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 project area 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).

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 project area 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 project area 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 ( $\pm$  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). Dusky dolphins are resident year round in the Benguela.

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.

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).

In summary, the Humpback and Southern Right whale are likely to be encountered year-round, with numbers in the Cape Columbine area highest between September and February, and not during winter as is common on the South Coast breeding grounds. Several other large whale species are also most abundant on the West Coast during winter: fin whales peak in May-July and October-November; sei whale numbers peak in May-June and again in August-October and offshore Bryde's whale numbers are likely to be highest in January-February. Whale numbers on the shelf and in offshore waters are thus likely to be highest between October and February.

Of the migratory cetaceans, the Blue is listed as 'critically endangered', Fin and Sei whales are listed as 'Endangered' and the Bryde's (inshore) and Humpback whale as 'Vulnerable' in the IUCN Red Data book. All whales and dolphins are given protection under the South African Law. The Marine Living Resources Act, 1998 (No. 18 of 1998) states that no whales or dolphins may be harassed, killed or fished. No vessel or aircraft may, without a permit or exemption, approach closer than 300 m to any whale and a vessel should move to a minimum distance of 300 m from any whales if a whale surfaces closer than 300 m from a vessel or aircraft.

The 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 (see Figure 4-7). 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 study area: at Kleinzee (incorporating Robeiland), at Bucchu Twins near Alexander Bay, and Strandfontein Point (south of Hondeklipbaai). The colony at Kleinzee has the highest seal population and produces the highest seal pup numbers on the South African Coast (Wickens 1994). The colony at Buchu Twins, formerly a non-breeding colony, has also attained breeding status (M. Meyer, SFRI, pers. comm.). Non-breeding colonies occur south of Hondeklip Bay at Strandfontein Point and on Bird Island at Lamberts Bay, with the McDougall's Bay islands and Wedge Point being haul-out sites only and not permanently occupied by seals. All have important conservation value since they are largely undisturbed at present. 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. 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).

## 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)<sup>1</sup>. 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 (*Thyrstites 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.

Sea Concession area 6C is situated near to the fishing harbour of Port Nolloth, a regional fishing node which operates at a low level of development. Historically, the harbour accommodated a West Coast rock lobster fishery, an experimental hake-long-line fishery and a small experimental trawl fishery during the 1980's (targeting gurnards and sole). Currently there is little fishing activity taking place from Port Nolloth (only inshore West Coast rock lobster and traditional line fishing). As the harbour is relatively shallow and does not have a breakwater, it becomes inaccessible to vessels during rough weather conditions and cannot accommodate larger vessels (length greater than 22 m). This has been a restrictive factor to the development of fisheries in the region. The main commercial sectors operating in the vicinity of the study area are discussed below:

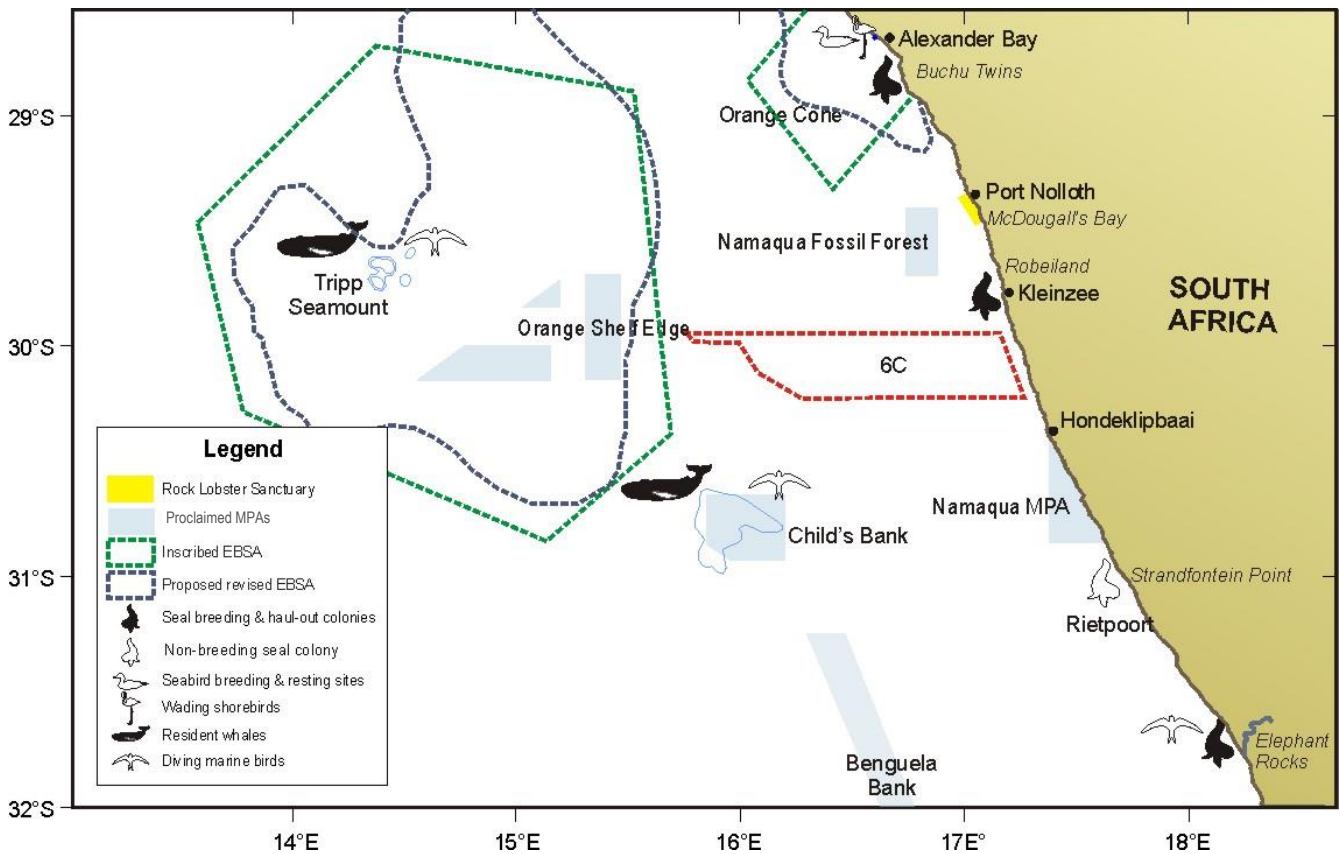
#### 4.1.4.1.1 Small Pelagic Purse-Seine

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.

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<sup>1</sup> The Exclusive Economic Zone is the zone extending from the coastline out to a distance of 200 nautical miles within which South Africa holds exclusive economic rights.



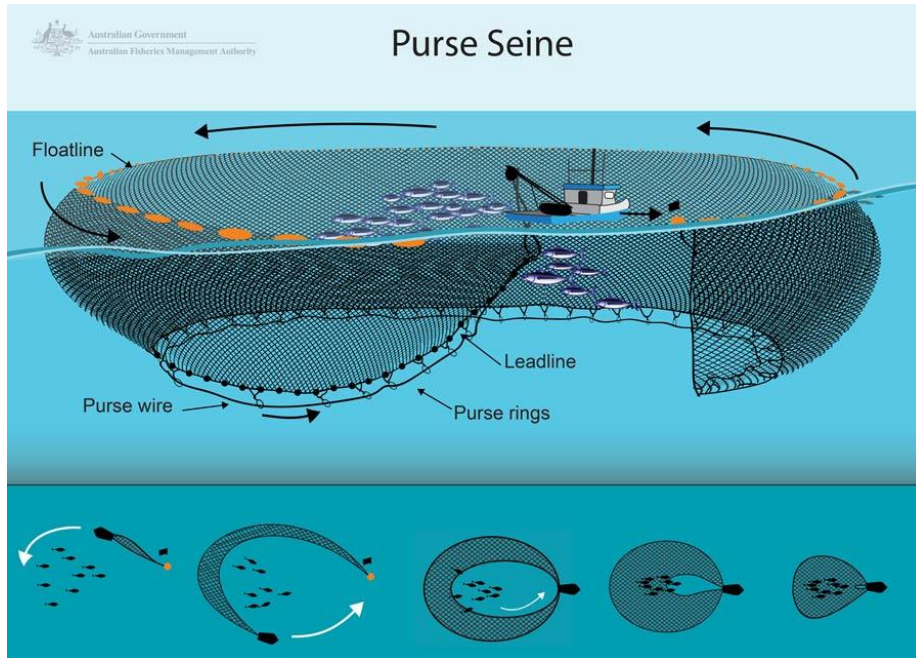


**FIGURE 4-7: PROJECT - ENVIRONMENT INTERACTION POINTS ON THE WEST COAST, ILLUSTRATING THE LOCATION OF SEA CONCESSION 6C (RED POLYGON) IN RELATION TO SEABIRD AND SEAL COLONIES AND RESIDENT WHALE POPULATIONS.**

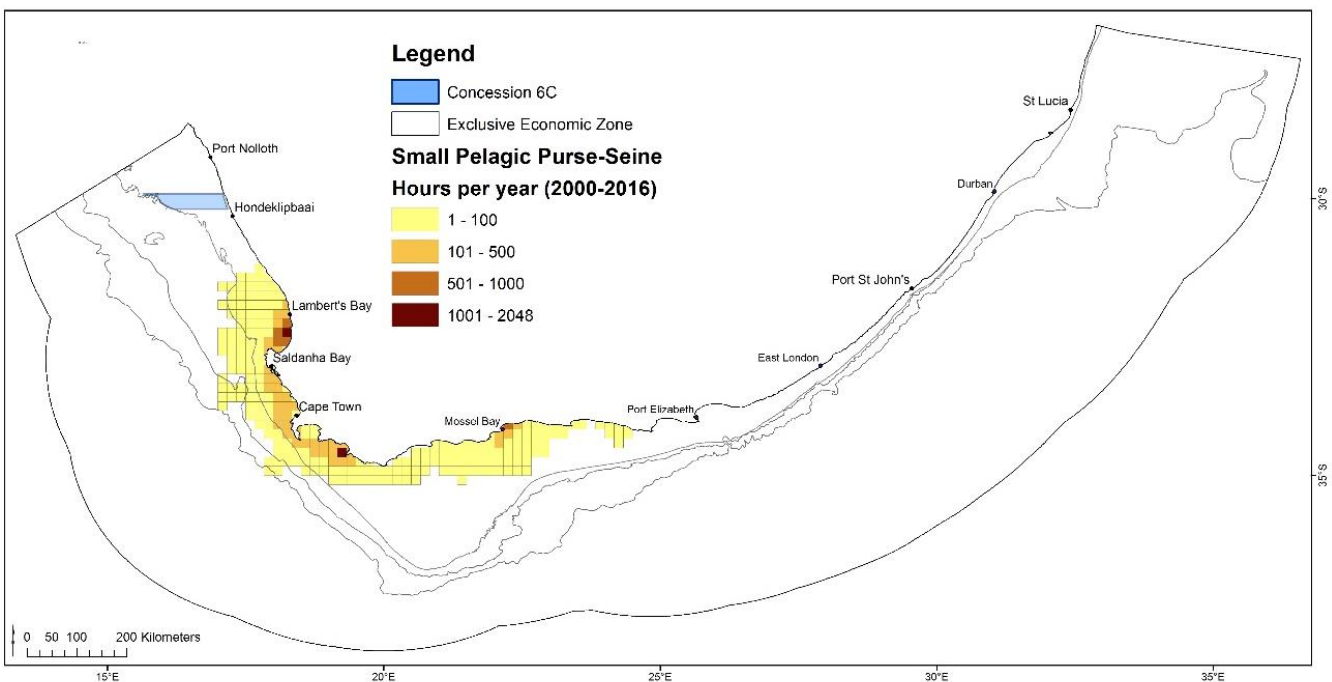
Once a shoal has been located the vessel steams around it and encircle it with a large net. The depth of the net is usually between 60 m and 90 m. Netting walls surround aggregated fish both from the sides and from underneath, thus preventing them from escaping by diving downwards. These are surface nets framed by lines: a float line on top and lead line at the bottom (see Figure 4-8). 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 area are shown in Figure 4-9. The map omits fishing grid blocks which have less than one hour of fishing effort per year (average

values for the period 2000 to 2016), as sporadic fishing events have been recorded within the concession area but these are considered to be insignificant in the overall context of the distribution of fishing activity by the sector. The concession area is situated at least 120 km northward of grounds fished regularly by the purse-seine sector. The concession area does, however, overlap spawning and recruitment areas for small pelagic species.



**FIGURE 4-8: SCHEMATIC OF TYPICAL PURSE-SEINE GEAR DEPLOYED IN THE “SMALL” PELAGIC FISHERY. (SOURCE: [HTTP://WWW.AFMA.GOV.AU/PORTFOLIO-ITEM/PURSE-SEINE](http://www.afma.gov.au/portfolio-item/purse-seine)).**



**FIGURE 4-9: SEA CONCESSION 6C 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

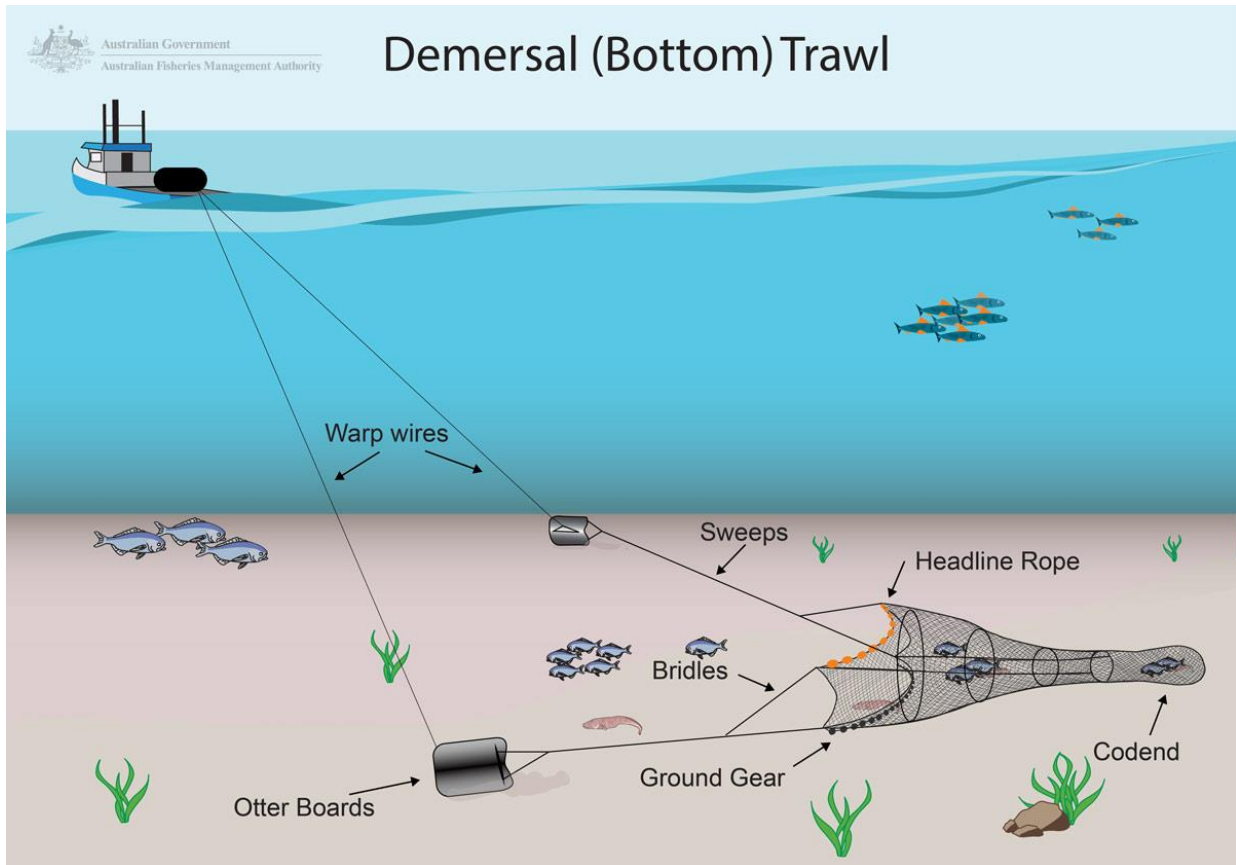
The hake-directed trawl fishery is the most valuable sector of the South African fishing industry and is split into two sub-sectors: the offshore (“deep-sea”) sector which is active off both the South and West Coasts, and the much smaller inshore trawl sector which is active off the South Coast. A fleet 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.

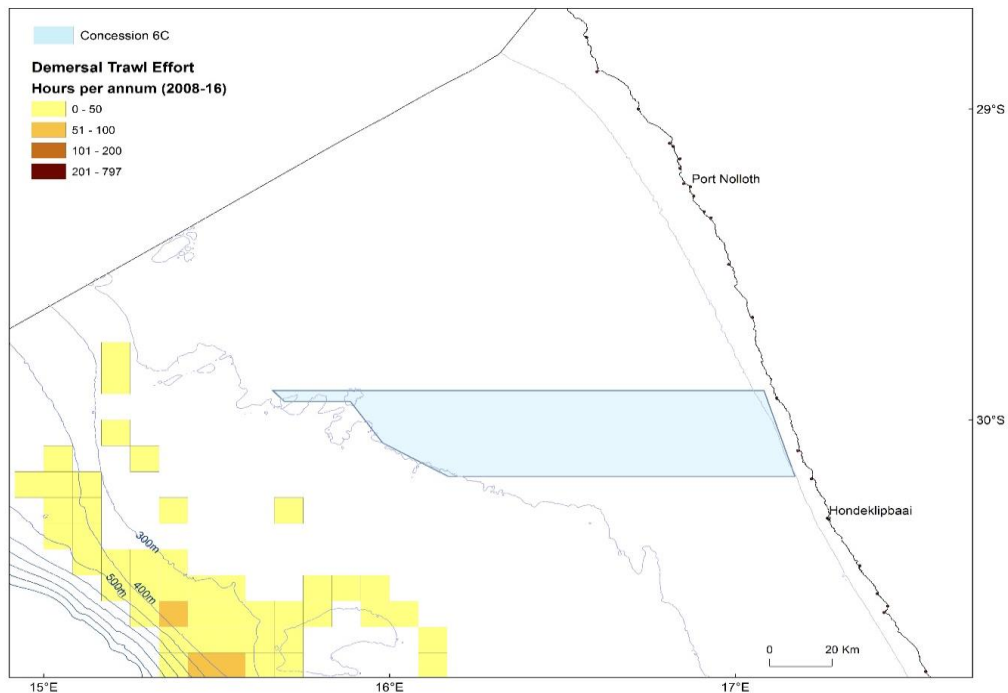
The offshore fleet is segregated into wetfish and freezer vessels which differ in terms of the capacity for the processing of fish at sea and in terms of vessel size and capacity. While freezer vessels may work in an area for up to a month at a time, wetfish vessels may only remain in an area for about 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 4-10). 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 shows the demersal trawl effort and catch between 2008 and 2016 in relation to the area of interest. 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. In the vicinity of the concession area, demersal trawling is centred along the 500 m bathymetric contour but ranges to 300 m and to 200 m in places (e.g. around Child’s Bank submarine canyon). There is no direct overlap between trawling grounds and Sea Concession area 6C, which is situated at least 30 km from the designated footprint of trawling ground. The concession area does, however, coincide with spawning and recruitment areas for hake and other demersal species.



**FIGURE 4-10: TYPICAL GEAR CONFIGURATION USED BY DEMERSAL TRAWLERS (OFFSHORE) TARGETING HAKE (SOURCE: [HTTPS://WWW.AFMA.GOV.AU/FISHERIES-MANAGEMENT/METHODS-AND-GEAR/TRAWLING](https://www.afma.gov.au/fisheries-management/methods-and-gear/trawling)).**



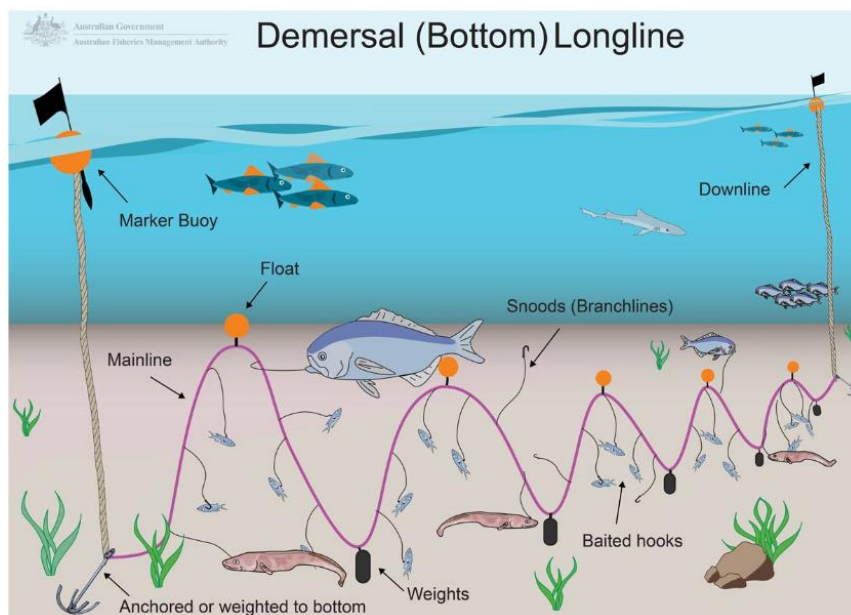
**FIGURE 4-11: SEA CONCESSION 6C IN RELATION TO THE SPATIAL DISTRIBUTION OF TRAWLING EFFORT EXPENDED BY THE DEMERSAL TRAWL SECTOR (2008 TO 2016).**

#### 4.1.4.1.3 Demersal Long-Line

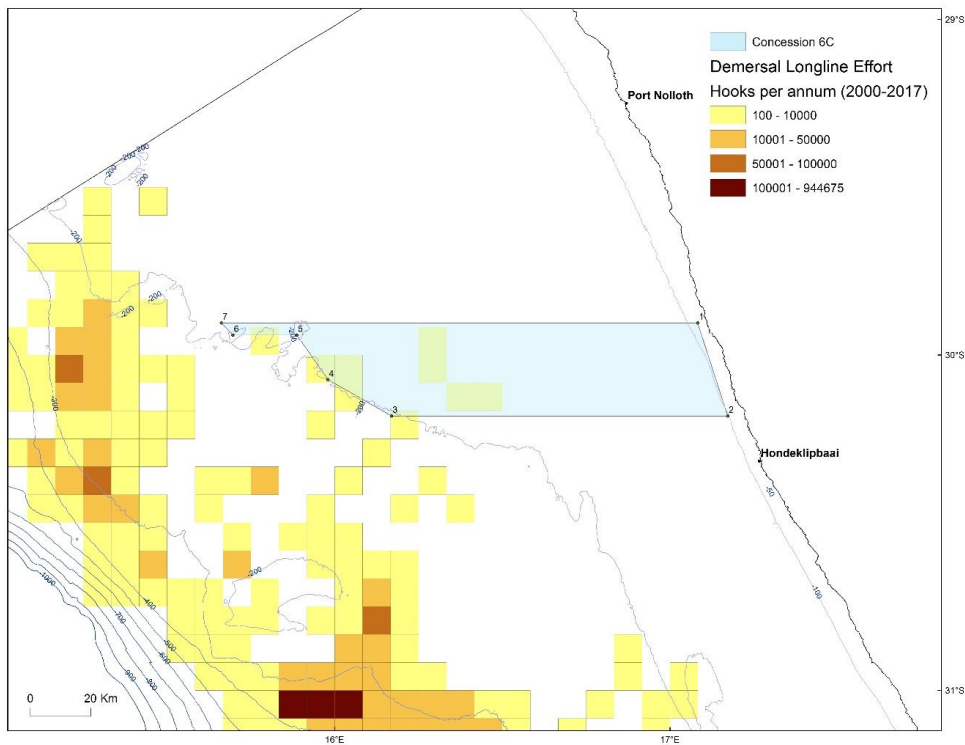
The demersal long-line fishing technique is used to target bottom-dwelling species of fish. Like the demersal trawl fishery, the target species of the longline fishery is the Cape hakes, with a small amount of non-targeted commercial by-catch.

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 4-12). 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. Fishing activity records (from 2000 to 2017) shows frequented grounds at distances of 20 km and 40 km from the north-westerly and south-westerly extents of the concession area, respectively (see Figure 4-13). However, there are records of sporadic activity within the concession area that amounts to an average of one line set per year and a catch of approximately 4 tons of hake. This is equivalent to approximately 0.05% of the total landing of hake by the sector per year during this period. As noted above, that the concession area overlaps spawning and recruitment areas for hake and other demersal species.



**FIGURE 4-12: TYPICAL CONFIGURATION OF DEMERSAL (BOTTOM-SET) HAKE LONG-LINE GEAR USED IN SOUTH AFRICAN WATERS (SOURCE: [HTTP://WWW.AFMA.GOV.AU/PORTFOLIO-ITEM/LONGLINING](http://www.afma.gov.au/portfolio-item/longlining)).**



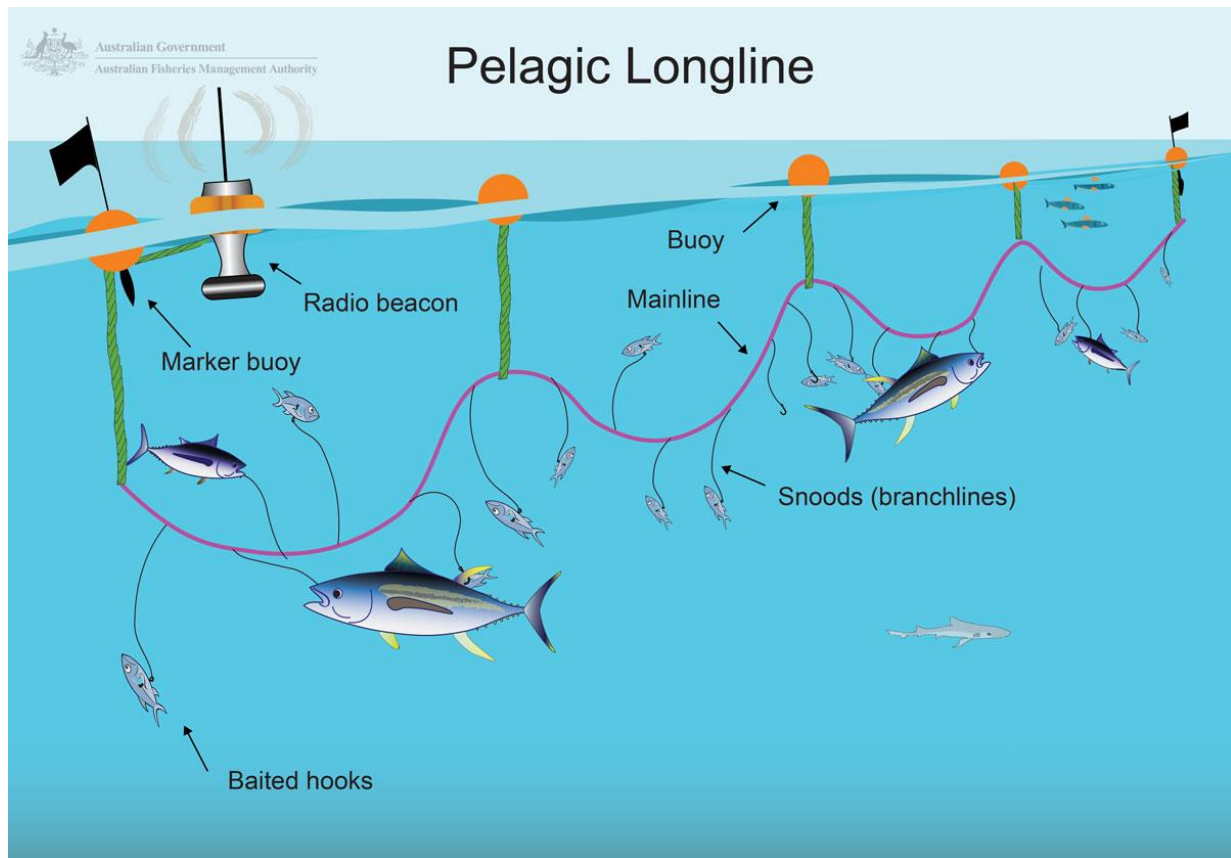
**FIGURE 4-13: SEA CONCESSION 6C IN RELATION TO THE SPATIAL DISTRIBUTION OF EFFORT EXPENDED BY DEMERSAL LONG-LINE FISHERY (2000 – 2017).**

#### 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 4-14). 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.

The fishery operates extensively from the continental shelf break into deeper waters, year-round. Pelagic long-line vessels are primarily concentrated seawards of the 500 m depth contour where the continental slope is steepest and can be expected within the area of interest.



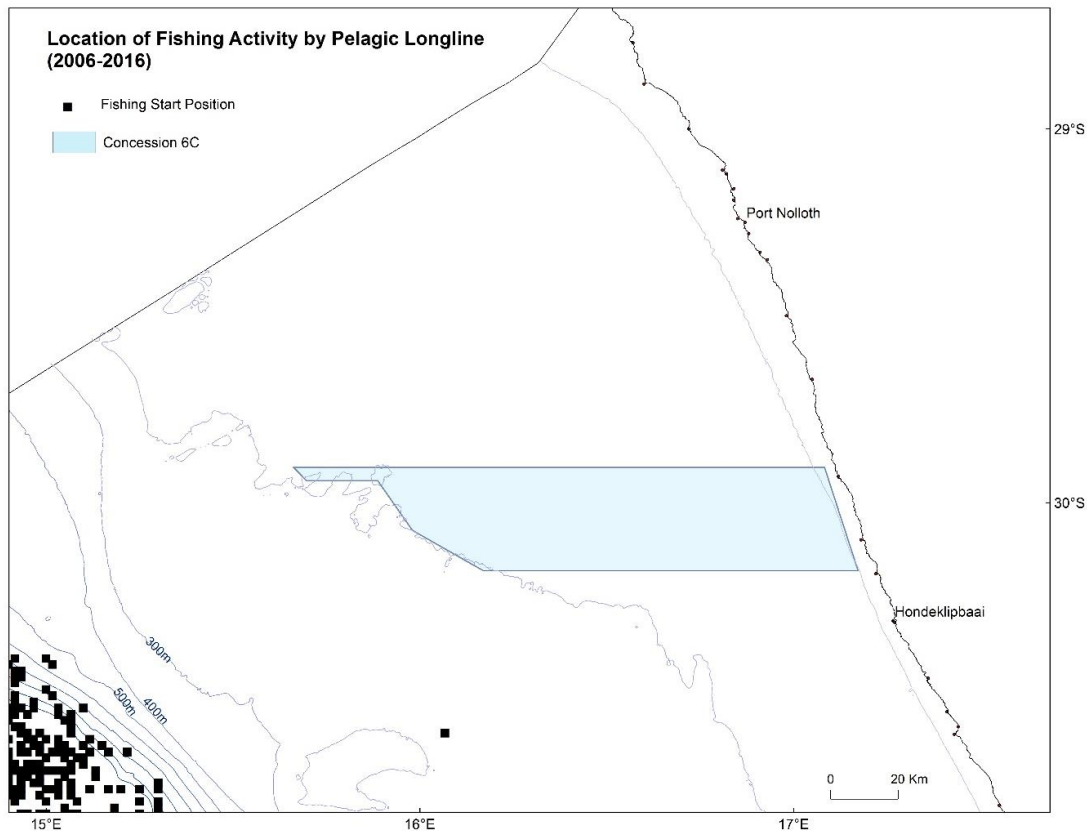
**FIGURE 4-14: TYPICAL PELAGIC LONG-LINE CONFIGURATION TARGETING TUNA, SWORDFISH AND SHARK SPECIES (SOURCE: [HTTPS://WWW.AFMA.GOV.AU/FISHERIES-MANAGEMENT/METHODS-AND-GEAR/LONGLINING](https://www.afma.gov.au/fisheries-management/methods-and-gear/longlining)).**

Vessels operate predominantly from the shelf break and into deeper waters and are prohibited from operating within 12 nm of the coastline (or within 20 nm of the coastline off KwaZulu-Natal). In the vicinity of Concession Area 6C, vessels operate along and offshore of the 500 m depth contour, which is situated about 90 km offshore of the concession area (See Figure 4-15). There is no direct overlap of the concession area with either fishing ground or spawning and recruitment areas of large pelagic species.

