



Exploration Drilling within Block ER236, off the East Coast of South Africa

Final Environmental Impact Assessment Report

December 2018

www.erm.com

The business of sustainability



Exploration Drilling within Block ER236, off the East Coast of South Africa

Eni

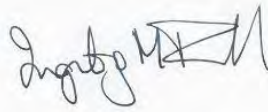
Final Environmental Impact Assessment Report

December 2018

Compiled by: Vicky Stevens, Lindsey Bungartz and Stephanie
Gopaul

For and on behalf of Environmental Resources
Management

Approved by: Ingeborg McNicoll



Signed:

Position: Senior Partner

Date: 12 December 2018

This report has been prepared by Environmental Resources Management the trading name of Environmental Resources Management Southern Africa (Pty) Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

NON-TECHNICAL SUMMARY

INTRODUCTION

This Non-Technical Summary provides a synopsis of the Final Environmental Impact Assessment (EIA) Report prepared as part of EIA process being undertaken for the proposed exploration drilling programme in Block ER236, off the East Coast of South Africa (hereafter referred to as 'the project').

PURPOSE OF THIS EIA REPORT

Environmental Resources Management (ERM) has been appointed by Eni South Africa BV (Eni) to undertake, as an Independent Environmental Practitioner, the full EIA process for the project as per the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations, 2014 (as amended in 2017). The project requires Environmental Authorisation (EA) from the National Department of Mineral Resources (DMR), through the Petroleum Agency South Africa (PASA). The DMR is the competent authority for the project, which means that it has powers to either authorise the development or refuse it. The project would be authorised under NEMA.

The primary objectives of the EIA process has been to identify and assess potentially significant environmental impacts related to the proposed activities, and to design appropriate mitigation, management and control measures in order to assure the protection of the natural offshore environment and the safety of people and communities. To identify potential negative impacts related to project activities better, dedicated specialist studies have been undertaken (see below for more details). These have allowed the adoption of the best available technologies and practices for impact prevention and mitigation.

These prevention and mitigation measures, as well as monitoring objectives, are described within the Environmental Management Programme Report (EMPr), which forms *Chapter 9* and *Annex F* of the Final EIA Report. This is required under Chapter 5 of the National Environmental Management Act (NEMA) (No 107, 1998), as amended, and becomes legally binding on condition of approval of the project by the competent authority.

PROJECT AND PROPONENT BACKGROUND

Eni and Sasol Africa Limited (Sasol) hold an Exploration Right off the East Coast of South Africa. Eni and Sasol are considering the possibility of conducting an exploration drilling¹ programme in Block ER236. The purpose of the exploration drilling programme is to work out if there are any commercially viable hydrocarbons (oil and gas) under the seabed to make it worthwhile for Eni and Sasol to undertake further development in the Block.

Eni is an international integrated energy company, active in 71 countries in the world with a staff of over 33,000 employees. Eni is engaged in hydrocarbon exploration and production, gas and power, refining, marketing and renewables across the entire value creation chain. Eni is a world leader in subsea drilling, with over 872 subsea wells (of which 284 are deep water or ultra-deep water) drilled safely across 20 different offshore environments, presenting their own unique challenges. Its expertise has been achieved through innovation of technology and an experienced workforce who adopt the company's best practice controls and procedures.

As part of the exploration programme, Eni may drill up to six deep water wells within Block ER236, four wells within northern area of interest and two wells within the southern area of interest (*Figure 1*). The starting location (in the northern or southern area) is not yet defined, nor is the sequence of wells, which is subject to the results of the first exploration well and acquired data interpretation.

The drilling of the first exploration well is planned for some time between November 2019 and March 2020, and the drilling of one well is expected to take in the order of two months to complete. The expected drilling depth would be approximately 3,800 m to 4,100 m in the northern area of interest and 5,100 m in the southern area of interest, from the sea surface, through the seabed, to target depth.

Depending on the result of the first exploration well, if the well is dry operations will move to another location. If a successful discovery will be found, Eni will decide to drill an appraisal well close to the same location, or to drill another explorative well. A maximum of two explorative and two appraisal wells are expected to be drilled in the northern area of interest, while one explorative and one appraisal in the southern area of interest. The time sequence of these possible additional wells will be dependent on the results of the first exploration well and most likely will not occur immediately after the drilling of the initial well.

¹ When conducting exploration drilling activities, there are two types of wells drilled: the exploration well and the appraisal well. The exploration well is drilled to determine if a hydrocarbon reservoir is present. The appraisal well is located close to the exploration well. It is drilled only in case of a discovery of the hydrocarbon reservoir, and is used to establish the quantity and potential flow rate (how fast it flows) of any hydrocarbon present. The appraisal of the reservoir extension and characteristics will support the decision for a development phase, in order to produce the hydrocarbon. The development phase will require a new EIA assessment and it's not part of this EA authorization.

Well testing may be conducted only on the appraisal wells if they present potential commercial quantities of hydrocarbon.

At the end of the operations both kind of wells, exploration and appraisal, will be plugged¹ and abandoned (“decommissioning”) as per international standards and best practice. The well and wellhead is sealed off with cement plugs. The abandoned wells will have a downhole tested barrier that will seal the reservoir from and to seabed and will prevent the unwanted release of hydrocarbon and the wellhead will be left on the seabed. The position of the wellheads will be marked on HydroSAN Office charts for safe navigation.

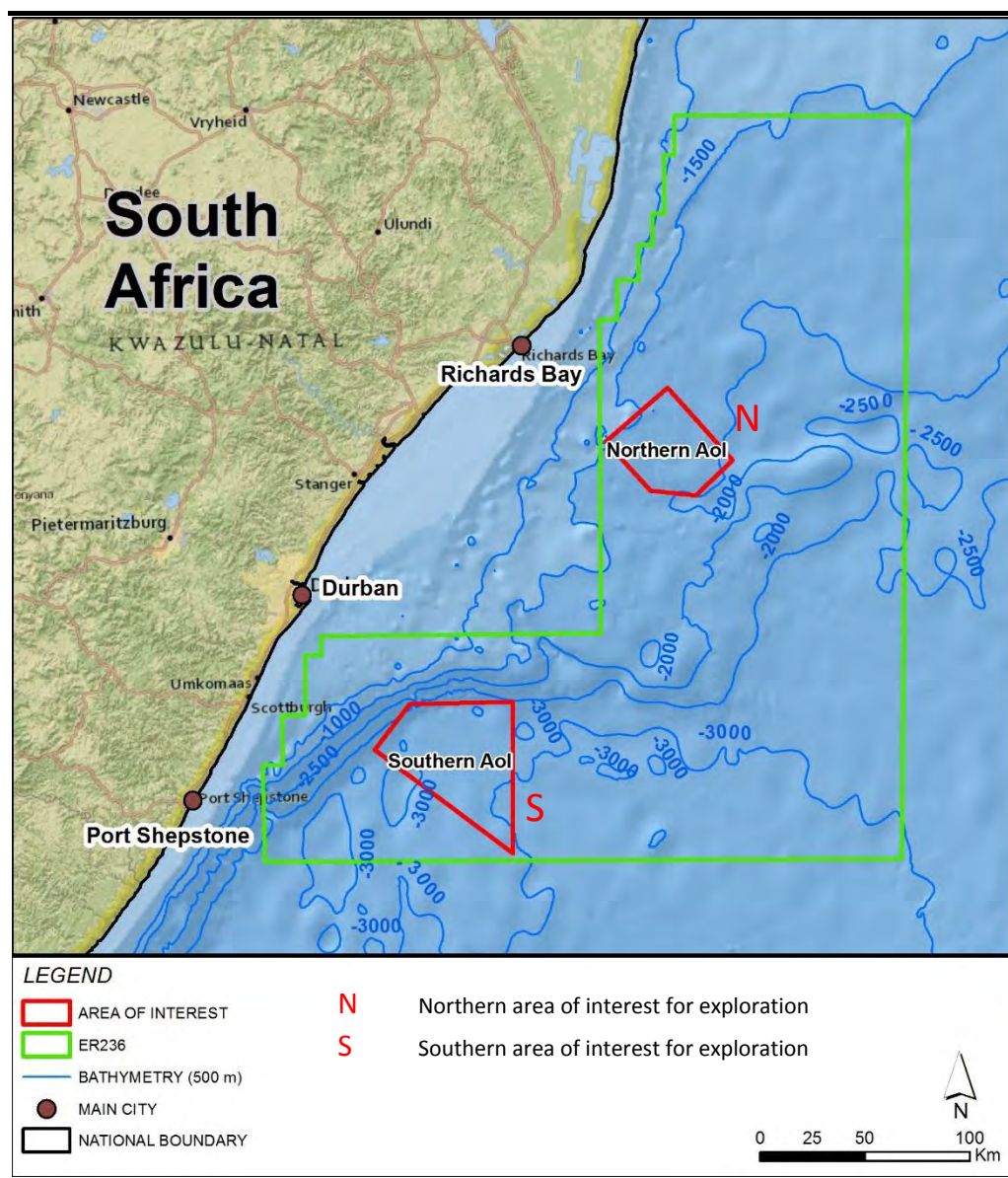
PROJECT LOCATION

Eni proposes to drill exploration wells inside Block ER236, within two areas of interest:

- A **northern area of interest** (approximately 1,717.50 km² in area), which is located, at its closest point, approximately 62 km from shore, in water depths ranging between 1,500 m and 2,100 m (*Figure 1*).
- A **southern area of interest** (approximately 2,905 km² in area), which is located, at its closet point, approximately 65 km from shore, in water depths ranging between 2,600 m and 3,000 m (*Figure 1*).

¹ For exploration wells, the plugging and abandonment job will be final, in that no re-entry of the well is planned. In the event of a discovery, for appraisal wells the cement plug will have a different composition and dimension (length) to allow the capability to re-drill the cement and recover the well for a future development phase.

Figure 1 Map of the Project Location



Source: EIA Report, 2018.

PROJECT ACTIVITIES

The main project related components include the following:

- Offshore exploration well;
- Deep water drillship (*Figure 2*);
- Exclusion zone around drillship;
- Shore base (Richards Bay or Durban);
- Supply vessels, stand-by vessels and helicopters; and
- Infrastructure and services.

Figure 2 *Example of a Drillship*



Source: Shutterstock, 2017

The project activities associated with drilling include the following phases:

- Mobilisation Phase
 - The deep water drillship will be mobilised to the first well location from West Africa or East Africa.
 - Support vessels may sail directly in convoy with the drillship to site or from the Richards Bay or Durban shore base.
 - Operation of the shore-based facilities for handling support services needed by the drillship.
 - Remote Operated Vehicle (ROV) surveys pre-drilling survey of the seabed and positioning of the well.
- Drilling Phase
 - Drilling of a well in either the northern or southern area of interest.
 - Well execution (side track, logging, completion) options.
 - Well testing for appraisal option.
- Well Plugging, Abandonment (“Decommissioning”) and Demobilisation Phase
 - Well plugging and abandonment.
 - Demobilisation of the drillship, vessel and local logistics base.

All activities will be conducted in a way, which conforms to recognised industry international best practice. A detailed description of project activities has been reported within *Chapter 3* of the Final EIA Report (“*Project Description*”).

Despite many advances in seismic data acquisition and analysis, currently no alternatives exist to definitively establish the presence of hydrocarbon reserves other than through exploration and appraisal drilling.

PLANNED EMISSIONS AND DISCHARGES, WASTE MANAGEMENT

The planned drilling activities and project operations will result in the occurrence of air emissions, discharges to sea, waste requiring land disposal and noise emissions.

All vessels will have equipment, systems and protocols in place for prevention of pollution by oil, sewage and garbage in accordance with MARPOL 73/78. A project specific Waste Management Plan (covering all wastes generated offshore and onshore) will be developed in accordance with MARPOL 73/78 requirements, South African regulations and Eni's waste management guidelines. An Oil Spill Contingency Plan (OSCP) will be developed for this project, in terms of the nationally adopted Incident Management System for spills and the National OSCP.

ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

Table 1 presents a summary of the key baseline sensitivities in the Project Area.

Table 1 ***Summary of Key Sensitivities***

Feature	Description
Marine Protected Areas (MPAs)	<ul style="list-style-type: none"> Block ER236 overlaps with <u>the iSimangaliso MPA, Uthukela Banks MPA and Protea Banks MPA</u>. There is no overlap of the areas of interest for drilling with recently approved MPAs. It should be noted that sections of the original Block ER236 which overlapped with the existing iSimangaliso and Aliwal Shoal MPA's were relinquished during the Exploration Right renewal process in 2016.
Seabed features and benthic habitat	<ul style="list-style-type: none"> The northern area of interest for well drilling lies offshore, east of the Natal Bight in >1,500 m water depth. In the northern area of interest for well drilling, Southwest Indian Upper and Lower Bathyal benthic habitats (habitats occurring on the seabed) are found, whereas Southern Indian Lower Bathyal benthic habitat dominates in the southern area of interest, both of which have been assigned an ecosystem threat status of 'least threatened' in the SANBI 2011 National Biodiversity Assessment. The benthic communities within these habitats are generally the same throughout the southern African East Coast region, differing only by seabed type and/or depth zone.