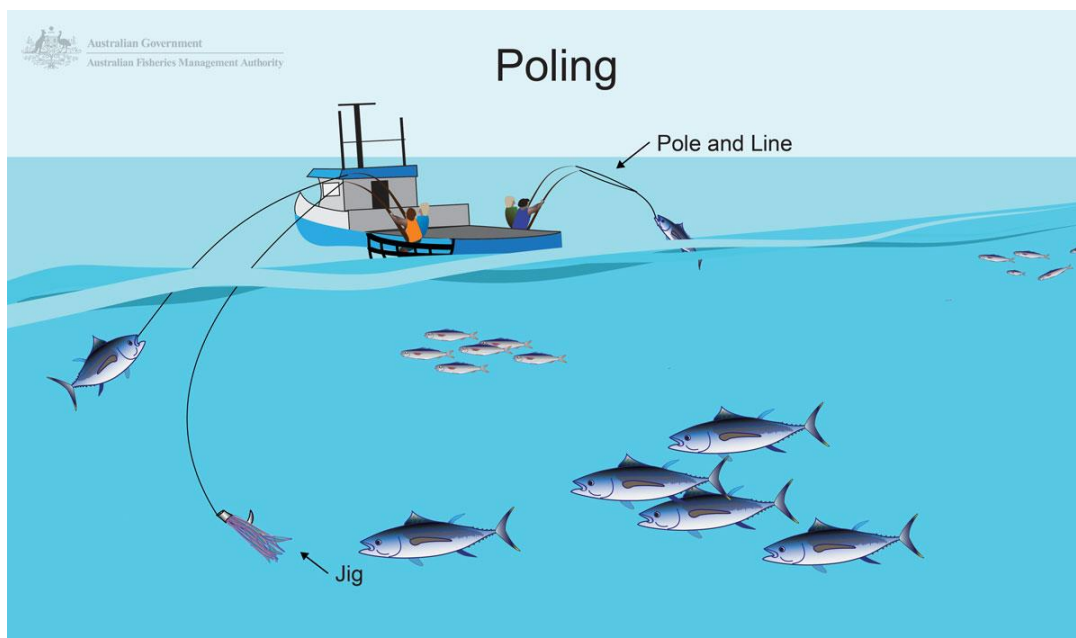
#### 4.1.4.1.5 Tuna Pole

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 4-16). 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).



**FIGURE 4-15: SEA CONCESSION 6C IN RELATION TO SPATIAL DISTRIBUTION OF FISHING POSITIONS RECORDED BETWEEN 2006 AND 2016 BY THE SOUTH AFRICAN LARGE PELAGIC LONGLINE SECTOR.**

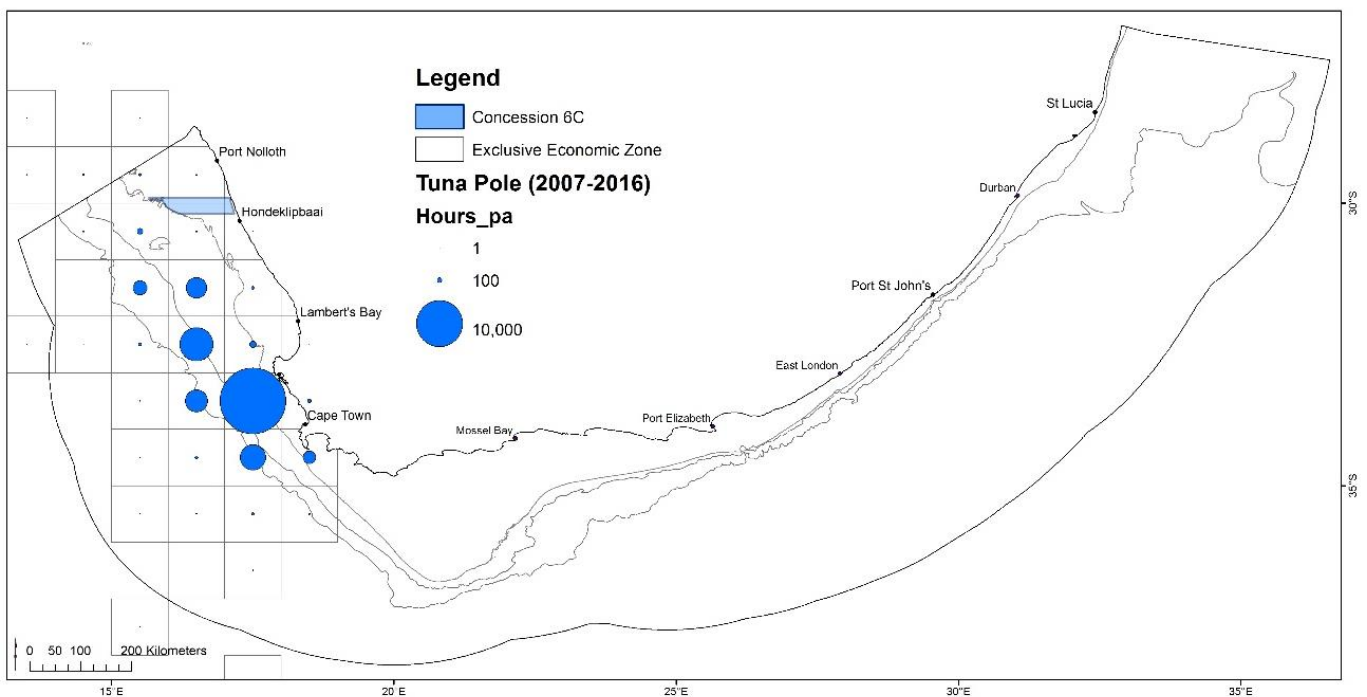


**FIGURE 4-16: SCHEMATIC DIAGRAM OF POLE AND LINE OPERATION. (SOURCE: [HTTP://WWW.AFMA.GOV.AU /PORTFOLIO-ITEM/MINOR-LINES/](http://www.afma.gov.au/portfolio-item/minor-lines/)).**



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 4-17. Although the main targeted fishing grounds off the West Coast are situated south of the concession area, there are records of fishing activity which coincide with the north-western extent of the concession area which is most likely due to vessels fishing en route to favoured grounds off Tripp Seamount on the Namibian side of the maritime border. Over the period 2007 to 2016, 32 fishing events were reported within the concession area (this is comparable to 32 days of fishing effort) with a cumulative catch of 58.3 tons of albacore over this period. This amounts to 5.8 tons per year which is equivalent to 0.2% of the total albacore landed by the sector (nationally).



**FIGURE 4-17: SEA CONCESSION 6C IN RELATION TO THE SPATIAL DISTRIBUTION OF TUNA POLE CATCH (2007 TO 2016).**

#### 4.1.4.1.6 Traditional Line-Fish

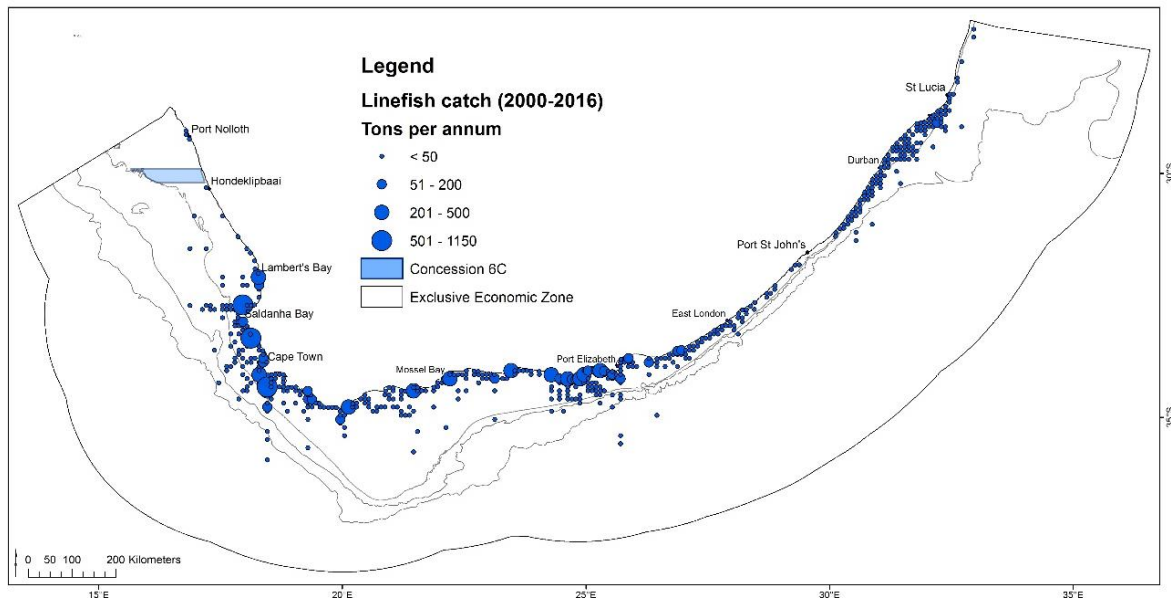
The line-fishery is divided into the commercial and recreational sectors, with the subsistence sector now falling under the classification of small-scale fishing. The commercial (or traditional) line fishery is the country's third most important fishery in terms of total tons landed and economic value. 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. Sea Concession 6C coincides with line-fish management Zone A which extends from the Namibian border to Cape Infanta. Fishing vessels generally range up to a maximum offshore distance of about 70 km, although fishing at this outer limit and beyond is sporadic (C. Wilke, pers. comm).

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).

Fishing activity is reported by landing point. In the vicinity of Sea Concession 6C, Hondeklipbaai is the closest landing point. Over the period 2000 to 2016, an average landing of 182 kg per year was reported for the area. Over the same period 2.5 tons of catch was reported for fishing positions in the vicinity of Port Nolloth, situated 70 km northward of the concession area. The combined catch at Hondeklipbaai and Port Nolloth is equivalent to approximately 0.03% of the overall national landings of the sector. 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 Sea Concession 6C.



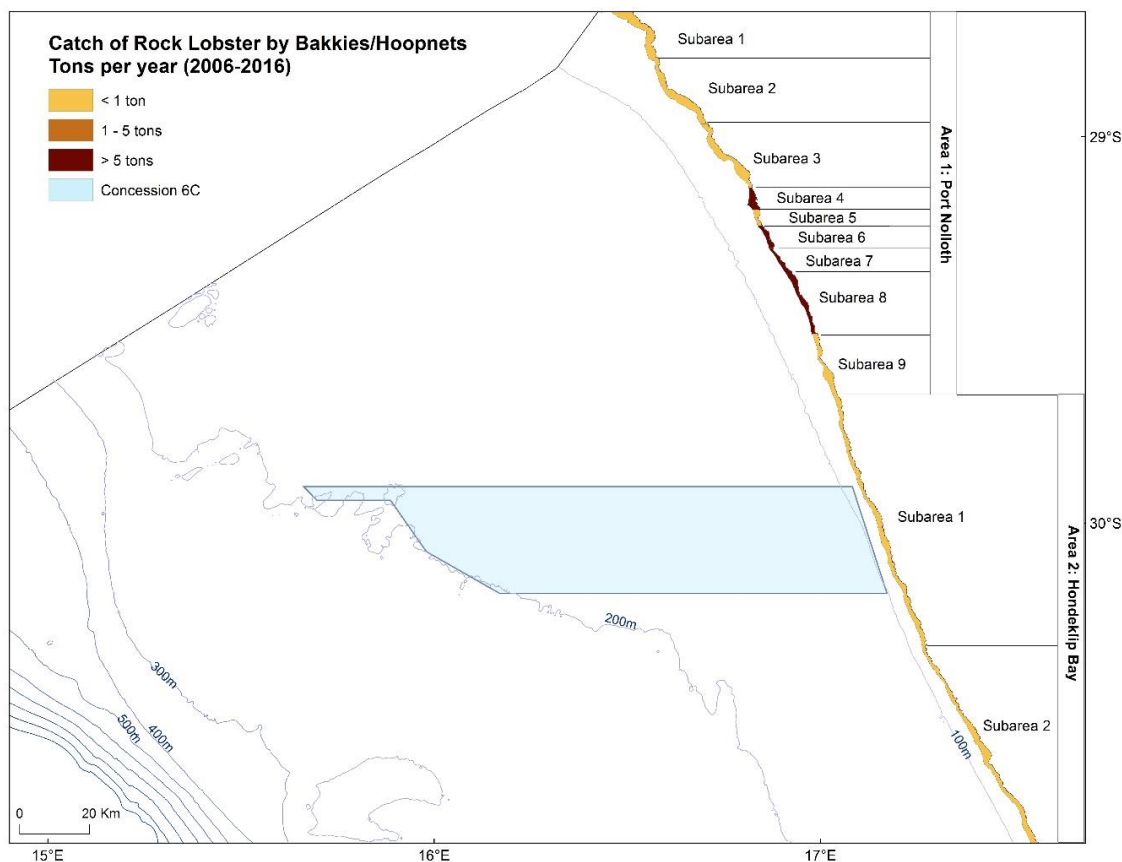
**FIGURE 4-18: SEA CONCESSION 6C IN RELATION TO SPATIAL DISTRIBUTION OF CATCH LANDED BY THE SOUTH AFRICAN TRADITIONAL LINE-FISH SECTOR (2000 – 2016).**

#### 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.

The Sea Concession area falls within Zone A, Management Area 2 (Hondekliipbaai) and Subarea 1 (Agtervoorklip to Swartduin), which extends along the coastline from 30°19'S to 29°40'S. Over the period 2006 to 2017 there has been no effort recorded by trap boats within the area, however there has been activity recorded by the near-shore sector amounting to 230 traps per year yielding 930 kg of rock lobster. Commercial catches of rock lobster in Management Area 2 are limited to shallow water (<30 m) with almost all the catch being taken shallower than 15 m depth. There is therefore no direct overlap with the proposed bulk sampling activities which would be located offshore of the 70 m depth contour. The areas fished by bakkies (using hoopnets) in the vicinity of marine concession area 6C are shown in Figure 4-19.



**FIGURE 4-19: SEA CONCESSION 6C IN RELATION TO THE AVERAGE CATCH PER SEASON (TONS WHOLE WEIGHT) BY THE NEARSHORE (BAKKIE) SECTOR OF THE WEST COAST ROCK LOBSTER FISHERY (2006 TO 2016).**

#### 4.1.4.1.8 Abalone Ranching

The Abalone (*Haliotis 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 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 on the inshore portion of Sea Concession 6C, thus there is a small degree of overlap (see Figure 4-18).

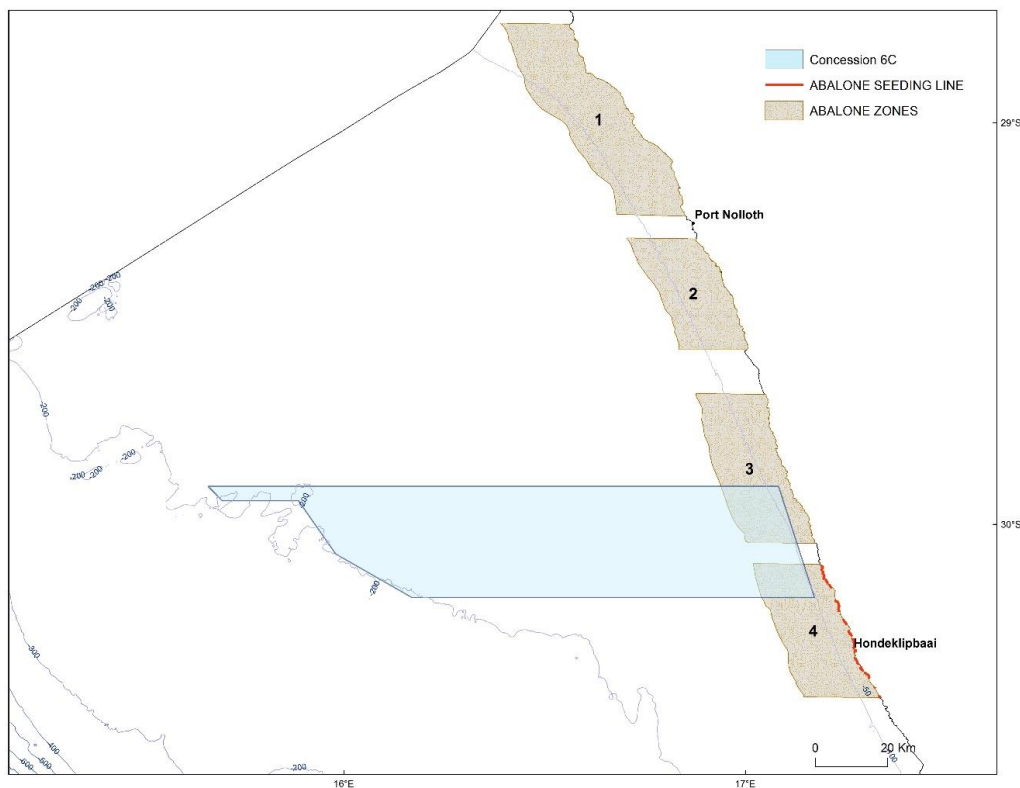


FIGURE 4-20: LOCATION OF SEA CONCESSION 6C IN RELATION TO OF ABALONE RANCHING ZONES.

#### 4.1.4.1.9 Small-Scale Fisheries

Small-scale fishers using traditional fishing gear have historically harvested marine resources along the coastline of South Africa for consumptive use, livelihoods, and medicinal purpose. In compliance with an order from the Equality Court to redress the inequality suffered by the small scale fishers, the small-scale fishery policy implementation plan was initiated in 2016 (DAFF 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.

In the Eastern Cape, KwaZulu-Natal and the Northern Cape, small-scale fishers live predominantly in rural areas while those in the Western Cape live mainly in urban and peri-urban areas. Resources are managed in terms of a community-based co-management approach that aims to ensure that harvesting and utilisation of the resource occurs in a sustainable manner in line with the ecosystems approach.

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.

DAFF recommended five basket areas: 1. Basket Area A – The Namibian border to Cape of Good Hope – 57 different resources 2. Basket Area B – Cape of Good Hope to Cape Infanta – 109 different resources 3. Basket Area C – Cape Infanta to Tsitsikamma – 107 different resources 4. Basket Area D – Tsitsikamma to the Pondoland MPA – 138 different resources 5. Basket Area E – Pondoland MPA to the Mozambican border – 127 different resources. Sea Concession Area 6C falls within the area demarcated as Basket Area 1, within which Hondeklipbaai is the access point for participants in the small-scale fishing sector.

#### 4.1.4.1.10 Beach-Seine and Gillnet Fisheries

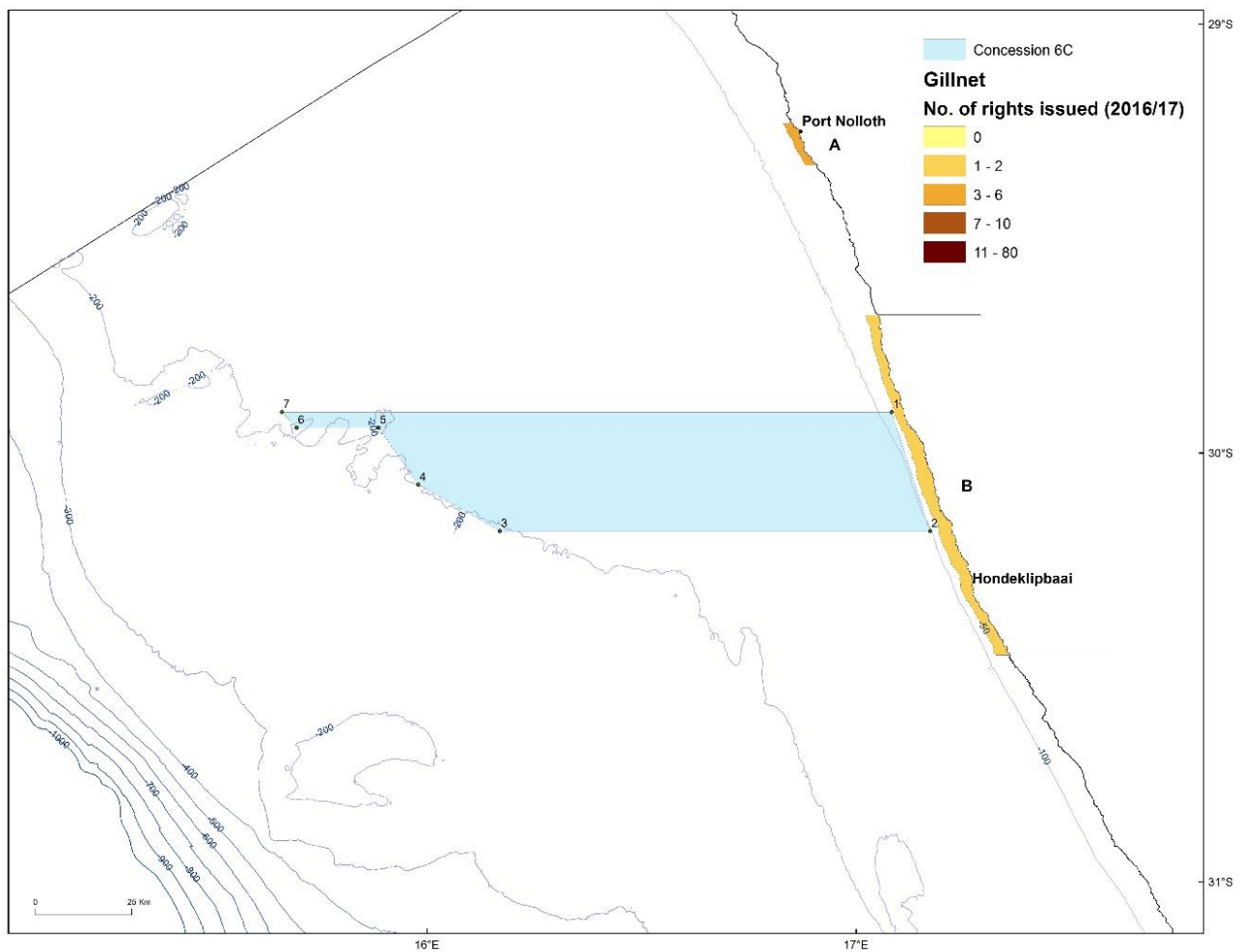
There are a number of active beach-seine and gillnet operators throughout South Africa (collectively referred to as the “netfish” sector). Initial estimates indicate that there are at least 7 000 fishermen active in fisheries using beach-seine and gillnets, mostly (86%) along the West and South coasts. 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 (*Callorhynchus 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). There are currently no rights issued for Area B (Hondekliipbaai).

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 (Hondekliipbaai).

Sea Concession 6C is situated offshore of Management Area B (see Figure 4-21) and the range of gillnets (50 m) and that of beach-seine activity (20 m) is not likely to directly overlap with the concession area where bulk sampling would take place in waters deeper than 70 m.

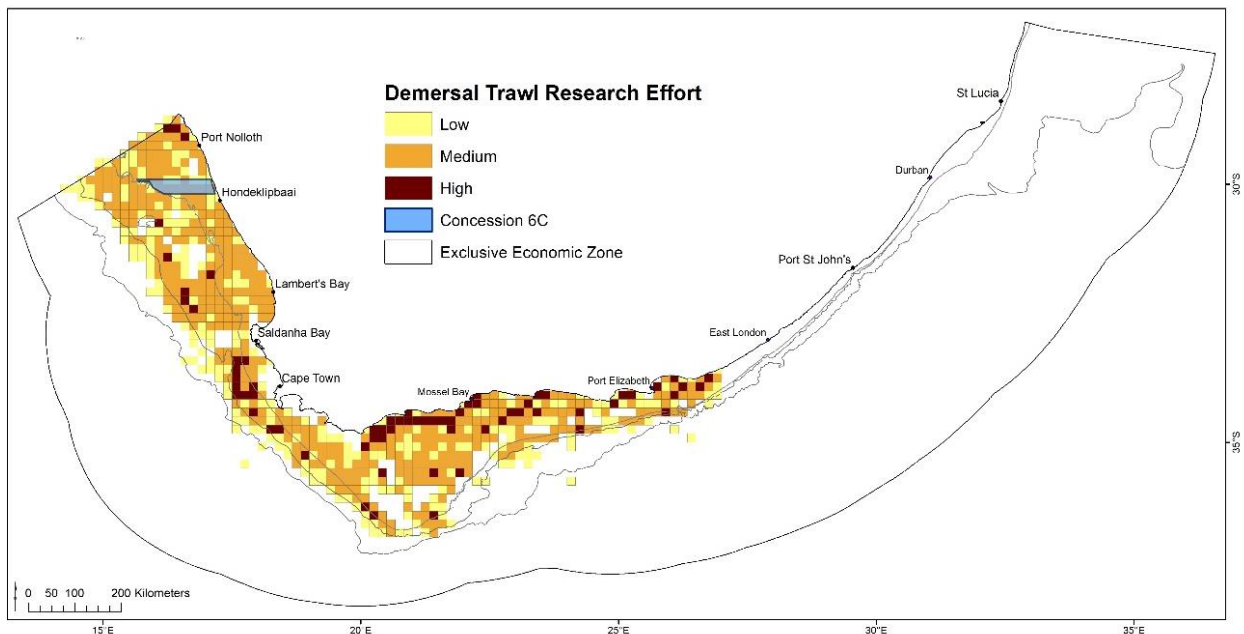


**FIGURE 4-21: SEA CONCESSION 6C IN RELATION TO THE RIGHTS ISSUED FOR GILLNET FISHING AREAS A & B.**

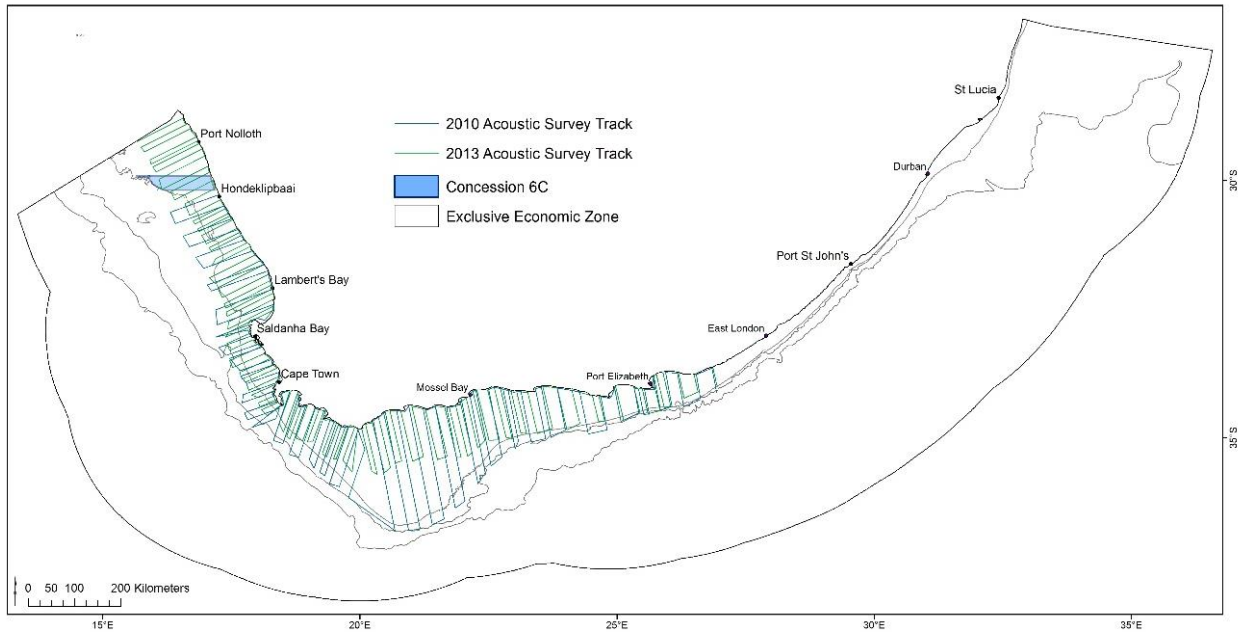
#### 4.1.4.1.11 Fisheries Research

Swept-area trawl surveys of demersal fish resources are carried out in January (West Coast survey) and April/May (South Coast survey) 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 (see Figure 4-22). Approximately 120 trawls are conducted during each survey over a period of approximately one month.

The biomass of small pelagic species is assessed bi-annually by an acoustic survey. The first of these surveys is timed to commence in mid-May and runs until mid-June, while the second starts in mid-October and runs until mid-December. The timing of the demersal and acoustic surveys is not flexible, due to restrictions with availability of the research vessel as well as scientific requirements. During these surveys the survey vessels travel pre-determined transects (perpendicular to bathymetric contours) running offshore from the coastline to approximately the 200 m isobath (see Figure 4-23). The surveys are designed to cover an extensive area from the Orange River on the West Coast to Port Alfred on the East Coast and the DAFF survey vessel progresses systematically from the Northern border Southwards, around Cape Agulhas and on towards the east. Acoustic biomass surveys take place inshore of the 200 m isobath.



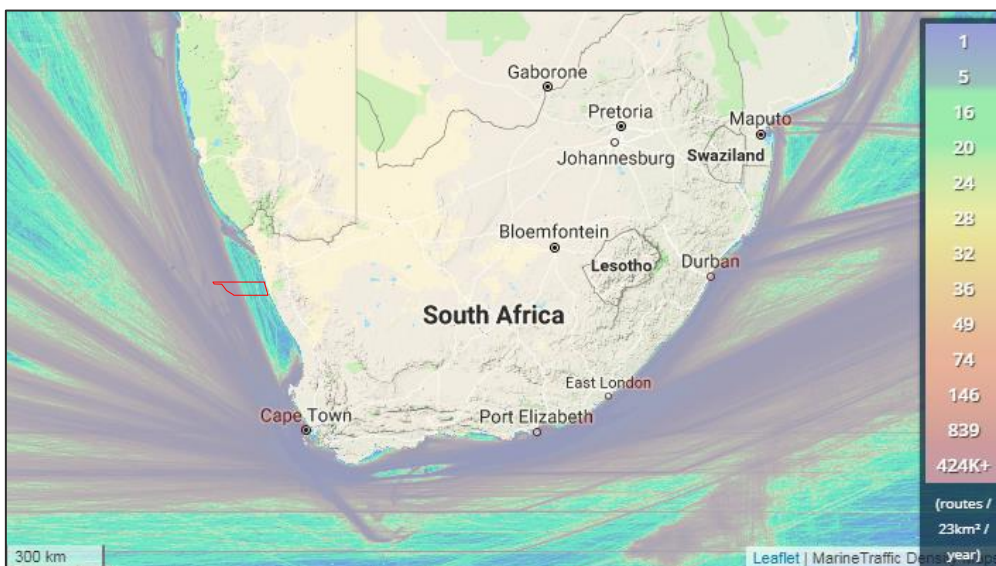
**FIGURE 4-22: SEA CONCESSION 6C IN RELATION TO THE SPATIAL DISTRIBUTION OF TRAWLING EFFORT EXPENDED DURING RESEARCH SURVEYS UNDERTAKEN BY DAFF BETWEEN 1985 AND 2012**



**FIGURE 4-23: SEA CONCESSION 6C IN RELATION TO THE SPATIAL DISTRIBUTION OF TRACKS UNDERTAKEN DURING BIOMASS SURVEYS OF SMALL PELAGIC SPECIES UNDERTAKEN BY DAFF DURING 2010 AND 2013.**

**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 overlap with the western portion of the Sea Concession 6C area.



**FIGURE 4-24: THE MAJOR SHIPPING ROUTES ALONG THE WEST COAST OF SOUTH AFRICA SHOWING PETROLEUM LICENSE BLOCKS (DATA FROM THE SOUTH AFRICAN CENTRE FOR OCEANOGRAPHY). APPROXIMATE LOCATION OF SEA CONCESSION AREA 6C IS ALSO SHOWN.**

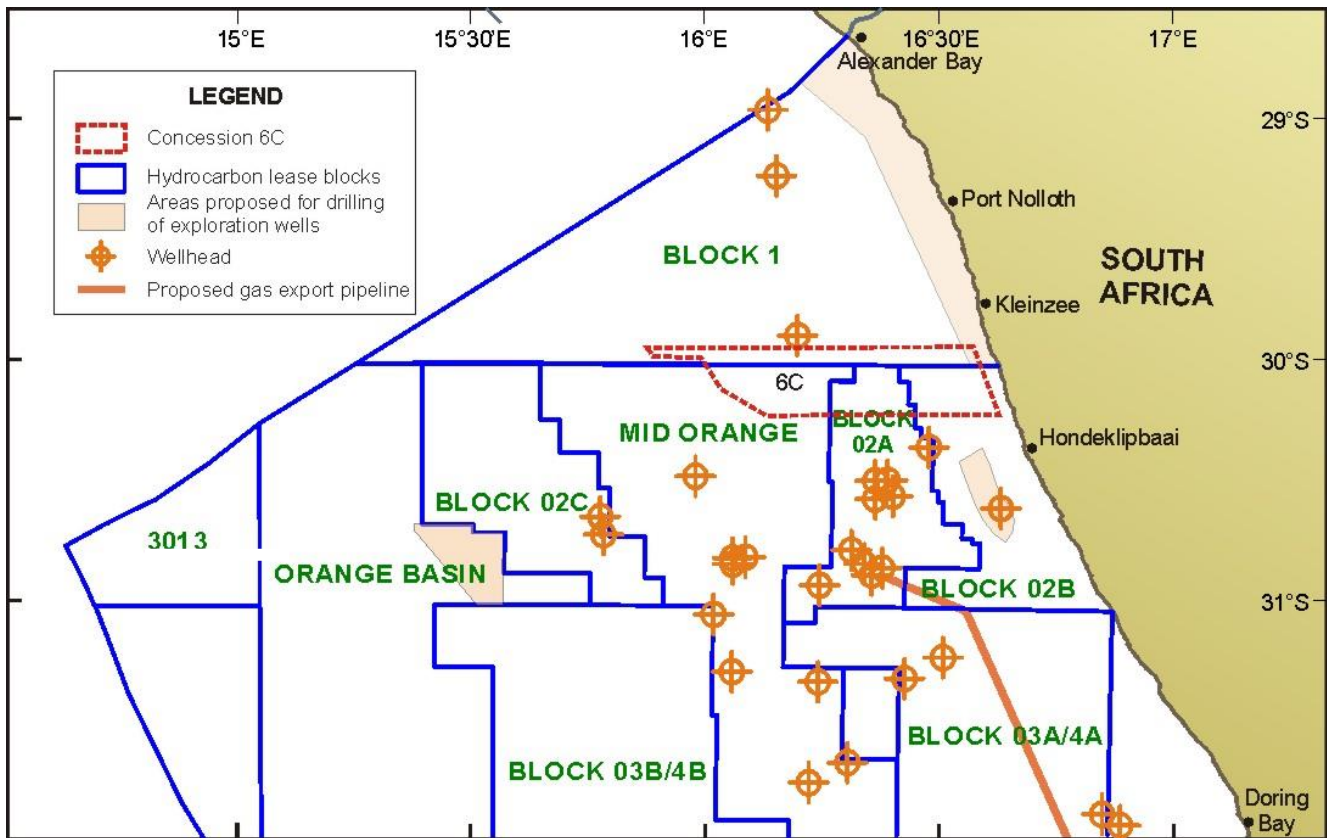


### 4.1.4.3 Oil and Gas Exploration and Production

#### 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 (see Figure 4-25). 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. Although no wells have recently been drilled in the area, further exploratory drilling is proposed for inshore and offshore portions of Block 1, with further target areas in Block 2B and the Orange Basin.



**FIGURE 4-25: SEA CONCESSION AREAS 6C IN RELATION TO THE LOCATION OF HYDROCARBON LEASE BLOCKS, EXISTING WELL HEADS, PROPOSED AREAS FOR EXPLORATORY WELLS AND THE ROUTING OF THE PROPOSED IBHUBESI GAS EXPORT PIPELINE.**

#### 4.1.4.3.2 Development and Production

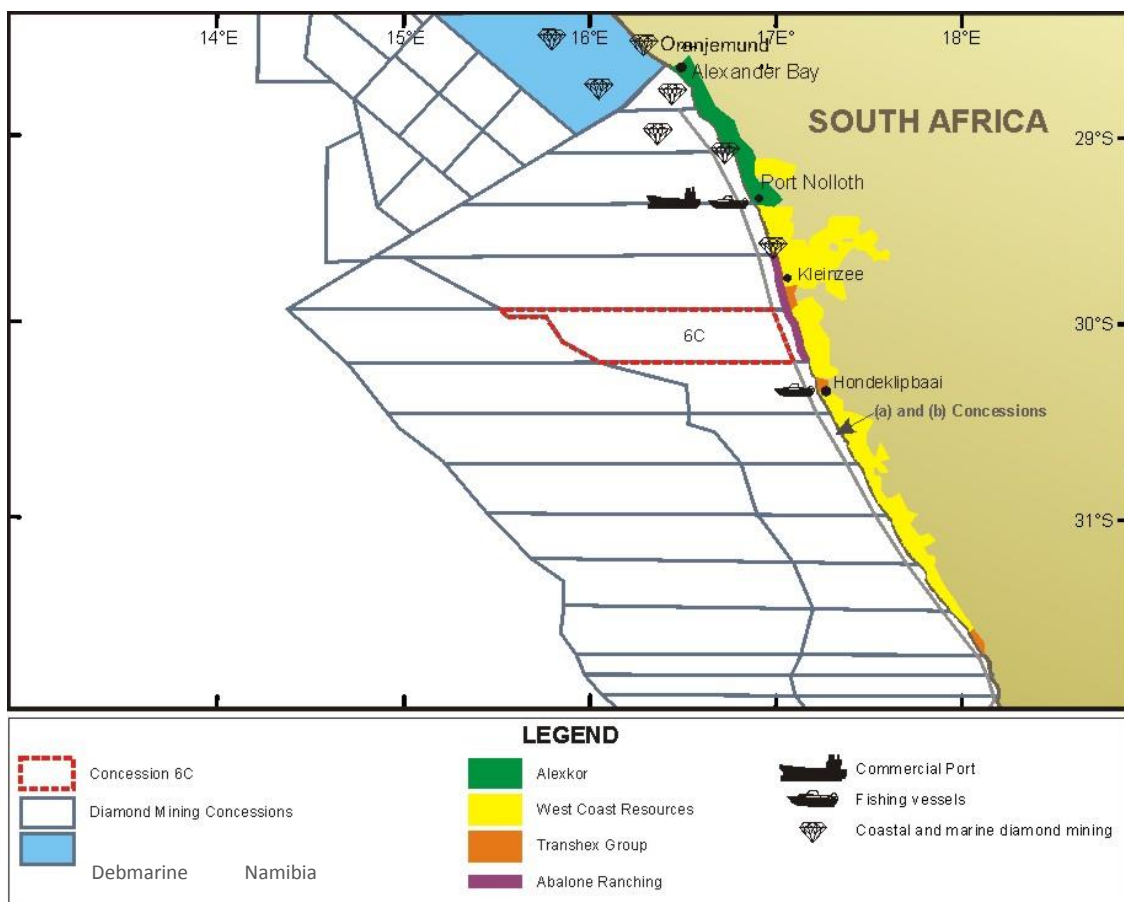
There is no current development or production from the South African west coast offshore. The Ibhubesi Gas Field (Block 2A) and Kudu Gas Field (which lies several hundred kilometres to the north-west off the coast of southern Namibia) have been identified for development. In this regard, a subsea pipeline 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.

#### 4.1.4.4 Diamond Prospecting and Mining

The coastal area onshore of Sea Concession 6C falls within the West Coast Resources coastal diamond concession areas and as public access is restricted, recreational activities along the coastline between Hondeklipbaai and Alexander Bay is limited to the area around Port Nolloth.

The concession area lies adjacent to a number of marine diamond concession areas (see Figure 4-26). 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).

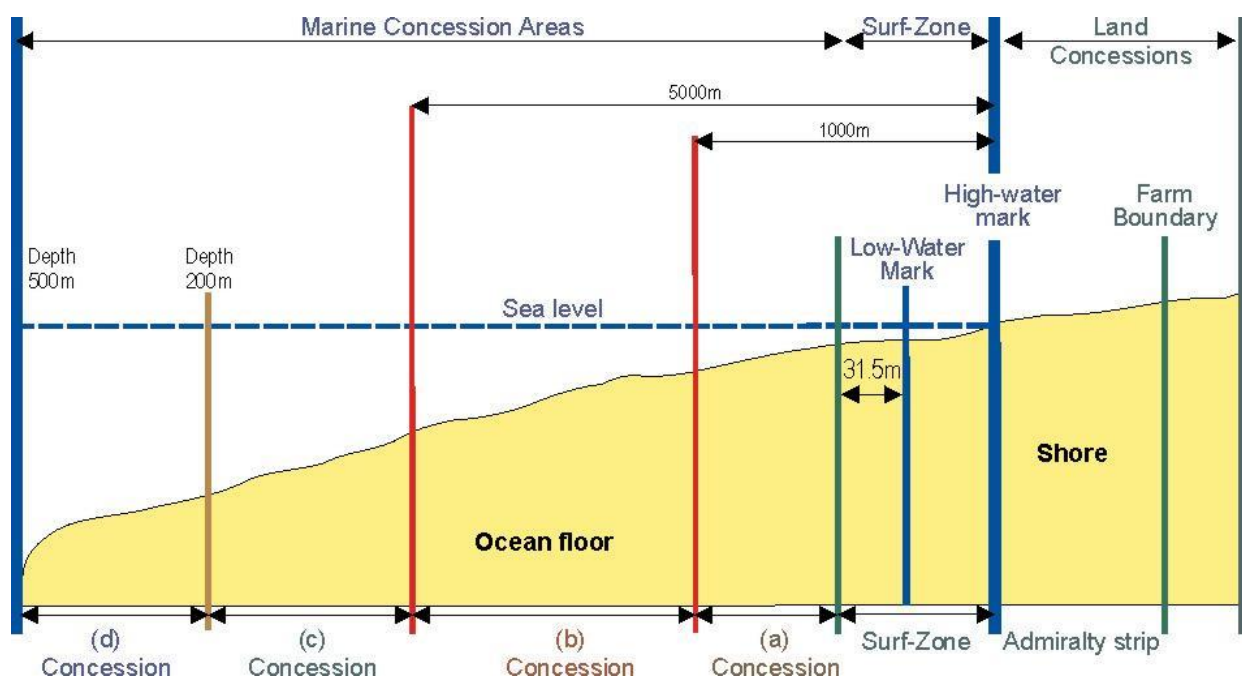


**FIGURE 4-26: LOCATION OF SEA CONCESSION 6C IN RELATION TO MARINE DIAMOND MINING CONCESSIONS AND PORTS FOR COMMERCIAL AND FISHING VESSELS AND THE PROPOSED SAMPLING TARGET AREA**

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<sup>2</sup> 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. However, with reference to the Alexkor 2013 Annual Report, it is noted that the number of days had declined from 79 in 2003 to eight in 2012 and 23 in 2013.

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<sup>2</sup> – 1 000 m<sup>2</sup>/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.



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

Offshore diamond mining and prospecting in the “C” Concession areas is currently limited to operations by Belton Park Trading 127 (Pty) Ltd in concessions 2C and 3C for mining and De Beers Marine (Pty) Ltd for prospecting in concessions 4C, 5C and 6C. In Namibian waters, offshore diamond mining by Debmarine Namibia (Pty) Ltd is currently operational in the Atlantic 1 Mining Licence Area.

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.

#### 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 Table 4-6 and

Figure 4-28), although none overlap with the proposed bulk sampling area. Green Flash Trading received their prospecting rights for Areas 251 and 257 in 2012/2013. The prospecting rights for Agrimin1, Agrimin2 and SOM1 have expired (Jan Briers, DMR pers. comm., December 2013).

**TABLE 4-6: LIMITS OF PROSPECTING BLOCKS FOR GLAUCONITE AND PHOSPHORITE WITHIN THE WEST COAST REGION. IN EACH CASE THE BLOCK IS A POLYGON OF POINTS LABELLED A, B, C, D, ETC**

| Block Title | Corner points | Latitude (S):    | Longitude (E):   |
|-------------|---------------|------------------|------------------|
| Agrimin1    | A             | 32° 49' 40.11"   | 17° 19' 57.12"   |
|             | B             | 32° 49' 39.93"   | 16° 44' 23.13"   |
|             | C             | 33° 17' 40.92"   | 17° 01' 11.70"   |
|             | D             | 33° 13' 59.88"   | 17° 07' 59.99"   |
| Agrimin2    | A             | 33° 56' 23.4654" | 17° 27' 23.9975" |
|             | B             | 34° 54' 31.9601" | 18° 07' 40.2233" |
|             | C             | 34° 53' 59.5830" | 18° 27' 34.4074" |
|             | D             | 33° 55' 43.0337" | 17° 57' 58.6973" |
| SOM1        | A             | 32° 49' 39.00"   | 16° 50' 9.66"    |
|             | B             | 33° 10' 24.74"   | 16° 53' 29.30"   |
|             | C             | 33° 40' 00.00"   | 17° 50' 00.00"   |
|             | D             | 33° 23' 30.00"   | 17° 50' 00.00"   |
|             | E             | 33° 19' 00.00"   | 17° 24' 00.00"   |
|             | F             | 33° 29' 00.00"   | 17° 41' 00.00"   |
|             | G             | 33° 16' 00.00"   | 17° 41' 00.00"   |
|             | H             | 32° 49' 00.00"   | 17° 20' 08.08"   |

#### 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.

#### 4.1.4.6 Other

##### 4.1.4.6.1 Anthropogenic marine hazards

Human use of the marine environment has resulted in the addition of numerous hazards on the seafloor. Readers are referred to the Annual Summary of South African Notices to Mariners No. 5 or charts from the South African Navy or Hydrographic Office for the location of different underwater hazards along the West Coast.

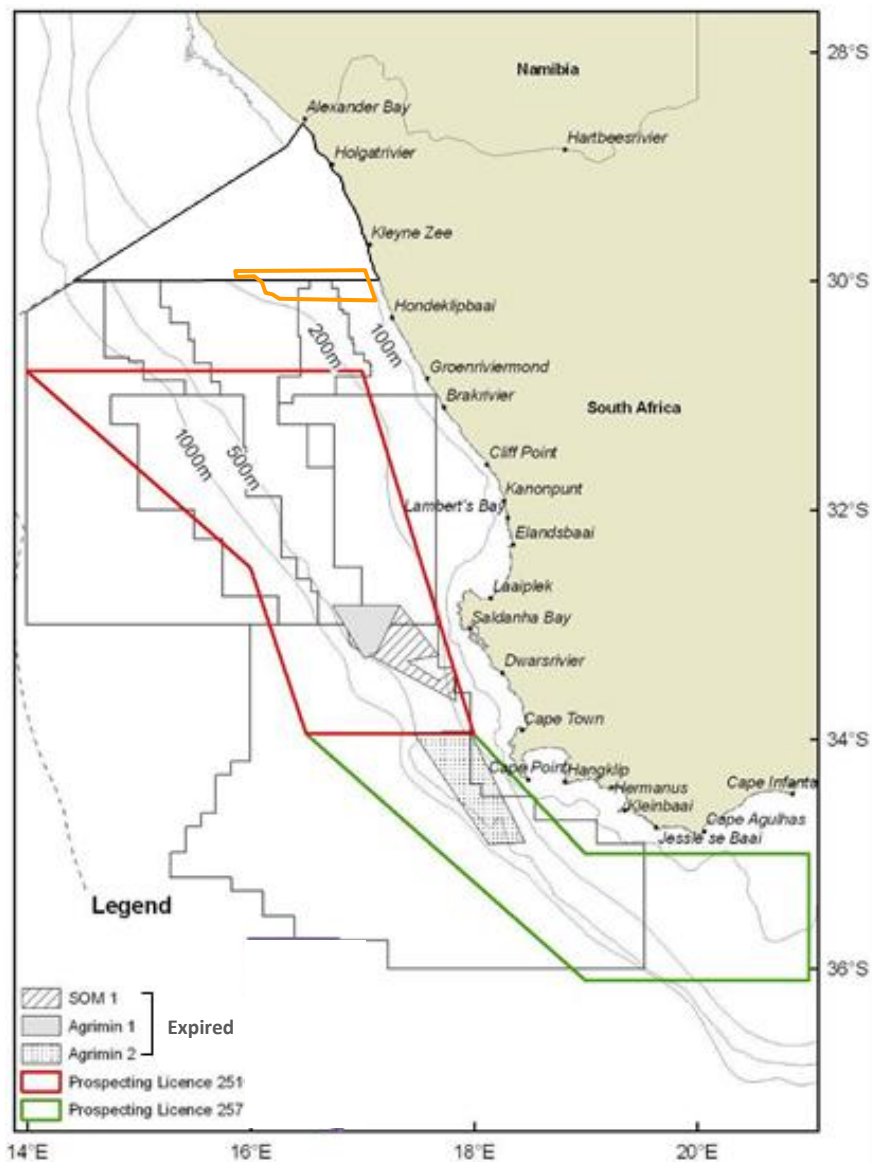


FIGURE 4-28: APPROXIMATE LOCATION OF SEA CONCESSION 6C (ORANGE) IN RELATIONS TO GLAUCONITE AND PHOSPHORITE PROSPECTING AREAS (AGRIMIN1, AGRIMIN2 AND SOM1).

#### 4.1.4.6.2 Undersea Cables

There are a number of submarine telecommunications cable systems across the Atlantic and the Indian Ocean (see Figure-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](http://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).

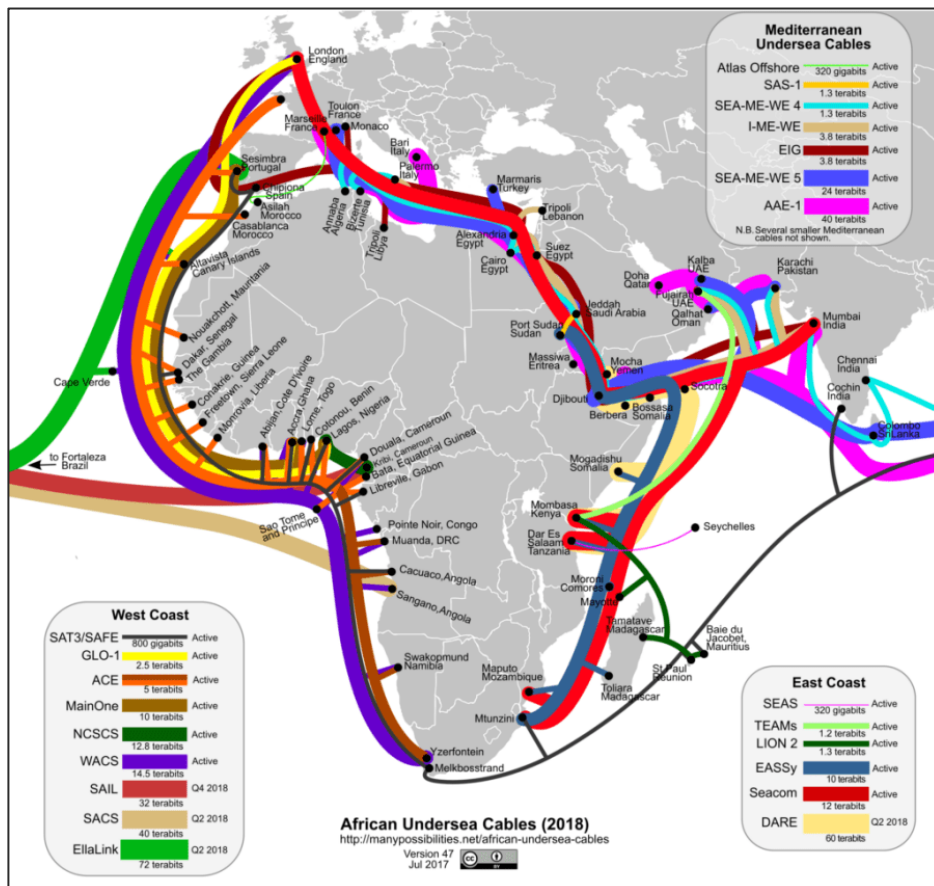


FIGURE 4-29: CONFIGURATION OF THE CURRENT AFRICAN UNDERSEA CABLE SYSTEMS, JULY 2018 (FROM [HTTP://WWW.MANYPOSSIBILITIES.NET](http://WWW.MANYPOSSIBILITIES.NET)).

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.

#### 4.1.4.6.3 Archaeological Sites

As the West Coast contains a wealth of shell middens, cave deposits, historical artefacts, palaeontological sites and shipwrecks close to the shore, the occurrence of such sites further offshore cannot be excluded.

##### a) Palaeontological sites

Stevenson & Bamford (2003) describe an abundance of fossilised yellowwood tree trunks in an approximate 2 km<sup>2</sup> area of seabed outcrop in 136-140 m depth located within Sea Concession 4C. The fossilized wood and accompanying cold water coral colonies are considered vulnerable to any activities that could impact on the seabed (FAO 2006; Rogers *et al.* 2008; FAO 2009; Sink *et al.* 2012a,b). In addition, there are other sites where fossilised yellowwood has been observed within Sea Concession 5C. These sites are located approximately 25 km north of Sea Concession 6C.

Following the application of the Conservation on Biological Diversity's (CBD) Ecologically or Biologically Significant Marine Areas (EBSA) criteria, the area (referred to as the Namaqua Fossil Forest) was identified as unique, and presented at the CBD Southeast Atlantic Ocean regional workshop for consideration as an EBSA warranting formal conservation (Sink & Kirkman 2013).

##### b) Shipwrecks

Over 2 000 shipwrecks are present along the South African coastline. The majority of known wrecks along the West Coast are located in relatively shallow water close inshore (within the 100 m isobath). Wrecks older than 60 years old have National Monument status.

Possible wrecks most likely to be encountered during the proposed marine sediment sampling are those most likely to fall outside of known shallow water wreck events. The majority of shipwreck locations are unknown as they have been documented only through survivor accounts, archival descriptions and eyewitness reports recorded in archives and databases. In the area under consideration, there are at least five vessels that could possibly have been wrecked in the vicinity of the concession area (see Table 4-7) as well as a further 28 vessels that may be somewhere in the area.

**TABLE 4-7: SHIPWRECKS POTENTIALLY LOCATED WITHIN THE BROADER PROJECT AREA.**

| Vessel Name        | Date | Comment  |
|--------------------|------|--|
| Eros               | 1918 | This 174-ton steel steamer was wrecked either off Port Nolloth or off Lamberts Bay.  |
| Haab               | 1897 | This 861-ton wooden barque was abandoned near Concession 5C and therefore may be in or near 6C. Approximate co-ordinates: 29° 49.902'S 16° 40.070'E.   |
| Jessie Smith       | 1853 | This 226-ton British brig was wrecked somewhere off Alexander Bay, Orange River Mouth. The vessel was swept out to sea and it is possible that the wreck may be somewhere in the concession area 4C.                                   |
| Ocean King         | 1881 | This 419-ton barque apparently hit a reef about 3-4 miles (6.4 – 8 km) offshore and about 20 miles (32km) south of Port Nolloth. This vessel may be in the vicinity of Concession 4C. Approximate co-ordinates: 29.47567 S 16.89444 E. |
| Laporte / La Porte | 1904 | This 2448-ton steamer was on a voyage from Cardiff for Cape Town with coal   |

| Vessel Name | Date | Comment   |
|-------------|------|---|
|             |      | when she foundered in a north-westerly gale approximately 160 km from shore and 80 km north of Port Nolloth. There are differing reports as to where the vessel sank. Approximate co-ordinates include: <ul style="list-style-type: none"> <li>• Position 1: 28° 35.691'S 14° 48.532'E</li> <li>• Position 2: 28° 37.133'S 16° 24.555'E</li> <li>• Position 3: 29° 17.078'S 15° 55.764'E**</li> </ul> |

#### 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 Sea Concession 6C. No ammunition dumps are located within the extent of Sea Concession 6C.

## 4.2 MARINE PROTECTED AREAS

### 4.2.1 Conservation Areas and Marine Protected Areas

Numerous conservation areas and marine protected areas (MPA) exist along the coastline of the Northern Cape, however, the proposed bulk sampling area falls outside of all these MPAs. The only conservation area in the vicinity of Concession 6C in which restrictions apply is the McDougall's Bay rock lobster sanctuary near Port Nolloth, which is closed to commercial exploitation of rock lobsters (refer to Figure 4-7). This area lies inshore and north of Concession 6C.

Using biodiversity data mapped for the 2004 and 2011 National Biodiversity Assessments a systematic biodiversity plan has been developed for the West Coast with the objective of identifying coastal and offshore priority focus areas for MPA expansion (Sink *et al.* 2011; Majiedt *et al.* 2013). Potentially vulnerable marine ecosystems (VMEs) that were explicitly considered during the planning included the shelf break, seamounts, submarine canyons, hard grounds, submarine banks, deep reefs and cold water coral reefs.

The biodiversity data were used to identify nine focus areas for protection on the West Coast between Cape Agulhas and the South African – Namibian border. These focus areas were carried forward during Operation Phakisa, which identified potential MPAs. The potential MPA areas were recently presented to Government and accepted for future declaration as new MPAs. On 23 May 2019, 20 MPAs were formally gazetted and published. Those within the broad project area are shown in Figure 4-7. Sea Concession 6C does not overlap with any of these areas.

In the spatial marine biodiversity assessment undertaken for Namibia (Holness *et al.* 2014), the Orange Shelf Edge area, which includes Tripp Seamount and a shelf-indenting submarine canyon, was identified as being of high priority for place-based conservation measures. To this end, Ecologically or Biologically Significant Areas (EBSA) spanning the border between Namibia and South Africa were proposed and inscribed under the Convention of Biological Diversity (CBD). The proposed Orange Shelf Edge EBSA comprises shelf/shelf edge habitat with hard and unconsolidated substrates, including at least eleven offshore benthic habitat types of which four habitat types are 'Threatened', one is 'Critically Endangered' and one 'Endangered'. The proposed Orange Shelf Edge EBSA is one of few places where these threatened habitat types are in relatively natural/pristine condition. The local habitat heterogeneity is also thought to contribute to the Orange Shelf Edge being a persistent hotspot of species richness for demersal fish species. Although focussed primarily on



the conservation of benthic biodiversity and threatened benthic habitats, the EBSA also considers the pelagic habitat, which is characterized by medium productivity, cold to moderate Atlantic temperatures and moderate chlorophyll levels related to the eastern limit of the Benguela upwelling on the outer shelf. A more focussed version of the EBSA has been submitted and is currently undergoing consideration for official recognition by the CBD. The principal objective of the EBSA is identification of features of higher ecological value that may require enhanced conservation and management measures. No specific management actions have been formulated for the Orange Shelf Edge area at this stage.

A further EBSA – the transboundary Orange Cone - is located to the north of the Sea Concession area, while the Benguela Upwelling System transboundary EBSA extends along the entire southern African West Coast from Cape Point to the Kunene River and includes a portion of the high seas beyond the Angolan EEZ.

The Orange River Mouth wetland located to the north of Concession 6C provides an important habitat for large numbers of a great diversity of wetland birds and is listed as a Global Important Bird Area (IBA) (ZA023/NA 019) (BirdLife International 2005). The area was designated a Ramsar site in June 1991, and processes are underway to declare a jointly-managed transboundary Ramsar reserve. Further IBAs south of the project area include the Olifants River Estuary (ZA078), Verlorenvlei (ZA082), the Lower Berg River wetlands (ZA083) and the West Coast National Park and Saldanha Bay Islands (ZA084). All of these are located well to the south and inshore of the Sea Concession area.

#### 4.2.2 Threat Status and Vulnerable Marine Ecosystems

'No-take'<sup>2</sup> MPAs offering protection of the Namaqua biozones (sub-photic, deep-photic, shallow-photic, intertidal and supratidal zones) are absent northwards from Cape Columbine (Emanuel *et al.* 1992, Lombard *et al.* 2004). 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 have 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 (see Figure 4-30), the threat status of the benthic habitats within Sea Concession 6C, and those potentially affected by proposed bulk sampling activities, were identified (see Table 4-8).