Feature	Description
Coelacanths	<ul style="list-style-type: none"> The Tugela (600 to 2,800 m deep) and Goodlad Canyons (20 to 1,400 m deep) lie in close proximity to the southern and northern areas of interest for drilling respectively. Coelacanths have a narrow habitat range and have been found internationally in water depths between 90 to 300 m, in canyons with connections to the continental shelf. Due to the depths of the canyons which lie in close proximity to the northern and southern areas of interest, and limited food sources at this depth, combined with the fact that these canyons lack connectivity to the continental shelf, it has been evaluated by the specialist based on available data that the Tugela and Goodlad Canyons are unlikely to offer suitable habitat for coelacanths. Additionally, no drilling will be done within canyons.
Deep Water Corals	<ul style="list-style-type: none"> The occurrence of deep water corals in Block ER 236 and the areas of interest are unknown. This will be established through pre-drilling ROV surveys
Whales and Dolphins	<ul style="list-style-type: none"> There are 36 species of whales and dolphins (cetaceans) that are likely to be found within Block ER236. Of the 36 species, the Antarctic Blue whale is 'critically endangered', the Indo-Pacific humpback dolphin, fin whale and sei whale are considered 'endangered' and the Ifafi-Kosi Bay sub-population of the Indo-Pacific bottlenose dolphin, Sperm whale and Bryde's whale (inshore population) are considered 'vulnerable' in the IUCN South African Red Data book List Assessment. The most common species within the area of interest (in terms of likely encounter rate, not total population sizes) are likely to be the common bottlenose dolphin, Indo-Pacific bottlenose dolphin, short-finned pilot whale and humpback whale. Block ER236 lies within the migratory route of Humpback (Least Concern) and Southern Right (Least Concern) whales. <ul style="list-style-type: none"> Southern right whales will pass through Block ER236 in July and August and again on their southward migration in October/November. Humpbacks have a bimodal distribution off the East coast, most reaching southern African waters around April, continuing through to September/October when the southern migration begins and continues through to December and as late as February. The calving season for Humpbacks extends from July to October, peaking in early August.
Marine Turtles	<ul style="list-style-type: none"> Five species of turtle are known to occur along the East Coast: leatherback, which is most frequently sighted, and the loggerhead, green, olive ridley and hawksbill turtles. In the IUCN Red listing, the hawksbill turtle is described as 'Critically Endangered', green turtle is 'Endangered' and leatherback, loggerhead and olive ridley are 'Vulnerable' on a global scale. Both the leatherback and the loggerhead turtle nest on the beaches of the northern KZN coastline (St Lucia, iSimangaliso) between mid-October and mid-January. Hatchlings are born from mid-January through to mid-March when the Agulhas Current is warmest. Once hatchlings enter the sea, they move southward following the Agulhas Current and are thought to remain in the southern Indian Ocean gyre for the first five years of their lives. The inshore regions of the northern portion of Block ER236, coincide with the inter-nesting migrations for leatherbacks, but the area of interest lies outside of the inter-nesting range. Leatherback and loggerheads are likely to be encountered in Block ER236 during their foraging migrations.
Fish spawning, nursery and recruitment areas	<ul style="list-style-type: none"> The areas of interest are offshore of the major fish spawning and migration routes and ichthyoplankton abundance is likely to be low. The sardine run along the Eastern Cape coast and up to southern KZN is inshore of the area of interest. Pilchard eggs are inshore of the area of interest.
Large Pelagic Long Line Fishing	<ul style="list-style-type: none"> The area of interest overlaps with the long line fishing area which targets primarily tuna but also swordfish.

Feature	Description
Marine Traffic	<ul style="list-style-type: none"> The Project Area may overlap with the routes taken by tankers and bulk carriers. The supply vessels may interact with the inshore vessel traffic due to the collection of supplies from the Port of Durban or Richard's Bay. Important East Coast commercial harbours include Port Elizabeth, East London, Durban and Richards Bay.
Recreational users	<ul style="list-style-type: none"> The recreational use of marine resources along the East Coast typically occurs within inshore waters in the vicinity of coastal towns and holiday resorts.

THE EIA PROCESS

INITIAL PUBLIC PARTICIPATION PHASE

The project description and notices of intention to commence with an EIA process were placed in the public domain between 15- 21 September 2017. Background Information Documents (BIDs) were distributed via email/post on 15 September 2017. Adverts were placed in several newspapers in English and isiZulu. A preliminary stakeholder database was compiled and the public, stakeholders and commenting authorities were invited to register as a stakeholder and comment on the project/ process. Site notices were placed at the following locations:

- eThekweni Municipality libraries:
 - Durban North;
 - Durban Central Lending;
 - Amanzimtoti;
 - Warner Beach;
 - Isipingo Beach;
 - Umkomaas; and
 - Tongaat Beach.
- uMhlathuze Local Municipality:
 - Richards Bay Municipality;
 - Richards Bay Library; and
 - Entrance to the Port of Richards Bay.

SCOPING PHASE

The Scoping Phase undertaken according to the requirements of NEMA and the available Public Participation Guideline. This involved a process of notifying Interested and Affected Parties (I&APs) of the proposed project and EIA process in order to ensure that all potential key environmental impacts, including those requiring further investigation, were identified.

The Final Scoping Report (including Plan of Study) was submitted to PASA on 8 March 2018 for its consideration. Adverts to inform I&AP's of the release of the Draft Scoping Report and scheduled public meetings were published in the following newspapers:

- The Zululand Observer (in English on 18 October 2017);
- Ilanga Newspaper (in Zulu on 26 October 2017);
- Isolezwe (in Zulu on 26 October 2017) and
- The Mercury (in English on 26 October 2017).

Additionally, notification letters were sent to registered I&APs on 26 October 2017. Due to a delay in finalisation of the specialist studies, the Draft Scoping Report was retracted and the application withdrawn 07 November 2017 and re-released for public comment. Re-release of Draft Scoping Report. Notification letters were sent on 22 January 2018 and adverts to inform I&AP's of the re-release of the Draft Scoping Report and scheduled public meetings were published in the following newspapers on 22 January 2018:

- Ilanga Newspaper (in Zulu);
- Isolezwe (in Zulu);
- The Mercury (in English) and
- The Zululand Observer (in English).

Public meeting notification was sent out on 5 February 2018. Three public engagement meetings were held at the following locations:

- Richards Bay (The Richards Hotel) – 6 February 2018;
- Durban (Tropicana Hotel) - 7 February 2018; and
- Port Shepstone (Port Shepstone Country Club) – 8 February 2018.

A 30 day comment period was facilitated on Draft Scoping Report from 22 January 2018 to 1 March 2018 and the final report was submitted on 8 March 2018. The Department accepted the Final Scoping Report on 16 April 2018.

EIA PHASE

The data collected for the baseline description have been selected to be representative of the Project Area considered in the context of an EIA process. Based on the available data, the impact assessment has been conducted for all sensitivities not de-risked during the Scoping Phase and includes updates resulting from stakeholder input after the completion of the Final Scoping Report. All the proposed preventive and mitigation measures have been provided and reported in details in *Chapter 9 (EMPr)* and *Annex F* of the Final EIA Report.

Specialist Studies

The following specialist studies (*Annex D*) were undertaken during the EIA Phase to address the key issues that required further investigation and detailed assessment, namely:

- Oil spill and drill cuttings modelling;
- Marine ecology;
- Fisheries; and
- Maritime heritage baseline.

Oil spill and drill cuttings modelling used available metocean data to model the extent and concentration of various discharge scenarios (including drilling cuttings and hydrocarbon spills). The other specialist studies involved the gathering of relevant data (including the results of the modelling study) in order to identify and assess environmental impacts that may occur as a result of the proposed project.

These impacts were then assessed according to pre-defined rating scales. Specialists also recommended appropriate mitigation or optimisation measures to minimise potential impacts or enhance potential benefits, respectively.

The results of oil spill and drill cuttings modelling specialist studies have been reviewed and commented on by an Independent Peer Reviewer. Comments from the peer reviewer are available in *Annex D6* of the Final EIA Report. A Non-Technical Summary of the Oil Spill Modelling report has also been prepared by ERM to facilitate stakeholder understanding of the oil spill report. The summary can be found in *Annex D7* of the Final EIA Report.

ERM experienced unforeseen delays in the finalising of specialist studies for the Exploration Drilling within Block ER236, which resulted in the lapse of the EIA Application on the 3 August 2018. In line with Section 21(2)(a) and (b) of the NEMA EIA Regulations, Eni commenced the new EIA process with the submission of an amended application form and the release of the Draft EIA Report for comment. PASA confirmed that this approach was acceptable on 29 August 2018.

Update of the Final EIA Report

The Draft EIA Report was released on 25 September 2018 for a 30 day comment period. A notification letter was sent to all registered I&APs on the stakeholder database to inform them that a new EIA process has been initiated and that the Draft EIA Report was available for comment. The report was available online on the project webpage (www.erm.com/eni-exploration-eia) and at the following locations:

- Durban Central Lending Public Library
- Port Shepstone Library

- Richards Bay Library
- East London Central Library
- Nelson Mandela Bay Municipality – Linton Grange Library

Further to this, the 30 day comment period was extended by another 14 days (closing on 8 November 2018) to accommodate the release of the isiZulu translated Draft EIA Report. This was following open house meetings held in KwaZulu-Natal, where I&APs requested that the report be translated into isiZulu. The isiZulu Draft EIA Report was made available on 18 October 2018 online on the project webpage, as well as at the locations mentioned above. Additionally, the report was also made available at the Austerville library.

This Final EIA Report has been updated based on comments received on the Draft EIA Report. The report was updated to address stakeholder concerns and clarifications (Annex B). These changes are underlined to enable stakeholders to easily see that their comments have been taken into consideration.

A Comments and Response Report, reflecting stakeholder comments received during the stakeholder engagement process and responses by ERM, specialists and the proponent, is included in Annex B. This forms an integral part of and must be read in conjunction with the Final EIA Report. The Final EIA Report has been submitted to PASA for decision on 14 December 2018. A notification letter has been sent to all registered I&APs on the project database and the report is available online on the project webpage (www.erm.com/eni-exploration-eia) and at the public locations mentioned above.

The contact details of the Applicant and the independent EAP are provided in Table 2 below:

Table 2 **Contact Details of the Applicant and EAP**

Contact Details of project Applicant / Proponent	Contact Details of the EAP
Eni South Africa BV 1st Floor, Icon Building c/o Cube WS Cnr Lower Long St. & Hans Strijdom Rd. Foreshore, 8001, Cape Town, South Africa Contact person: Nicole Lomberg T: +27 21 412 1582	ERM Postnet Suite 90 Private Bag X12 Tokai 7966 Vicky Stevens 1st Floor Great Westerford 240 Main Road Rondebosch 7700 Cape Town South Africa T +27 21 681 5400 F +27 21 686 0736 E eni.exploration.eia@erm.com

ENVIRONMENTAL AND SOCIAL-ECONOMIC IMPACT ASSESSMENT OF PLANNED ACTIVITIES

The primary objective of the EIA process has been to identify and assess potentially significant environmental impacts related to the proposed drilling activities and to design appropriate mitigation measures, management and control plans for the identified impacts in order to assure the protection of offshore environment and safety of people and communities.

To assess the potential impacts of the project execution, a methodology comprising the following was applied:

- **Impacts identification and definition:** aimed at determining what could potentially occur as a result of the exploration activities' interaction with the physical, chemical, biological and socio-economic environment.
- **Impacts evaluation:** potential impacts have been assessed in order to determine their significance by combining the magnitude of the potential impact and the sensitivity of the resources/receptors that are potentially impacted.
- **Definition of mitigations:** according to the impact significance, appropriate control and management measures have been recommended. The basic principle of mitigation is to avoid or minimise any negative impact in the first place, rather than trying to remedy its negative effect later.
- **Residual Impacts Evaluation:** once mitigation measures are proposed, the final step in the Impact Assessment Process has been to assign residual impact significance, remaining after mitigation.
- **Implementation of the Environmental Management Programme (EMPr):** the EMPr (*Chapter 9* and *Annex F*) aims to ensure that all mitigation measures and commitments included in the Final EIA Report will be implemented throughout the lifecycle of the exploration activity, in an effective manner.

Only the impacts considered potentially significant are evaluated further in the Final EIA Report. The impacts considered non-significant are discussed briefly in planned events (*Chapter 7*) and scoped out of the detailed assessment.