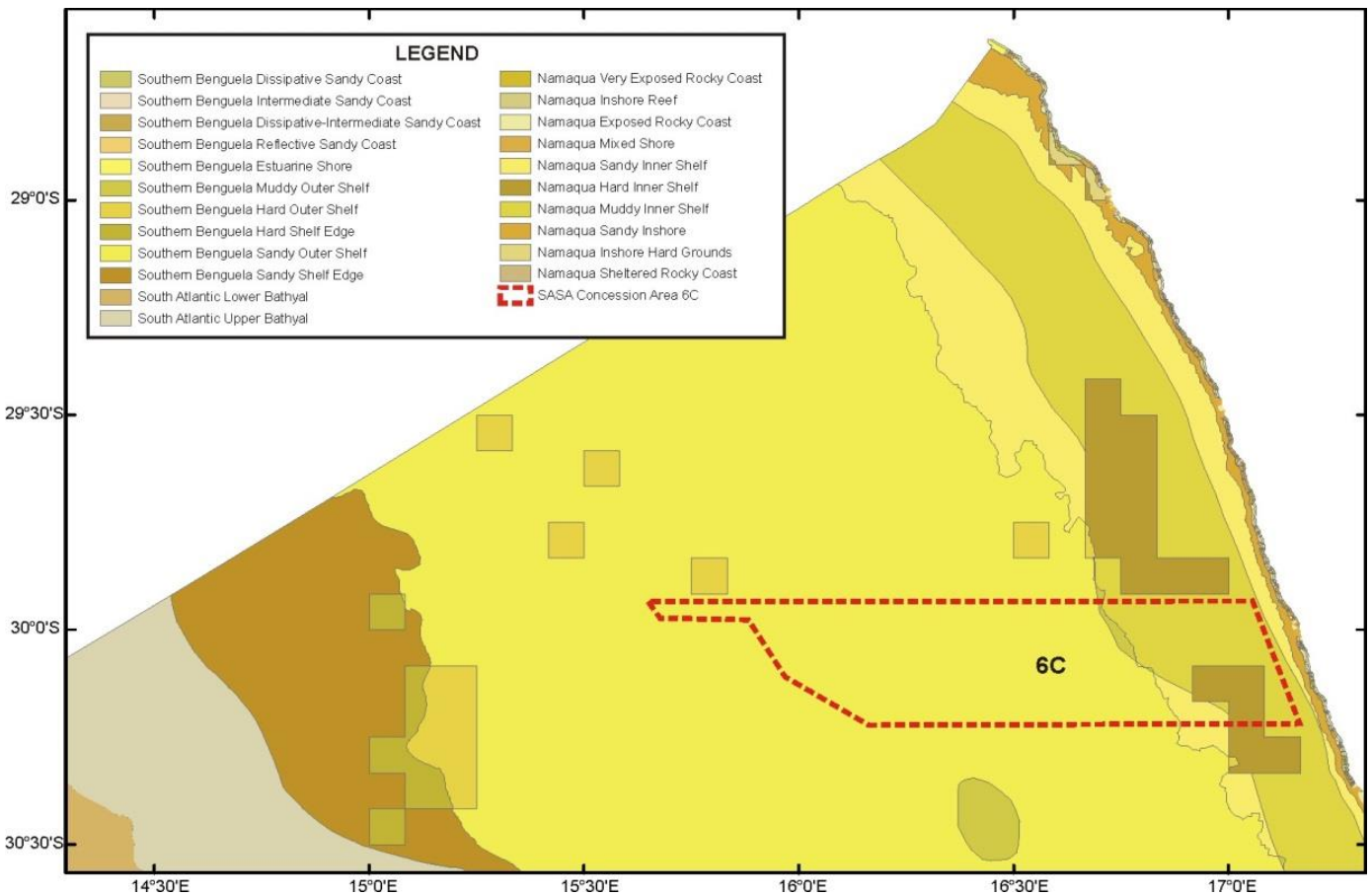
#### 4.2.3 Development Potential of the Marine Environment in the Project Area

The economy of the Namaqualand region is dominated by mining. However, with the decline in the mining industry and the closure of many of the coastal mines, the economy of the region is declining and jobs are being lost with potential devastating socio-economic impacts on the region. The Northern Cape provincial government has recognized the need to investigate alternative economic activities to reduce the impact of minerals downscaling and has commissioned a series of baseline studies of the regional economy (Britz & Hecht 1997, Britz *et al.* 1999, 2000, Mather 1999). These assessments concluded that fishing and specifically mariculture offer a significant opportunity for long term (10+ years) sustainable economic development along the Namaqualand coast. The major opportunities cited in these studies include hake and lobster fishing

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<sup>2</sup> *no-take* means that extraction of any resources is prohibited.

(although the current trend in quota reduction is likely to limit development potentials), seaweed harvesting and aquaculture of abalone, seaweeds, oysters and finfish. The Northern Cape provincial government is facilitating the development of the fishing and mariculture sectors by means of a holistic sector planning approach and has in partnership with a representative community and industry based Fishing and Mariculture Development Association (FAMDA), developed the Northern Cape Province Fishing and Mariculture Sector Plan. This plan forms part of the ‘Northern Cape - Fishing and Mariculture Sector Development Strategy’ ([www.northern-cape.gov.za](http://www.northern-cape.gov.za), accessed December 2013) whereby implementation of the plan will be coordinated and driven by FAMDA.



**FIGURE 4-30: BENTHIC AND COASTAL HABITAT TYPES IN SEA CONCESSION 6C**

**TABLE 4-8: ECOSYSTEM THREAT STATUS FOR MARINE AND COASTAL HABITAT TYPES IN SEA CONCESSION 6C (ADAPTED FROM SINK ET AL. 2011).**

| Habitat Type                        | Threat Status    |
|-------------------------------------|------------------|
| Namaqua Hard Inner Shelf            | Least Threatened |
| Namaqua Sandy Inner Shelf           | Least Threatened |
| Namaqua Muddy Inner Shelf           | Least Threatened |
| Southern Benguela Sandy Outer Shelf | Least Threatened |
| Southern Benguela Muddy Outer Shelf | Least Threatened |

As discussed in Section 4.1.4.1.8, the creation of abalone ranching enterprises around Hondeklip Bay and Port Nolloth have been identified as part of the sector plan’s development targets ([www.northern-cape.gov.za](http://www.northern-cape.gov.za)). In the past, experimental abalone ranching concessions have been granted to Port Nolloth Sea Farms (PNSF) in

sea mining areas 5 and 6, a 60-km strip of coastline, and to Ritztrade in the Port Nolloth area ([www.northern-cape.co.za](http://www.northern-cape.co.za)).

These experimental operations have shown that although abalone survival is highly variable depending on the site characteristics and sea conditions, abalone ranching on the Namaqualand coast has the potential for a lucrative commercial business venture (Sweijd *et al.* 1998, de Waal 2004).

Besides abalone sea-ranching, several other potential projects were identified in the sector plan. Most of these are land-based aquaculture projects (e.g. abalone and oyster hatcheries in Port Nolloth and abalone grow-out facility in Hondeklip Bay), but included was a pilot project to harvest natural populations of mussels and limpets in the intertidal coastal zone along the entire Northern Cape coast. The objective of the project was to determine the stock levels and to ascertain what percentage of the biomass of each species can be sustainably harvested, as well as the economic viability of harvesting the resource.

## 5 KEY PROJECT ISSUES

A number of key issues have been identified by the EIA project team during the scoping process to date. These are presented below, together with responses by the project team. No importance is to be assigned to the order in which these are presented.

### 5.1 EFFECT ON MARINE FAUNA

**Issue:** The proposed bulk sampling operations could result in a number of impacts on marine fauna. Potential impacts include:

- Normal discharges to the marine environment from a variety of sources, including deck drainage, machinery space drainage, sewage and galley wastes from survey and support vessels;
- Localised disturbance of marine fauna due to noise and lighting from bulk sampling vessel, seabed crawler and support vessels;
- Physical damage to the seabed, alteration of sediment structure, alteration in benthic fauna community composition and potential reduction in benthic biodiversity due to 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.

**Response:** Potential impacts on marine fauna will be addressed in the marine faunal assessment (see Section 6.2.2). The marine faunal assessment has assessed the potential impacts relating to the proposed bulk sampling activities on marine fauna (including cetaceans, seals, turtles, seabirds, fish, invertebrates and plankton species). The marine faunal assessment is based on, *inter alia*, a review and collation of existing information and data from the international scientific literature, the Generic EMP prepared for marine diamond mining off the West Coast of South Africa and information sourced from the internet.

### 5.2 EFFECT ON FISHERIES

**Issue:** The proposed project could have an impact on commercial and recreational fishing activities, as a result of the legislated 500 m safety zones around the vessel during bulk sampling operations. Impacts could include disruption to fishing activities and decreased fishing effort; loss-of-access to fishing grounds; and the subsequent loss of catch. Accidental oil spills during normal operations could also have an impact on fishing activities.

**Response:** A fishing industry assessment was commissioned to, *inter alia*, determine the fishing effort and catch (data sourced from the Department of Agriculture, Forestry and Fisheries) of all fisheries operating off the West Coast in relation to Sea Concession 6C. All fishing sectors that operate within and adjacent to the proposed bulk sampling area could be impacted by the exclusion zone around the survey vessels. The terms of reference for the fishing industry assessment are presented in Section 6.2.3.

### 5.3 EFFECT ON OTHER MARINE PROSPECTING, MINING AND EXPLORATION ACTIVITIES

**Issue:** The presence of the bulk sampling vessel with the associated 500 m safety zone could interfere with other prospecting, mining and exploration activities in the area.

**Response:** The location of Sea Concession 6C in relation to existing exploration and marine mining and prospecting areas is presented in Sections 4.1.4.3, 4.1.4.4 and 4.1.4.5. This impact will be assessed using experience gained from the environmental assessment of similar operations elsewhere in the region and information from the Generic EMP prepared for marine diamond mining off the West Coast of South Africa. Additional input from a specialist is not deemed necessary.

### 5.4 EFFECT ON MARINE TRANSPORT ROUTES

**Issue:** The presence of the bulk sampling vessel with the associated 500 m safety zone could interfere with shipping in the area.

**Response:** 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 prospecting / mining vessels, especially between Kleinsee and Oranjemund. The majority of the shipping traffic *en route* to and from Cape Town passes offshore of the project area.

This impact will be assessed using experience gained from the environmental assessment of similar operations elsewhere in the region and information from the Generic EMP prepared for marine diamond mining off the West Coast of South Africa. Additional input from a specialist is not deemed necessary. It may be necessary to discuss this issue with the South African Maritime Safety Authority (maritime co-ordination centre), as they monitor the movement of vessels around the South African coast.

### 5.5 EFFECT ON SHIPWRECKS

**Issue:** Bulk sampling activities and the deposition of processed sediments could disturb cultural heritage material on the seabed, particularly historical shipwrecks.

**Response:** The majority of known shipwrecks off the coast of South Africa occur in waters shallower than 100 m within 50 km of the coast. Thus, the likelihood of disturbing a shipwreck is expected to be very small considering the vast size of the South African offshore area. However, an Underwater Heritage Impact Assessment has been undertaken to determine if there are any known shipwrecks in the area. The terms of reference for the Underwater Heritage Impact Assessment are presented in Section 6.2.4.

### 5.6 EFFECT ON SOCIO-ECONOMIC ENVIRONMENT

**Issue:** The proposed project could amongst others result in the following socio-economic impacts or benefits:

- Creation of limited employment opportunities; and
- Generation of limited direct revenues associated with operational activities such as refuelling, vessel repair, etc.

**Response:** Offshore bulk sampling is highly technical and requires specialised units and crews, most of which are based outside South Africa. There would, however, be opportunities for local companies to provide support services in Cape Town or Saldanha, e.g. vessel supplies, support vessels, catering, cleaning, security,

etc. Therefore, job creation opportunities would be limited and of very short duration (approximately three weeks per survey).

Limited direct revenues would be generated as a result of the proposed bulk sampling activities. Revenue generating activities are related to the actual operations and could include refuelling, vessel / gear repair, port duties and hire of local fishing vessels as support vessel.

These potential benefits will be assessed using experience gained from the environmental assessment of similar operations elsewhere in the region. Additional input from a specialist is not deemed necessary.

## 6 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

This chapter provides the Plan of Study for EIA in accordance with the requirements of Section 2(i) of Appendix 2 of the EIA Regulations 2014, which states that a Scoping Report must include a Plan of Study for EIA which sets out the proposed approach to the environmental impact assessment of the application. It includes information on specialist studies that will be undertaken during the EIA Phase and the terms of reference for these studies, as well as the predefined rating scales that will be used to assess potential impacts.

### 6.1 INTRODUCTION

If the Scoping Report is accepted by the Department of Mineral Resources (DMR), specialist studies that were commissioned to address the effects of the prospecting activities on marine fauna, fisheries and shipwrecks (refer to Section 2.6) will be integrated into the EIR.

The terms of reference for these studies are presented in Section 6.2 below. As part of these studies, specialists gathered data relevant to identifying and assessing environmental impacts that might occur as a result of the proposed project in their particular field of expertise. They will provide baseline information and identify and assess impacts according to predefined rating scales (see Section 6.3). Specialists will also suggest ways in which negative impacts could be mitigated and benefits could be enhanced.

### 6.2 TERMS OF REFERENCE FOR THE SPECIALIST STUDIES

#### 6.2.1 General Terms of Reference for the Specialist Studies

The following general terms of reference applied to the specialist studies:

- Describe the baseline conditions that exist in the study area and identify any sensitive areas that would need special consideration;
- Review the Comments and Responses Report to ensure that all relevant issues and concerns relevant to fields of expertise are addressed;
- Identify and assess potential impacts of the proposed operations;
- Identify and list all legislation and permit requirements that are relevant to the development proposal;
- Identify areas where issues could combine or interact with issues likely to be covered by other specialists, resulting in aggravated or enhanced impacts;
- Indicate the reliability of information utilised in the assessment of impacts as well as any constraints to which the assessment is subject (e.g. any areas of insufficient information or uncertainty);
- Where necessary consider the precautionary principle in the assessment of impacts;
- Identify feasible ways in which impacts could be mitigated and benefits enhanced giving an indication of the likely effectiveness of such mitigation and how these could be implemented in the management of the proposed operation;
- To ensure that specialists use a common standard, the determination of the significance of the assessed impacts will be undertaken in accordance with a common Convention (see Section 2);
- Comply with DEA guidelines as well as any other relevant guidelines on specialist study requirements for EIAs;
- Include specialist expertise and a signed statement of independence; and

- Comply with Regulation 12 and Appendix 6 of the EIA Regulations 2014, which specifies requirements for all specialist reports.

### 6.2.2 Marine Fauna

The specific terms of reference used for the marine faunal assessment included the following:

- Provide a general description of the local marine fauna (including cetaceans, seals, turtles, seabirds, fish, invertebrates and plankton species) within Sea Concession 6C and greater West Coast. The description to be based on, *inter alia*, a review of existing information and data from the international scientific literature, the Generic EMP prepared for marine diamond mining off the West Coast of South Africa and information sourced from the internet;
- Identify, describe and assess the significance of potential impacts of the proposed prospecting operations on the local marine fauna, including but not limited to:
  - > physical damage to the seabed, alteration of sediment structure, alteration in benthic fauna community composition and potential reduction in benthic biodiversity due to prospecting activities;
  - > impacts on benthic fauna due to the discharge of processed sediments, including direct mortality, smothering of relatively immobile or sedentary species and biochemical effects (e.g. direct toxicity and bioaccumulation);
  - > behavioural avoidance of the prospecting area;
  - > masking of environmental sounds and communication; and
  - > indirect impacts due to effects on prey.
- Identify practicable mitigation measures to avoid/reduce any negative impacts and indicate how these could be implemented in the start-up and management of the proposed project.

### 6.2.3 Fisheries

The specific terms of reference used for the fisheries assessment included the following:

- Provide a general description of the fishing activities expected in Sea Concession 6C and along the greater West Coast;
- Undertake a spatial and temporal assessment of expected fishing effort and catch in Sea Concession 6C for each sector identified;
- Assess the impact of the prospecting activities on the different fishing sectors;
- Assess the impact of the proposed exclusion zones around the prospecting vessel and potential disturbance of fish on the fishing activities based on the estimated percentage loss of catch and effort; and
- Make recommendations for mitigation measures that could be implemented to minimise or eliminate negative impacts on and enhance any benefits to the fishing industry.

### 6.2.4 Underwater Cultural Heritage Material

The specific terms of reference used for the Underwater Heritage Impact Assessment included the following:

- Undertake a desktop study of the database of known and suspected wrecks in the area ascertained through the study of available written and oral resources;
- Identify potential Maritime and Underwater Cultural Heritage (MUCH) sites within the designated area; and
- Recommend management measures for sites before and during development.



## 6.3 CONVENTION FOR ASSIGNING SIGNIFICANCE RATINGS TO IMPACTS

The identification and assessment of environmental impacts is a multi-faceted process, using a combination of quantitative and qualitative descriptions and evaluations. It involves applying scientific measurements and professional judgement to determine the significance of environmental impacts associated with the proposed project. The process involves consideration of, *inter alia*: the purpose and need for the project; views and concerns of I&APs social and political norms, and general public interest.

### 6.3.1 Identification and Description of Impacts

Identified impacts are described in terms of the nature of the impact, compliance with legislation and accepted standards, receptor sensitivity and the significance of the predicted environmental change (before and after mitigation). Mitigation measures may be existing measures or additional measures that were identified through the impact assessment and associated specialist input. The impact rating system considers the confidence level that can be placed on the successful implementation of mitigation.

### 6.3.2 Evaluation of Impacts and Mitigation Measures

Impacts are assessed using SLR's standard convention for assessing the significance of impacts, a summary of which is provided below.

In assigning significance ratings to potential impacts before and after mitigation the approach presented below is to be followed.

1. **Determine the impact consequence rating:** This is a function of the "intensity", "duration" and "extent" of the impact (See Section 6.3.4). The consequence ratings for combinations of these three criteria are given below.
2. **Determine impact significance rating:** The significance of an impact is a function of the consequence of the impact occurring and the probability of occurrence (see Section 6.3.5). Significance is determined using the table in Section 6.3.5.
3. **Modify significance rating (if necessary):** Significance ratings are based on largely professional judgement and transparent defined criteria. In some instances, therefore, whilst the significance rating of potential impacts might be "low", the importance of these impacts to local communities or individuals might be extremely high. The importance/value which interested and affected parties attach to impacts will be highlighted, and recommendations should be made as to ways of avoiding or minimising these perceived negative impacts through project design, selection of appropriate alternatives and / or management.
4. **Determine degree of confidence of the significance assessment:** Once the significance of the impact has been determined, the degree of confidence in the assessment will be qualified (see Section 6.3.3). Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact.

### 6.3.3 Criteria for Impact Assessment

The criteria for impact assessment are provided below.

| Criteria   | Rating                  | Description   |
|--|-------------------------|---|
| <b>Criteria for ranking of the INTENSITY (SEVERITY) of environmental impacts</b> | <b>ZERO TO VERY LOW</b> | Negligible change, disturbance or nuisance. The impact affects the environment in such a way that natural functions and processes are not affected. People / communities are able to adapt with relative ease and maintain pre-impact livelihoods.  |
|  | <b>LOW</b>              | Minor (Slight) change, disturbance or nuisance. The impact on the environment is not detectable or there is no perceptible change to people's livelihood.   |
|  | <b>MEDIUM</b>           | Moderate change, disturbance or discomfort. Where the affected environment is altered, but natural functions and processes continue, albeit in a modified way. People/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. |
|  | <b>HIGH</b>             | Prominent change, disturbance or degradation. Where natural functions or processes are altered to the extent that they will temporarily or permanently cease. Affected people/communities will not be able to adapt to changes or continue to maintain-pre impact livelihoods.                  |
| <b>Criteria for ranking the DURATION of impacts</b>                              | <b>SHORT TERM</b>       | < 5 years.  |
|  | <b>MEDIUM TERM</b>      | 5 to < 15 years.  |
|  | <b>LONG TERM</b>        | > 15 years, but where the impact will eventually cease either because of natural processes or by human intervention.  |
|  | <b>PERMANENT</b>        | Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.  |
| <b>Criteria for ranking the EXTENT / SPATIAL SCALE of impacts</b>                | <b>LOCAL</b>            | Impact is confined to project or study area or part thereof, e.g. limited to the area of interest and its immediate surroundings.   |
|  | <b>REGIONAL</b>         | Impact is confined to the region, e.g. coast, basin, catchment, municipal region, etc.  |
|  | <b>NATIONAL</b>         | Impact is confined to the country as a whole, e.g. South Africa, etc.   |
|  | <b>INTERNATIONAL</b>    | Impact extends beyond the national scale.   |
| <b>Criteria for determining the PROBABILITY of impacts</b>                       | <b>IMPROBABLE</b>       | Where the possibility of the impact to materialise is very low either because of design or historic experience, i.e. ≤ 30% chance of occurring.   |
|  | <b>POSSIBLE</b>         | Where there is a distinct possibility that the impact would occur, i.e. > 30 to ≤ 60% chance of occurring.  |
|  | <b>PROBABLE</b>         | Where it is most likely that the impact would occur, i.e. > 60 to ≤ 80% chance of occurring.  |
|  | <b>DEFINITE</b>         | Where the impact would occur regardless of any prevention measures, i.e. > 80% chance of occurring.   |
| <b>Criteria for determining the DEGREE OF CONFIDENCE of the assessment</b>       | <b>LOW</b>              | ≤ 35% sure of impact prediction.  |
|  | <b>MEDIUM</b>           | > 35% and ≤ 70% sure of impact prediction.  |
|  | <b>HIGH</b>             | > 70% sure of impact prediction.  |
| <b>Criteria for the DEGREE</b>   | <b>NONE</b>             | No change in impact after mitigation.   |

| Criteria   | Rating          | Description  |
|--|-----------------|--|
| <b>TO WHICH IMPACT CAN BE MITIGATED</b> - the degree to which an impact can be reduced / enhanced  | <b>VERY LOW</b> | Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.  |
|  | <b>LOW</b>      | Where the significance rating drops by one level, after mitigation.  |
|  | <b>MEDIUM</b>   | Where the significance rating drops by two to three levels, after mitigation.  |
|  | <b>HIGH</b>     | Where the significance rating drops by more than three levels, after mitigation.   |
| <b>Criteria for LOSS OF RESOURCES</b> - the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable | <b>LOW</b>      | Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected. |
|  | <b>MEDIUM</b>   | Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.                  |
|  | <b>HIGH</b>     | Where the activity results in an irreplaceable loss of a resource.   |

### 6.3.4 Determining Consequence

Consequence attempts to evaluate the importance of a particular impact, and in doing so incorporates extent, duration and intensity. The ratings and description for determining consequence are provided below.

| Rating           | Description  |
|------------------|--|
| <b>VERY HIGH</b> | Impacts could be EITHER:<br>of <b>high intensity</b> at a <b>regional level</b> and endure in the <b>long term</b> ;<br>OR<br>of <b>high intensity</b> at a <b>national level</b> in the <b>medium term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>national level</b> in the <b>long term</b> .   |
| <b>HIGH</b>      | Impacts could be EITHER:<br>of <b>high intensity</b> at a <b>regional level</b> and endure in the <b>medium term</b> ;<br>OR<br>of <b>high intensity</b> at a <b>national level</b> in the <b>short term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>national level</b> in the <b>medium term</b> ;<br>OR<br>of <b>low intensity</b> at a <b>national level</b> in the <b>long term</b> ;<br>OR<br>of <b>high intensity</b> at a <b>local level</b> in the <b>long term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>regional level</b> in the <b>long term</b> .   |
| <b>MEDIUM</b>    | Impacts could be EITHER:<br>of <b>high intensity</b> at a <b>local level</b> and endure in the <b>medium term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>regional level</b> in the <b>medium term</b> ;<br>OR<br>of <b>high intensity</b> at a <b>regional level</b> in the <b>short term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>national level</b> in the <b>short term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>local level</b> in the <b>long term</b> ;<br>OR<br>of <b>low intensity</b> at a <b>national level</b> in the <b>medium term</b> ;<br>OR<br>of <b>low intensity</b> at a <b>regional level</b> in the <b>long term</b> . |
| <b>LOW</b>       | Impacts could be EITHER<br>of <b>low intensity</b> at a <b>regional level</b> and endure in the <b>medium term</b> ;<br>OR<br>of <b>low intensity</b> at a <b>national level</b> in the <b>short term</b> ;<br>OR<br>of <b>high intensity</b> at a <b>local level</b> and endure in the <b>short term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>regional level</b> in the <b>short term</b> ;<br>OR<br>of <b>low intensity</b> at a <b>local level</b> in the <b>long term</b> ;<br>OR<br>of <b>medium intensity</b> at a <b>local level</b> and endure in the <b>medium term</b> .  |

| Rating          | Description  |
|-----------------|--|
| <b>VERY LOW</b> | Impacts could be EITHER<br>of <i>low intensity</i> at a <i>local level</i> and endure in the <i>medium term</i> ;<br>OR<br>of <i>low intensity</i> at a <i>regional level</i> and endure in the <i>short term</i> ;<br>OR<br>of <i>low to medium intensity</i> at a <i>local level</i> and endure in the <i>short term</i> .<br>OR<br><b>Zero to very low intensity</b> with any combination of extent and duration. |

### 6.3.5 Determining Significance

The consequence rating is considered together with the probability of occurrence in order to determine the overall significance using the table below.

|             |           | PROBABILITY   |               |           |           |
|-------------|-----------|---------------|---------------|-----------|-----------|
|             |           | IMPROBABLE    | POSSIBLE      | PROBABLE  | DEFINITE  |
| CONSEQUENCE | VERY LOW  | INSIGNIFICANT | INSIGNIFICANT | VERY LOW  | VERY LOW  |
|             | LOW       | VERY LOW      | VERY LOW      | LOW       | LOW       |
|             | MEDIUM    | LOW           | LOW           | MEDIUM    | MEDIUM    |
|             | HIGH      | MEDIUM        | MEDIUM        | HIGH      | HIGH      |
|             | VERY HIGH | HIGH          | HIGH          | VERY HIGH | VERY HIGH |

In certain cases it may not be possible to determine the significance of an impact. In these instances the significance is **UNKNOWN**.

## 6.4 ALTERNATIVES TO BE CONSIDERED

The project scope to be considered and assessed in the EIA is the proposed bulk sampling operations within Sea Concession 6C, as described in Section 3. A summary of the project alternatives that will be considered during the EIA is provided in Section 3.3.

## 6.5 DESCRIPTION OF THE ASPECTS TO BE ASSESSED

The environmental aspects relevant to the anticipated impacts as described in Section 5 will be considered and investigated in the EIA Phase.

## 6.6 CONSULTATION PROCESS DURING EIA PHASE

### 6.6.1 Consultation with the Competent Authority

Any conditions attached to the acceptance of the Scoping Report by DMR will be implemented in the EIA process. If requested, a meeting shall be held with DMR (as the competent authority).

The EIR (including EMPr) will be submitted to DMR in both draft and final formats. Opportunities for consultation and participation in the EIA process are shown in Table 6-1.

## 6.6.2 Public Participation Process during the EIA Phase

A description of the tasks that will be undertaken during the EIA Phase, with specific reference to the opportunities for consultation and participation for I&APs is detailed below and shown in Table 6-1.

### 6.6.2.1 Notification of I&APs

All I&APs registered on the project database will be notified of relevant events in the EIA process via electronic mail or, if required, post. This will include when the EIR is available for public review; invitations to possible public feedback meetings/open days (if required); and notification of the authority decision.

### 6.6.2.2 Information to be provided to I&APs

The EIR (including specialist studies and EMPr) will be released for a 30-day review and comment period. The following tasks will be undertaken in order to notify I&APs of the release of the EIR:

- A notification letter (with an Executive Summary) will be sent to all registered I&APs to inform them of the release of the EIR and where the full report can be reviewed.
- Copies of the full report will be made available on the SLR website.

Once DMR has issued a decision on the application, I&APs on the project database will be informed accordingly of the decision, the reasons therefore and the fact that an appeal may be lodged in terms of the National Appeals Regulations 2014.

### 6.6.2.3 Details of the engagement process

The stakeholder engagement process in the EIA Phase will include the following:

- Ongoing identification and notification stakeholders;
- Registration of parties as I&APs on the project database;
- Collation of issues and concerns into a Comments and Responses Report for inclusion in the EIR;
- Circulation of the EIR for public review (30 days);
- Executive Summaries will be made available (in English); and
- Notification of I&APs on the database of the decision and appeal process.

## 6.7 INTEGRATION AND ASSESSMENT

The specialist findings, recommendations and other relevant information will be integrated into an EIR. The full specialist studies will be included as appendices to the EIR.

## 6.8 MEASURES TO AVOID, REVERSE, MITIGATE OR MANAGE IDENTIFIED IMPACTS

An EMPr will be compiled and included in the EIR. The EMPr will be structured in terms of Appendix 4 of the EIA Regulations 2014 (as amended). The EMPr will provide recommendations on how to undertake the proposed project throughout all relevant phases of the project activities. The aim of the EMPr will be to ensure that the project activities are managed to avoid or reduce potential negative environmental impacts and enhance potential positive environmental impacts. The EMPr will detail the impact management objectives, outcomes and actions as required, the responsibility for implementation and the schedule and timeframe. Requirements for monitoring of environmental aspects, as well as compliance monitoring and reporting, will

also be detailed. The EMPr will also include the required environmental awareness plan for the construction phase.

If approved by the relevant authorities, the provisions of the EMPr would be legally binding on the project applicant and all its contractors and suppliers.

## 6.9 DESCRIPTION OF TASKS AND INDICATIVE TIMING OF THE EIA PHASE

The EIA Phase has been developed to ensure that it complies with Section 23 and Appendices 3 and 4 to the EIA Regulations 2014 (as amended). The various tasks / activities (including the indicative timing thereof) that will be undertaken during the EIA Phase are described in Table 6-1.

**TABLE 6-1: KEY TASKS (AND INDICATIVE TIMING) OF THE EIA PHASE**

| Task No. | EAP activity  | Indicative Schedule     | Opportunities for consultation and participation |
|----------|---|-------------------------|--|
| 1        | <ul style="list-style-type: none"> <li>Ongoing consultation with I&amp;APs.</li> </ul>  | August– September 2019  | ✓  |
| 2        | <ul style="list-style-type: none"> <li>Manage specialist activities and receive inputs for EIR.</li> <li>Internal review specialist studies.</li> </ul>                           | August– September 2019  |  |
| 3        | <ul style="list-style-type: none"> <li>Assess environmental impacts and identify management measures.</li> <li>Compile EIR and EMPr.</li> </ul>                                   | August– September 2019  |  |
| 4        | <ul style="list-style-type: none"> <li>Release EIR to I&amp;APs for 30-day comment period.</li> </ul>   | October - November 2019 | ✓<br>Comments on EIR to be sent to SLR           |
| 5        | <ul style="list-style-type: none"> <li>Assimilate comments.</li> <li>Finalise EIR and EMPr.</li> </ul>  | November 2019           |  |
| 6        | <ul style="list-style-type: none"> <li>Submit updated EIR to DEA&amp;DP (within 106 days from acceptance of Scoping Report).</li> </ul>   | November 2019           |  |
| 7        | <ul style="list-style-type: none"> <li>Notify I&amp;APs of authority decision (which must be made within 107 days of submission of EIR) and associated appeal process.</li> </ul> | April 2020              | ✓<br>Appeals to be sent to the Minister          |

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## **APPENDIX A: DMR SCOPING REPORT TEMPLATE**



## mineral resources

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

### **SCOPING REPORT**

# **SCOPING REPORT FOR BULK SAMPLING ACTIVITIES FOR OFFSHORE MARINE DIAMONDS, WEST COAST, SOUTH AFRICA**

SUBMITTED FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

**NAME OF APPLICANT:** De Beers Consolidated Mines (Pty) Ltd

**TEL NO:** 011 374 7000 / 011 374 7203

**FAX NO:** 011 309 3284

**POSTAL ADDRESS:** Corner Crownwood Road and Diamond Drive, Theta Ext 4,  
Johannesburg, 2013

**PHYSICAL ADDRESS:** Same as above.

**FILE REFERENCE NUMBER SAMRAD:** To be confirmed.

## **IMPORTANT NOTICE**

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining “will not result in unacceptable pollution, ecological degradation or damage to the environment”.