Table 3 Potential Impacts from Planned Activities

No.	Issue	Impact	Pre-mitigation Significance Rating	Key Mitigation Measures	Post mitigation Significance Rating
1	Key Impacts Identified from Planned Activities				
1.1	Climate change	Burning of <u>hydrocarbons from vessels and during well testing (if confirmed) for appraisal wells.</u>	Negligible	<ul style="list-style-type: none"> Compliance to MARPOL 73/78 Annex VI regulations regarding the reduction of NOx, SOx and GHG emissions from vessel engines. All diesel motors and generators will undergo routine inspections and receive adequate maintenance to minimise soot and unburnt diesel released to the atmosphere. 	Negligible
1.2	Seawater and sediment quality degradation /contamination and impacts on marine fauna	Wastewater discharges from the drillship, supply and support vessels	Negligible	<ul style="list-style-type: none"> Compliance with MARPOL 73/78 Annex I, Annex IV, Annex V standards for all project vessels. 	Negligible
		Physical disturbance to the seabed, sediments and benthic fauna from pre-drilling Remote Operated Vehicle (ROV) surveys	Negligible	<ul style="list-style-type: none"> Implement procedures for ROVs that stipulate that the ROV does not land or rest on the seabed as part of normal operations 	Negligible
		Physical disturbance to the seabed, sediments and benthic fauna from drilling operations	Negligible	<ul style="list-style-type: none"> Ensure drill site is located more than 500 m from any identified vulnerable habitats. Use high efficiency solids control equipment to minimize liquid content on cuttings, maximize reuse and recycle of drilling mud, reduce the need for fluid change out and minimise the final amount of residual spent mud. 	Negligible
		<u>Impact of disposal of muds and cuttings at the seabed on benthic fauna</u>	Moderate	<ul style="list-style-type: none"> Use high efficiency solids control equipment to minimize liquid content on cuttings, maximize reuse and recycle of drilling mud, reduce the need for fluid change out and minimise the final amount of residual spent mud; Maximize re-use and re-cycle of used WBM and NADF for different drilled section and for drilling other wells; Minimize spent WBM discharge to sea; avoid NADF mud discharge. 	Minor
		<u>Impact of disposal of muds and cuttings at the seabed on Deep Water Corals (sessile fauna)</u>	Moderate	<ul style="list-style-type: none"> Ensure drill site is located more than 500 m from any identified vulnerable habitats 	Minor

No.	Issue	Impact	Pre-mitigation Significance Rating	Key Mitigation Measures	Post mitigation Significance Rating
		<u>Physical disturbance to the seabed, sediments and benthic fauna from the disposal of cement at the seabed</u>	Negligible	<ul style="list-style-type: none"> Eni will monitor cement returns and will terminate pumping if returns are observed on the seafloor 	Negligible
		WBM biochemical impacts related to drill cuttings and muds on marine fauna present in the water column	Negligible	<ul style="list-style-type: none"> Eni's specifications for discharge of WBM includes: <ul style="list-style-type: none"> Discharge of cuttings via a caisson in >15 m depth. Discharge of cuttings only in water >30 m depth. Hg: max 1 mg/kg dry weight in stock barite. Cd: max 3 mg/kg dry weight in stock barite. Maximum chloride contraction must be less the four time the ambient concentration of fresh or brackish receiving water. Ship-to-shore otherwise. 	Negligible
		NADF biochemical impacts related to drill cuttings and muds on marine fauna present in the water column	Minor	<ul style="list-style-type: none"> Eni's specifications for discharge of NADF retained on drill cuttings includes: <ul style="list-style-type: none"> Discharge of cuttings via a caisson in >15 m depth. Discharge of cuttings only in water >30 m depth. Organic Phase Drilling Fluid concentration: maximum residual non aqueous phase drilling fluid (NAF) 5% (C16-C18 internal olefins) or 9.4% (C12-C14 ester or C8 esters) on wet cuttings. Hg: max 1 mg/kg dry weight in stock barite. Cd: max 3 mg/kg dry weight in stock barite. Ship-to-shore otherwise. 	Negligible
		Disturbance of marine fauna by the masking of biologically relevant sounds by underwater noise associated with drilling operations	Minor	Vessels should also undergo regular maintenance regime to reduce noise, which includes the cleaning of propeller and underwater hull.	Minor
		Avoidance behaviour of marine fauna due to disturbance by underwater noise associated with drilling operations	Negligible	Vessels should also undergo regular maintenance regime to reduce noise, which includes the cleaning of propeller and underwater hull.	Negligible
		Impacts of helicopter noise associated with drilling on marine fauna	Moderate	Avoid extensive low-altitude coastal flights (<914 m and within 2 km of the shore)	Minor
		Impact of light from project vessels on marine fauna	Negligible	The lighting on the drilling unit and support vessels should be reduced to a minimum compatible with safe operations whenever and wherever possible.	Negligible

No.	Issue	Impact	Pre-mitigation Significance Rating	Key Mitigation Measures	Post mitigation Significance Rating
1.4	Disturbance to fishing (commercial and subsistence)	Impacts related to restricted access to fishing grounds	Minor	Affected stakeholders to be notified of the location, duration and timing of drilling activities.	Minor
1.5	Abandonment of wellhead(s) on seafloor	Impacts of the presence of the wellhead during abandonment on other marine activities	Negligible	Prior to demobilization of the vessel from the area, the abandoned wellhead location must be surveyed and accurately charted with the HydroSAN Office.	Negligible
1.6	No-Go alternative	Impact of the no-go alternative	Moderate (negative)	No mitigation required	Moderate (positive)
2	Additional Relevant Impacts Identified through Stakeholder Engagement during Scoping				
2.1	Maritime Heritage	Exploration drilling	Negligible	Any pre-drill remote sensing data collected to ground-truth seabed conditions is to be archaeologically reviewed to establish whether any shipwrecks are present on the seabed	Negligible
2.2	Local employment	Employment of labour and allocation of jobs Training / capacity building of local people	Negligible	At this early stage, the project employment opportunities are limited. Eni will establish a recruitment policy which prioritises the employment of South African and local residents at the onshore logistics base over foreigners, where possible. This outlook is anticipated to significantly change based on the success of the exploratory well. True potential is realised at the subsea field development stage of the lifecycle.	Negligible

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT ASSESSMENT OF UNPLANNED ACTIVITIES

The following accidental events were considered to be potentially significant in the EIA phase and have been assessed through a dedicated Oil Spill Modelling Study (*Annex D4* of the Final EIA Report):

- Accidental oil spill due to a blowout;
- Accidental oil spill due to a vessel collision; and
- Accidental oil spill due to the accidental disconnection of the riser occurring during drilling.

The probability of a blowout is very low described in *Chapter 8* (Unplanned/Accidental Events).

The industry focus, commitment and effort, in particular for major oil companies like Eni, is to conduct operations with the highest safety standards, in order to perform drilling operations with no risk and harm to the people, the environment and the asset. In order to minimize the residual risk of incidents, strict rules are defined by international standards (API/ISO) and best practice and must be followed by the company, the drilling contractors and all parties involved in drilling operations, including maritime and logistic operations.

To prevent an unwanted oil spill, Eni has defined number of mandatory responses, control and management measures, and resources that will be implemented during drilling operations. These include advanced planning of tools that can be used and training of personnel to reduce the severity of impacts in the event of a spill. These tools include the use of a subsea BOP (Blowout Preventer), to immediately shut in the well in case of emergency. In addition, the availability of a capping system can provide a backup tool to be used in case of failure of BOP. A new (advanced) capping system has been developed after the Macondo incident to successfully shut-in the well and contain any further spill. The capping system is now an effective option in case of emergency.

All the response procedures form part of an Oil Spill Contingency Plan (OSCP) that must be developed prior to the beginning of the proposed drilling activities. The OSCP shall be reviewed and approved by the South African Maritime Safety Authority (SAMSA) prior to start of drilling. On approval, SAMSA will issue a Pollution Safety Certificate.

Table 4 Summary of Potential Risks or Unplanned Activities and their Residual Significance ratings

No.	Issue	Impact	Post-mitigation Significance Rating	Key Mitigation/Management Measures
1	Unplanned Activities			
1.1	Risk significance of oil spills on marine and coastal habitats and species	Hydrocarbon spill from a vessel collision (i.e. loss of diesel) on marine and coastal habitats and species (Invertebrates, pelagic fish and larvae, and for marine mammals and turtles)	Minor (ALARP)	<ul style="list-style-type: none"> Prior to the start any drilling operation, Eni adopts several control measures, starting from the well design and engineering phases. During drilling operations, the drillship have real time monitoring of drilling parameters in order to reduce the risk of unexpected hydrocarbon influx (kicks) inside the well and to maximize the safety during the construction of the well at different drilled sections. In order to minimize the risk of negative and unwanted events (such as a blowout), the well design and the operation procedures, device and equipment, will guarantee the presence of a second barrier in case of failure of the primary barrier. A Well Control Contingency Plan (WCCP) will be put in place for each well
1.2		Hydrocarbon spill from a vessel collision on marine and coastal habitats and species (seabirds)	Moderate (ALARP)	
1.3		Oil spill due to blowout surface risk to invertebrates, fish, marine mammals and turtles (including species inside MPAs)	Minor (ALARP)	
1.4		Oil spill due to blowout surface risk to marine and coastal habitats and species (seabirds)	Moderate (ALARP)	
1.5		Oil spill due to blowout - sub-surface risk to invertebrates, fish, marine mammals and turtles (including species inside MPAs)	Minor (ALARP)	
1.6		Oil spill due to blowout -sub-surface risk to seabirds	Minor (ALARP)	
1.7		Loss of drilling fluids and cuttings due to riser disconnect on marine and coastal habitats and species (Invertebrates, pelagic fish and larvae, and for marine mammals and turtles)	Minor (ALARP)	
1.8		Loss of drilling fluids and cuttings due to emergency riser disconnect on seabirds	Moderate (ALARP)	
1.9		Loss of drilling fluids and cuttings due to emergency riser disconnect on invertebrates, fish, marine mammals and turtles (including species inside MPAs)	Minor (ALARP)	
1.10	Risk significance of oil spills on marine and coastal based livelihoods	Oil spill due to blowout or diesel spill on tourism	Moderate (ALARP)	<ul style="list-style-type: none"> Develop a Fisheries Management Plan (FMP) that will be implemented in event of an accidental oil spill.
1.11		Oil spill due to blowout or diesel spill on small-scale and subsistence fisheries	Moderate (ALARP)	
1.12		Oil spill due to blowout or diesel spill on recreational fisheries	Minor (ALARP)	

No.	Issue	Impact	Post-mitigation Significance Rating	Key Mitigation/Management Measures
1.13		Oil spill due to blowout or diesel spill on commercial fisheries	Minor (ALARP)	
1.14	Accidental vessel on vessel collision on community and workforce health and safety	Vessel collision on workforce health and safety	Minor (ALARP)	<ul style="list-style-type: none"> • Distribute a Notice to Mariners prior to the commencement of the drilling operations to inform them of drilling activities, including timing and location thereof; • project vessels to inform other ships and boats by radio announcements regarding drilling activity location; • Use of signals, lights and markings on the project vessel(s); • Enforce a safety/exclusion zone with a 500 m radius around the project vessels
1.15		Vessel collision on community health and safety	Moderate (ALARP)	

CONCLUDING REMARKS

Through the EIA process, certain control and mitigation measures have been recommended as part of the project to manage the anticipated impacts. These control and mitigation measures identified ensure that the project is fully compliant with South African Regulations as well as Eni's best practice procedures and international policy frameworks for subsea operations. These form part of the EMPr (*Chapter 9 and Annex F*) developed based on the outcomes of Final EIA Report.

All mitigations listed in the EMPr shall be implemented during the project to ensure that potential risks and adverse impacts associated with the project are mitigated to a level, which is deemed adequate for the project to proceed.

The 'No-Go' alternative for this project has also been assessed and would result in the loss of this potential opportunity for energy production and associated economic and social benefits, although the drilling sites would remain in its current environmental state.

The EIA process also involves a stakeholder engagement process to address the concerns and allow contributions by stakeholders and Interested & Affected Parties (I&APs). Engagement with stakeholders also discloses project information, particularly regarding Eni project activities offshore and the safety requirements and control measures in respect of the proposed drilling operations.

In summary, based on the findings of this assessment and taking into account the benefits associated with obtaining knowledge regarding the viability and extent of available reserves that may be exploited at a later stage, ERM is of the opinion that the proposed exploration drilling activities on Block ER236 to determine whether there are sufficient hydrocarbons under the seabed to substantiate further development, should be authorised. This is, however, contingent on the implementation of the mitigation measures and monitoring for potential environmental and socio-economic impacts as outlined in the Final EIA Report and EMPr (*Chapter 9 and Annex F*) being implemented by Eni.

Acronyms and Abbreviations

°C	Celsius Degrees
°F	Fahrenheit Degrees
ACEP	African Coelacanth Ecosystem Project
ADI	Areas of Direct Influence
AEL	Atmospheric Emission Licence
AIDS	Acquired Immune Deficiency Syndrome
AII	Areas of Indirect Influence
ALARP	As low as reasonably practicable
AOI	Area of Influence
API	American Petroleum Institute
BAR	Basic Assessment Report
bbl	Barrel
BID	Background Information Document
BOP	Blowout Preventer
CA	Competent Authority
CaCl ₂	Calcium Chloride
Ca(OH) ₂	Calcium Hydroxide
CBD	Convention on Biological Diversity
CCAPS	Climate Change and African Political Stability
CH ₄	Methane
CITES	Convention on International Trade in Endangered Species
cm	centimetres
cm/s	centimetre per second
CMS	Convention on Migratory Species
CO	Carbon monoxide
CO ₂	Carbon dioxide
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea
CPUE	Catch per Unit Effort
CRR	Comment and Responses Report
CSIR	Council for Scientific and Industrial Research
CV	Curriculum Vitae
CWDP	Coastal Waters Discharge Permit
DAFF	Department of Agriculture, Forestry and Fishery
DAH	Dissolved-phase Aromatic Hydrocarbons
dB	Decibel
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DMR	National Department of Mineral Resources
DP	Dynamic Positioning
DPS	Dynamic Positioning System
DSR	Demand Side Response
DWAF	Department of Water Affairs and Forestry
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EBSAs	Ecologically and Biologically Significant Areas
ECC	Emergency Control Centre
EEZ	Exclusive Economic Zone
EHP	Environmental Health practitioner
EHS	Environmental Health and Safety
EKZNW	Ezemvelo KZN Wildlife
EIA	Environmental Impact Assessment
EIR	Environmental Implementation Review
EMBF	Enhanced Mineral Oil Based Fluid
EMEPSAL	ExxonMobil Exploration and Production South Africa Limited
EMF	Environmental Management Framework

EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EOC	Emergency Operations Centre
EPAs	Estuary Protected Areas
ERM	Environmental Management Resources
ERR	Emergency Response Room
ERP	Emergency Response Plan
ESG	Emergency Support Group
FAO	Food and Agricultural Organization
FMP	Fisheries Management Plan
FPSO	Floating Production Storage and Offloading Vessel
FSR	Final Scoping Report
GCLME	Guinea Current Large Marine Ecosystem
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GPS	Global Positioning System
GWP	Global Warming Potential
GRT	Gross Registered Tonnage
GSLWP	Greater St Lucia Wetland Park
ha	Hectares
HCFC	Halons and hard chlorofluorocarbons
HIV	Human Immunodeficiency Virus
HQ	Head Quarter
HSE	Health Safety & Environment
HSEQ	Health Safety Environment & Quality
HSSE	Health Safety Security & Environment
HydroSAN	South African Navy Hydrographic Office
Hz	Hertz
I&APs	Interested and Affected Parties
IA	Impact Assessment
IAEA	International Atomic Energy Agency
IBAs	Important Bird Areas
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICRC	International Commission on Radiological Protection
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IMO	International Maritime Organization
in ³	Cubic Inch
IOGP	International Association of Oil & Gas Producers
IOPP	International Oil Pollution Prevention
IOTC	Indian Ocean Tuna Commission
IPCC	Intergovernmental Panel on Climate Change
IPIECA	International Petroleum Industry Environmental Conservation
ISO	International Organization for Standardization
ITOPF	International Tanker Owners Pollution Federation
ITCZ	Intertropical Convergence Zone
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
IWCF	International Well Control Forum
JNCC	Joint Nature Conservation Committee
KCDM	King Cetshwayo District Municipality
KCl	Potassium Chloride
kg	kilogram

km	Kilometer
km ²	Square kilometer
kt	kilotonnes
KZN	KwaZulu-Natal
LC ₅₀	Lethal Concentration 50%
LM	Local Municipalities
LNG	Liquefied Natural Gas
LTMBF	Low Toxicity Mineral Oil Based Fluids
LWD	Logging while Drilling
m	Meter
m ³	Cubic Meter
m/s	meter per second
mg/m ³	milligram per cubic meter
MARPOL	International Convention for the Prevention of Pollution by Ships
MEDEVAC	Medical Evacuation
MES	Minimum Emission Standards
mg	milligram
MGO	Marine Gas Oil
MIG	Municipal Infrastructure Grant
MLRA	Marine Living Resources Act
mm	Millimeter
MM	Metropolitan Municipality
MMH	Ministry of Mines and Hydrocarbons
MMO	Marine Mammal Observer
MPAs	Marine Protected Areas
MPRDA	Mineral and Petroleum Resources Development Amendment
MPRDAA	Mineral and Petroleum Resources Development Amendment Act
MSD	Marine Sanitation Device
NABF	Non Aqueous Base Fluid
NaCl	Sodium Chloride
NADF	Non-aqueous drilling fluid
NAPA	National Action Plan for Adaptation to Climate Change
Navtext	Navigational Telex
NDP	National Development Plan
NE	North-east
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMAQA	National Environmental Management: Air Quality Act
NEMBA	National Environmental Management Biodiversity Act
NEMICMA	National Environmental Management: Integrated Coastal Management Act
NEMWA	National Environmental Management: Waste Act
NOSCP	National Oil Spill Contingency Plan
NO _x	Oxides of Nitrogen
NOWCP	National Oiled Wildlife Preparedness & Response Plan
NTS	Non-Technical Summary
N ₂ O	Nitrous oxide
OGP	Oil & Gas Producers
OIM	Offshore Installation Manager
OPRC	Oil Pollution Preparedness, Response and Co-operation
OSCP	Oil Spill Contingency Plan
OSRL	Oil Spill Response Limited
OSRP	Oil Spill Response Plan
OWRP	Oiled Wildlife Response Plan
Pa	Pascal
P&A	Plug & Abandonment
PAH	Polycyclic Aromatic Hydrocarbons

PAM	Passive Acoustic Monitoring
PASA	Petroleum Agency South Africa
POB	Personnel on Board
PM2.5	Particulate Matter < 2.5 µm
PM10	Particulate Matter < 10 µm
PPE	Personal Protective Equipment
ppm	Parts Per Million
PPP	Public Participation Process
PS	Performance Standard
PSC	Production Sharing Contract
PSV	Platform Supply Vessel
RBIDZ	Richards Bay Industrial Development Zone
RDP	Reconstruction and Development Programme
RO	Reverse Osmosis
ROV	Remote Operated Vehicle
s	Second
SA	South Africa
SAHRA	South African Heritage Resource Agency
SAMSA	South African Maritime Safety Authority
SANBI	South African National Biodiversity Institute
SBF	Synthetic Based Fluids
SDCEA	South Durban Community Environmental Alliance
SDF	Spatial Development Framework
S&EIR	Scoping and Environmental Impact Report
SEZ	Special Economic Zones
SO ₂	Sulphur dioxide
SO _x	Sulphur oxide
SOLAS	International Convention for the Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SMP	Stakeholder Management Plan
SNC	Second National Communication
SSB	Single Side Band
SSHE	Security Safety Health and Environment
SWIS	Subsea Well Intervention Services
TAE	Total Applied Effort
TB	Tuberculosis
TOPS	Threatened Or Protected Species
TSS	Total Suspended Solids
UNCLOS	United Nations Convention on Law of the Sea
UNEP	United Nation Environment Programme
UNFCCC	UN Framework Convention on Climate Change
USAID	United States Agency for International Development
UTM	Universal Transverse Mercator
VHF	Very High Frequency
VOC	Volatile Organic Compound
VOS	Voluntary Observing Ship
VSP	Vertical Seismic Profile
WBF	Water Based Fluid
WBM	Water Based Mud
WCCP	Well Control Contingency Plan
WCMC	World Conservation Monitoring Centre
WESSA	Wildlife and Environment Society of South Africa
WGS84	World Geodetic System 1984
WIOFish	Western Indian Ocean Fisheries
WML	Waste Management Licence
WMP	Waste Management Plan
WWC	World Water Council

Contents

1	INTRODUCTION	1-1
1.1	PROJECT BACKGROUND	1-1
1.2	PURPOSE OF THIS REPORT	1-1
1.3	SUMMARY OF EIA PROCESS	1-1
1.4	PROJECT PROPONENT	1-1
1.5	THE EIA TEAM	1-1
1.6	UNDERTAKING BY EAP	1-1
1.7	EIA REPORT REQUIREMENTS AS PER EIA REGULATIONS GNR 982/2014	1-1
1.8	STRUCTURE OF THE EIA REPORT	1-1
2	ADMINISTRATIVE AND LEGAL FRAMEWORK	2-1
2.1	INTRODUCTION	2-1
2.2	OVERVIEW OF 'ONE ENVIRONMENTAL SYSTEM'	2-1
2.3	KEY RELEVANT LEGISLATION	2-1
2.4	OTHER APPLICABLE LEGISLATION	2-1
3	PROJECT DESCRIPTION	3-1
3.1	INTRODUCTION	3-1
3.2	PROJECT NEED AND DESIRABILITY	3-1
3.3	PROJECT LOCATION	3-1
3.4	EXPLORATION DRILLING PROGRAM AND PROJECT SCHEDULE	3-1
3.5	MAIN PROJECT COMPONENTS	3-1
3.6	PROJECT ACTIVITIES PER PHASES	3-1
3.7	PLANNED EMISSIONS AND DISCHARGES, WASTE MANAGEMENT	3-1
3.8	UNPLANNED EMISSIONS AND DISCHARGES	3-1
3.9	PROJECT ALTERNATIVES	3-1
4	BASELINE CONDITIONS	4-1
4.1	OVERVIEW	4-1
4.2	PROJECT AREA	4-1
4.3	ENVIRONMENTAL BASELINE	4-1
4.4	SOCIO-ECONOMIC BASELINE	4-1
4.5	SUMMARY OF KEY SENSITIVITIES	4-1
5	PUBLIC PARTICIPATION	5-1
5.1	PUBLIC PARTICIPATION OBJECTIVES	5-1
5.2	LEGISLATIVE CONTEXT	5-1
5.3	PUBLIC PARTICIPATION ACTIVITIES	5-1
5.4	<u>FEEDBACK FROM OPEN HOUSE MEETINGS</u>	5-1
5.5	SUMMARY OF STAKEHOLDER CONCERNS	5-1
6	IMPACT ASSESSMENT METHODOLOGY	6-1
6.1	INTRODUCTION	6-1

6.2	<i>IMPACT IDENTIFICATION AND CHARACTERISATION</i>	6-1
6.3	<i>DETERMINING IMPACT MAGNITUDE</i>	6-1
6.4	<i>DETERMINING RECEPTOR SENSITIVITY</i>	6-1
6.5	<i>ASSESSING SIGNIFICANCE</i>	6-1
6.6	<i>MITIGATION POTENTIAL AND RESIDUAL IMPACTS</i>	6-1
6.7	<i>RESIDUAL IMPACT ASSESSMENT</i>	6-1
6.8	<i>CUMULATIVE IMPACTS</i>	6-1
7	<i>ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF PLANNED ACTIVITIES</i>	7-1
7.1	<i>INTRODUCTION</i>	7-1
7.2	<i>IDENTIFICATION AND SCREENING OF KEY IMPACTS</i>	7-1
7.3	<i>PLANNED OPERATIONS: KEY ENVIRONMENTAL IMPACTS</i>	7-1
7.4	<i>PLANNED OPERATIONS: KEY SOCIAL IMPACTS</i>	7-1
7.5	<i>CUMULATIVE IMPACTS FROM PLANNED OPERATIONS</i>	7-1
7.6	<i>IDENTIFICATION AND SCREENING OF POTENTIAL CUMULATIVE IMPACTS</i>	7-1
7.7	<i>EVALUATION OF POTENTIAL CUMULATIVE IMPACTS</i>	7-1
8	<i>UNPLANNED /ACCIDENTAL EVENTS</i>	8-1
8.1	<i>INTRODUCTION</i>	8-1
8.2	<i>METHODOLOGY</i>	8-1
8.3	<i>ASSESSMENT OF ACCIDENTAL OIL SPILL AND BLOWOUT</i>	8-1
9	<i>ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)</i>	9-1
9.1	<i>INTRODUCTION</i>	9-1
9.2	<i>OBJECTIVES</i>	9-1
9.3	<i>CONTENTS OF AN EMPR</i>	9-1
9.4	<i>DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER</i>	9-1
9.5	<i>SITE AND PROJECT DESCRIPTION</i>	9-1
9.6	<i>POTENTIAL IMPACTS ASSESSED</i>	9-1
9.7	<i>IMPLEMENTATION OF EMPR</i>	9-1
9.8	<i>SPECIFIC MANAGEMENT PLANS</i>	9-1
9.9	<i><u>INSURANCE</u></i>	9-1
9.10	<i>ENVIRONMENTAL MANAGEMENT PROGRAMME COMMITMENTS REGISTER</i>	9-1
9.11	<i>MONITORING</i>	9-1
9.12	<i>AUDITING</i>	9-1
10	<i>SUMMARY AND CONCLUSION</i>	10-1
10.1	<i>INTRODUCTION</i>	10-1
10.2	<i>SUMMARY OF IMPACTS IDENTIFIED AND ASSESSED</i>	10-1
10.3	<i>RECOMMENDATIONS</i>	10-1
10.4	<i>CONCLUDING STATEMENT</i>	10-1
11	<i>REFERENCES</i>	11-1