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of Section 17(1)(c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is, therefore, an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

## **OBJECTIVE OF THE SCOPING PROCESS**

- 1) The objective of the scoping process is to, through a consultative process—
  - (a) identify the relevant policies and legislation relevant to the activity;
  - (b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
  - (c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
  - (d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
  - (e) identify the key issues to be addressed in the assessment phase;
  - (f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
  - (g) identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

## 1. CONTACT PERSON AND CORRESPONDENCE ADDRESS

### 1.1 DETAILS OF THE EAP WHO PREPARED THE REPORT:

The details and role of the environmental assessment practitioner (EAPs) that were involved in the preparation of this scoping report are provided in Table 1-1 below.

Neither SLR Consulting (South Africa) (Pty) Ltd nor any of the specialists involved in the environmental assessment process have any interest in the project other than fair payment for consulting services rendered as part of the environmental assessment process.

**Table 1-1: Details of the EAP**

|                          |                                      |
|--------------------------|--------------------------------------|
| Name of the practitioner | Jonathan Crowther (Project Reviewer) |
| Tel No.:                 | 021 461 1118/9                       |
| Fax No.:                 | 021 461 1120                         |
| E-mail address           | jonathan@slrconsulting.com           |

### 1.2 EXPERTISE OF THE EAP

|                                  |   |
|----------------------------------|---|
| <b>NAME</b>                      | Jonathan Crowther   |
| <b>RESPONSIBILITY ON PROJECT</b> | Project leader and quality control.   |
| <b>DEGREE</b>                    | M.Sc. (Env. Sci.), B.Sc. Hons (Geol.)   |
| <b>PROFESSIONAL REGISTRATION</b> | Pr.Sci.Nat., Member IAIAAsa   |
| <b>EXPERIENCE IN YEARS</b>       | 30  |
| <b>EXPERIENCE</b>                | Jonathan Crowther has been involved in environmental consulting since 1988 and is currently the EMPA Operations Manager of SLR Consulting (South Africa) (Pty) Ltd. He has expertise in a wide range of environmental disciplines, including Environmental Impact Assessments (EIA), Environmental Management Plans / Programmes, Environmental Planning & Review, Environmental Control Officer services, and Public Consultation & Facilitation. He has project managed a number of offshore oil and gas EIAs for various exploration and production activities in South Africa and Namibia. He also has extensive experience in projects related to roads, property developments and landfill sites. |

|                                  |   |
|----------------------------------|---|
| <b>NAME</b>                      | Nicholas Arnott   |
| <b>RESPONSIBILITY ON PROJECT</b> | Project consultant and report writing.  |
| <b>DEGREE</b>                    | B.Sc. Hons (Earth and Geographical Science)   |
| <b>PROFESSIONAL REGISTRATION</b> | Pri. Sci. Nat., Member IAIAAsa  |
| <b>EXPERIENCE IN YEARS</b>       | 12  |
| <b>EXPERIENCE</b>                | 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, infrastructure projects (e.g. roads), housing and industrial developments. |

|                                  |  |
|----------------------------------|--|
| <b>NAME</b>                      | Rizqah Baker   |
| <b>RESPONSIBILITY ON PROJECT</b> | Project assistant  |
| <b>DEGREE</b>                    | B.A Hons. (Envir. & Geog. Sci.)  |
| <b>PROFESSIONAL REGISTRATION</b> | Member IAIAAsa   |
| <b>EXPERIENCE IN YEARS</b>       | 2  |
| <b>EXPERIENCE</b>                | Rizqah Baker has been working in the environmental field for two years. 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 brings with her strong report writing skills and practical experience in the review and implementation of Environmental Management Programmes. |

Proof of registrations of the EAP is provided in Appendix 1 and the relevant curricula vitae are attached in Appendix 2.

## 2. DESCRIPTION OF THE PROPERTY

The proposed bulk sampling activities would be undertaken within Sea Concession 6C, which is located off the West Coast of South Africa.

|   |   |               |               |
|---|---|---------------|---------------|
| <b>Farm Name</b>  | N/A - Sea Concession 6C is an offshore area located approximately 5 km seaward off the West Coast of South Africa.  |               |               |
| <b>Corner of property point co-ordinates</b>                | 1   | 29° 54' 18" S | 17° 04' 56" E |
|   | 2   | 30° 10' 55" S | 17° 10' 19" E |
|   | 3   | 30° 10' 55" S | 16° 10' 10" E |
|   | 4   | 30° 04' 26" S | 15° 58' 47" E |
|   | 5   | 29° 56' 28" S | 15° 53' 13" E |
|   | 6   | 29° 56' 28" S | 15° 41' 46" E |
|   | 7   | 29° 54' 18" S | 15° 39' 43" E |
| <b>Application area (Ha)</b>                                | 345 764   |               |               |
| <b>Magisterial district</b>                                 | N/A   |               |               |
| <b>Distance and direction from nearest town</b>             | The inshore boundary is located 5 km seaward of the coast. The nearest towns are Kleinzee and Hondeklip Bay, which are located approximately 25 km and 20 km east of Sea Concession 6C, respectively. |               |               |
| <b>21 digit Surveyor General Code for each farm portion</b> | N/A - the proposed project is located offshore.   |               |               |

## 3. LOCALITY MAP

A map showing the locality of Sea Concession 6C is provided in Figure 4-1.

## 4. DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

### 4.1 LISTED AND SPECIFIED ACTIVITIES

The EIA Regulations 2014 (as amended) promulgated in terms of Chapter 5 of National Environmental Management Act (NEMA), 1998 (Act 107 of 1998), 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 Environmental Authorisation has been obtained from the competent authority. The Minister of Mineral Resources remains responsible for the granting of Environmental Authorisation (EA) for Prospecting Right Applications in term 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 Environmental Impact Assessment (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 proposed project triggers, amongst others, Activity 19 contained in Listing Notice 2, thus a full Scoping and EIA process must be undertaken in order for the Department of Mineral Resources (DMR) 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 4-1 below.

**Table 4-1: List of activities/infrastructure associated with the proposed project**

| NAME OF ACTIVITY  | APPROXIMATE AERIAL EXTENT OF THE ACTIVITY (HA)  | LISTED ACTIVITY NUMBER AND APPLICABLE LISTING NOTICE |
|---|---|--|
| <p><i>“The decommissioning of any activity requiring-</i></p> <p><i>(i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or</i></p> <p><i>(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.”</i></p>  | <p>Extent of Sea Concession 6C (345 764 ha)</p> | <p>Activity 22 of GN No. R983 (Listing Notice 1)</p> |
| <p><i>“The removal and disposal of minerals contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly 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.”</i></p> | <p>Extent of Sea Concession 6C (345 764 ha)</p> | <p>Activity 19 of GN No. R984 (Listing Notice 2)</p> |

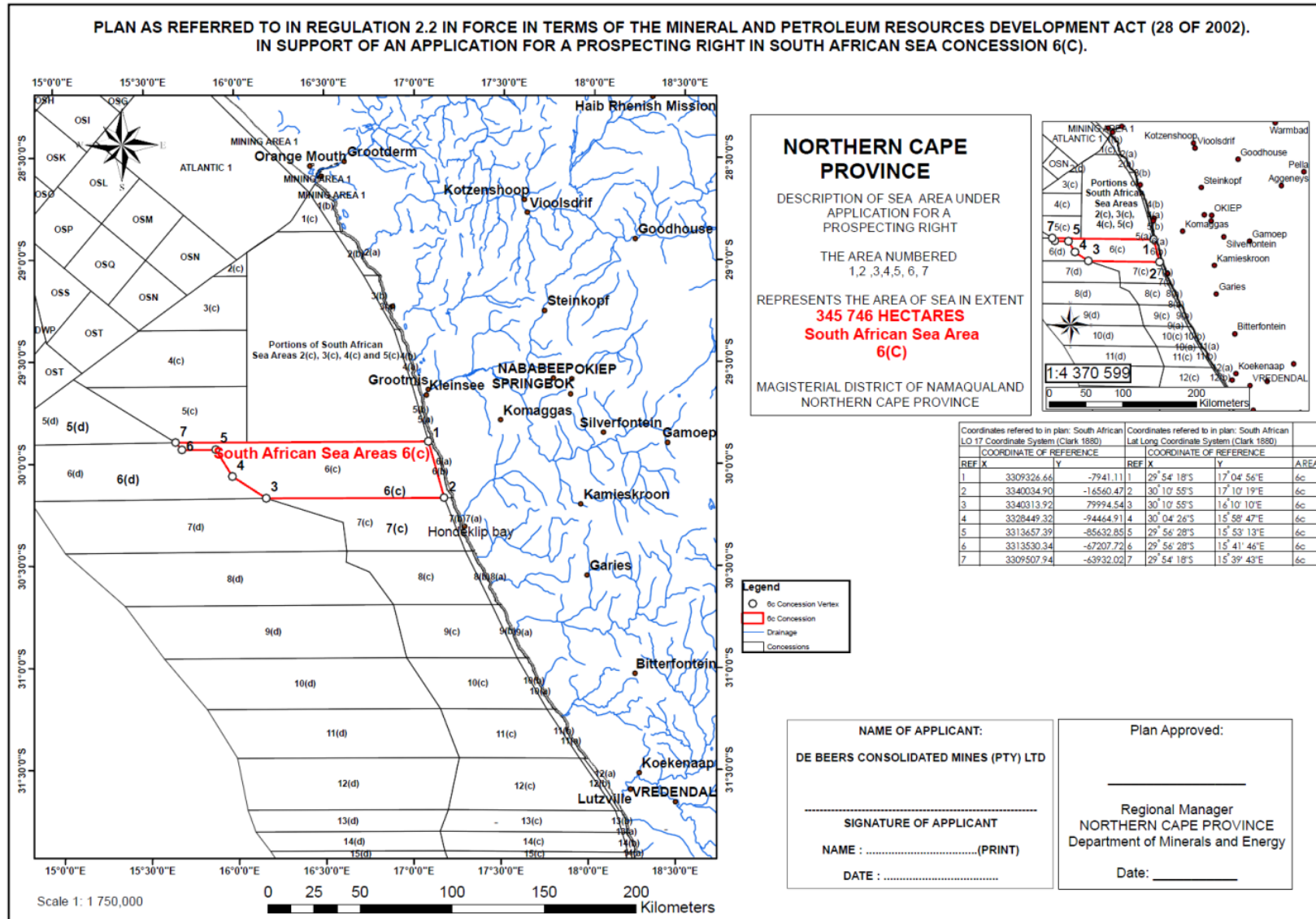


Figure 4-1: Location of the 6C Prospecting Right area, off the West Coast of South Africa.



## 4.2 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

### 4.2.1 PROJECT OVERVIEW

#### 4.2.1.1 Mineral Resource

The target mineral for the bulk sampling activities is diamonds. In addition to the proposed bulk sampling activities, the proposed prospecting operations would also entail regional scale and high-resolution geophysical surveys and sampling. EA for the planned geophysical surveys and sampling activities has already been granted.

Due to the dynamic nature of prospecting, the work programme may have to be modified, extended or curtailed as data and analyses become available (e.g. in some locations within Sea Concession 6C, the proposed bulk sampling activities could be undertaken without having first undertaken geophysical surveys or sampling). The overall prospecting programme would run over a five-year period.

#### 4.2.1.2 Offshore Bulk Sampling Vessel

The proposed bulk sampling activities would be undertaken using a vessel of opportunity, which may include the De Beers Marine (Pty) Ltd (of the appointed operator for Beers Consolidated Mines (Pty) Ltd) *mv Coral Sea* or one of the marine diamond vessels operated by Debmarine Namibia (Pty) Ltd or a similar vessel (see Figure 4-2). In this regard, there are two possible basic configurations of vessel available for sampling: (i) the vertical method, utilising a tool mounted on a drill string; and (ii) the horizontal method, using a seabed crawler.

A description of these bulk sampling methodologies as well as information pertaining to the number of samples and total project footprint are provided below.



Figure 4-2: Possible vessels of opportunity that could be utilised during sampling – *mv Coral Sea* (left) and *mv Mafuta* (right).

#### 4.2.1.3 Proposed Bulk Sampling Method

##### Vertical method

The vertical method utilises an ADS (Alternative Drill System) deployed at the end of a drill string which is suspended from a derrick mounted mid-ships and deployed through a moon pool. The drill stem is

suspended in a state of constant tension by means of a compensation system that absorbs the motion of the ship, enabling the ADS to remain in contact with the seabed. The tool agitates the unconsolidated sediments and airlifts all sediment particles of up to 250 mm in diameter to the vessel for processing. The material from the seabed is pumped onto multi-decked screens to separate the boulders and sandy silt from the size fraction of interest - the 'plantfeed' (approx. 1.5 mm – 19 mm in diameter). All material except the plantfeed is returned overboard immediately after having passed over the screens. The plant feed is then separated using a dense medium separation system and the diamonds are extracted using an X-ray sorter.

Sediments are recovered to a depth of typically between 0.5 m and 4 m.

#### Horizontal method

The horizontal method makes use of a seabed crawler. The seabed crawler is lowered to the seabed by a hoist winch and heave compensator via a large, fixed A-frame over the stern of the vessel (see Figure 4-3). The seabed crawler is fitted with acoustic seabed navigation and imaging systems that allow for the remote operation of the crawler from the surface support vessel through power and signal umbilical cables. The seabed crawler is track-driven and is equipped with a dredge pump system, hydraulic power pack and a jet-water system to facilitate the agitation and suction of unconsolidated surficial sediments to the vessel (see Figure 4-4). Onboard processing of the sediments takes place in the same way as described in section 4.2.1.3. The seabed crawler would remove the seabed sediments to a depth of typically between 0.5 m to 4 m in a set path within the target area identified for bulk-sampling activities.



**Figure 4-3: Deployment of the seabed crawler**



**Figure 4-4: Schematic diagram showing operation of a seabed crawler and photograph of seabed crawler**

#### 4.2.1.4 Summary of operations

The planned bulk sampling operations would have a total footprint of approximately 480 000 m<sup>2</sup> and would be undertaken in a total of 60 days over the duration of the 5-year licence period. The bulk prospecting operation could consist of up to 60 pits and / or trenches. These would typically each be approximately 8000 m<sup>2</sup> in extent and 1.5 m in depth. Specific details are provided in Table 4-2 below.

**Table 4-2: Summary of proposed bulk sampling operations**

| Activity                               | Detail                         |                       |
|--|--------------------------------|-----------------------|
| <b>Number of pits/trenches planned</b> | Up to 60                       |                       |
| <b>Dimensions of pits/trenches</b>     | <b>Length</b>                  | Up to 400 m           |
|  | <b>Breadth</b>                 | Typically 20 m        |
|  | <b>Depth</b>                   | Typically up to 1.5 m |
| <b>Total Volume Overburden (Waste)</b> | Maximum 480 000 m <sup>3</sup> |                       |
| <b>Total Volume Ore</b>                | Maximum 240 000 m <sup>3</sup> |                       |
| <b>Density Overburden</b>              | 1.5 t/m <sup>3</sup>           |                       |
| <b>Density Ore</b>                     | 1.9 t/m <sup>3</sup>           |                       |

#### 4.2.2 REHABILITATION

The immediate impact on the seabed entails the localised removal of the seabed habitat, with the fine sediment surface layers replaced with coarse sediments (boulders and gravels). The majority of the material that is pumped to the surface is returned directly to the sea after the primary screening process. Operations are designed such that the coarse tailings, and to some extent the finer sediments, discharged from the vessels land back into disturbed areas as far as possible. This avoids reprocessing the same sediments, minimises the disturbance footprint and provides material for re-establishment of habitat. Sediments typically settle rapidly, with most of the silt sinking within minutes. Mixing with descending seawater then results in dilution of the finer sediment, with the remaining particulate matter settling over a period of hours. Seabed research programs have demonstrated the re-establishment of the ecological functioning of the seabed after removal of the diamonds. Seabed recovery rates are linked to fine sediment infill, the rate of which is

influenced by a range of factors including resuspension and settlement of sediments from adjacent areas by near-seabed currents, Orange River flooding etc. Recolonisation takes place by passive translocation of animals during storms or sediment slumping from nearby unaffected areas, active immigration of mobile species, and immigration and settlement of pelagic larvae and juveniles.

### 4.2.3 VESSEL EMISSIONS AND DISCHARGES

This section provides a brief description of the types of emissions and discharges that are expected from the bulk sampling and related activities. 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.

#### 4.2.3.1 Discharges to sea

##### 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 standard before discharge overboard. Drainage from marine (weather) deck spaces would wash directly overboard.

##### Sewage

Although South Africa is not yet a signatory to MARPOL Annex IV Regulations for the Prevention of Pollution by Sewage from Ships, the contracted vessels would be required to comply, wherever possible, with the requirements of this Annex.

##### Food (galley) wastes

The disposal into the sea of food waste is permitted in terms of MARPOL 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 the vessel would be approximately 0.15 m<sup>3</sup>.

##### 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.

##### Other

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

#### **4.2.3.2 Land Disposal**

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 a typical bulk sampling operation is given below.

##### 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.

##### Scrap metal

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

##### 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.

##### 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.

##### 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.

##### 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.

##### 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.

#### **4.2.3.3 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.

## **5. POLICY AND LEGISLATIVE CONTEXT**

An overview of the key legislative requirements applicable to the proposed prospecting operations followed in the Scoping and EIA process is provided below.

### **5.1 LEGISLATIVE REQUIREMENTS**

#### **5.1.1 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002**

In terms of the Mineral and Petroleum Resources Development Act (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.

In June 2018, De Beers lodged an application with DMR for a Prospecting Right in terms of the MPRDA and an Application for EA in terms of NEMA. In response to the EA application, DMR indicated that the planned bulk sampling activities would, in accordance with Section 20(2) of the MPRDA, require written permission from the Minister of Mineral Resources for the removal and / or disposal of diamonds found in the course of prospecting operations.

In light of the above, the removal and disposal of minerals contemplated in terms of Section 20 of the MPRDA triggers listed activity 19 of Listing Notice 2 (GN R984, as amended by GN No. 325 of 7 April 2017).

#### **5.1.2 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 Environmental Authorisations. 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.

A summary of the EIA Regulations 2014 (as amended) and an outline of the identified listed activities which are triggered in terms of the EIA Regulations 2014 (as amended) are provided in Section 4.1 above.

### **5.1.3 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) does 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.

### **5.1.4 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.

DEA 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).

### **5.1.5 OTHER RELEVANT LEGISLATION**

In addition to the foregoing, De Beers 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);
- Dumping at Sea Control Act, 1980(No. 73 of 1980);
- 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-Shore Act, 1935 (No. 21 of 1935);
- 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).

## 5.2 GUIDELINES AND POLICIES

The guidelines and policies listed in Table 5-1 below have been / or will be taken into account during the Scoping and EIA process.

**Table 5-1: Guidelines and policies relevant to the proposed project.**

| Guideline | Governing body | Applicability |
|-----------|----------------|---------------|
|-----------|----------------|---------------|



| Guideline   | Governing body | Applicability  |
|---|----------------|--|
| Guideline on need and desirability in terms of the EIA Regulations (2014)                                       | DEA            | This guideline informed the consideration of the need and desirability aspects of the proposed project.                    |
| Specialist Studies, Integrated Environmental Management, Information Series 4 (2002)                            | DEA            | This guideline was consulted to ensure adequate development of terms of reference for specialist studies.                  |
| Impact significance, Integrated Environmental Management, Information Series 5 (2002)                           | DEA            | 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)                 | DEA            | 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) | DEA            | This guideline was consulted to inform the consideration of alternatives.  |
| Environmental Management Plans, Integrated Environmental Management, Information Series 12 (2004)               | DEA            | 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)               | DEA            | This guideline was consulted to inform the approach to impact reporting.   |

## 6. NEED AND DESIRABILITY OF THE PROPOSED PROJECT

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, such as bulk sampling in the case of this application. A key intent of the Minerals and Mining Policy of South Africa states that Government will: "promote exploration and investment leading to increased mining output and employment" (Minerals and Mining Policy of South Africa, 1998). The Policy states further that:

- "The South African mining industry, one of the country's few world-class industries, has the capacity to continue to generate wealth and employment opportunities on a large scale;
- Mining is an international business and South Africa has to compete against developed and developing countries to attract both foreign and local investment. Many mining projects in South Africa have tended to be unusually large and long term, requiring massive capital and entailing a high degree of risk; and
- South Africa has an exceptional minerals endowment, and in several major commodities has the potential to supply far more than the world markets can consume."

In the more recently published Department of Minerals Resources Strategic Plan 2014 – 2019, the foreword by the Minister of Mineral Resources notes that the Department "*will continue to promote mineral value addition to strengthen the interface between extractive industries and national socio-economic developmental objectives*" and "*contribute towards decent employment, inclusive growth and industrialisation of South Africa*".

The Northern Cape Provincial Spatial Development Framework 2012 (PSDF) also notes that "*the greatest value from marine and coastal resources is generated through the mining and fishing sectors*" and that the "*Northern Cape has an abundance of diamond deposits both onshore and in marine deposits. This has led to*

*the development of a large diamond mining sector, which has become the dominant activity of the coastal zone”.*

In terms of the above, it is evident that the proposed bulk sampling activities are deemed to be a key component of the current national and provincial economies and future mining projects are a means to assist Government in meeting broader societal needs.

## **7. PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED**

The overall prospecting programme would run over a five-year period.

## **8. DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PREFERRED SITE ALTERNATIVE**

NEMA prescribes that every application for EA must include, *inter alia*, an investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity (i.e. No-Go Alternative).

“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;
- the type of activity to be undertaken;
- the technology to be used in the activity; and
- the option of not implementing the activity.

This section presents the various alternatives considered in this Scoping Report.

### **8.1 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 diamond deposits that occur within Sea Concession 6C, no further location alternatives are considered in the Scoping and EIA process.

The different bulk sampling methodologies being considered in the Scoping and EIA process are described in detail in Section 4.2.1.3 above.

### **8.2 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 diamond 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 bulk sampling activities

### **8.3 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED**

#### **8.3.1 PRE-APPLICATION PUBLIC PARTICIPATION PROCESS**

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 pre-application public participation process are summarised in Box 8-1 below and all supporting information is presented in appendices to this report.

#### **BOX 8-1: TASKS UNDERTAKEN DURING THE PRE-APPLICATION PUBLIC PARTICIPATION 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 69 I&APs have been registered on the project database (see Appendix B of the main Scoping Report).

- **I&AP Notification Letters**

All identified I&APs were 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 I&APs to register 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 August to 13 September 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.

### **8.4 SUMMARY OF ISSUES RAISED BY I&APS**

This will be provided in the final Scoping Report.

### **8.5 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITES**

A detailed description of the biophysical and socio-economic environment likely to be affected by the proposed project in the study area is provided in Section 4 of the main Scoping Report. It 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.

## **8.6 IMPACTS IDENTIFIED**

A number of key issues have been identified by the Scoping and EIA project team. These are presented in Section 5 of the main Scoping Report. These include:

- Effect on marine fauna;
- Effect on fisheries;
- Effect on marine mining and exploration activities;
- Effect on marine transport routes;
- Effect on shipwrecks; and
- Effect on socio-economic environment.

## **8.7 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS**

The methodology to be used to determine the significance of environmental impacts is detailed in the Plan of Study for EIA and presented in Section 6 of the main Scoping Report. A summary of the methodology to be followed is provided in Section 9.4 below.

## **8.8 POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY (IN TERMS OF THE INITIAL SITE LAYOUT) AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED**

As indicated above, the key issues that have been identified by the Scoping and EIA project team are provided in Section 5 of the main Scoping Report.

A detailed assessment of the identified potential impacts and confirmation of their significance (with input from the specialist investigations, where required) will be undertaken as part of the EIA phase.

## 8.9 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

The table below provides a list of likely project activities and possible management and mitigation measures that could be implemented for the identified project activities, as well as a preliminary assessment of the potential for residual risk.

**Table 8-1: Possible mitigation measures and potential for residual risk**

| ACTIVITIES                           | POTENTIAL IMPACT                               | TYPICAL MITIGATION MEASURES   | POTENTIAL FOR RESIDUAL RISK |
|--------------------------------------|--|---|-----------------------------|
| Vessel operations                    | Deck drainage into the sea                     | Compliance with environmental management programme and Marpol 73/78 standards.  | Low                         |
|                                      | Machinery space drainage into the sea          |   |                             |
|                                      | Sewage effluent into the sea                   |   |                             |
|                                      | Galley waste disposal into the sea             |   |                             |
|                                      | Solid waste disposal into the sea              |   |                             |
| Impact on marine fauna               | Sediment removal                               | Avoid sensitive habitats. Use dynamically positioned sampling vessels are used in preference to vessels requiring anchorage.              | Medium – Low                |
|                                      | Physical crushing of benthic biota             |   |                             |
|                                      | Generation of suspended sediment plumes        |   |                             |
|                                      | Smothering of benthos in redepositing tailings |   |                             |
|                                      | Noise associated with prospecting activities   |   |                             |
| Impact on other users of the sea     | Fishing industry                               | Notification and communication with key stakeholders.   | Medium - Low                |
|                                      | Fisheries research                             |   |                             |
|                                      | Marine mining and prospecting                  |   |                             |
|                                      | Petroleum exploration                          |   |                             |
|                                      | Marine transport routes                        |   |                             |
| Impact on cultural heritage material | Impact on palaeontological material            | Exclude areas where shipwreck sites are identified from the drill and bulk sampling programmes, prior to undertaking sampling activities. | Low                         |
|                                      | Impact on historical shipwrecks                |   |                             |

## 8.10 THE OUTCOME OF THE SITE SELECTION MATRIX FINAL SITE LAYOUT PLAN

Not applicable.

## 8.11 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

The location of the proposed prospecting activities is ultimately determined by De Beer's application for a Prospecting Right in Sea Concession 6C.

## **8.12 STATEMENT MOTIVATING THE PREFERRED SITE**

See Section 8.11 above.

## **9. PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS**

In accordance with the requirements of Section 2(i) of Appendix 2 of the EIA Regulations 2014, a detailed Plan of Study for EIA is presented in Section 6 of the main Scoping Report. The Plan of Study for EIA sets out the proposed approach to the environmental impact assessment of the application.

### **9.1 DESCRIPTION OF ALTERNATIVES TO BE CONSIDERED INCLUDING THE OPTION OF NOT GOING AHEAD WITH THE ACTIVITY.**

A description of the alternatives to be considered in the EIA Phase is provided in Section 0 above.

### **9.2 DESCRIPTION OF THE ASPECTS TO BE ASSESSED AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS**

A detailed description of the aspects to be assessed as part of the EIA process is presented in Section 5 of the main Scoping Report. The following aspects of the proposed project will be addressed in the EIA:

- Discharges/disposal to the sea;
- Deck and machinery space drainage;
- Sewage, galley and solid waste;
- Sediment removal;
- Generation of suspended sediment plumes;
- Smothering of benthos in redepositing tailings; and
- Project interactions with the fishing industry, other marine prospecting / mining activities, petroleum exploration and shipping.

### **9.3 DESCRIPTION OF ASPECTS TO BE ASSESSED BY SPECIALISTS**

A detailed description of the aspects to be assessed by specialists is presented in Section 5 of the main Scoping Report. In summary, it is anticipated that the specialists would assess potential impacts on marine fauna and fisheries linked to the physical prospecting operations, deposition of tailings, vessel emissions and discharges, and the presence of the prospecting vessel within Sea Concession 6C.

## **9.4 PROPOSED METHOD OF ASSESSING THE ENVIRONMENTAL ASPECTS INCLUDING ALTERNATIVES**

The proposed method for the assessment of environmental issues is set out in Section 6.3 of the Plan of Study for EIA, presented in Section 6 of the main Scoping Report. The assessment methodology will consider the following rating scales when assessing the significance of potential impacts:

- Extent of impact;
- Duration of impact;
- Intensity of impact;
- Consequence of impact;
- Status of impact;
- Probability of impact occurring;
- Significance of impact;
- Degree to which impact can be mitigated;
- Degree to which a resource is lost; and
- Degree of confidence of assessment.

## **9.5 THE PROPOSED METHOD OF ASSESSING DURATION SIGNIFICANCE**

Refer to Section 9.4 above.

## **9.6 THE STAGES AT WHICH THE COMPETENT AUTHORITY WILL BE CONSULTED**

### **9.6.1 COMPLETION OF THE SCOPING PHASE**

The following steps are envisaged for the remainder of the Scoping Phase:

- After closure of the comment period, the Scoping Report will be updated to incorporate the comments received. All comments received during the review of this Scoping Report will be assimilated and responded to in an updated Comments and Responses Report; and
- The updated Scoping Report will be submitted to DMR for acceptance.

If the Scoping Report is accepted, the project will proceed onto the EIA Phase.

### **9.6.2 EIA PHASE**

#### **9.6.2.1 Specialist studies**

Three specialist studies were 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 cultural heritage material. The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed project. These impacts were then assessed according to pre-defined rating scales (see Section 9.4 above). Specialists also recommended appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits, respectively. The terms of reference used for these studies are presented in Section 6 of the main Scoping Report.

### **9.6.2.2 Integration and Assessment**

The specialist information and other relevant information will be integrated into an Environmental Impact Report (EIR), which will include an Environmental Management Programme (EMP). The specialist studies will be included as appendices to the EIR. The EIR will be released for a 30-day comment period and all I&APs on the project database will be notified when the EIR is available for comment.

After closure of the comment period, all comments received on the draft report will be incorporated and responded to in a Comments and Responses Report. The draft report will then be updated, to which the Comments and Responses Report will be appended, and submitted to DMR for consideration and decision-making.

## **9.7 PARTICULARS OF THE PUBLIC PARTICIPATION PROCESS WITH REGARD TO THE IMPACT ASSESSMENT PROCESS THAT WILL BE CONDUCTED**

### **9.7.1 STEPS TO BE TAKEN TO NOTIFY INTERESTED AND AFFECTED PARTIES**

Project information in the form of an executive summary will be provided to I&APs on the project database. A copy of the report will be made available on the SLR website. I&APs will be notified when the EIR is available for public review via electronic mail and post (where necessary).

### **9.7.2 DETAILS OF THE ENGAGEMENT PROCESS TO BE FOLLOWED**

As outlined in Section 9.6 above, the EIR will be released for a 30-day comment period and all I&APs on the project database will be notified when the EIR is available for comment. After closure of the comment period, all comments received on the draft report will be incorporated and responded to in a Comments and Responses Report. The draft report will then be updated and submitted to DMR for consideration and decision-making. Registered I&APs on the project database will be informed that the revised EIR has been submitted to DMR and a copy of the report will be made available on the SLR website for information-purposes.

After the Minister of Mineral Resources 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.

### **9.7.3 DESCRIPTION OF THE INFORMATION TO BE PROVIDED TO INTERESTED AND AFFECTED PARTIES**

See Section 9.7.1 and 9.7.2 above.

## **9.8 DESCRIPTION OF THE TASKS THAT WILL BE UNDERTAKEN DURING THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS**

See Section 9.7 above.



**9.9 MEASURES TO AVOID, REVERSE, MITIGATE, OR MANAGE IDENTIFIED IMPACTS AND TO DETERMINE THE EXTENT OF THE RESIDUAL RISKS THAT NEED TO BE MANAGED AND MONITORED**

See Section 9.4 above.

**9.10 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY**

Not Applicable.

**9.10.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON**

A description of the baseline socio-economic environment likely to be affected by the proposed project in the study area is provided in Section 5 of the main Scoping Report. A detailed assessment of the identified potential impacts and confirmation of their significance (with input from the specialist investigations) will be undertaken as part of the EIA phase.