LIST OF ANNEXES

Annex A Details of EAP and Declaration

Annex B Public Participation Documents

Annex B1 Stakeholder Database

Annex B2 Initial Notification

Annex B2.1 Notification Letter

Annex B2.2 Advert

Annex B2.3 Background Information Document

Annex B3 Site Notices

Annex B4 Scoping Notification

Annex B4.1 Initial Draft Scoping Report Notifications

Annex B4.1.1 Notification Letter

Annex B4.1.2 Release of the Initial Draft Scoping Report

Annex B4.1.3 Withdrawal of Draft Scoping Report

Annex B4.2 Re-release of Draft Scoping Report

Annex B4.2.1 Notification Letter

Annex B4.2.2 Adverts

Annex B4.2.3 Public Meeting Notification

Annex B4.2.4 Extension of Commenting Period

Annex B4.3 Scoping Presentation

Annex B5 EIA Notification

Annex B5.1 Notification Letters

Annex B5.1.1 Notification of Public Meeting

Annex B5.1.2 Notification of Postponement of Public Meeting

Annex B5.2 Notification of Lapse

Annex B6 Draft EIA Comment Phase

Annex B6.1 Open House Meetings

Annex B6.1.1 Notification Letter

Annex B6.1.2 Newspaper Adverts

Annex B6.1.3 SMS Notification

Annex B6.2 Notification of isiZulu EIA

Annex B6.2.1 Email Notification

Annex B6.2.2 SMS Notification

Annex B6.3 Proof of Receipt of EIA Report

Annex B6.4 Posters

Annex B6.5 Registers

Annex B6.6 Open House Meeting Observations

Annex B7 Site Website

Annex B8 Comments and Responses Report

Annex B9 Comments Received

Annex B10 Comments Received Post-Commenting Period

Annex C Authority Communications

Annex C1 Final Scoping Report Acceptance

Annex C2 EA Acknowledgement from PASA

Annex C3 Meeting with Eastern Cape EDTEA

Annex C3.1 Minutes of Meeting with Eastern Cape EDTEA

Annex C3.2 Presentation to Eastern Cape EDTEA

Annex C4 Meeting with Ezemvelo KZN Wildlife

Annex C4.1 Minutes of Meeting with Ezemvelo KZN Wildlife

Annex C4.2 Presentation to Ezemvelo

Annex C5 Communication with Commenting Authorities

Annex C5.1 Notification Letter

Annex C5.2 Email Notifications

Annex C5.3 Ezemvelo KZN Wildlife Acknowledgement

Annex C5.4 KZN DAFF Response

Annex C5.5 Communication with SAHRA

Annex C6 Comments Received from Commenting Authorities

Annex C6.1 Comments Received from SAHRA

Annex C6.2 Comments Received from Ezemvelo KZN Wildlife

Annex D Specialist Studies

Annex D1 Marine Ecology

Annex D2 Fisheries

Annex D3 Maritime Heritage

Annex D4 Oil Spill Modelling

Annex D5 Cuttings Modelling

Annex D6 Peer Review of ERM Oil Spill Report Cuttings Modelling

Annex D7 NTS of ERM Oil Spill Report

Annex D8 Social Baseline

Annex D9 Specialist CV's

Annex E Financial Provisions

Annex F Final Environmental Management Programme Report

Annex G Glossary

1.1 PROJECT BACKGROUND

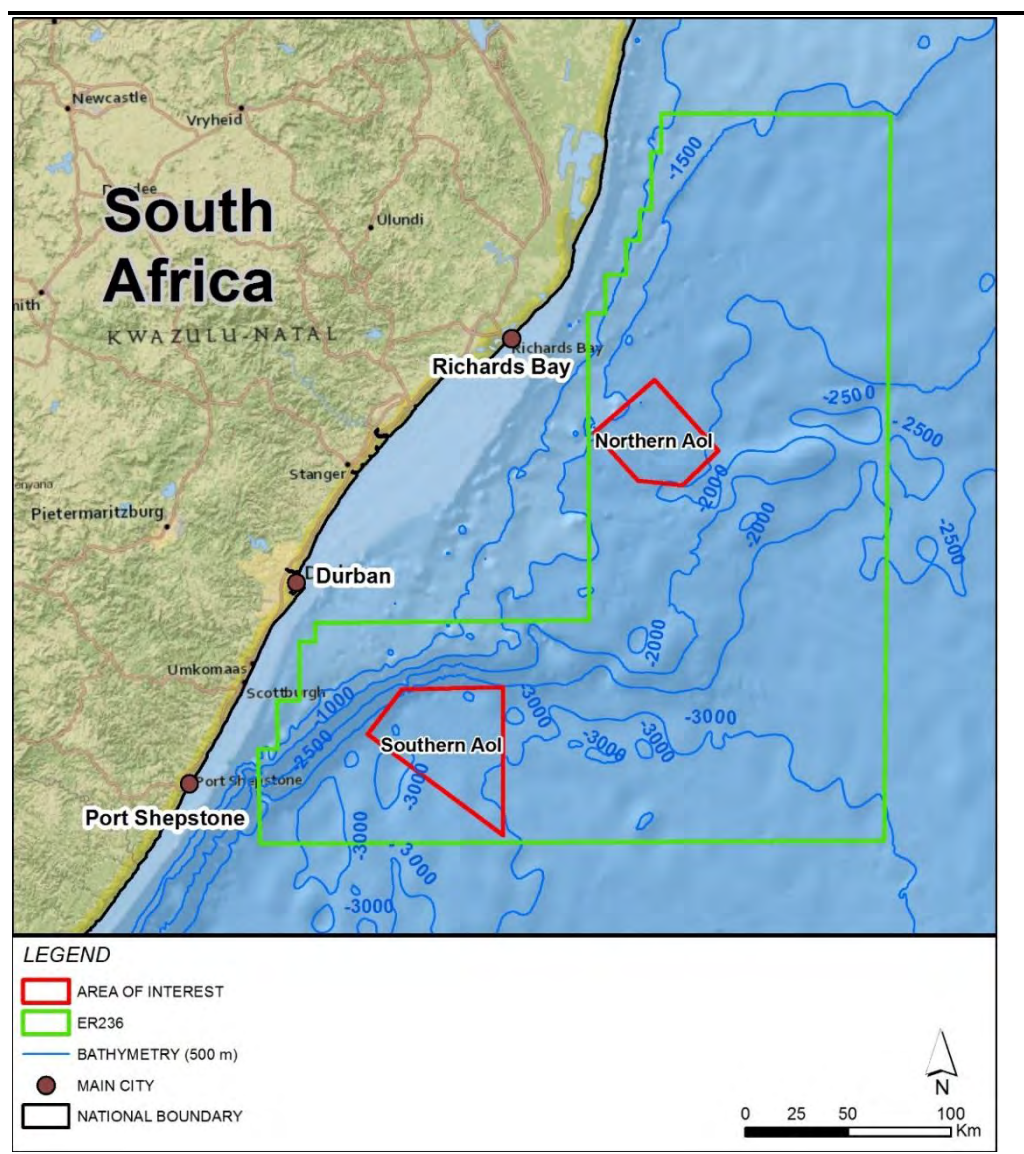
Eni South Africa BV (Eni), and Sasol Africa Limited (Sasol) hold an Exploration Right off the East Coast of South Africa. Eni and Sasol are considering the possibility of conducting an exploration drilling programme in Block ER236 (12/3/236) to assess the commercial viability of the hydrocarbon reservoir for future development.

Eni is considering drilling up to six deep water wells within Block ER236, four wells within the 1,717.50 km² northern area of interest, in water depths ranging between 1,500 m and 2,100 m and two wells within the 2,905 km² southern area of interest (*Figure 1.1*), in water depth ranging between 2,600 m and 3,000 m. The specific number of wells and their locations would be based on a number of factors, including further analysis of geological data, the geological target (the hydrocarbon bearing geology into which the well is to be drilled), and the presence of any seafloor obstacles. In addition, the success (if valuable hydrocarbon is discovered) of the first well in each area will determine whether or not subsequent wells are drilled. The drilling of the northern and the southern areas of interest will be undertaken as two separate campaigns, commencing either in the northern or southern area of interest.

The drilling of the first exploration well is planned for some time between November 2019 and March 2020, dependent on drillship availability, amongst a number of other planning requirements. The expected drilling depth would be approximately 3,800 m and 4,100 m from the sea surface, through the seabed, to target depth in the northern area of interest, while at around 5,100 m in the southern area of interest. The drilling of one well is expected to take in the order up to 71 days to complete.

Depending on the success of the first well within the northern area of interest, up to three additional wells comprising an additional exploration well at a second location and the possibility of one appraisal close to each exploration well location, may be drilled to establish the quantity and potential flow rate of any hydrocarbon present. The time sequence of these possible additional wells will be dependent on the results of the first exploration well, and will not occur immediately after the drilling of the initial well. Within the southern area of interest, one potential exploration well may be drilled and a possible appraisal well depending on the results of the first well. Well testing may be conducted on the appraisal wells if they present potential commercial quantities of hydrocarbon.

Figure 1.1 Locality Map



1.2 PURPOSE OF THIS REPORT

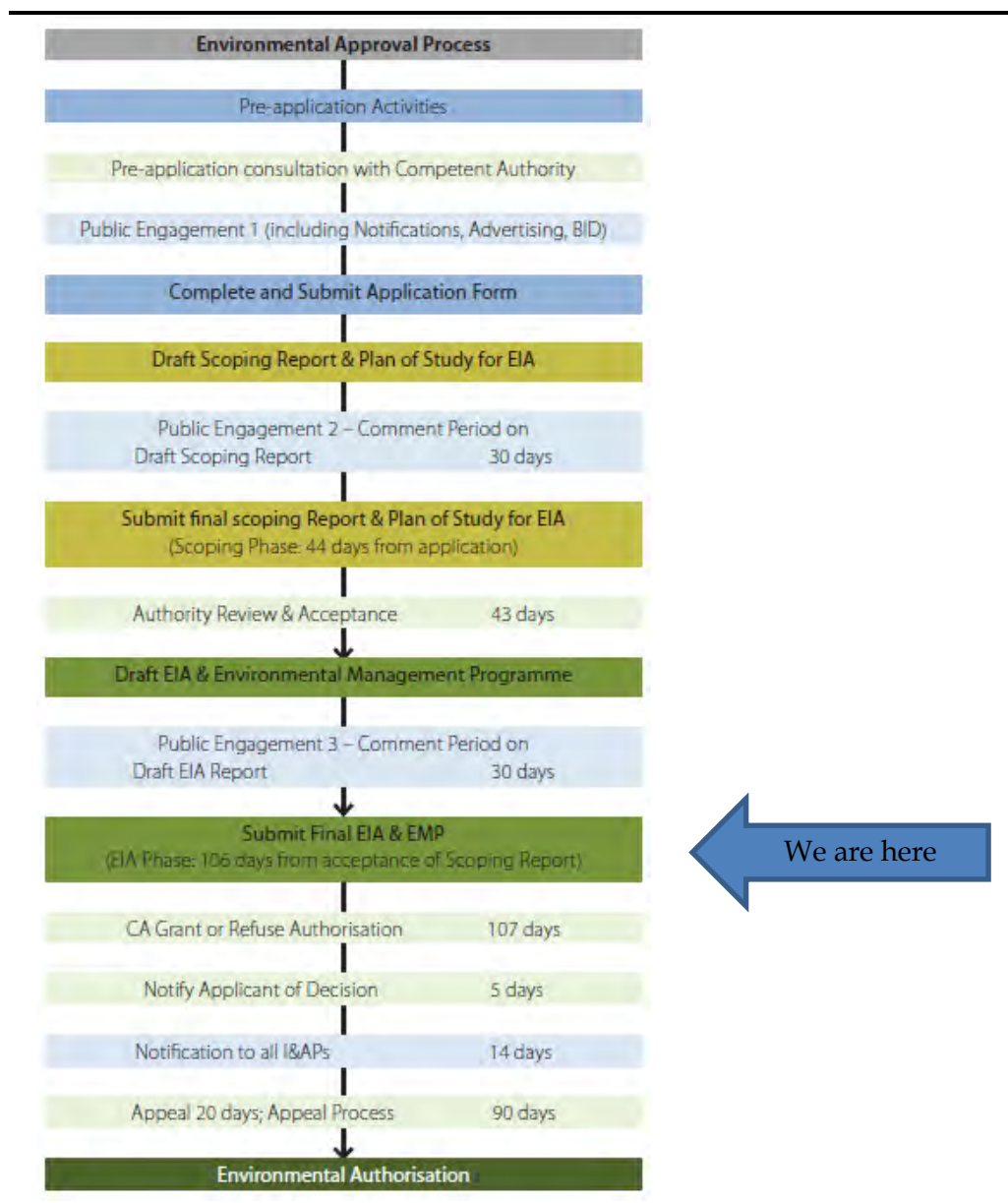
ERM has been appointed by Eni to undertake the full Environmental Impact Assessment (EIA) process as per the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations, 2014 (as amended in 2017). The project requires Environmental Authorisation (EA) from the National Department of Mineral Resources (DMR), through the Petroleum Agency South Africa (PASA). The authorisation would be under NEMA. Since this is an offshore oil and gas project, the DMR is the competent authority, which means that it has powers to either authorise the development or refuse it.

This Final EIA Report summarises the EIA process undertaken to date and provides an overview of the proposed project, affected environment and the findings of the specialist studies. It also assesses the significance of the potential impacts of the proposed project and determines measures to manage and mitigate these impacts.

The EIA process in South Africa is regulated by the NEMA Environmental Assessment Regulations (GNR R982/2014) as amended. The overall process required is illustrated in *Figure 1.2* and has been adhered to up until the current stage (which is submission of the final EIA Report for decision-making). A summary of the timeline is as follows:

- Pre-application consultation with Competent Authority- 5 September 2017.
- Public Engagement 1 (including Notifications, Advertising, Background Information Document)- 15 September – 21 September 2017.
- Complete & Submit Application form- Application acknowledged by PASA on 29 January 2018.
- Draft Scoping Report & Plan of Study for EIA- 26 October 2017.
Withdrawal of Draft Scoping report – 07 November 2017. Re-release of Draft Scoping Report- 22 January 2018.
- Public Engagement 2 (30 day Comment Period on Draft Scoping Report).
- Submit Final Scoping Report & Plan of Study for EIA (Scoping Phase: 44 days from application)- 22 January 2018- 1 March 2018.
- Submit Final Scoping Report & Plan of Study for EIA (Scoping Phase: 44 days from application)- 22 January 2018.
- Authority Review & Acceptance Scoping Report (43 Days)- Accepted on 16 April 2018.
- Amended Application for the EIA phase approved by PASA 29 August 2018.
- Draft EIA & Environmental Management Programme- Released on 25 September 2018.
- Public Engagement 3 (30 day Comment Period on Draft EIA Report)- 25 September 2018 – 8 November 2018.
- Submit Final EIA & EMP (EIA Phase: 106 days from acceptance of Scoping Report)- 14 December 2018.

Figure 1.2 Prescribed EIA Process and Timeframe



Source: ERM, 2017

1.3.1 Pre-Assessment Public Participation (Initial Notification)

The EIA process is initiated through a pre-assessment Public Participation Process (PPP). The pre-assessment process is not a mandatory requirement in terms of the EIA regulations (2014) but is beneficial in order to identify Interested and Affected Parties (I&APs). As part of this process, adverts announcing the project were released in four newspapers; namely the Mercury (English), Isolezwe (isiZulu), Ilanga (isiZulu) and the Zululand Observer (English). These adverts were released during the week of 18 September 2017.

1.3.2 *Application*

On 22 January 2018, the Environmental Authorisation Application Form together with the Draft Scoping Report was submitted to PASA. PASA is responsible for evaluating the Environmental Authorisation Application for this project. PASA is then expected to enter into negotiations with the applicant (Eni) and make recommendations to the Minister of Mineral Resources (Competent Authority) on the acceptability of the application.

1.3.3 *Scoping*

A principal objective of the Scoping Phase is to identify the key environmental, social and health issues and those project activities with the potential to contribute to, or cause, impacts to the environmental and social receptors.

At the Scoping Phase, the key issues are identified (often together with input from key stakeholders) and understood to a level, which allows the definition of the Plan of Study for the EIA Report.

Issues that are not relevant are scoped out. This enables the resources for the EIA process to be focused on collecting required information and identifying significant impacts while carrying out specialist studies and stakeholder engagement activities in an effective and efficient manner.

Specifically, the objectives of the Scoping Phase are to:

- Understand the legislative context and establish a description of baseline conditions;
- Identify project alternatives and preferred options for the proposed development;
- Identify stakeholders and plan or initiate communication with these stakeholders so as to gather issues of concern;
- Identify potential significant impacts; and
- Develop the Plan of Study for the EIA Report, which sets out the proposed approach to the EIA process, potential impacts to be evaluated and methodology to be used.