**9.10.2 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT**

A description of the maritime and underwater cultural heritage resources likely to be affected by the proposed project in the study area is provided in Section 5 of the main Scoping Report.

It was noted that the likelihood of disturbing a shipwreck would be very low considering the vast size of the South African offshore area.

In the event that any cultural heritage material is destroyed, the impact would be of very high significance. However, as the location of possible shipwrecks could be confirmed through the use of various seafloor survey techniques, these areas could be avoided. A detailed assessment of the identified potential impacts and confirmation of their significance (with input from the specialist investigations) will be undertaken as part of the EIA phase.

**9.10.3 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT**

Not applicable.

**10. UNDERTAKING BY THE EAP**

The undertaking by the EAP is attached as Appendix C to the main Scoping Report.

## **APPENDIX 1: EAP PROOF OF REGISTRATION**

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# SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

**Jonathan Crowther**

Registration number: 400145/93

is registered as a

**Professional Natural Scientist**

in terms of section 20(3) of the Natural Scientific Professions Act, 2003  
(Act 27 of 2003)

in the following field(s) of practice (Schedule I of the Act)

**Environmental Science**

**22 November 1993**



22 November 1993

Pretoria

President

Executive Director

# SACNASP

South African Council for Natural Scientific Professions

26 June 2015

400145/93

Mr J Crowther Pr.Sci.Nat.  
Unit 35, Roeland Square  
30 Drury Lane  
Cape Town  
Western Cape  
8001

Dear Mr Crowther

PROFESSIONAL REGISTRATION IN TERMS OF SECTION 20(3)(a) OF THE NATURAL SCIENTIFIC PROFESSIONS ACT, 2003 (ACT NO 27 OF 2003)

It is my pleasure to inform you that your registration as a *Professional Natural Scientist* in the field of practice *Environmental Science* was successful and approved on 22 November 1993. Your registration number is 400145/93.

Your registration entitles you to describe yourself as a "Professional Natural Scientist" and use the prescribed title "Pr.Sci.Nat." after your name. (Section 22.)

Included herewith are your registration certificate and a copy of the code of conduct. The registration certificate remains the property of the Council and has to be returned to the Executive Director within 30 days after cancellation or lapse of registration. (section 24 of the Act.). Registered persons must adhere to the code of conduct. Failure to do so constitutes improper conduct. (Section 28 of the Act.).

The Council may cancel the registration of a registered person if the person has erroneously been registered, or has been registered on information subsequently proved to be false; or if the person fails to pay the prescribed annual fee. [Section 21(1)(a) of the Act.]

Should your registration as a Professional Natural Scientist lapse or be cancelled you may not pretend to be, or in any manner hold or allow yourself to be held out as a registered person. You may not use the name or title of another registered person or perform any act purporting to lead persons to believe that you are registered in terms of this Act. (Section 27.)

The Council wishes you a successful career as a Professional Natural Scientist.

Yours sincerely



**R.W. BECKER Pr.Sci.Nat.**  
**EXECUTIVE DIRECTOR**

## Code of Conduct

The Council has drawn up the following Code of Conduct with which registered persons must comply. Failure to do so constitutes improper conduct.

In practising their professions, Certificated, Candidate and Professional Natural Scientists must:

1. Have due regard to public safety, public health and public interest generally.
2. Have due regard to harmful practices against the environment.
3. Discharge their duties to their respective employers or clients efficiently and with integrity.
4. Conduct themselves in such a way as to uphold the dignity, standing and reputation of the natural scientific professions.
5. Not undertake natural scientific work for which their education, experience or background have not rendered them competent to perform.
6. Disclose to their respective employers or clients in writing:
  - (a) any interest which they may have in any company, firm or organisation, or with any person, and which is related to the work for which they may be or may have been employed; and
  - (b) particulars of any royalty or other financial benefit which accrues or may accrue to them as a result of such work.
7. Not deliberately injure directly or indirectly, the professional reputation, prospects or business of another registered person.
8. Not knowingly attempt to supplant another registered person after a formal offer of employment has been made.
9. Not advertise their professional services in a self-laudatory manner or in a manner that is derogatory to the dignity of the profession.
10. Not knowingly misrepresent or permit misrepresentation of their own or their associates' academic or professional qualifications, nor exaggerate their own degree of responsibility for any work of a natural scientific nature.
11. Not, without a satisfactory reason, destroy calculations, documentary or any other evidence required for the verification of their work.
12. Not personally, or through any other agency, attempt to obtain consulting work by way of touting or bribery.
13. Order their conduct when practising their professions in another country in accordance with these rules in so far as they are not inconsistent with the law of the country concerned; provided that they shall also adhere to the standards of professional conduct in that country.



**herewith certifies that**

**Nicholas David Arnott**

Registration Number: 113939

**is registered as a**

**Professional Natural Scientist**

in terms of section 20(3) of the Natural Scientific Professions Act, 2003  
(Act 27 of 2003)

in the following field(s) of practice (Schedule 1 of the Act)

Environmental Science

Effective 25 May 2016

Expires 31 March 2020



A handwritten signature in black ink, appearing to read 'Botha', written over a horizontal line.

Chairperson

A handwritten signature in black ink, appearing to read 'M. ...', written over a horizontal line.

Chief Executive Officer



## **APPENDIX 2: CV OF EAP**

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# CURRICULUM VITAE



## JONATHAN CROWTHER

### OPERATIONS MANAGER

Environmental Management Planning & Approvals,  
Africa

### QUALIFICATIONS

|             |      |                       |
|-------------|------|-----------------------|
| M.Sc        | 1988 | Environmental Science |
| B.Sc (Hons) | 1983 | Geology               |
| B.Sc        | 1982 | Geology and Geography |

### EXPERTISE

- Environmental Impact and Social Assessment
- Environmental Management Plans/Programmes
- Public Participation & Facilitation
- Environmental Compliance & Monitoring

Jonathan is the SLR Operations Manager for Environmental Management Planning & Approvals, Africa. He has over 30 years of experience with expertise in a wide range of environmental disciplines, including Environmental Impact and Social Assessments (ESIA), Environmental Management Plans, Environmental Planning, Environmental Compliance & Monitoring, and Public Participation & Facilitation.

He has project managed a large number of offshore oil and gas EIAs for various exploration and production activities in Southern Africa. He also has extensive experience in large scale infrastructure projects including some of the largest road projects in South Africa, ESIA's for waste landfill facilities, general industry and the built environment.

### PROJECTS

#### Oil and Gas Exploration and Production

**Total E&P South Africa B.V. Provision of environmental services for well drilling in Block 11B/12B, offshore South Coast, South Africa (2019 - ongoing)**

Provided environmental support ahead of an exploration well drilling operation, environmental compliance services during the drilling operation and appointed to prepare a close-out report on completion of the drilling operation. Project director, client liaison, report compilation and ECO services.



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| <p><b>Total E&amp;P South Africa B.V. Application to amend Environmental Management Programme Block 11B/12B, offshore South Coast, South Africa (2018)</b></p>        | <p>TEPSA is the holder of an Environmental Management Programme to undertake exploration well drilling in Block 11B/12B offshore of the South Coast, South Africa. An amendment application was undertaken to change the well completion status described in the programme. Client liaison, report compilation and quality review.</p> |
| <p><b>PGS Exploration (UK) Limited – Reconnaissance Permit Application to undertake a 2D and 3D seismic surveys offshore West Coast South Africa (2018)</b></p>       | <p>Environmental Management Programme Amendment process for the proposal to undertake a 2D and 3D speculative seismic surveys offshore West Coast, South Africa. Project director, documentation and quality review.</p>   |
| <p><b>PGS Exploration (UK) Limited – Reconnaissance Permit Application Amendment to undertake a 3D seismic survey offshore KwaZulu-Natal, South Africa (2018)</b></p> | <p>Environmental Management Programme Amendment process for a 3D speculative seismic survey offshore of KwaZulu-Natal, South Africa. Project director, documentation and quality review.</p>   |
| <p><b>Shell Namibia Upstream BV – EIA for proposed offshore well drilling, Namibia (2017)</b></p>   | <p>EIA for the drilling of up to two deep water exploration wells in Petroleum Exploration Licence 39 off the coast of southern Namibia. Provided project management and quality review during the Scoping Phase of the EIA.</p>   |
| <p><b>PGS Exploration (UK) Limited – Reconnaissance Permit Application to undertake 2D and 3D seismic surveys, South Africa (2017)</b></p>                            | <p>Environmental Management Programme process for a Reconnaissance Permit Application to undertake 2D and 3D speculative seismic surveys of the East Coast, South Africa. Project director, documentation and quality review.</p>  |
| <p><b>Rhino Oil &amp; Gas Exploration South Africa (Pty) Ltd - EIAs for various onshore exploration right applications, South Africa (2015 - 2017)</b></p>            | <p>Individual ESIAs were undertaken for exploration right applications for the initial exploration phases for onshore gas in five license areas across the eastern part of South Africa. Provided high level management support and documentation review.</p>  |
| <p><b>Spectrum Geo Limited – Reconnaissance Permit Application to acquire 2D multi-client seismic data, South Africa (2017)</b></p>                                   | <p>Undertook the Environmental Management Programme for a reconnaissance permit application to acquire 2D multi-client seismic survey data off the Southern Coast, South Africa. Project director and provided quality review.</p>   |
| <p><b>Rhino Oil &amp; Gas Exploration South Africa (Pty) Ltd – Application for exploration programmes for two offshore blocks, South Africa (2015 - 2017)</b></p>     | <p>Appointed to undertake an EIA for exploration right applications for 2D seismic surveys for each of two blocks located offshore of the West Coast, South Africa. Project director and quality control of the EMP.</p>   |

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| <p><b>Petroleum Geo-Services (Pty) Ltd – Addendum application for expansion of speculative seismic survey, South Africa (2016)</b></p>              | <p>Facilitated and undertook the EMP Addendum for the expansion of a speculative seismic survey off the South Coast of South Africa. Project management and quality review of the EMP.</p>  |
| <p><b>BHP Billiton Petroleum (South Africa 3B/4B) Limited - Relinquishment of Licence Block 3B/4B, South Africa (2016)</b></p>                      | <p>Application for a Closure Certificate and consolidated Environmental Risk Report and Closure Plan for the relinquishment of Licence Block 3B/4B (ER 12/3/23) off the West Coast, South Africa. Project director and quality review.</p>  |
| <p><b>Murphy Oil Corporation - Exploration well drilling in Licence Blocks 2613A and 2613B, Namibia (2014-2016)</b></p>                             | <p>EIA for the drilling of up to two exploration wells in Licence Blocks 2613A and 2613B off the coast of Namibia. Project director and quality review.</p>   |
| <p><b>Sunbird Energy Ltd - Ibhubesi Gas Project, South Africa (2013 - 2016)</b></p>   | <p>EIA for the proposed Ibhubesi Gas Project, West Coast, South Africa. The project includes the development of an offshore well field, a 400 km offshore pipeline, an onshore pipeline and onshore processing facility. Tasks involved stakeholder engagement, document compilation, high level project management, quality control and overall review of the EIA.</p> |
| <p><b>Anadarko South Africa (Pty) Ltd - Exploration Right renewal for Licence Blocks 5, 6 &amp; 7, South Africa (2015)</b></p>                      | <p>Preparation of an Environmental Compliance Report as part of the Exploration Right renewal for Licence Blocks 5, 6 &amp; 7 (ER 12/3/224) off the South-West Coast of South Africa. Project director and quality review.</p>  |
| <p><b>ExxonMobil Exploration and Production South Africa Ltd – Well drilling Roadmap and Permitting Plan, South Africa (2015)</b></p>               | <p>Development of a high level Regulatory Roadmap and Permitting Plan for offshore exploration well drilling and associated onshore activities for ExxonMobil’s South African licence areas, focusing on the Tugela South licence area off the East Coast, South Africa. Project director and quality review.</p>   |
| <p><b>Nabirm Energy Services - 2D seismic survey compliance, Block 2113, Namibia (2014-2015)</b></p>  | <p>EMP Compliance and audit services for a 2D seismic survey in the offshore portion of Block 2113A in the Walvis Basin off the coast of Namibia. Project director and quality review.</p>  |
| <p><b>Thombo Petroleum (Pty) Ltd – Exploration Right application to undertake well drilling in Block 2B, South Africa (2014- 2015)</b></p>          | <p>The scope of work included undertaking an EIA and EMP Addendum for exploration well drilling in Block 2B situated off the West Coast of South Africa. Project management and quality control tasks were undertaken.</p>  |
| <p><b>Murphy Oil Corporation and TGS-Nopec Geophysical Company ASA – 3D seismic survey, Licence Blocks 2613A and 2613B, Namibia (2013-2014)</b></p> | <p>EIA for a proposed 3D seismic survey in Licence Blocks 2613A and 2613B, Lüderitz Basin, off the coast of Namibia. Project director and quality review.</p>   |

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| <p><b>Shell South African Upstream B.V – EIA and EMP Amendment to undertake exploration well drilling in Orange Basin, South Africa (2013-2015)</b></p> | <p>EIA and EMP for an amendment to the existing Exploration Right to undertake Exploration Well Drilling in the Orange Basin Deep Water Block, West Coast, South Africa. Provided client interaction, high level management and quality control.</p>   |
| <p><b>Cairn South Africa (Pty) Ltd – Exploration right amendment to undertake well drilling in Block 1, South Africa (2013-2015)</b></p>                | <p>EIA and EMP for an amendment to the existing Exploration Right to undertake Exploration Well Drilling in Block 1, West Coast, South Africa. Project director and quality control of the EIA.</p>  |
| <p><b>OK Energy Ltd - Proposed exploration programme in the Northern Cape Ultra-deep Licence Area, South Africa (2014)</b></p>                          | <p>EMP for an Exploration Right application for undertaking an exploration programme (including seismic survey, tensor gravity and magnetics, bathymetry survey, seabed sampling) in the Northern Cape Ultra-deep Licence Area in the Orange Basin off the Northwest Coast of South Africa. Project director and quality review.</p>         |
| <p><b>Total E and P South Africa (Pty) Ltd – Deep Water well drilling in Block 11B/12B, south Africa (2013-2014)</b></p>                                | <p>Undertook the Environmental Compliance services during and the environmental audit on completion of the deep water well drilling operation in Block 11B/12B, South Coast South Africa. Audit services, compiled the audit report and project management.</p>  |
| <p><b>Anadarko South Africa (Pty) Ltd - Seafloor geochemical sampling programme, Licence Blocks 5/6 &amp; 7, South Africa (2013)</b></p>                | <p>EMP Addendum for a seafloor geochemical sampling programme in Petroleum Licence Blocks 5/6 &amp; 7 off the South-West Coast of South Africa. The sampling programme consisted of seafloor sampling (piston coring), seafloor heat flow measurements and a possible multi-beam bathymetry survey. Project director and quality review.</p> |
| <p><b>Spectrum ASA – Speculative 2D seismic survey, Namibia (2013)</b></p>  | <p>EIA for a proposed 2D speculative seismic survey in the Orange Basin, Namibia. Project director and provided quality control.</p>   |
| <p><b>CGG Services SA - Proposed 2D speculative seismic survey in the Durban Basin, South Africa (2013)</b></p>   | <p>EMP for a Reconnaissance Permit application for undertaking a speculative 2D seismic survey in the Durban Basin off the East Coast of South Africa. Project director and quality review.</p>  |
| <p><b>Tullow Kudu Limited – 2D and 3D seismic survey, Namibia (2013)</b></p>  | <p>ESIA for a proposed 3D and 2D seismic survey in Licence Blocks 2012B, 2112A and 2113B, Walvis Basin, Namibia. Project director, client interface and quality control.</p>   |
| <p><b>Sasol Petroleum International (Pty) Ltd – 2D seismic survey programme, South Africa (2012-2013)</b></p>   | <p>EMP for a proposed 2D seismic survey programme in the Durban and Zululand Basins off the East Coast of South Africa. Project director and provided quality control.</p>   |
| <p><b>Anadarko South Africa (Pty) Ltd - Exploration programme, Licence Block 2C, South Africa (2012-2013)</b></p>                                       | <p>EMP for a proposed exploration programme in Block 2C off the West Coast, South Africa. The exploration programme included 2D/3D seismic surveys, multi-beam bathymetry survey, seafloor sampling and seafloor heat flow measurements. Project director and quality review.</p>  |

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| <p><b>Total E and P South Africa (Pty) Ltd – Application for various exploration activities, South Africa (2012-2013)</b></p> | <p>EMP for a proposed 2D seismic survey, sonar bathymetry and drop core sampling in the Outeniqua South Area, South Coast, South Africa. Project director and quality review.</p>  |
| <p><b>Impact Africa Limited - Exploration programme, Tugela North, South Africa (2012-2013)</b></p>                           | <p>EMP for a proposed exploration programme in the Tugela North area off the East Coast, South Africa. The exploration programme included Airborne geophysical acquisition (gravity and magnetics), 2D/3D seismic surveys, seafloor heat flow measurements, multi-beam bathymetry survey and seafloor sampling. Project director and quality review.</p> |
| <p><b>PetroSA (Pty) Ltd – Amendment application for a seismic survey campaign, South Africa(2012)</b></p>                     | <p>EMP Amendment for a proposed seismic survey campaign in Block 1, West Coast, South Africa. Project director and EMP review.</p>   |
| <p><b>Bayfield Energy Ltd – EMP amendment for a proposed seismic survey, South Africa (2012)</b></p>                          | <p>EMP Amendment for a proposed seismic survey in the Pletmos Inshore Area, South Coast, South Africa. Project director and report review.</p>   |
| <p><b>CGG Veritas Services (UK) Ltd – Speculative seismic survey, South Africa (2012)</b></p>                                 | <p>EMP for a proposed speculative seismic survey off the East Coast, South Africa. Project director and quality control of the EIA.</p>  |
| <p><b>Signet Petroleum Ltd – Application to undertake 2D and 3D seismic surveys, Namibia (2011)</b></p>                       | <p>EIA for proposed 2D and 3D seismic surveys in Block 2914B off the southern coast of Namibia. Project director, client interaction and quality control.</p>  |
| <p><b>PetroSA (Pty) Ltd - 2D/3D seismic survey, Blocks 5 &amp; 6, South Africa (2011)</b></p>                                 | <p>EMP for a 2D/3D seismic survey campaign in Blocks 5 &amp; 6 off the South-West Coast of South Africa. Project director and quality review.</p>  |
| <p><b>Chariot Oil &amp; Gas - Proposed seismic survey off the coast of Namibia (2011)</b></p>                                 | <p>EIA process for a seismic survey off the coast of Namibia. EIA and EMP compliance monitoring services were also provided during the survey operations and a Close-out Report produced. Project director and quality review.</p>   |
| <p><b>HRT Netherlands B.V. – Application to undertake a 3D seismic survey, Namibia (2010-2011)</b></p>                        | <p>EIA for a 3D seismic survey in two offshore areas, Namibia. Project director and quality review.</p>  |
| <p><b>Atacama Consulting for Dominion Oil – Proposed seismic survey, Uganda (2010)</b></p>                                    | <p>Undertook an independent review of the EIA undertaken for a proposed onshore and offshore seismic survey in the Queen Elizabeth National Park, Uganda. Site visit, documentation review and report.</p>   |

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| <p><b>PetroSA (Pty) Ltd – Proposed F-O Field development, South Africa (2008-2011)</b></p>   | <p>EIA and EMP for the development of the F-O Gas Field in Petroleum Licence Block 9, South Coast, South Africa. The project included the drilling of up to 14 production wells in the F-O Gas Field and connecting the gas field to the existing F-A Platform via a new 39 km subsea production pipeline. Project director, client liaison and quality control.</p>         |
| <p><b>Enigma Oil and Gas – Proposed 2D and 3D seismic survey, Namibia (2008-2009)</b></p>  | <p>EIA for proposed 2D and 3D seismic surveys in three areas off the coast of Namibia.. Project management and quality review.</p>   |
| <p><b>PetroSA (Pty) Ltd – 3D seismic survey, Block 1, West Coast, South Africa (2008)</b></p>  | <p>EMP for a 3D seismic survey in Block 1 (ER83) off the West Coast of South Africa. Project director and quality review.</p>  |
| <p><b>Petroleum Agency SA – South African Shelf Claim Project (2007)</b></p>   | <p>Compiled an Environmental Report for a proposed seismic survey to be undertaken as part of the South African Shelf claim project. Project management and quality control.</p>   |
| <p><b>PetroSA (Pty) Ltd – Construction of the South Coast Gas Project, South Africa (2007)</b></p>   | <p>Management of various aspects of the EMP for the construction phase of the South Coast Gas project, including being appointed as the Chair and Secretariat of the Environmental Monitoring Committee, Mossel Bay, South Africa.</p>   |
| <p><b>BHP Billiton Petroleum (Americas) Inc – Proposed 2D seismic survey, Namibia (2007)</b></p>   | <p>EIA for a proposed 2D seismic survey in the Northern Block, Namibia. Project management and quality control.</p>  |
| <p><b>Forest Exploration International (SA) – Proposed Ibhubesi Gas Project (2006-2008)</b></p>  | <p>EIA and EMP for the proposed Ibhubesi Gas Project. This included the drilling of 99 wells, offshore production platforms, a 70 km pipeline to the shore and an onshore processing plant. The project is located off West Coast, South Africa. Project director, client interaction and quality review.</p>  |
| <p><b>Ferromarine Africa - Oil and Gas Service Hub in the Port of Cape Town and Fabrication Yard for Oil and Gas Structures in the Port of Saldanha, South Africa (2006)</b></p> | <p>Construction and Operational EMPs for two facilities for the servicing and fabrication of oil and gas structures, i.e. an oil and gas service hub at A-Berth in the Port of Cape Town and an oil and gas structures fabrication yard in the Port of Saldanha, South Africa. Project director and quality review.</p>  |
| <p><b>BHP Billiton Petroleum (Americas) Inc – Deep water exploration well drilling, South Africa (2004-2007)</b></p>   | <p>Compiled an Expanded Environmental Notification for a proposed deep water exploration well in Petroleum Licence Block 3B/4B off the West Coast of South Africa. Project management, client interaction and quality control.</p>   |
| <p><b>PetroSA (Pty) Ltd – South Coast Gas Development Project, South Africa (2004-2007)</b></p>  | <p>EIA and EMP for the proposed South Coast Gas Development project in Petroleum Block 9, South Africa. The project included well drilling, injection wells, an offshore gas pipeline and the connection to existing infrastructure. Involvement included the role as project director, client interaction, facilitation of stakeholder interaction and quality control.</p> |

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| <p><b>Pioneer Natural Resources (Pty) Ltd – Application for the drilling of three exploration wells (2003)</b></p>  | <p>Preparation of an Environmental Notification document and Close-out Reports for the drilling of three exploration wells in Block 9, South Coast, South Africa. Project manager, stakeholder engagement, report compilation and quality control.</p>   |
| <p><b>PetroSA (Pty) Ltd – Proposed development of the Sable Oil Field, South Africa (2001)</b></p>  | <p>Undertook the EMPR for the proposed development of the Sable Oil Field, offshore South Coast, South Africa. This included well drilling, seafloor infrastructure and an FPSO. Project manager, stakeholder engagement, report compilation and quality control.</p>  |
| <p><b>Petroleum Agency SA – Generic EMPR for oil and gas prospecting, South Africa (2001)</b></p>   | <p>The appointment was to develop a Generic EMPR for oil and gas prospecting for the whole of the South African Offshore. This covered seismic surveys and exploration well drilling. Key impacts were identified and assessed, and templates were developed for future explorers. Client interaction, project management, report compilation and quality control.</p> |
| <p><b>Brown and Root on behalf of Shell Exploration and Production Namibia – Route selection for the proposed Kudu Gas pipeline (1998-1999)</b></p>   | <p>Provided environmental baseline and legislative input into the route selection for the proposed Kudu Gas pipeline between Oranjemund, Namibia and Cape Town, South Africa. Site visit, client interaction, report delivery and quality control.</p>   |
| <p><b>Soekor E&amp;P (Pty) Ltd – Extension of the Oribi Oil Production facility (1997)</b></p>  | <p>In a joint venture with the CSIR, undertook the EIA and EMPR for the proposed extension of the Oribi Oil Production facility and hydrocarbon exploration in Block 9 off the South Coast, South Africa. Management of the process and compilation of the EIA and EMPR.</p>   |
| <p><b>Road and related infrastructure</b></p>   |  |
| <p><b>GIBB (Pty) Ltd for Western Cape Government (WCG): Department of Transport &amp; Public Works - Swartberg River Bridge, South Africa (2016-2017)</b></p>   | <p>Basic Assessment process for the proposed implementation of erosion protection measures along a section of the Swart River which is traversed by the TR 34, approximately 7 km north of Prince Albert. Project director and quality control.</p>  |
| <p><b>SMEC SA (Pty) Ltd for Saldanha Bay IDZ Licencing Company (SOC) Ltd - Proposed new access roads to the Saldanha Bay IDZ, south Africa (2016-2017)</b></p>  | <p>Basic Assessment for the construction of two new access roads linked to the back of port area of the Saldanha Bay IDZ. Project director and quality review.</p>   |
| <p><b>Bergstan SA Consulting and Development Engineers (Pty) Ltd for WCG: Department of Transport and Public Works – Proposed stormwater repairs on Main Road 101, Cape Town, South Africa (2014-2016).</b></p> | <p>Basic Assessment and environmental compliance for the storm damage repair of slopes and roadway on MR101 between Simon’s Town and Smitswinkel Bay, Cape Town. Project director, stakeholder engagement, alternate ECO and quality review.</p>   |

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| <p><b>Bergstan SA Consulting and Development Engineers (Pty) Ltd for WCG: Department of Transport and Public Works – Resurfacing of a section of Victoria Road, Cape Town, South Africa (2014-2015)</b></p>         | <p>Environmental compliance services for the repair and resurfacing of Victoria Road (MR103) km 2.1 to km 4.75 between Oudekraal and Llandudno, Cape Town. Project director.</p>  |
| <p><b>Gibb (Pty) Ltd for WCG: Department of Transport &amp; Public Works - Proposed changes to the proclaimed road network affected by the raising of the Clanwilliam Dam wall, South Africa (2013-ongoing)</b></p> | <p>Environmental input and facilitation of the public participation process for the proposed changes to the proclaimed secondary road network that would be affected by the raising of the Clanwilliam Dam wall. Project director, stakeholder engagement and quality review.</p>   |
| <p><b>Kantey &amp; Templer Consulting Engineers (Pty) Ltd for WCG: Department of Transport &amp; Public Works, South Africa (2012-2017)</b></p>   | <p>Basic Assessment for the proposed safety and operational improvement to the R44 Road between Somerset West and Stellenbosch. Project director, stakeholder engagement and quality review.</p>  |
| <p><b>Hatch GOBA (Pty) Ltd for WCG: Department of Transport &amp; Public Works, South Africa (2015-2016)</b></p>  | <p>Maintenance Management Plan for proposed flood damage repairs to bridge and culvert structures along various roads in the Eden and Winelands Municipal areas between Ladismith and Montagu, Western Cape. Project director and provided quality review.</p>  |
| <p><b>ERO Engineers (Pty) Ltd for WCG: Department of Transport &amp; Public Works, South Africa (2015-2016)</b></p>   | <p>Compiled a Maintenance Management Plan for the proposed rehabilitation and reseal of Main Road 233, between the R27 and just north of Langebaan, Western Cape. Project director and quality review.</p>  |
| <p><b>Bergstan SA Consulting and Development Engineers (Pty) Ltd for WCG: Department of Transport &amp; Public Works (2014-2015)</b></p>  | <p>Basic Assessment for the storm damage repair of slopes and roadway on Main Road MR101 between Simons Town and Smitswinkel Bay, Western Cape. Project director and quality review.</p>  |
| <p><b>AECOM SA (Pty) Ltd. for South African National Roads Agency SOC Limited – Upgrading of National Route 7, South Africa (2013-2015)</b></p>   | <p>The project involved the proposed upgrading of the National Route 7 between Leliefontein and Hopefield intersections near Malmesbury, Western Cape. This included widening of the existing road to a dual carriageway, consolidating access and secondary roads and the addition of new interchanges. A Basic Assessment and an EIA were undertaken for two different portions of this section of the N7. Project director, stakeholder engagement and quality review.</p> |
| <p><b>EFG Engineers (Pty) Ltd for WCG: Department of Transport and Public Works –Hermanus to Stanford Road Upgrade Project, South Africa (2013-2014)</b></p>  | <p>Basic Assessment for the upgrading of Trunk Road 28 Section 2 (TR28/2) between Hermanus and Stanford, Western Cape. Project director, stakeholder engagement and quality review.</p>   |

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| <p><b>BKS (Pty) Ltd for WCG: Department of Transport &amp; Public Works – Road network improvements to support Saldanha IDZ, South Africa (2012-2015)</b></p>               | <p>EIA for the proposed road network improvements required to support the development of the Saldanha Industrial Zone and port expansion, Western Cape. Project director and quality control.</p>   |
| <p><b>Aurecon (Pty) Ltd for WCG: Department of Transport &amp; Public Works – Flood repair of damaged structures, South Africa (2012-2013)</b></p>                          | <p>Five Basic Assessments for the repair of flood damaged structures along roads in the Eden District Municipality, Southern Cape. Project director and quality control.</p>  |
| <p><b>ERO Engineers (Pty) Ltd for South African National Roads Agency Limited – N7 Improvement between Melkbos and Atlantis intersections, South Africa (2010-2011)</b></p> | <p>EIA for the improvement of National Route N7 Section1 between Melkbos and Atlantis Intersections, Western Cape. The project involved duelling of the N7, consolidating of access points and the upgrade of the existing intersections to grade-separated interchanges. Project director, facilitated stakeholder engagement and provided quality control.</p>  |
| <p><b>BKS (Pty) Ltd for South African National Roads Agency Limited – Improvement of five bridges over the Orange River, South Africa (2009-2011)</b></p>                   | <p>A Basic Assessment was undertaken for the improvement and widening of five large bridges where the R27 National Route, Section 10 &amp; 11, cross the Orange River between Kenhardt and Keimoes, Northern Cape. Further services involved providing environmental compliance services (ECO services) during the construction operation and completion auditing. Overall project director, attended specialist site visit and review all project documentation.</p> |
| <p><b>Bergstan South Africa (Pty) Ltd for WCG: Department of Transport &amp; Public Works – Repair to flood damaged bridges (2009-2010)</b></p>                             | <p>Basic Assessment for the reconstruction of three flood damaged bridges in the Hex River Valley, Western Cape. Project director and quality control.</p>  |
| <p><b>UWP (Pty) Ltd for South African National Roads Agency Limited – Rehabilitation of National Routes N1 and N9 near Colesberg, South Africa (2008-2011)</b></p>          | <p>Basic Assessment for the proposed rehabilitation of National Route 9 Section 7 from Wolwefontein (km63.63) to Colesberg (km94.84) including a new N1/N9 access interchange at Colesberg, Western Cape. Project director and quality review.</p>  |
| <p><b>HHO Africa (Pty) Ltd for WCG: Department of Transport and Public Works – Construction of the Koeberg Interchange, Cape Town, South Africa (2008-2011)</b></p>         | <p>Environmental compliance during the construction phase of the Koeberg Interchange upgrade. Alternative ECO services and project director.</p>  |