The following steps have been undertaken as part of the Scoping Phase, and are described below:

- Pre-application correspondence with the PASA;
- Desktop review of available information;
- Preparation of the Draft Scoping Report;
- Submission of application form;

- Release of Draft Scoping Report for public comment; and
- Finalisation of Scoping Report for submission to PASA.

The Draft Scoping Report was made available to stakeholders on 22 January 2018¹, for a period of 30 days, through the project website, selected libraries and hard copies (provided on request). Adverts were published on 22 January 2018 in four newspapers, The Mercury (in English) and Isolezwe (in Zulu) and The Zululand Observer and Ilanga Newspaper (in Zulu), to advertise the release of the Draft Scoping Report and public engagement sessions.

During the 30 day comment period (ended on 5 March 2018), three public engagement sessions were undertaken from 7 to 9 February 2018 in Richards Bay, Durban and Port Shepstone respectively.

Based on specific stakeholder request, an additional (fourth) follow up meeting was held on 28 February 2018 at the Austerville Community Hall. An isiZulu language translator was present at this meeting as requested. Stakeholders comments and answers have been included in a Comment and Responses Report (CRR), compiled and included as an annex in the final Scoping Report (FSR). The objective of the stakeholder engagement undertaken was to present the proposed project and EIA process as well as identify associated issues, concerns and opportunities. Further details on the stakeholder consultation and engagement process are included in *Chapter 5*.

The final Scoping Report (including Plan of Study) was submitted to PASA on 8 March 2018 for consideration. PASA's Approval Letter of the final Scoping Report was issued on 16 April 2018.

1.3.4 Baseline Data Collection

This Final EIA Report provides a description of the existing biophysical, biological and socio-economic conditions as a basis against which the impacts of the project can be assessed. The baseline includes information on receptors and resources that were identified during Scoping as having the potential to be significantly affected by the proposed project. The description of the baseline has the following main objectives:

- To identify the key physical, biological and socio-economic resources and conditions in areas potentially affected by the project;
- To describe, and where possible quantify, their characteristics (i.e. their nature, condition, quality and extent);
- To provide data to aid the prediction and evaluation of possible impacts;

¹ *It should be noted that an earlier version of the Draft Scoping Report was released for comment on 27 October 2017. Due to a change in project scope, a notification was sent out on 7 November 2017 to notify stakeholders that the report would be re-released for a full 30 day comment period in early 2018.

- To inform judgements about the importance, value and sensitivity or vulnerability of resources and receptors; and
- To serve as a reference for future monitoring of impacts of the project.

Secondary data that were collected as part of the desktop study included the following (as a minimum):

- Integrated Development Plans (IDPs) of the Province and the District including Local Economic Development Plans (LEDs);
- Spatial Development Frameworks (SDF);
- Environmental Management Frameworks (EMF);
- State of Environment Reports (SOER);
- Growth and Development Strategy (GDS) of the Province;
- A desktop review of Statistics South Africa Data (Census 2011); and
- Other reporting from developments in surrounding blocks.

Further to this, Marine Ecology, Fisheries and Heritage Assessments were conducted to determine the baseline conditions of the Project Area. The Project Area is offshore of the KwaZulu-Natal (KZN) coast, between St Lucia and East London and includes the entire Block ER236.

1.3.5 *Lapse of Application and New Application*

The final Scoping Report was submitted to PASA on 8 March and approved on 16 April 2018. Due to unforeseen delays in the finalisation of the specialist studies for the exploration drilling within Block ER236, subsequent delays in the drafting of the EIA Report were experienced. Consequently, the Draft EIA Report could not be disclosed to the public for within the regulated 106 day timeframe (i.e. by the 3 August 2018) as prescribed in Section 23(1)(a) of the NEMA EIA Regulations. As such, the EIA Application lapsed on the 3 August 2018.

Subsequent to the lapsing of the application, Eni re-applied for environmental authorisation. There had been no changes to the baseline environmental and social conditions described in the Final Scoping Report (which was approved by PASA on 16 April 2018). In accordance with Section 21(2)(a) and (b) of the NEMA EIA Regulations, Eni was authorised to commence with the new EIA process with the submission of an amended application form and the release of the Draft EIA Report for comment. PASA confirmed the acceptability of this approach on 29 August 2018 (refer to Annex C) and authorized the Final EIA Report to be submitted for decision by 14 December 2018.

1.3.6 *Impact Assessment*

Impact assessment and development of mitigation measures is an iterative process that commences during the Scoping stage and continues throughout the EIA process. The key objectives of this process are as follows:

- To analyse how the project may interact with the baseline conditions in order to define, predict and evaluate the likely extent and significance of environmental, social and health impacts that may be caused by the project.
- To develop and describe acceptable and cost effective mitigation measures that avoid, reduce, control, remedy or compensate for negative impacts and enhance positive benefits.
- To evaluate the predicted positive and negative residual impacts of the project.
- To develop a system whereby mitigation measures will be integrated with the project and will be taken forward as commitments.
- This is achieved through the development of a final Environmental Management Programme, included in *Chapter 9* and *Annex F*.

The objectives of the impact assessment process described above may thus be summarised by reference to the following four main steps:

- Prediction of what will happen as a consequence of project activities;
- Evaluation of the importance and significance of the impact;
- Development of mitigation measures to manage significant impacts where practicable; and
- Evaluation of the significance of the residual impact.

Where significant residual impacts remain after mitigation measures are applied, further options for mitigation may be considered and impacts re-assessed until they are reduced to as low as reasonably practicable (ALARP) levels.

This approach takes into account the technical and financial feasibility of mitigation measures. The methodology used to assess the significance of impacts from planned activities is described in more detail in *Chapter 6* of this report.

In addition to predicted impacts from planned activities, described in more detail in *Chapter 7*, those impacts that could result from an accident or a non-routine event within the project are taken into account in *Chapter 8*. In these cases the likelihood (probability) of the event occurring is considered. The impact of non-routine events is therefore assessed in terms of the risk, taking into account both the consequence of the event and the probability of occurrence.

1.3.7

Management Planning

The range of measures to mitigate impacts identified through the EIA process is included within the Project Description and Impact Assessment chapters in this report. These have been brought together in the Environmental Management Programme (EMPr) for the project (*Chapter 9* and *Annex F*).

The EMPr consists of the set of management, mitigation and monitoring measures to be taken during implementation of the project, to eliminate adverse environmental and socioeconomic impacts, offset them, or reduce them to acceptable levels. The plan details the specific actions that are required to implement the controls and mitigation measures that have been agreed through the EIA process, including details on monitoring, responsible parties, documentation and reporting.

1.3.8

Reporting and Disclosure

The Draft EIA Report was released on 25 September 2018 for a 30 day comment period. A notification letter was sent to all registered I&APs on the stakeholder database to inform them that a new EIA process has been initiated and that the Draft EIA Report was available for comment.

Adverts were published on 18 September in the Mercury (in English) and the Zululand Observer (in English) and on 21 September 2017 in the Ilanga and Isolezwe Newspapers (in Zulu), to advertise the release of the Draft Scoping Report and public engagement sessions.

The report was available online on the project webpage (www.erm.com/eni-exploration-eia) and at the following locations:

- Durban Central Lending Public Library
- Port Shepstone Library
- Richards Bay Library
- East London Central Library
- Nelson Mandela Bay Municipality – Linton Grange Library

Further to this, the 30 day comment period was extended by another 14 days (closing on 8 November 2018) to accommodate the release of the isiZulu translated Draft EIA Report. This was following open house meetings held in KwaZulu-Natal, where I&APs requested that the report be translated into isiZulu. This report was made available online on the project webpage as well as at the abovementioned locations on 18 October 2018. Additionally, some hard copies of the report (in English and isiZulu) have been made available at the Austerville library.

A notification letter has been sent to all registered I&APs on the project database and the report is available online on the project webpage (www.erm.com/eni-exploration-eia) and at the public locations mentioned above to communicate the timeframe extension for comment period to the Draft EIA Report.

A Comments and Response Report, reflecting stakeholder comments received during the stakeholder engagement process and responses by ERM, specialists and the proponent has been prepared and included in Annex B of this report. This forms an integral part of and must be read in conjunction with the Final EIA Report.

1.3.9 *Final EIA Report submittal*

This document, the Final EIA Report, has been updated based on comments received on the Draft EIA Report. The report was updated to address stakeholder concerns and clarifications (Annex B). These changes are underlined to enable stakeholders to see easily that their comments have been taken into consideration.

The Final EIA Report will be submitted to PASA on 14 December 2018 for its decision.

A notification letter will be sent to all registered I&APs on the project database and the report is available online on the project webpage (www.erm.com/eni-exploration-eia) and at the public locations mentioned above. The Competent Authority then have 107 days to adjudicate and a further 5 days to notify Eni of the decision reached. Once the decision is reached, ERM are obligated to notify all registered I&APS of such decision and provide details on the reasons for the decision, conditions of such decision and opportunity to appeal if required.

1.4 *PROJECT PROPONENT*

The contact details for the applicant are presented below:

Box 1.1 Contact Details of Project Applicant / Proponent

Eni South Africa BV
1st Floor, Icon Building c/o Cube WS
Cnr Lower Long St. & Hans Strijdom Rd.
Foreshore, 8001, Cape Town, South Africa
Wrk: +27 21 412 1582
Contact person: Nicole Lomberg
HSE & Sustainability Coordinator

1.5 *THE EIA TEAM*

ERM is a global environmental consulting organisation employing over 5,000 specialists in over 150 offices in more than 40 countries. In South Africa, ERM Southern Africa employs over 150 environmental consultants out of offices in Johannesburg, Durban and Cape Town.

1.5.1

Declaration of Independence

The requirement for environmental consultants to act independently and objectively is a well-established principle in South African law and elsewhere. The EIA regulations (GN R.982, as amended), specifically state that an EAP (environmental assessment practitioner) (must have) no business, financial, personal or other interest in the activity, application or appeal in respect of which that EAP is appointed in terms of these Regulations other than fair remuneration for work performed in connection with that activity; or that there are no circumstances that may compromise the objectivity of that EAP in performing such work.

ERM is a privately owned company registered in South Africa. ERM has no financial ties to, nor is ERM a subsidiary, legally or financially, of Eni. Remuneration for the services by the Proponent in relation to this report is not linked to an approval by the decision-making authority. Furthermore, ERM has no secondary or downstream interest in the development.

The role of the environmental consultants is to provide credible, objective and accessible information to government and other stakeholders, so that an informed decision can be made about whether the project should proceed or not.

The ERM team selected for this project possesses the relevant expertise and experience to undertake this EIA process. As such, ERM has signed the legally required declaration of independence to function as an objective Environmental Assessment Practitioner (EAP).

The CV and the declaration of independence from the Independent Environmental Practitioner are presented in *Annex A*. The contact details of the EAP for the application are presented in *Box 1.2*

Box 1.2

Contact Details of the EAP

Environmental Resources Management Southern Africa (Pty) Ltd.

Postnet Suite 90

Private Bag X12

Tokai

7966

Vicky Stevens

1st Floor | Great Westerford | 240 Main Road | Rondebosch | 7700

Cape Town | South Africa

T +27 21 681 5400 | F +27 21 686 0736

E eni.exploration.eia@erm.com

The core EIA team members and specialists involved in this EIA Report are listed in *Table 1.1*.

Table 1.1 The EIA Team

Name	Organisation	Role	Qualifications, Experience
Ingeborg McNicoll	ERM	Project Director	BSc (Hons) Marine Biology. 35 years' experience
Vicky Stevens	ERM	Project Manager and EAP	MSc (oceanography), 12 years' experience
Lindsey Bungartz	ERM	Social and Stakeholder Engagement Specialist	BSocSc (Hons), 10 years' experience
Dr Andrea Pulfrich	Pisces Environmental Services (Pty) Ltd	Marine Ecology Specialist	PhD (Fisheries Biology), 20 years' experience
Dr David Japp	Capricorn Marine Environmental (Pty) Ltd (CapMarine)	Fisheries Specialist	MSc (Ichthyology and Fisheries Science), 30 years' experience
Sarah Wilkinson			BSc (Hons) Oceanography and Botany, University of Cape Town, 14 years' experience
Dr John Gribble	ACO Associates CC	Maritime Heritage Specialist	BA (Hons), MA Archaeology, 20 years' experience
Michael J. Fichera	ERM	Oil Spill and Drill cuttings modelling Specialist	B.S. in Civil Engineering and an M.E. in Environmental Engineering, 25 years' experience
Mr Stephen Luger	PRDW	Modelling Peer Reviewer	MSc Engineering, 24 years' experience

1.6 UNDERTAKING BY EAP

Section 16 (1) (b) (iv), Appendix 1 Section 3 (1) (r), Appendix 2 Sections 2 (1)(i) and (j) and Appendix 3 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs from stakeholders and interested and affected parties;
- 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; and
- The level of agreement between the EAP and interested and affected parties on the Plan of Study for undertaking the environmental impact assessment.

As such, ERM and the practitioners managing the project confirm the following:

- To the best of our knowledge that the information provided in this Report is the most recent detail provided by the proponent and specialists thus far in the process.
- Comments and associated response are included in *Annex B* and summarised in a comments and responses report (CRR).
- Information provided to and communication with stakeholders is included in *Annex B*.

1.7 EIA REPORT REQUIREMENTS AS PER EIA REGULATIONS GNR 982/2014

Table 1.2 illustrates the legislated content of the EIA Report.