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| <p><b>BKS (Pty) Ltd for City of Cape Town – Construction of the Hospital Bend upgrade, Cape Town, South Africa (2008-2010)</b></p>   | <p>Environmental compliance for the construction phase of the upgrading of the N2 Hospital Bend, Cape Town. Facilitated the Environmental Monitoring Committee, alternative ECO and project manager.</p>   |
| <p><b>BKS (Pty) Ltd for WCG: Department of Transport &amp; Public Works - Upgrading of TR 2, M5 Viaduct to Black River Parkway Interchange, South Africa (2007-2011)</b></p> | <p>Basic Assessment and environmental compliance during construction for the upgrading of Trunk Road 2 Section 1 (M5) between the M5 Viaduct and the Black River Parkway Interchange, Cape Town. Project management of the Basic Assessment and ECO</p>  |
| <p><b>City of Cape Town – Proposed Bloubos and Gustrow Roads, South Africa (2007-2011)</b></p>   | <p>EIA for the proposed new sections of Bloubos and Gustrow Roads for the Gordon’s Bay and Sir Lowry’s Pass Development Areas, Cape Town. Project management, report writing, stakeholder facilitation and quality control.</p>  |
| <p><b>Kwezi V3 (Pty) Ltd for WCPA: Department of Transport and Public Works – Development of borrowpits in the Central Karoo District, South Africa (2007)</b></p>           | <p>EMPR for the development of 40 borrowpits for the regravelling of trunk-, main- and divisional roads in the Central Karoo District, Western Cape. Roles included project management, attending the specialist site visit, report writing and quality control.</p>   |
| <p><b>Jeffares &amp; Green (Pty) Ltd for WCPA: Department of Transport and Public Works – Upgrading of roads in the Redelinghuys area, South Africa (2006-2009)</b></p>      | <p>Basic Assessment for the proposed upgrading of Main Road 531, regravelling of Main Road 534 and development of 10 borrowpits in the Redelinghuys area, Western Cape. Project director and quality review.</p>   |
| <p><b>South African National Roads Agency Limited – Propose N2 Wild Coast Toll Road, South Africa (2005-2011)</b></p>  | <p>EIA for the proposed N2 Wild Coast Toll Road, Eastern Cape to Kwa-Zulu Natal. The proposed project involved various improvements to a 550 km stretch of the N2 between East London and Durban. A 90 km greenfield alignment formed the northern end of the Eastern Cape section which included the crossing of five large river gorges. Project co-director, client liaison and quality review.</p> |
| <p><b>HHO Africa for PGWC (Department of Transport) – Grading of the road between Gansbaai and Bredasdorp (2005-2010)</b></p>  | <p>Undertook the EIA for the proposed upgrading to a tarred road of the existing gravel road between Gansbaai and Bredasdorp. An EMPR was also compiled for a number of borrowpits that were required of the proposed project. Project director, stakeholder engagement, report drafting and quality review.</p>   |
| <p><b>Protea Parkways Consortium and South African National Roads Agency Limited – N1 Second Huguenot Tunnel Completion, Western Cape, South Africa (2008-2009)</b></p>      | <p>Basic Assessment for the proposed completion of the second tunnel bore of the Huguenot Tunnel on National Route 1 and construction of the western and eastern access roads. Project manager and quality review.</p>   |

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| <p><b>BKS (Pty) Ltd for PGWC (Department of Transport) – Rehabilitation of the N2. Modderdam Road to Airport Interchange, South Africa (2005-2007)</b></p>           | <p>Scoping Study for the proposed rehabilitation and widening of the N2 between Modderdam Road and Airport Interchange, Cape Town. Project manager, stakeholder engagement and quality control.</p>  |
| <p><b>Protea Parkways Consortium and South African National Roads Agency Limited – Proposed N1/N2 Winelands Toll Highway (2000-2009)</b></p>                         | <p>EIA for the proposed Winelands N1N2 Toll Highway, Western Cape. The proposed project included upgrading of various sections of the N1 and N2 national roads outside Cape Town, grade separated intersections, a bypass around Somerset West and various toll plaza locations. Roles included a substantial stakeholder engagement process, project management, specialist report review and report writing.</p> |
| <p><b>BKS (Pty) Ltd for PGWC (Department of Transport) – Construction of the TR31, South Africa (1999-2004)</b></p>  | <p>Prepared the Construction EMP and provided Environmental Control Officer services for the construction of Phase 2 and 3 of the TR31 between Worcester and Robertson. Project Director and environmental compliance.</p>   |
| <p><b>BKS (Pty) Ltd for City of Cape Town – Proposed upgrading of Hospital Bend, Cape Town, South Africa (1998-2002)</b></p>   | <p>EIA for the upgrading of the N2 from Rhodes Drive Interchange to the top of Hospital Bend, Cape Town. Project management, stakeholder engagement, client liaison and quality review.</p>  |
| <p><b>Mining and Minerals Sites</b></p>  |  |
| <p><b>De Beers Marine (Pty) Ltd – Prospecting Right application for offshore marine Diamonds in Sea Concession 6C, West Coast, South Africa (2019 – ongoing)</b></p> | <p>SLR is undertaking an Environmental Impact Assessment process for the proposed offshore Bulk Sampling operations in the Sea Concession 6C, off the West Coast of South Africa. Project director and reviewer.</p>   |
| <p><b>De Beers Marine (Pty) Ltd – Prospecting Right application for offshore marine Diamonds in Sea Concession 6C, West Coast, South Africa (2018)</b></p>           | <p>A Basic Assessment process was undertaken for the proposed offshore prospecting operations in the Sea Concession 6C, off the West Coast of South Africa. Project reviewer.</p>  |
| <p><b>Landfill Sites and Waste Water Treatment Works</b></p>   |  |

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| <p><b>City of Cape Town – Supplementary EIA for a Regional Landfill Site to service the City of Cape Town, South Africa (2010-2014)</b></p> | <p>Supplementary EIA for the proposed regional landfill site to service the City of Cape Town. This involved updating the earlier EIA following court proceedings and a revised Ministerial decision. Project director, report compilation, facilitation of public participation and quality review.</p>  |
| <p><b>Arcus Gibb (Pty) Ltd for Theewaterskloof Municipality, South Africa (2008-2011)</b></p>   | <p>Scoping Study and EIA for the proposed upgrading of the Grabouw Wastewater Treatment Works, Western Cape. Stakeholder engagement, quality review and project director.</p>   |
| <p><b>City of Cape Town – EIA for a Regional Landfill Site to service the City of Cape Town, South Africa (2001-2007)</b></p>               | <p>EIA for the proposed new regional landfill site to service the City of Cape Town. The project involved a preliminary assessment of a large number of candidate landfill sites. These were shortlisted to four which were evaluated in the Scoping Report. The two recommended sites were carried through for detailed assessment in the EIA. Project manager, client liaison, stakeholder interaction, specialist engagement, report writing and quality review.</p> |
| <p><b>City of Cape Town – EIA for the proposed licensing of the Bellville South Landfill site, South Africa (1999-2001)</b></p>             | <p>EIA for the proposed licensing of the Bellville South Waste Disposal Site, Cape Town. Various completion development scenarios were included in the assessment. Stakeholder interaction, specialist engagement, client liaison, report drafting, quality control and project manager.</p>  |
| <p><b>Cape Agulhas Municipality – Proposed regional solid waste disposal site, South Africa (1999-2001)</b></p>                             | <p>EIA for a proposed regional solid waste disposal site for the towns of Struisbaai, L'Agulhas and Suiderstrand, Western Cape. Stakeholder engagement and quality review.</p>  |
| <p><b>Mossop Western Leathers – Proposed closure of the Herman Road Waste Disposal facility, South Africa (1998)</b></p>                    | <p>EIA for the proposed closure of the Hermon Road Waste Disposal Site, Wellington. Project manager, stakeholder interaction, specialist engagement, report writing and quality review.</p>   |
| <p><b>Greater Hermanus Municipality – Study to identify a regional waste site for the region, South Africa (1997)</b></p>                   | <p>EIA for the identification of a regional waste site for the Hermanus, Kleinmond and Bot River regions, Western Cape. Stakeholder engagement, report compilation and project management.</p>  |
| <p><b>Kleinmond Municipality – Selection of a new waste disposal site to serve the area, South Africa (1996)</b></p>                        | <p>Scoping Study for the selection of a new waste disposal site to serve the area between Rooi-Elis and Kleinmond, Western Cape. Project manager, stakeholder engagement and report compilation.</p>  |
| <p><b>Southern Natal Joint Services Board – Siting of regional landfill sites, South Africa (1994)</b></p>                                  | <p>EIA procedure (from initial assessment to comments report) for the siting of two regional landfill sites in southern Natal. Report compilation, client liaison and project management.</p>   |
|   | <p><b>Water and Sewage Pipelines</b></p>  |

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| <p><b>BVi Consulting Engineers Western Cape (Pty) Ltd for City of Cape Town: Transport for Cape Town – Proposed upgrade of the Bayside Canal, South Africa (2016 - ongoing)</b></p>   | <p>Basic Assessment for the proposed upgrading of the Bayside Canal Outfall System located in Tableview, Cape Town. Project director and quality review.</p>  |
| <p><b>BVi Consulting Engineers WC (Pty) Ltd for the City of Cape Town: Transport for Cape Town – Proposed stormwater pipeline linking Sunningdale to the Big Bay stormwater outfall pipeline, South Africa (2015 -2016)</b></p> | <p>Basic Assessment process for the construction of a new stormwater pipeline to route runoff from Sunningdale Phases 12A, 13 and 14 to the existing Big Bay Outfall pipeline located at the eastern boundary of the suburb of Big Bay, Cape Town. Project director and quality review.</p> |
| <p><b>Jeffares &amp; Green (Pty) Ltd for Stellenbosch Municipality – Jamestown Bulk Water Supply, South Africa (2012-2013)</b></p>  | <p>Basic Assessment for the proposed Jamestown Bulk Water Supply pipeline and reservoir, Stellenbosch. Project director and quality review.</p>   |
| <p><b>Sujean Investments (Pty) Ltd - Kuils River Flood Alleviation Project, Cape Town, South Africa (2010-2011)</b></p>   | <p>Basic Assessment for the proposed Kuils River flood alleviation measures for Erf 38771, Bellville. Project director and quality review.</p>  |
| <p><b>City of Cape Town – Bulk Water system for the Gordon’s Bay Development Area, South Africa (2007-2009)</b></p>   | <p>Basic Assessment for the proposed bulk water system for the Gordon’s Bay Development Area, Cape Town. Project director, stakeholder engagement and quality review.</p>   |
| <p><b>City of Cape Town – Extension of the Trappies Sewer line, South Africa (2007)</b></p>   | <p>Basic Assessment for the proposed extension of the Trappies Sewer line, Gordon’s Bay, Cape Town. Project director, stakeholder engagement and quality review.</p>  |
| <p><b>Velddrift Salt Company (Pty) Ltd - Seawater Pump Station and Pipeline, South Africa (2003)</b></p>  | <p>Scoping Study, EMP and ECO for a seawater pump station and pipeline to augment water supply to the Velddrift Salt Company’s operation north of Laaiplek, Western Cape. Project manager, stakeholder engagement and quality review.</p>   |
| <p><b>Entech Consulting Engineers for the Boland District Municipality - Eerste River Bulk Sewage Scheme, South Africa (1999-2001)</b></p>  | <p>EIA for the proposed Eerste River Bulk Sewage Scheme, Stellenbosch. Project manager, stakeholder engagement, report compilation, quality review.</p>   |
|   | <p><b>Rivers and Wetlands</b></p>   |

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| <p><b>City of Cape Town - proposed Sir Lowry's Pass River flood alleviation and upgrade, South Africa (2007-2011)</b></p>  | <p>Scoping Study and EIA for the proposed Sir Lowry's Pass River flood alleviation and upgrade in the Gordon's Bay and Sir Lowry's Pass Development Area, Cape Town. Project manager, stakeholder engagement, report compilation, quality review.</p> |
| <p><b>Stewart Scott International for City of Cape Town: Helderberg Administration – Proposed Lourens River Flood Alleviation Measures, South Africa (2000-2001)</b></p>     | <p>EIA, Construction EMP and ECO for the proposed Lourens River Flood Alleviation measures, Cape Town. Project director, stakeholder engagement and quality control.</p>  |
| <p><b>Southern Waters for City of Cape Town, South Peninsula Municipality - Management Plan for Zeekoevlei/Rondevlei, South Africa (2000)</b></p>                            | <p>Public consultation for the development of a Management Plan for Zeekoevlei/Rondevlei, Cape Town. Facilitated the public consultation for the development of the plan.</p>   |
| <p><b>Helderberg Municipality and Cape Metropolitan Council - upgrade of the Moddergat River, South Africa (1999)</b></p>  | <p>EIA for the proposed upgrade of the Moddergat River, Macassar, Cape Town. Project director, stakeholder engagement and quality control.</p>  |
| <p><b>General Industries and similar</b></p>   |   |
| <p><b>Irvin &amp; Johnson Limited - Abalone Processing Facility, Western Cape, South Africa (2017-ongoing)</b></p>   | <p>Basic Assessment and EIA for a proposed abalone processing facility and expansion of the existing abalone farm, respectively, at the existing I&amp;J operation near Gansbaai. Project director and quality control.</p>                           |
| <p><b>International Mining &amp; Dredging Holdings Ltd – Mining Right Application for offshore diamond concession Block 2C, South Africa (2015-2016)</b></p>                 | <p>EIA for a Mining Right Application for an offshore diamond concession in Block 2C off the West Coast of South Africa. Project director and quality review.</p>   |
| <p><b>International Mining &amp; Dredging Holdings Ltd – Application for sediment sampling for diamond mining concession areas, West Coast, South Africa (2014-2015)</b></p> | <p>Basic Assessment for marine sediment sampling activities in Diamond Mining Concession Areas off the West Coast, South Africa. Project director and quality review.</p>   |
| <p><b>Saldanha Bay IDZ Licencing Company – Establishment of an Oil and Gas Offshore Supply Base, South Africa (2013-2016)</b></p>  | <p>EIA for the proposed establishment of an Oil and Gas Offshore Supply Base at the Saldanha Bay IDZ. Project director and quality review.</p>  |

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| <p><b>ZAA Engineering Projects and Naval Architecture (Pty) Ltd for Transnet National Ports Authority - Pre-feasibility study for an offshore LPG handling and storage facility, Saldanha Bay, South Africa (2011)</b></p> | <p>Environmental input into the pre-feasibility study for the proposed offshore LPG handling and storage facility, Port of Saldanha, Western Cape. Project manager and environmental content input.</p>   |
| <p><b>FerroMarine Cape – Construction of the Oil and Gas Service Hub, Port of Cape Town, South Africa (2010-2011)</b></p>  | <p>ECO for the construction of an Oil and Gas Service Hub in the Port of Cape Town. Project director and alternate ECO.</p>   |
| <p><b>Yachtport SA (Pty) Ltd – Marine Lift Facility, Saldanha Bay, South Africa (2009-2011)</b></p>  | <p>Basic Assessment and ECO for the proposed Marine Lift Facility in the Small Craft Harbour, Port of Saldanha. Project director and quality review.</p>  |
| <p><b>Richmond Business Park Joint Venture Consortium – Proposed Richmond Park Development, Cape Town, South Africa (2010-2012)</b></p>  | <p>EIA for the proposed Richmond Park Development for the project facilitation joint venture on behalf of the successful land claimants, Cape Town. Project director, stakeholder engagement and quality review.</p>  |
| <p><b>SAB Maltings (Pty) Ltd – Proposed Steep Water Purification Plant, Caledon, South Africa (2008-2011)</b></p>  | <p>EIA for a Waste Management Licence Application for the construction of a Steep Water Purification Plant (Two- phased Membrane Bioreactor and Reverse Osmosis system) at the South African Breweries’ Malting Plant, Caledon, Western Cape. Project director, stakeholder engagement and quality control.</p>                             |
| <p><b>Savannah Environmental (Pty) for Eskom Holdings Ltd – Proposed Eskom Wind Energy Facility (Sere Wind Farm), Koekenaap, South Africa (2007-2008)</b></p>  | <p>Environmental Review of the EIA and EMP for the proposed Eskom Wind Energy Facility and associated infrastructure (Sere Wind Farm), near Koekenaap, Western Cape. Review of process and report.</p>  |
| <p><b>Finavera Renewables Ltd – Proposed Wave Energy Project, Western Cape, South Africa (2007-2008)</b></p>   | <p>Environmental input for a site pre-selection exercise for a proposed Wave Energy Project located off the Southwest Coast of South Africa. Project manager and research.</p>  |
| <p><b>Irvin &amp; Johnson Limited – Offshore aquaculture Project, Mossel Bay, South Africa (2007-2009)</b></p>   | <p>Basic Assessment for a proposed aquaculture project in Mossel Bay. The project involved the develop of 18 floating flexible type cages within a concession area off the coast of Mossel Bay to produce indigenous line fish (namely yellow tail, dusky cob and silver cob). Project director, specialist review and quality control.</p> |
| <p><b>Tow Surf South Africa – Noise and Emissions evaluation of Tow Surfing, Cape Town, South Africa (2006)</b></p>  | <p>Environmental evaluation of the effects of tow surfing in terms of noise and emissions on surrounding residential areas. Project manager and report compilation.</p>   |

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| <p><b>Water Research Commission – Compilation of a Groundwater Licensing Guide (2004-2007)</b></p>  | <p>A member of the project consultant team that prepared a Groundwater Licensing Guide to guide groundwater development and use applications. Project manager and workshop participant.</p>  |
| <p><b>P &amp; I Associates (Pty) Ltd – Proposed wreck reduction of vessel BBC China, Eastern Cape, South Africa (2004)</b></p>                | <p>Environmental Assessment for the proposed wreck reduction of the vessel BBC China, Wild Coast. Project manager, facilitate specialist input and compilation of EMP for the wreck reduction operation.</p>   |
| <p><b>PetroSA (Pty) Ltd – Unleaded Fuel Refinery Conversion Project, Mossel Bay, South Africa (2003-2005)</b></p>                             | <p>EIA for the upgrading of the PetroSA refinery near Mossel Bay for the conversion to 100% unleaded fuel production. Project director and quality review.</p>   |
| <p><b>Namakwa Sands Ltd – Proposed extension of mining and processing operations, West Coast, South Africa (2003)</b></p>                     | <p>Initial environmental investigation for the proposed extension of Namakwa Sands’ mining, mineral separation and smelting operations. Project director, specialist site visit and quality review.</p>  |
| <p><b>Caltex SA (Pty) Ltd – Processing and disposal of sulphur produced at the Milnerton refinery, South Africa (2001-2002)</b></p>           | <p>EIA for the additional equipment to process sulphur produced at the Milnerton Oil refinery and offsite disposal of sulphur. Project director and quality review.</p>  |
| <p><b>PetroSA (Pty) Ltd – Distillate Project, Voorbaai Tank Farm, South Africa (2001)</b></p>   | <p>Compilation and implementation of construction-phase Environmental Management Plan for the Low Aromatic Distillate Project, Voorbaai Tank Farm Mossel Bay. Project manager and report compilation.</p>  |
| <p><b>Caltex SA (Pty) Ltd – Capacity increase of the Saldanha-Milnerton crude oil pipeline, South Africa (2000)</b></p>                       | <p>EIA for the increase in the flow-rate of the Saldanha-Milnerton crude oil pipeline. Project management, stakeholder engagement and report compilation.</p>  |
| <p><b>LAMA International for Sappi Saiccor – Construction of the extended marine outfall pipeline, KwaZulu-Natal, South Africa (1996)</b></p> | <p>Compiled the Construction EMP and undertook the construction compliance for the duration of the construction operation to extend the Sappi Saiccor marine outfall pipeline, Umkomaas, KwaZulu-Natal. Project manager, report compilation and ECO.</p> |
| <p><b>CSIR – Proposed Gas monitoring laboratory at Cape Point, South Africa (1994-1996)</b></p>   | <p>Public consultation for the proposed CSIR gas monitoring laboratory at Cape Point. Quality review.</p>  |
| <p><b>CSIR for Saldanha Steel (Pty) Ltd – Proposed steel mill for Saldanha Bay (1994-1995)</b></p>  | <p>Facilitated the public consultation process for the proposed development of a steel mill in the Saldanha Bay area. Stakeholder engagement and co-project manager.</p>   |
|   | <p><b>Tourism/Resort</b></p>   |

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| <p><b>Meerenhof Properties (Pty) Ltd - Proposed expansion of dams on Uitsig Farm, Cape Town, South Africa (2016 – ongoing)</b></p> | <p>Basic Assessment for the proposed expansion of dams on Uitsig Farm, Constantia, Cape Town to provide for additional storage for summer irrigation purposes. Project director, stakeholder engagement and quality review.</p>   |
| <p><b>City of Cape Town – Feasibility Study for proposed Monwabisi Coastal Node, Cape Town, South Africa (2011)</b></p>            | <p>Feasibility study for the proposed Monwabisi Coastal Node, Cape Town. Project manager and content contributor.</p>   |
| <p><b>Olympian Developing Company – Proposed multi-purpose estate, Firgrove, South Africa (2003-2005)</b></p>                      | <p>EIA for the development of a multi-purpose estate on Rem. Farm 681, Firgrove/ Macassar, Cape Town (Sitari Fields Golf Estate). Project director, stakeholder engagement, review of specialist studies and quality control.</p>   |
| <p><b>Lourensford Estate – Construction of Lourensford Winery, Somerset West, South Africa (2002-2003)</b></p>                     | <p>Compiled the Construction and Operation EMP and undertook compliance monitoring for the development of a wine cellar on Lourensford Estate, Somerset West, Cape Town. Report compilation and ECO.</p>  |
| <p><b>Johnnic Property Development (Pty) Ltd – Atlantic Beach Golf Estate, Cape Town, South Africa (1997)</b></p>                  | <p>EIA for the proposed development of the Atlantic Beach Golf Estate, Melkbosstrand, Cape Town. Project director, specialist study review, report compilation and quality review.</p>  |
| <p><b>Table Mountain Aerial Cableway Company - Upgrade of the Table Mountain Cableway, Cape Town, South Africa (1995-1996)</b></p> | <p>EIA for the proposed upgrading of the Table Mountain Aerial Cableway, Cape Town. Facilitated public consultation process, reviewed specialist studies, report compilation and project management. Member of the Environmental Monitoring Committee for the duration of the construction operation.</p> |
| <p><b>Built Environment</b></p>  |   |
| <p><b>Luna Trust - Proposed Subdivision of Erf 177476, St James, Cape Town, South Africa (2017 – Ongoing)</b></p>                  | <p>Basic Assessment for the proposed subdivision into two additional portions of Erf 177476, St James, Cape Town. Project director, client liaison and quality review.</p>  |
| <p><b>Peter Koekemoer – Rectification process for house construction in Cape Town, South Africa (2015-2016)</b></p>                | <p>EIA for a Section 24G application process for House Koekemoer ERF 3446, Oranjezicht, Cape Town. Project director, client interaction and quality review.</p>   |
| <p><b>Rustyrose 41 (Pty) Ltd t/a Brights Hardware (Pty) Ltd - Rezoning of Erf 10565 Belville (2011-2013)</b></p>                   | <p>Basic Assessment for the proposed rezoning of a portion of Erf 10565, Boston (Belville), Cape Town and ECO services for the duration of the construction period.</p>   |



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| <p><b>Martin Kelly – Proposed subdivision of a portion of Erf 1, Simon’s Town, South Africa (2006-2011)</b></p>               | <p>Basic Assessment for the proposed subdivision and rezoning of a portion of Erf 1, Simon’s Town (Glencairn), Cape Town. Project manager, stakeholder engagement, specialist report review, client interaction and quality control.</p>   |
| <p><b>Llandudno Surf Lifesaving Club – Extension of the club boathouse, Cape Town, South Africa (2007-2010)</b></p>           | <p>Basic Assessment for the proposed extension of the Llandudno Surf Lifesaving Club Boathouse, Llandudno, Cape Town. Project director, authority liaison and quality review.</p>  |
| <p><b>Cape Town Community Housing Company – Proposed Royal Maitland Phase 3, Cape Town, South Africa (2006-2007)</b></p>      | <p>Basic Assessment for the proposed rezoning and subdivision of Erf 23300, Maitland (Royal Maitland Phase 3). Project management and quality review.</p>  |
| <p><b>Rocklands Eco Estate (Pty) Ltd – Proposed development of Rocklands Farm, Simon’s Town, South Africa (2005-2011)</b></p> | <p>Basic Assessment for the proposed rezoning and subdivision of parts of Portions 1 and 2 of Farm 1020, Simon’s Town (Rocklands Farm), Western Cape. Stakeholder engagement, specialist study review, report compilation, client interaction, project management and quality review.</p>  |
| <p><b>Trans Caledon Tunnel Authority – Construction of the Berg River Dam, Franschhoek, South Africa (2005-2008)</b></p>      | <p>Environmental compliance for various construction components of the Berg River Dam Project, Franschhoek, Western Cape. Tasks included weekly site visits, ECO report compilation and monthly audit reports for the duration of the construction operation.</p>  |
| <p><b>Gavin Wurz – Proposed development of Farm Rouen, Strand, South Africa (2004)</b></p>                                    | <p>Scoping Study for the proposed rezoning and subdivision of Farm Rouen on Erven 5100 &amp; 5101, Strand, Cape Town. Project manager, stakeholder engagement and quality review.</p>  |
| <p><b>Plattner Racing Stables – Redevelopment of Rondeberg Farm, West Coast, South Africa (1999-2000)</b></p>                 | <p>Environmental input included undertaking a Scoping Study for the proposed rezoning and development of Farm Rondeberg Flats, No. 116, West Coast north of Cape Town. A Construction EMP and Operation EMP were also compiled. The project included the construction of a horse racing track, jockey stables and various other supporting infrastructure. Project management, stakeholder engagement, specialist study review, report compilation and quality review.</p> |
| <p><b>Thesen &amp; Co – Proposed development of Thesen Island, Knysna, South Africa (1994-1996)</b></p>                       | <p>Facilitation of the public consultation process for the proposed development options for Thesen Island, Knysna.</p>   |
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**MEMBERSHIPS**

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| <b>CEAPSA</b>      | Certified as an Environmental Practitioner with the Interim Certification Board for Environmental Assessment Practitioners of South Africa (2006) |
| <b>ICB</b>         | Interim Certification Board member, since 1999  |
| <b>IWM</b>         | Member of the Institute of Waste Management, since 1998   |
| <b>IAIASa</b>      | Member of the International Association for Impact Assessment South Africa, since 1997  |
| <b>Pr.Sci.Nat.</b> | Registered as a Professional Natural Scientist - Environmental Scientist, 1993 (Reg. no. 400145/93)   |

**PUBLICATIONS**

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|  | R Parsons, L Eichstadt, J Crowther, J Blood. (2008) "Application Procedure for the Development and Use of Groundwater". WRC Report No. 1510/1/08.  |
|  | Shippey K., Campbell H.M. and Crowther J. (1997). "Constructing successful environmental management plans for building sites". IAIA '97 Conference, Integrated Environmental Management in Southern Africa: The State of the Art and Lessons Learnt. Pilansberg, South Africa.                 |
|  | Crowther J. and Dorren D. (1994) "Public consultation in the search for regional landfill sites, South Coast Natal". Wastecon '94 All-Africa Congress, Somerset West, South Africa.  |
|  | Hendry R W, Crowther J and Homes R (1990) "Stabilisation of Rock Cuttings on the Florence to Worcester Section of the National Route N1, South Africa". International Society for Rock Mechanics, International symposium on Static and Dynamic Considerations in Rock Engineering, Swaziland. |
|  | Crowther J., Parsons R. and Palm J. (1986). "Experience of Public Participation in developing new waste disposal sites". Wastecon '96 International Congress. Convened by the Institute of Waste Management, Durban, South Africa.   |

# CURRICULUM VITAE



## NICHOLAS ARNOTT

### ENVIRONMENTAL CONSULTANT

Environmental Management, Planning and Approvals,  
South Africa

### QUALIFICATIONS

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| Pr.Sci.Nat. | 2016 | Professional Natural Scientist (Environmental Science) with the South African Council for Natural Scientific Professions |
| BSc (Hons)  | 2005 | Earth and Geographical Sciences (Environmental Management)   |
| BSc         | 2004 | Earth and Geographical Sciences, Zoology   |

### EXPERTISE

- Environmental Impact Assessment
- Environmental Management Programme
- Public Participation
- Environmental compliance & monitoring
- Management of specialists

During his time at SLR, Nicholas has been responsible for undertaking environmental assessment processes for various projects relating to the mining, oil & gas, roads and related infrastructure, housing and industrial sectors. He has been involved in a number of projects in South Africa and has experience working in the Democratic Republic of Congo (DRC), Zambia and Zimbabwe.

He has expertise in a wide range of environmental disciplines, including Environmental Impact Assessments (EIA), Environmental Management Plans / Programmes (EMP), Basic Assessment Reports, Maintenance Management Plans (MMP), Environmental Auditing & Monitoring, Section 24(G) Rectification Applications and Public Consultation & Facilitation.

### PROJECTS

#### Mining and Minerals

**De Beers Marine (Pty) Ltd – Prospecting Right application for offshore marine Diamonds in Sea Concession 6C, West Coast, South Africa (Current)**

Environmental Impact Assessment (EIA) process for the proposed offshore Bulk Sampling operations in the Sea Concession 6C, off the West Coast of South Africa. Nicholas is the project manager and is responsible for the compilation of the Scoping and Environmental Impact Reports, undertaking of the required public participation process and management of the appointed specialists.

**Bilboes Holdings (Pvt) – Proposed Isabella, McCays and Bubi Sulphide Gold Project, Zimbabwe (Current)**

Environmental and Social Impact Assessment (ESIA) for the proposed expansion of an existing gold mine complex located in Zimbabwe. Nicholas is the project assistant and compiled the Scoping Report, assisted with the undertaking of the required public participation process and management of the appointed specialists.