Table 1.2 *Legislated Content of EIA Report (GNR 982/2014) and Corresponding Sections in this Report*

Legislated Content- Appendix 3 Section 3	Section in this Report
(a) details of-	
(i) the EAP who prepared the report	Chapter 1 and Annex A
(ii) the expertise of the EAP, including a curriculum vitae	Chapter 1 and Annex A
(b) the location of the activity	Chapter 3
(i) the 21 digit Surveyor General code of each cadastral land parcel;	
(ii) where available, the physical address and farm name;	
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	
(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-	Chapter 3
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	
(d) a description of the scope of the proposed activity, including:	
(i) all listed and specified activities triggered and being applied for; and	Chapter 2
(ii) a description of the associated structures and infrastructure related to the development (including the need and desirability of the project, as well as the No-Go option)	Chapter 3
(e) a description of the policy and legislative context within which the development is located and explanation of how the proposed development complies with and responds to the legislation and policy context;	Chapter 2
(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;	Chapter 3
(g) a motivation for the preferred development footprint within the approved site;	Chapter 3
(h) a full description of the process followed to reach the proposed development footprint within the approved site, including:	
(i) details of all the development footprint alternatives considered;	Chapter 3

Legislated Content- Appendix 3 Section 3	Section in this Report
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Chapter 5 and Annex B
(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;	Chapter 8 and Annex B
(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 4 and Annex D
(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated.	Chapters 7 and 8
(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	Chapter 6
(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	Chapters 7 and 8
(viii) the possible mitigation measures that could be applied and level of residual risk	Chapters 7, 8 and 9
(ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and	N/A
(x) a concluding statement indicating the preferred alternative development location within the approved site;	Chapters 3 and 7
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-	Chapters 3 and 7
(i) a description of all environmental issues and risks that were identified during the environmental impact process; and	Chapters 7 and 8
(ii) an assessment of the significance of each issue and risk and an identification of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Chapters 7 and 8
(j) an assessment of each identified potentially significant impact and risk, including-	Chapters 7 and 8
(i) cumulative impacts;	Chapters 7 and 8
(ii) the nature, significance and consequences of the impact and risk;	Chapters 7 and 8
(iii) the extent and duration of the impact and risk;	Chapters 7 and 8
(iv) the probability of the impact and risk occurring;	Chapters 7 and 8
(v) the degree to which the impact and risk can be reversed;	Chapters 7 and 8
(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	Chapters 7 and 8
(vii) the degree to which the impact and risk can be mitigated;	Chapters 7 and 8
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Chapters 7 and 8

Legislated Content- Appendix 3 Section 3	Section in this Report
(l) an environmental impact statement which contains-	
(i) a summary of the key findings of the environmental impact assessment;	Chapters 7 and 8
(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	Chapter 3
(iii) a summary of the positive and negative impacts of the proposed activity and identified alternatives;	Chapter 10
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Chapter 9 and <u>Annex F</u>
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through assessment;	Chapters 3 and 7
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Chapter 9 and <u>Annex F</u>
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Chapters 7 and 8
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 10
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	N/A
(s) an undertaking under oath or affirmation b the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Annex A
(t) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Annex E
(u) an indication of any deviation from the approved Scoping Report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation; (v) any specific information that may be required by the competent authority; and	Chapter 7 and Chapter 8
(w) any other matters required in terms of section24(4)(a) and (b) of the Act.	N/A

The structure of this EIA Report is shown in *Table 1.3*.

Table 1.3 *Proposed EIA Report Structure*

Chapter Number	Contents Heading	Explanatory Note
	Acronyms and Abbreviations	A description of the abbreviations and acronyms used in the report.
	Non- Technical Summary	Summary of the entire EIA Report.
1	Introduction	This <i>Chapter</i> outlines the development and structure of the EIA Report including the background, terms of reference, EIA process approach and declaration.
2	Administrative Framework	This <i>Chapter</i> outlines the policy, legal and institutional framework within which the EIA process has been conducted.
3	Project Description	This <i>Chapter</i> provides the project motivation, as well as a concise description of the project and its geographical and temporal context. It will include a site description, an overview of the project design and details of project inputs and outputs. <u>The need and desirability of the project is explained in this Chapter and the No- Go option is also described herein.</u>
4	Baseline Condition	This <i>Chapter</i> summarises the available baseline data on the environmental and social resources and receptors within the Project Area. It will be based on secondary data sources and will consider changes in the baseline condition without the development in place. Specialist input has been included in the <i>Chapter</i> .
5	Public Participation Process	This <i>Chapter</i> presents the results of consultation undertaken as part of the EIA process, plus plans for future consultation. It identifies key project stakeholders and present their feedback on the project.
6	Impact Assessment Methodology	This <i>Chapter</i> provides the methodology used to assess the impacts of the project on the bio-physical, terrestrial and socio-economic environment.
7	Impact Assessment – Planned Activities	This <i>Chapter</i> documents the predicted positive and negative impacts of the project, outline general and specific mitigation measures to reduce, remove or avoid negative impacts to environmental and social receptors as well as measuring for monitoring these impacts. Any residual impacts (post mitigation) are outlined. Cumulative impacts are assessed as appropriate.
8	Impact Assessment – Unplanned/ Accidental Events	This <i>Chapter</i> documents the predicted impacts of unplanned events and provides mitigation measures to reduce, remove or avoid negative impacts to environmental and social receptors as well as measuring for monitoring these impacts.
9	Environmental Management Programme (EMPr)	The EMPr draws together the possible mitigation measures; group them logically into components with common themes; define the specific actions required and timetable for implementation; identify training needs, institutional roles and responsibilities for implementation.
9	Conclusion	This <i>Chapter</i> provides conclusions based on the assessment as well as outline any further

Chapter Number	Contents Heading	Explanatory Note
		recommendations.
Bibliography & References		All references made in the report and documents drawn upon during the course of the assessment
Annexes		<ul style="list-style-type: none"> • Annex A: Details of Environmental Assessment Practitioner and Declaration of Independence • Annex B: Public Participation Process • Annex C: Authority Communications • Annex D: Specialist Studies • Annex E: Financial Provision • <u>Annex F: Environmental Management Programme</u> • <u>Annex G: Glossary of Terms</u>

2.1 INTRODUCTION

This *Chapter* provides an overview of legislation, conventions and information documents that have informed the scope and content of this report and the approach to the EIA process.

2.2 OVERVIEW OF ‘ONE ENVIRONMENTAL SYSTEM’

In 2007 / 2008, the Department of Environmental Affairs (DEA) and the Department of Mineral Resources (DMR) agreed that environmental regulation would be removed from the scope of the MPRDA and would be regulated under NEMA, which would give rise to a “One Environmental System” for the country relating to mining and related activities. The implementation of this was given effect by the National Environmental Management Amendment Act, 2008 (No. 62 of 2008) (NEMAA) and the Mineral and Petroleum Resources Development Amendment Act, 2008 (No. 49 of 2008) (MPRDAA).

Subsequent to 8 December 2014, all applications for Environmental Authorisations (EA’s), including those for mining and petroleum related activities, previously regulated in terms of the MPRDA, must now be undertaken in terms of NEMA and the associated EIA Regulations.

2.3 KEY RELEVANT LEGISLATION

2.3.1 *Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)*

The primary legislation governing the South African upstream mining and petroleum sector is the MPRDA. Although the MPRDA governs South Africa’s petroleum industry as well as its mining industry, petroleum activities are primarily accommodated within a separate chapter of the statute; namely, *Chapter 6*. *Chapter 6* of the statute makes provision for two permits (reconnaissance permits and technical co-operation permits) and two rights (exploration rights and production rights).

In terms of the MPRDA, an Exploration Right must be approved prior to the commencement of exploration activities. Eni and Sasol hold an existing Exploration Right for ER236, which is currently in its first two year renewal period, as of 11 July 2017.

The Act should be read together with the Mineral and Petroleum Resources Development Regulations, 2004 (GNR.527 of 23 April 2004); (MPRDA Regulations) and it should be noted that MPRDA Amendment Bill was withdrawn in August 2018 with new oil and gas legislation currently in development. This would, however, not change the Environmental Authorisation process or requirements in terms of NEMA.

2.3.2 *National Environmental Management Act (Act No. 107 of 1998)*

The National Environmental Management Act (No.107 of 1998) (NEMA) is the South African framework legislation with respect to environmental protection and management. Section 2 of NEMA provides a range of environmental principles that are to be applied by organs of state when making decisions that significantly affect the environment. Two of the key principles include:

- Environmental management must place people and their needs at the forefront, and serve their physical, psychological, developmental, cultural and social interests equitably.
- Development must be socially, environmentally and economically sustainable.

NEMA also provides for the participation of Interested and Affected Parties (I&APs) and stipulates that decisions must take into account the interests, needs and values of all I&APs.

Section 28 of NEMA imposes a duty of care on every person who causes, has caused, or may cause significant pollution or degradation of the environment to take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring.

The Environmental Authorisation process in South Africa is governed by NEMA as amended and the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended) promulgated under NEMA. The relevance of this legislation is summarised below.

NEMA Environmental Authorisation

Chapter 5 of NEMA, as amended, outlines the general objectives and implementation of Integrated Environmental Management. This provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals that are likely to have a detrimental effect on the environment. Whilst Section 23 sets out the basic objectives and principles of the IEM procedure, Section 24 sets out how these objectives and principles are to be accomplished.

Regulations governing the environmental authorisation process have been promulgated in terms of NEMA and include the following:

- Environmental Impact Assessment Regulations (GNR R982/2014);
- Environmental Impact Assessment Regulations Listing Notice 1 (GNR 983/2014);
- Environmental Impact Assessment Regulations Listing Notice 2 (GNR 984/2014); and
- Environmental Impact Assessment Regulations Listing Notice 3 (GNR 985/2014).

*It should be noted that the above regulations were amended in April 2017 by Government Notices 324, 325, 326 and 327.

Activities that trigger GNR 983 and GNR 985 require a Basic Assessment Report (BAR) process to be undertaken, whereas activities identified in terms of GNR 984 will require a full Scoping and Environmental Impact Report (S&EIR) process. GNR 982 sets out the general procedure to follow when conducting either a BAR or S&EIR process.

With reference to the EIA Regulations 2014 (as amended), the identification of the competent authority states as follows:

‘The competent authority in respect of the activities listed in this part of the schedule is the competent authority in the province in which the activity is to be undertaken, unless-

- a) It is an application for an activity contemplated in section 24C(2) of the Act, in which case the competent authority is the Minister or an organ of state with delegated powers in terms of section 42(1) of the Act; and
- b) The listed or specified activity is or is directly related to:
 - i. **Prospecting or exploration of a mineral or petroleum resource;** or
 - ii. Extraction and primary processing of a mineral or petroleum resource.

It is therefore understood that the competent authority for this project will be the Department of Mineral Resources (DMR). As such, Eni will be required to obtain a positive Environmental Authorisation from the DMR prior to commencement of the proposed activities. The Petroleum Agency of South Africa (PASA) accept and process offshore petroleum EA applications on behalf of the DMR, however the DMR is required to sign off on the final decision.

Numerous trigger activities have been identified for this project in terms of all the listing notices (refer to *Table 2.1*).

In instances where all the listing notices are triggered (as in this project), GNR 984 requirements will take precedent and the project will be subject to a full Scoping & Environmental Impact Report process prior to commencement of any of the associated activities.

Table 2.1 *Listed Activities in Terms of the NEMA EIA Regulations, 2014 (as amended, 2017)*

Listed Activity	Activity Description	Project Trigger
GNR 983 Activity 14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	The proposed drilling operation would make use of infrastructure which would handle and potentially store oil, gas and/or fuel (diesel). Information on the anticipated storage capacity for these substances is currently not confirmed and this activity is included to provide for a situation where storage capacity exceeds 80 m ³ but falls below 500 m ³ .
GNR 983 Activity 22	The decommissioning of any activity requiring – (i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or (ii) a prospecting right, mining right, mining permit, production right or exploration 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.	In terms of Section 43(3) of the MPRDA, a closure certificate must be applied for upon, inter alia: <ul style="list-style-type: none"> the lapsing of an Exploration Right; or the relinquishment of any portion of the licence area. Based on the results of the well drilling programme, a decision would be made as to whether to permanently or temporarily abandon the wells. The possible abandonment of wells may result in a decision by Eni to relinquish the licence area or a portion thereof.
GNR 984 Activity 7	The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods— (i) in gas form, outside an industrial complex, using pipelines, exceeding 1,000 metres in length, with a throughput capacity of more than 700 tons per day; (ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1,000 metres in length, with a throughput capacity of more than 50 cubic metres per day;	The proposed project would make use of drilling infrastructure (e.g. pipes, casings etc.) which would potentially transport oil and/or gas to the drilling unit should a discovery be made. Due to the anticipated depth of the proposed wells, this infrastructure would exceed 1,000 m in length. The designed throughput capacity of this infrastructure could potentially exceed the thresholds specified in the listed activity.

Listed Activity	Activity Description	Project Trigger
GNR 984 Activity 14	The development and related operation of- (ii) An anchored platform; or (iii) any other structure or infrastructure on, below or along the sea bed	The proposed drilling operations would result in the placement of drilling equipment (ie a wellhead) on the seabed. In the case that a well is unsuccessful, the well will be abandoned and the BOP removed.
GNR 984 Activity 18	Any activity including the operation of that activity which requires an exploration right as contemplated in section 79 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including – (a) associated infrastructure, structures and earthworks;	Eni currently hold an Exploration Right for ER236. An Environmental Management Programme (EMPr) was undertaken for the initial Exploration Right application in terms of the MPRDA requirements at the time. The Work Programme approved for the Exploration Right and the EMPr did not cover the drilling of exploration wells. PASA has confirmed that an EIA in terms of NEMA is required to be undertaken for this activity.

Financial Provision Regulations, 2015

Section 24P of NEMA requires that the determination of financial provision is required by an applicant for EA relating to prospecting, mining, exploration, production or related activities on a prospecting, mining, exploration or production area (*Annex E*).