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| <p><b>Copper Tree Minerals – Proposed Kitwe Tailings Retreatment Project, Zambia (Current)</b></p>   | <p>ESIA for the proposed retreatment of historical tailings dumps located within the town of Kitwe, Zambia. Nicholas is the project manager for the ESIA phase and is responsible for the compilation of the ESIA Report, undertaking of the required public participation process and management of the appointed specialists.</p>          |
| <p><b>De Beers Marine (Pty) Ltd – Prospecting Right application for offshore marine Diamonds in Sea Concession 6C, West Coast, South Africa (2018)</b></p>           | <p>Basic Assessment process for the proposed offshore prospecting operations in the Sea Concession 6C, off the West Coast of South Africa. Nicholas compiled the Basic Assessment Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                                     |
| <p><b>Velddrift Salt Company (Pty) Ltd –Salt mine, Velddrift, South Africa (2018)</b></p>  | <p>Update the Financial Provision for the salt mine on Portion 69 of Farm 110 near Velddrift, Western Cape, South Africa. Nicholas undertook the update of the existing financial provision and prepared the assessment report.</p>  |
| <p><b>Impala Platinum Limited Unincorporated Joint Venture – EMP Performance Assessment and Closure Liability Estimate for Prospecting Operations (2017)</b></p>     | <p>EMP Performance Assessment and Closure Liability Estimate for the Klipgatkop 115-JQ prospecting operations. Nicholas was the project manager and compiled the EMP Performance Assessment and Closure Liability Estimate reports.</p>  |
| <p><b>Belton Park Trading 127 (Pty) Ltd – Mining Right application for offshore marine Diamonds in Sea Concession 2C, West Coast, South Africa (2016 - 2017)</b></p> | <p>EIA process for the proposed offshore mining of marine diamonds in the Sea Concession 2C, off the West Coast of South Africa. Nicholas compiled the Scoping and EIA Reports (including EMP), undertook the required public participation process and managed the appointed specialists.</p>   |
| <p><b>Belton Park Trading 127 (Pty) Ltd – Marine Sediment Sampling Activities in Sea Concessions 2C – 5C, West Coast (2014 - 2015)</b></p>                           | <p>Basic Assessment process for the proposed drill and bulk sampling of marine sediments in Sea Concessions 2C, 3C, 4C and 5C, off the West Coast of South Africa. Nicholas compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                                 |
| <p><b>Aquarius Platinum (SA) (Pty) Ltd – Prospecting rights application on the Farms Chieftains Plain 46-JT and Walhalla 1-JT (2014)</b></p>                         | <p>Environmental Management Programme (EMP) for the proposed prospecting activities to be undertaken on the Farm Chieftains Plain 46-JT and Walhalla 1-JT. Nicholas was the project manager and compiled the EMP for both projects.</p>  |
| <p><b>Aquarius Platinum (SA) (Pty) Ltd – Proposed Extension of the K5 Upper Underground Mining Area (2014)</b></p>   | <p>EIA amendment process for the existing K5 Upper Mining Right to provide for the extension of the K5 Upper underground mining area. Based on the strong public reaction to the project, AQPSA took the decision to place the project on hold. Nicholas was the project manager and undertook the initial public participation process.</p> |

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| <p><b>Banro Corporation - Proposed Namoya Gold Mining Project, Maniema, DRC (2013)</b></p>  | <p>ESIA for the proposed construction of a greenfield gold mine located in the DRC. Nicholas was the project manager and compiled the ESIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                               |
| <p><b>Aquarius Platinum (SA) (Pty) Ltd – Kroondal and Marikana EMP Consolidation (2013 - 2015)</b></p>  | <p>Consolidation of the existing approved EMPs for the Kroondal and Marikana Platinum Mines, located in the North West Province. Nicholas was the project manager and compiled of the Consolidated EIA Report (including EMP) for each operation and managed the appointed specialists.</p>     |
| <p><b>Aquarius Platinum (SA) (Pty) Ltd – WULA for the proposed extension of Everest Platinum Mine (2011 - 2012)</b></p>   | <p>Water Use License Application (WULA) process for the proposed expansion of the Everest Platinum Mine, located in Mpumalanga. Nicholas assisted in the compilation of the necessary WULA documentation, including the Integrated Water and Waste Management Plan (IWWMP) for the project.</p> |
| <p><b>Aquarius Platinum (SA) (Pty) Ltd – Proposed Extension of Everest Platinum Mine (2011 - 2012)</b></p>  | <p>EIA process for the proposed expansion of the Everest Platinum Mine, located in Mpumalanga. Nicholas was the project manager and compiled of the Scoping and EIA Reports (including EMP), undertook the required public participation process and managed the appointed specialists.</p>     |
| <p><b>Afplats (Pty) Ltd – EMP Performance Assessment for Prospecting Operations (2011)</b></p>  | <p>EMP Performance Assessment for the Wolwekraal 408-JQ and Kareepoort 407-JQ prospecting operations. Nicholas was the project manager and compiled the EMP Performance Assessment reports.</p>   |
| <p><b>Aquarius Platinum (SA) (Pty) Ltd – Re-assessment of the Financial Provision for Closure for Everest Platinum Mine (2011)</b></p>                          | <p>Annual re-assessment of the closure cost estimate for the Everest Platinum Mine. Nicholas was the project manager and compiled the annual review of the mines Financial Provision for Closure for 2011.</p>  |
| <p><b>Leeuw Mining and Exploration (Pty) Ltd – Proposed Underground Coal Mine (2011)</b></p>  | <p>EIA process for the proposed underground coal mine located near Utrecht, Kwa-Zulu Natal. Nicholas was the project manager and compiled of the Scoping and EIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>         |
| <td data-bbox="491 1512 1482 1637"> <p><b>Oil and Gas</b></p> </td>   | <p><b>Oil and Gas</b></p>   |
| <p><b>PGS Exploration (UK) Limited – Reconnaissance Permit Application to undertake a 2D and 3D seismic surveys offshore West Coast South Africa (2018)</b></p> | <p>EMP process for the proposal to undertake 2D and 3D speculative seismic surveys offshore of the West Coast, South Africa. Nicholas was the project manager and compiled the EMP report, undertook the required public participation process and managed the appointed specialists.</p>       |

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| <p><b>PGS Exploration (UK) Ltd – 2D and 3D seismic surveys compliance, South and East Coasts, South Africa (2015-2016)</b></p>   | <p>EMP Compliance and audit services for speculative 2D and 3D seismic surveys off the South and East Coasts of South Africa. Nicholas’ role included managing the audit process and compiling the survey close-out reports, which outlined the implementation of the EMP (compliance) and highlighted any problems and non-compliance issues that arose during each survey.</p>   |
| <p><b>PGS Exploration (UK) Limited – Reconnaissance Permit Application Amendment to undertake a 3D seismic survey offshore KwaZulu-Natal, South Africa (2018)</b></p>                          | <p>EMP Amendment process for the proposal to undertake a 3D speculative seismic survey offshore of KwaZulu-Natal, South Africa. Nicholas was the project manager and compiled the Amended EMP report, undertook the required public participation process and managed the appointed specialists.</p>   |
| <p><b>PGS Exploration (UK) Limited – Reconnaissance Permit Application to undertake 2D and 3D seismic surveys, South Africa (2017)</b></p>   | <p>EMP process for a Reconnaissance Permit Application to undertake 2D and 3D speculative seismic surveys of the East Coast, South Africa. Nicholas was the project manager and compiled the EMP report, undertook the required public participation process and managed the appointed specialists.</p>  |
| <p><b>Rhino Oil &amp; Gas Exploration South Africa (Pty) Ltd – Proposed Exploration Activities in offshore Licence Blocks 3617 and 3717, South-West coast of South Africa (2015 -2016)</b></p> | <p>EIA process for the proposed offshore exploration activities in Licence Blocks 3617 and 3717, South-West coast of South Africa. Nicholas assisted in the compilation of the Scoping and EIA Reports (including EMP), undertook the required public participation process and managed the appointed specialists.</p>   |
| <p><b>Rhino Oil &amp; Gas Exploration South Africa (Pty) Ltd – Proposed Exploration Activities in Various Inshore Licence Blocks, South-West coast of South Africa (2015 -2016)</b></p>        | <p>EIA process for the proposed exploration activities in various inshore Licence Blocks, South-West coast of South Africa. Nicholas assisted in the compilation of the Scoping and EIA Reports (including EMP), undertook the required public participation process and managed the appointed specialists.</p>  |
| <p><b>Total E &amp; P (SA) (Pty) Ltd - Proposed bathymetry survey and seabed sediment sampling in Block 11B/12B (2014 -2015)</b></p>   | <p>EMP Addendum for an application to undertake sonar surveys and seabed sediment sampling as part of the approved exploration programme for License Block 11B/12B. Nicholas was the project manager and compiled the EMP report, undertook the required public participation process and managed the appointed specialists.</p>   |
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|  | <p><b>Infrastructure – Roads</b></p>   |
| <p><b>Aurecon South Africa (Pty) Ltd for the South African National Roads Agency SOC Limited - Upgrade of N1/4 and development of borrow pits (Current)</b></p>                                | <p>Basic Assessment process for the proposed upgrade of a 17 km stretch of the N1 Section 4 from Monument River (km 46.00) to Doornfontein (km 63.00), including the improvement of the Matjiesfontein intersection and development of additional borrow pits. Nicholas is the project manager and responsible for the compilation of the Basic Assessment Report (BAR), undertaking the required public participation process and managing the appointed specialists.</p> |

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| <p><b>GIBB (Pty) Ltd for Western Cape Government (WCG): Department of Transport &amp; Public Works - Swart River Bridge, South Africa (2016 - 2017)</b></p>                                  | <p>Basic Assessment process for the proposed implementation of erosion protection measures along a section of the Swart River which is traversed by the TR 34, approximately 7 km north of Prince Albert. Nicholas was the project manager and compiled the Basic Assessment Report (BAR), undertook the required public participation process and managed the appointed specialist.</p> |
| <p><b>SMEC SA (Pty) Ltd for South African National Roads Agency SOC Ltd (SANRAL) - Proposed establishment of a Quarry, Ngquza Hill Local Municipality, Eastern Cape (2016 - ongoing)</b></p> | <p>EIA process for the proposed development of a quarry for the extraction of material for the construction of the Mthentu and Msikaba Bridges for the N2 Wild Coast Toll Highway. Nicholas compiled the Scoping and EIA Reports (including EMP), and project managed the required public participation process.</p>   |
| <p><b>Hatch Goba (Pty) Ltd for WCG:DTPW- Maintenance Management Plan for flood damage repair of structures in the Ladismith West area (2016 - 2017)</b></p>                                  | <p>Maintenance Management Plan (MMP) for the proposed repairs to road infrastructure at fourteen different sites that were damaged during flood events in the Ladismith West area situated between Ladismith and Montagu. Nicholas was the project manager and compiled the MMP, undertook the required public participation process and managed the appointed specialist.</p>           |
| <p><b>ERO Engineers (Pty) Ltd for WCG:DTPW - Proposed Repair and Reseal of Main Road (MR) 233 to Langebaan (2015)</b></p>  | <p>MMP for the proposed rehabilitation works of the MR 233 between the R 27 (km 6.80) and north of Langebaan (km 12.84). Nicholas was the project manager and compiled the MMP, undertook the required public participation process and managed the appointed specialist.</p>  |
| <p><b>Ekurhuleni Metropolitan Municipality (Eastern Region) – Proposed Gauteng Road (P1894) (2007 - 2009)</b></p>  | <p>EIA for the construction of a new road between Sam Smith Road (Tsakane) and Vlaktefontein Road (Kwa-Thema), Ekurhuleni Metropolitan Municipality. Nicholas was the project manager and compiled the Scoping and EIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>  |
| <p><b>Infrastructure – Water and Wastewater</b></p>  |  |
| <p><b>BVI Consulting Engineers WC (Pty) Ltd for the City of Cape Town: Transport for Cape Town – Proposed upgrade of the Bayside Canal (2015 -Ongoing)</b></p>                               | <p>Basic Assessment process for the upgrade of the Bayside Canal Outfall System located in Tableview, Cape Town. Nicholas is the project manager and is responsible for compiling the BAR, undertaking the required public participation process and managing the appointed specialists.</p>   |
| <p><b>Saldanha Bay Municipality - Maintenance Management Plans for the Bok and Mosselbank Rivers (2016 - 2017)</b></p>   | <p>MMP for the proposed maintenance activities to be undertaken within the Bok and Mosselbank Rivers. Nicholas was the project manager, compiled the MMPs and undertook the required public participation process.</p>   |

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| <p><b>BVI Consulting Engineers WC (Pty) Ltd for the City of Cape Town: Transport for Cape Town – Proposed stormwater pipeline linking Sunningdale to the Big Bay stormwater outfall pipeline (2015 -2016)</b></p> | <p>Basic Assessment process for the construction of a new stormwater pipeline to route runoff from Sunningdale Phases 12A, 13 and 14 to the existing Big Bay Outfall pipeline located at the eastern boundary of the suburb of Big Bay. Nicholas was the project manager and compiled the BAR, undertook the required public participation process and managed the appointed specialists.</p> |
| <p><b>Arup - Proposed Sandspruit Rehabilitation for Stormwater Management of Melrose Arch, Sandton (2010)</b></p>   | <p>Basic Assessment for the rehabilitation of the Sandspruit to facilitate the management of stormwater runoff emanating from the Melrose Arch precinct. Nicholas was the project manager and compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p>  |
| <p><b>Infrastructure – Solid Waste</b></p>  |   |
| <p><b>Energy Omega Oils (Pty) Ltd – Audit of Blackheath Waste Storage Facility (2017)</b></p>   | <p>External audit of the Blackheath Waste Storage Facility in terms of the National Norms and Standards for the Storage of Waste (Government Notice No. 926 of 29 November 2013). Nicholas undertook and compiled the audit report.</p>   |
| <p><b>Impala Platinum (Pty) Ltd - Proposed Central Salvage Yard (2011 - 2012)</b></p>   | <p>Basic Assessment process and Waste Management License application for the proposed construction of a salvage yard, and associated activities, located at Impala Platinum’s Rustenburg operations. Nicholas compiled the BAR (including EMP), undertook the required public participation and waste management license application processes and managed the appointed specialists.</p>     |
| <p><b>Power - Solar</b></p>   |   |
| <p><b>SolarReserve South Africa (Pty) Ltd – Proposed Kalkaar CSP and Photovoltaic Plants, Free State (2014 -2015)</b></p>   | <p>EIA process for the proposed construction of a Concentrated Solar Thermal Plant (CSP) and a Photovoltaic Plant, located in the Free State Province. Nicholas was the project manager and compiled of the Scoping and EIA Reports (including EMP) for both projects, undertook the required public participation process and managed the appointed specialists.</p>                         |
| <p><b>Built Environment – Residential</b></p>   |   |
| <p><b>Luna Trust - Proposed Subdivision of Erf 177476, St James (2017 – Ongoing)</b></p>  | <p>Basic Assessment process for the subdivision of Erf 177476 into five separate portions with the intent to sell four of the subdivided portions to third-parties for residential use. Nicholas is the project manager and is responsible for compiling the BAR, undertaking the required public participation process and managing the appointed specialists.</p>                           |
| <p><b>Mountain View Estate Shareblock Company Limited - Proposed</b></p>  | <p>EIA for a residential and aviation estate on the Farm Simonsview 490-JQ, and various portions of the Farms Kalkheuwel 493-JQ, Rhenosterspruit 495-JQ and Riverside 497-JQ, Gauteng and North West Province. Nicholas was the project manager and</p>   |



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| <p><b>Mountain View Estate</b><br/>(2009 - 2010)</p>   | <p>compiled of the Scoping and EIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>  |
| <p><b>Lead Wood Development Company (Pty) Ltd - Proposed Leadwood Nature Estate</b> (2008)</p>                                   | <p>EIA for a residential and game estate on the Remainder of Portion 2 of The Farm Happyland 241-KT, Hoedspruit, Limpopo. Nicholas was the project manager and compiled of the Scoping and EIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>              |
| <p><b>Hayes Matkovich Developments (Pty) Ltd – Proposed Standerton Country Estate</b> (2008)</p>                                 | <p>EIA for a golf estate on the Portions of the Farms Grootverlangen 409-IS and Langerwyl 410-IS, Standerton, Mpumalanga. Nicholas was the project manager and compiled of the Scoping and EIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>              |
| <p><b>Sugar Creek Trading 33 (Pty) Ltd - Proposed Development of Zandspruit Estate</b> (2007 -2008)</p>                          | <p>EIA for a residential, game and aviation estate on the Remainder of The Farm Happyland 241-KT, Hoedspruit, Limpopo. Nicholas was the project manager and compiled of the Scoping and EIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                 |
| <p><b>C.J.Irons CC - Taemane Residential Estate</b> (2007)</p>   | <p>Basic Assessment for the proposed residential estate located on a Part of the Remainder of Portion 52 of the Farm Garstfontein 374-JR, Pretoria, Gauteng. Nicholas was the project manager and compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p> |
| <p><b>Riverspray Lifestyle Estate (Pty) Ltd - Proposed Riverspray Lifestyle Estate</b> (2006)</p>                                | <p>EIA for a residential and lifestyle estate on bank of the Vaal River in Vanderbijlpark, Gauteng. Nicholas was the project manager and compiled of the Scoping and EIA Report (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                                    |
|  | <p><b>Built Environment – Recreation</b></p>   |
| <p><b>South African National Parks (SANParks) - Proposed Preekstoel Boardwalk Within the West Coast National Park</b> (2009)</p> | <p>Basic Assessment for the establishment of boardwalks in the Preekstoel section of the West Coast National Park, (SANParks). Nicholas was the project manager and compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                               |
| <p><b>SANParks - Construction of a Walkway and Suspension Bridges in the Tsitsikamma National Park</b> (2008)</p>                | <p>Basic Assessment for the establishment of a walkway and additional suspension bridges in the Tsitsikamma National Park, South Africa. Nicholas was the project manager and compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                     |
|  | <p><b>Other</b></p>  |
| <p><b>City of Tshwane Metropolitan Municipality - Proposed Expansion of the Winterveld Cemetery</b> (2007 - 2010)</p>            | <p>Basic Assessment for the expansion of the existing Winterveld Cemetery located within the City of Tshwane Metropolitan Municipality. Nicholas was the project manager and compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p>                      |

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| <p><b>City of Tshwane Metropolitan Municipality - Proposed Expansion of the Klipkruisfontein Cemetery (2007 - 2010)</b></p> | <p>Basic Assessment for the expansion of the existing Klipkruisfontein Cemetery located within the City of Tshwane Metropolitan Municipality. Nicholas was the project manager and compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p>  |
| <p><b>Tolplan (Pty) Ltd for SANRAL – Proposed Central Operations Centre (COC), Midrand (2009)</b></p>                       | <p>Basic Assessment for the proposed construction of the SANRAL COC Building. Nicholas was the project manager and compiled the BAR (including EMP), undertook the required public participation process and managed the appointed specialists.</p>  |
| <p><b>Erf5 Melrose Estate CC - Section 24G Rectification for a Roof Signboard (2008)</b></p>                                | <p>Rectification Application in terms of Section 24G (S24G) of the National Environmental Management Act, 1998 for the unlawful erection of a roof signboard on the corner of Juta and Eendracht Streets, Johannesburg. Nicholas was the project manager and compiled the Rectification Application (including EMP) and undertook the required public participation process.</p> |
| <p><b>Wideopen Leasing (Pty) Ltd – S24G Rectification for a Sky Sign, 78 Fox Street (2007)</b></p>                          | <p>Rectification Application in terms of S24G of the National Environmental Management Act, 1998 for the unlawful erection of a Sky Sign at 78 Fox Street, Johannesburg. Nicholas was the project manager and compiled the Rectification Application (including EMP) and undertook the required public participation process.</p>  |
| <p><b>MEMBERSHIPS</b></p>   |  |
| <p><b>International Association for Impact Assessment – South Africa (IAIASa)</b></p>                                       | <p>Member.</p>   |

# CURRICULUM VITAE



## RIZQAH BAKER

### ENVIRONMENTAL CONSULTANT

Environmental Management, Planning & Approvals,  
Africa

### QUALIFICATIONS

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|---------|------|--------------------------------------|
| BA Hons | 2016 | Environmental & Geographical Science |
| BA      | 2015 | Development & Environmental Studies  |

### EXPERTISE

- Environmental auditing
- Environmental Impact Assessments

Rizqah has 2 years' experience working in the environmental field, and has worked both in the public and private sectors. She worked in the Environmental & Heritage Management Department of the City of Cape Town; her roles included environmental auditing and providing comment on various Basic Assessment Reports, Method Statements, Environmental Management Plans and development proposals.

In the private sector she worked for an environmental rehabilitation firm and has spent considerable time in the field, having undertaken alien vegetation control and search and rescue operations.

### PROJECTS

**De Beers Marine (Pty) Ltd – Prospecting Right application for offshore marine diamonds in Sea Concession 6C, West Coast, South Africa (current)**

Scoping and Environmental Impact Assessment (EIA) process for the proposed offshore bulk sampling operations in Sea Concessions 6C, off the West Coast of South Africa. Rizqah assisted the Project Manager in the compilation of the Scoping and Environmental Impact Reports (EIR) and the undertaking of the required public participation process.

**EFG Engineers for the Western Cape Government (WCG): Department of Transport and Public Works – The upgrade of R310 between the N2 and Vlaeberg Road, Western Cape, South Africa (current)**

Environmental Control Officer (ECO) services for the upgrade of the R310 (Baden Powell Drive) between the N2 and Vlaeberg Road, Western Cape. Rizqah acted as the ECO and was responsible for ensuring the contractor complied with the Construction Environmental Management Programme (EMP).

**Aurecon South Africa (Pty) Ltd for the South African National Roads Agency SOC Limited – Upgrade of N1/4 and development of borrow pits, Western Cape, South Africa (current)**

Basic Assessment Process for the proposed upgrade of a 17 km stretch of the N1 Section 4 from monument River (km 46.00) to Doorfontein (km 63.00), including the improvement of the Matjiesfontein intersection and development of additional borrow pits. Rizqah assisted the Project Manager in the compilation of the Basic Assessment Report (BAR) and the undertaking of the required public participation process.

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| <p><b>HHO Africa for City of Cape Town: Transport and Urban Development Authority (CCT: TDA) – The upgrade of the R44 from Beach Road to Main Road, Somerset West, South Africa (current)</b></p> | <p>ECO services for the upgrade of the R44 (De Beers Interchange) between Beach Road and Main Road, Somerset West. Rizqah acted as the ECO and was responsible for ensuring the contractor complied with the EMP.</p>   |
| <p><b>Zevocept (Pty) Ltd – Development of a borrow pit, Western Cape, South Africa (current)</b></p>  | <p>Basic Assessment Process for the proposed development of a borrow pit on Farm Modder Rivier, Western Cape. Rizqah’s roles included the compilation of the BAR, the undertaking of the required public participation process and the management of the appointed specialists.</p>   |
| <p><b>Saldanha Bay IDZ Licensing Company SOC Ltd – The development of a used lubricant oil recycling facility at the Saldanha Bay IDZ, Western Cape (current)</b></p>                             | <p>Scoping and EIA process for a used lubricant oil recycling facility at the oil and gas offshore service complex within the Saldanha Bay IDZ. Rizqah assisted the Project Manager with the compilation of the Scoping report and managed the required public participation process.</p>                                       |
| <p><b>Saldanha Bay IDZ Licensing Company SOC Ltd – The storage of hazardous substances at the Saldanha Bay IDZ, Western Cape (current)</b></p>  | <p>Scoping and EIA process for fuel bunkering services at the oil and gas offshore service complex within the Saldanha Bay IDZ. Rizqah assisted the Project Manager with the compilation of the Scoping report and EIR.</p>   |
| <p><b>Bergstan South Africa – The construction of emergency services in Imizamo Yethu, Hout Bay (current)</b></p>   | <p>ECO services for the construction of emergency services in Imizamo Yethu, Hout Bay. Rizqah acted as the ECO and was responsible for ensuring the contractor complied with the Environmental Management Specifications.</p>   |
| <p><b>Clay Industry cc – Atmospheric Emissions Licence for a clay brick factory in Fisantekraal, Western Cape (2019)</b></p>  | <p>SLR was appointed to facilitate the Atmospheric Emissions License (AEL) application process to the CCT and associated public participation process. Rizqah’s role entailed the compilation of the AEL application, undertaking the public participation process and compilation of the Public Participation (PP) Report.</p> |
| <p><b>KNPS KIPTS, Melkbosstrand, Cape Town 2017)</b></p>  | <p>Provided comment on the BAR and Maintenance Management Plan (MMP) for the proposed development of the Koeberg Insulator Pollution Testing Station (KIPTS) at Koeberg Nuclear Power Station (KNPS), Melkbosstrand on behalf of the City of Cape Town: Environmental Management Department.</p>                                |
| <p><b>Health Care Waste Facility, Atlantis Industrial, South Africa (2017)</b></p>  | <p>Provided comment on the Basic Assessment Report for the proposed development of a health care waste facility in Atlantis Industrial on behalf of the City of Cape Town: Environmental Management Department.</p>   |
| <p><b>Diesel Tank Expansion at the KNPS, Melkbosstrand, South Africa (2017)</b></p>   | <p>Commented on the Basic Assessment Report for the proposed diesel tank expansion at Koeberg Nuclear Power Station, Melkbosstrand on behalf of the City of Cape Town: Environmental Management Department.</p>   |

|   |   |
|---|---|
| <p><b>Stonewood Mixed-Use Estate, Kraaifontein, South Africa (2017)</b></p> | <p>Provided comment on the Basic Assessment Report for the proposed development of Stonewood Mixed-Use Development in Kraaifontein on behalf of the City of Cape Town: Environmental Management Department.</p> |
| <p><b>SANCCOB Expansion, Table View, Cape Town (2017)</b></p>               | <p>Assisted in environmental auditing for the facility expansion of the Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), Table View.</p>  |
| <p><b>Portuguese &amp; Italian Clubs, Brooklyn, Cape Town (2017)</b></p>    | <p>Conducted environmental audits of the Italian and Portuguese Clubs, Brooklyn as required as part of the lease agreements between the City of Cape Town (lessor) and the Clubs (lessee).</p>                  |
| <p><b>OEMP, Big Bay, Cape Town (2017)</b></p>                               | <p>Reviewed and updated the Operational Environmental Management Plan (OEMP) of Big Bay, as required as part of the issued Environmental Authorisation (EA) of the Big Bay Developmental Area.</p>              |
| <p><b>MEMBERSHIPS</b></p>   |   |
| <p><b>IAIAsa</b></p>  | <p>Member of the International Association for Impact Assessments (South Africa).</p>   |
| <p><b>AWARDS</b></p>  |   |
| <p><b>USIP Certificate of Commendation (2018)</b></p>                       | <p>Received a Certificate of Commendation during the Urban Sustainability Internship Program (USIP) with the City of Cape Town for outstanding quality of work during the program.</p>                          |

## **APPENDIX B: I&AP DATABASE**

## DB03

|  |                   |  |                          |
|--|-------------------|--|--------------------------|
| Africa Energy Corp                                 | Mr J Maier        | South African Commercial Line Fishing Association  | Mnr W Croome             |
| Alexkor SOC Limited                                | Ms L Swartbooi    | South African Commercial Line Fishing Association  | The Manager              |
| Anadarko Petroleum Corporation                     | Mr M Ranoszek     | South African Deep Sea Trawling Industry Ass.      | Dr J Augustyn            |
| Baggers (Pty) Ltd                                  | Mrs L Labuschagne | South African Hake Longline Association            | Mr C Bodenham            |
| Belton Park Trading 127 (Pty) Ltd                  | Mr P Esposito     | South African Heritage Resources Agency            | Ms L Le Grange           |
| Cairn South Africa (Pty) Ltd                       | Mr S Karthik      | South African Heritage Resources Agency            | Mr R Timothy             |
| Cairn South Africa (Pty) Ltd                       | Mr A Pattnaik     | South African Heritage Resources Agency            | Ms B Williams            |
| Capricorn Marine Environment (CapMarine)           | Mr D Japp         | South African Maritime Safety Authority (SAMSA)    | Mr G Louw                |
| Capricorn Marine Environment (CapMarine)           | Ms S Wilkinson    | South African National Biodiversity Institute      | Dr K Sink                |
| De Beers Marine (Pty) Ltd                          | Ms M Kruse        | South African Navy Hydrographic Office             | Lieutenant I Coetzer     |
| De Beers Marine (Pty) Ltd                          | Ms L Roos         | South African Navy Hydrographic Office             | Mr M Nelson              |
| Department of Environment, Forestry and Fisheries  | Ms J Coetzee      | South African Navy Hydrographic Office             | Commander TJ van Niekerk |
| Department of Environment, Forestry and Fisheries  | Mr D Durholtz     | South African Pelagic Fishing Industry Association | Mr D de Villiers         |
| Department of Environmental Affairs                | Mr S Malaza       | South African Pelagic Fishing Industry Association | Mr P Foley               |
| Department of Environmental Affairs                | Ms T Mboweni      | South African Tuna Longline Association            | Mr D Lucas               |
| Department of Environmental Affairs                | Mr A Share        | Spectrum ASA                                       | Mr J Hall                |
| Department of Environmental Affairs: Oceans&Coasts | Ms F Ditinti      | Sunbird Energy Ltd                                 | Ms A Friedrichs          |
| Department of Mineral Resources                    | Ms D Karsten      | Sunbird Energy Ltd                                 | Mr N Rayner              |
| Department of Mineral Resources                    | Mr J Nieuwoudt    | Sungu Sungu Petroleum (Pty) Ltd                    | Mr S Lephoto             |
| Department of Mineral Resources                    | Mr N Ravhugoni    | Sungu Sungu Petroleum (Pty) Ltd                    | Mr S Lunn                |
| Irvin & Johnson Limited                            | Mr G Nassar       | Thombo Petroleum Limited                           | Mr T Ridley              |
| Kamiesberg Municipality                            | Mr J Cloete       | Trans Hex Group Limited                            | Mr L Delport             |
| Lusitania Trawling Services                        | Mr L De Freitas   | Trans Hex Group Limited                            | Ms L Morule              |
| N. Cape: Department of Env. Affairs & Nature Cons. | Mr B Cornelissen  | Viking Fishing                                     | Mr N Bacon               |
| N. Cape: Department of Env. Affairs & Nature Cons. | Mr B Fisher       |  |                          |
| N. Cape: Department of Env. Affairs & Nature Cons. | Ms T Leburu       |  |                          |
| N. Cape: Department of Env. Affairs & Nature Cons. | Ms D Moleko       |  |                          |
| N. Cape: Department of Env. Affairs & Nature Cons. | Ms E Swart        |  |                          |
| N.Cape: Dept. of Agriculture Forestry & Fisheries  | Mr L October      |  |                          |
| Nama Khoi Local Municipality                       | Ms S Titus        |  |                          |
| Namakwa District Municipality                      | Ms G Bezuidenhout |  |                          |
| Namakwa District Municipality                      | Mr C Fortuin      |  |                          |
| Namakwa District Municipality                      | Mr J Loubser      |  |                          |
| NC: Department of Mineral Resource                 | Mr K Muthewana    |  |                          |
| Oceana Group Limited                               | Mr M Copeland     |  |                          |
| Oceana Group Limited                               | Ms K Koen         |  |                          |
| Panda Marine                                       | Mr K Pansegrouw   |  |                          |
| Petra Diamonds                                     | Mr A Hendricks    |  |                          |
| Petroleum Agency SA                                | Mr S Mushwana     |  |                          |
| Petroleum Agency SA                                | Ms P Ngesi        |  |                          |
| Petroleum Agency SA                                | Mr D van der Spuy |  |                          |
| Pisces Environmental Services                      | Dr A Pulfrich     |  |                          |
| Sea Harvest Corporation Ltd                        | Mr R Hall         |  |                          |
| South African Commercial Fisherman Corp            | Ms C Attwood      |  |                          |

## **APPENDIX C: UNDERTAKING OF ENVIRONMENTAL ASSESSMENT PRACTITIONER**



## LETTER OF UNDERTAKING

UNDERTAKING in terms of Appendix 2 (Section 2j and 2k) of the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended):

I, Jonathan Crowther, The Environmental Assessment Practitioner (EAP) responsible for compiling this report, undertake that:

- The information provided herein is correct;
- The comments and inputs from stakeholders and I&APs have been correctly recorded;
- Information and responses provided to stakeholders and I&APs by the EAP is correct; and
- SLR agrees to implement the Plan of Study for EIA as presented in the Scoping Report. Any comments from stakeholders and I&APs on the Plan of Study for EIA have been / will be taken into consideration.

Signed on the 12 day of August 2019.

For and on behalf of SLR Consulting (South Africa) (Pty) Ltd



Jonathan Crowther Pr. Sci. Nat.

**Technical Director**

**SLR Consulting (South Africa) (Pty) Ltd.**

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