In terms of the National Environmental Management Act: Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, Operations (GN R1147, which came into effect on 20 November 2015, and the subsequent amendment published on 16 April 2018) an applicant or holder of a right must determine financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of exploration operations, as contemplated in the Act and to the satisfaction of the Minister of Mineral Resources. The financial provision determination and a decommissioning plan must be submitted to the Minister as part of the Environmental Authorisation application process.

The prescribed financial provision for the rehabilitation, management and closure of environmental impacts will be in place before the commencement of the drilling activities.

At the end of the operation (ie drilling and well completion) the well will be plugged and abandoned (“decommissioning”). This will involve setting cement plugs inside the wellbore and testing them for integrity. The BOP will be then retrieved at surface. A final seabed and wellhead inspection will be performed with an ROV and finally the drillship and support vessels will depart the area.

Financial provisions for well plugging and abandonment activities (decommissioning) is required and will be submitted to the Minister as part of the Environmental Authorisation application process. Refer to *Annex E* for the determination of financial provision related to the decommissioning plan of one exploratory well.

Eni will have the technical programme and associated costs of abandonment activities verified by an independent third party when setting up the guarantee. The financial provisions related to the decommissioning activities will be reviewed annually.

2.3.3 *National Environmental Management: Waste Act (Act No. 59 of 2008)*

Section 19 of National Environmental Management: Waste Act (No. 59 of 2008) (NEMWA) provides for the listing of waste management activities that have, or are likely to have a detrimental effect on the environment.

In accordance with this, GN 921 of 29 November 2013 lists waste management activities for which a waste management licence (WML) is required in terms of Section 20 of the Act. Furthermore, it classifies each of the waste management activities into different categories, with more onerous provisions assigned for activities that are regarded as being more detrimental to the environment. In this regard, 'Category A' activities require a NEMA BAR process to be conducted prior to commencement. 'Category B' activities require a full S&EIR process to be conducted, while 'Category C' activities are wholly exempt from the WML permitting process, as long as they show compliance with a set of prescribed standards.

It is ERM's understanding that a WML is not required for the currently proposed activities. However on finalisation of the drilling programme, should the predicted activities regarding waste change, Eni will review the requirements for a Waste Management Licence under the Act.

2.3.4 *National Environmental Management: Air Quality Act (Act No. 39 of 2004)*

National Environmental Management: Air Quality Act (No. 39 of 2004) (NEMAQA) deals with the control and management of emissions related to activities contained in the Listed Activities and Associated Minimum Emission Standards GN 893 of 22 November 2013 (MES). NEMAQA prescribes the need for an Atmospheric Emission Licence (AEL) if more than 10 kg of operational waste is incinerated per day. The AEL process involves the undertaking of a Basic Assessment in accordance with NEMA.

Should Eni decide to incinerate non-toxic combustible wastes on the drilling unit and support vessels, they would be required to apply to DEA: Air Quality Management Services for an AEL. It is however currently Eni's intention to bring all wastes to shore for appropriate disposal.

2.3.5

National Environmental Management: Integrated Coastal Management (No. 24 of 2008)

The National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) (NEMICMA) sets out a system of integrated coastal and estuarine management in South Africa to promote the conservation of the coastal environment and to ensure that the development and the use of natural resources within the coastal zone are socially and economically justifiable and ecologically sustainable. Section 69 of the NEMICMA prohibits the discharge of effluent that originates from a source on land into coastal waters except in terms of a CWDP issued by the DEA.

NEMICMA has also provided for the repeal of the former Sea-shore Act 21 of 1935 and the Dumping at Sea Control Act 73 of 1980.

Dumping Regulations

Dumping at Sea Regulations were published on 21 July 2017 in terms of sections 83(1) (g), (h), (k) and (r) of NEMICMA. These govern dumping permit applications as allowed for by section 71(1) of NEMICMA. However, it should be noted that, as per NEMICMA, dumping does not include:

- Disposing of, or storing in the sea any tailings or other material from the bed or subsoil of coastal waters generated by the lawful exploration, exploitation and associated off-shore processing of mineral resources from the bed, subsoil or substrata of the sea; and
- Operational waste from a vessel, aircraft, platform or other man-made structure at sea.

As such it is understood that a dumping permit would not be required for this project.

2.3.6

Marine Pollution (Control & Civil Liability) Act (No.6 of 1981) and South African Maritime Safety Authority Act (No. 5 of 1998)

In terms of the Marine Pollution (Control and Civil Liability) Act 6 of 1981, the Department of Transport is charged with the responsibility of ensuring that the appropriate actions are taken in order to minimise the impact of discharges of harmful substances (e.g. oil) from ships, tankers, or offshore installations. In terms of the South African Maritime Safety Authority Act 5 of 1998, the majority of these responsibilities are transferred to the South African Maritime Safety Authority (SAMSA). Section 52 of the SAMSA Act, however, delegates the responsibility for combating pollution of the sea and shoreline by oil to the Minister of Environmental Affairs (DEA). The implication of this is that the DEA is responsible for protection and clean-up measures to be taken once oil has been released into the sea, while SAMSA's responsibilities are limited to those actions required while the oil is within the confines of the ship.

Prior to drilling, an Oil Spill Contingency Plan will be required to be submitted to SAMSA for approval and issuance of a certificate. Both PASA and the DEA will be required to comment on the OSCP prior to issuing of the certificate by SAMSA.

2.4 OTHER APPLICABLE LEGISLATION

This section provides a list of other national and international legislation and conventions potentially applicable to the proposed project.

Additional authorisations or permits may be required in terms of such legislation, but fall outside the scope of this EIA process.

2.4.1 National Legislation

National legislation potentially relevant for the project (in addition to those presented in preceding sections) is listed below.

- Constitution of the Republic of South Africa (No. 108 of 1996);
- National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008);
- National Water Act (No. 36 of 1998);
- National Heritage Resources Act (No. 25 of 1999);
- National Environmental Management: Biodiversity Act (No. 10 of 2004);
- National Environmental Management: Protected Areas Act (No. 57 of 2003);
- Sea-Shore Act (No. 21 of 1935);
- Marine Living Resources Act (No. 18 of 1998);
- Occupational Health and Safety Act (No. 73 of 1989);
- Gas Act (No. 48 of 2001);
- Noise Control Regulations under the Environmental Conservation Act (No. 73 of 1989);
- Major Hazard Installation Regulations (GNR. 692 of 30 July 2001);
- Hazardous Substances Act (56 of 1973) and Regulations (No. 85 of 1983);
- Explosives Act (No. 15 of 2003);
- Electricity Regulation Act (No. 4 of 2006);
- Nature and Environmental Conservation Ordinance (No. 19 of 1974);
- Marine Pollution (Prevention of Pollution from Ships) Act (No. 2 of 1986);
- National Ports Act (No. 12 of 2005);
- Marine Traffic Act (No. 2 of 1981);
- Carriage of Goods by Sea Act, 1986 (No. 1 of 1986);
- Dumping at Sea Control Act, 1980 (No. 73 of 1980);
- 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 Nuclear Energy Regulator Act, 1999 (No. 47 of 1999);
- Nuclear Energy Act, 1999 (No. 46 of 1999);
- 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).

Applicable provisions from these laws and regulations will be incorporated into the design and implementation of the project.

2.4.2 *International Requirements*

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 (CBD), 1992;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973 (effective in 1975);
- Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1983; and

- RAMSAR Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971 (effective in 1975); and
- International Whaling Commission (IWC) resolution on addressing the impacts of anthropogenic underwater noise on cetaceans, 2018.

Other International Legislation and Agreements

- Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC), ratified in 2002;
- Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), 2015 (effective on November 2016);
- International Commission on Radiological Protection (ICRC); and
- International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material, 1984.

3.1 INTRODUCTION

This *Chapter* provides a description of the following topics:

- Need and desirability for the proposed project.
- Project location.
- Exploration drilling programme and schedule.
- Project information/ description, including the following:
 - Deep water drillship
 - Exclusion zone
 - Shore base
 - Supply and standby vessels
 - Personnel
 - Crew transfers
 - Infrastructure support and services.
- Project activities per phases
 - Mobilisation Phase
 - Drilling Phase
 - Well Execution Options
 - Well Testing Option
 - Well Abandonment (Plug and Abandonment “decommissioning”)
 - Demobilisation).
- HSE (Health, Environment and Safety) risk management during operations.
- Planned emissions and discharges.
- Unplanned emissions and discharges.
- Project alternatives, including the No-Go option.

3.2 PROJECT NEED AND DESIRABILITY

The Guideline on Need and Desirability, Department of Environmental Affairs (DEA), Pretoria, South Africa (2017); was used to guide this Chapter. As stated in the guideline; “need and desirability is based on the principle of sustainability”, implying that there must be a balanced approach in decision making.

The guideline further states that need and desirability of each application must be considered together with the content of "IDP¹s, SDF²s, EMFs³ and other relevant plans, frameworks and strategies" when considering each application. As such, this Chapter sets out the context of the proposed project, in light of the strategic local and national reporting available.

Fossil fuels (including gas and oil) play an important role in the socio-economic development of South Africa, while simultaneously providing the necessary infrastructural economic base for the country to become an attractive host for foreign investments in the energy sector (Ministerial foreword of the White Paper on the Energy Policy 1998).

The South African White Paper on the Energy Policy (1998) is the overarching policy document that has guided and continues to guide future policy and planning in the energy sector in South Africa. The white paper states that 'Government will ensure the optimal and environmentally sustainable exploration and development of the country's natural oil and gas resources to the benefit of all' and undertakes to 'ensure private sector investment and expertise in the exploitation and development of the country's oil and gas resources'. The successful exploitation of these natural resources would contribute to the growth of the economy and relieve pressure on the balance of payments.

The position of the National Development Plan (NDP) is reinforced in the Draft Integrated Energy Plan (IEP) (2016⁴), which seeks to determine how current and future energy needs can be addressed efficiently. Key objectives outlined in the plan include security of supply, minimising the cost of energy, diversity in supply sources and primary sources of energy and minimising emissions. The plan indicates that projected demand for crude oil will continue to increase in the medium to long term if current policies, politics and levels of access continue (IEP, 2016).

This is further supported by the Draft Integrated Resource Plan (2018) (Draft IRP), which has been published for public comment. The Draft IRP emphasizes the importance of developing gas supply options in South Africa (including from local production) as an alternative fuel for power generation activities.

The Guideline on Need and Desirability requires consideration of the financial viability of a project in terms of "justifiable economic development, measured against the broader societal short-term and long-term needs".

¹ Integrated Development Plan

² Spatial Development Framework

³ Environmental Management Framework

⁴ Still under public review and comment

Consideration of the needs and interests of the broader community are said to be reflected in the IDP, SDF and EMF of an area that must be considered. Chapter 4 details the socio- economic baseline of the affected areas, in line with findings of the applicable SFD/s and IDP/s. The current status of the broader communities are described in terms of contribution to workforce and GDP, access to basic services, access to basic infrastructure, key economic sectors, commercial fisheries and basic livelihood needs. The small scale fishery sector was identified as operating in “nearshore” waters unlikely to extend beyond 5.5 km from the coast. Such activities would not directly interact with the proposed drilling areas as the northern area of interest is located a minimum of 62 km offshore and the southern area of interest a minimum of 65 km offshore.

South Africa's current crude oil demand is over 600,000 barrels / day. South Africa currently imports approximately 70 percent of its liquid fuel, which comprises crude oil and finished products. The other approximately 30 percent is sourced from the local production of synfuels from coal and gas¹.

South Africa's current crude oil requirements are met by imports, mainly from the Middle East and Africa. Almost all crude oil is used for the production of liquid fuels, with a small percentage used towards lubricants, bitumen, solvents and other petrochemicals. As is the case elsewhere in the world, liquid fuels are primarily used to meet the country's transportation needs (IEP, 2016).

As a net importer of crude oil, and a developing country, South Africa is not in position to influence the price of crude oil. The South African liquid fuels industry is highly impacted by global developments and fluctuations in the crude oil price and the economy as a whole is therefore extremely vulnerable to the volatility of the global oil market (IEP, 2016).

Producing more oil and gas within South Africa is expected to contribute towards more stable prices, create new jobs and industries in the upstream and downstream oil and gas industry supply chain and sectors and counter volatility related to instabilities in major oil producing regions.

In addition, in mid-2014, the South African government launched Operation Phakisa², an approach that aims to enable South Africa to implement its policies and programmes better, faster and more effectively. One of Operation Phakisa's aims is to unlock the economic potential of South Africa's oceans. In this regard, four priority sectors have been selected as new growth areas in the ocean economy, including:

- Marine transport and manufacturing activities;

¹ http://www.energy.gov.za/files/petroleum_frame.html

² <https://www.operationphakisa.gov.za/pages/home.aspx>

- Offshore oil and gas exploration;
- Aquaculture; and
- Marine protection services and ocean governance.

The proposed exploration drilling provides an opportunity to fulfil Operation Phakisa's aim to unlock the oceans' economy by providing opportunities for oil and gas exploration in South African waters.

In light of the above, exploration success would result in long-term benefits for South Africa consisting of improved security of supply, in-country investments in a development project (including job creation), increased government revenues, contribution to economic growth and reduced dependence on the importation of hydrocarbons.

The Guideline of Need and Desirability states that "a risk averse and cautious approach (the precautionary principle) in the context of the protection of environmental rights is essentially about the assessment and management of risk." In line with this, the impacts and risks associated with the proposed project have been detailed in Chapter 7 and Chapter 8. In addition to embedded controls adopted to maintain a risk-averse approach, various client-specific standards have been presented to emphasise the proponent's commitment to identifying and managing foreseeable risks.

Additionally, various factors were taken into consideration during the alternatives assessment, where the risks associated with proposed options were screened in terms of environmental, health & safety, economical and engineering risks. The selection of the more feasible alternatives was conducted through this process and based on a risk-averse approach.

3.3

PROJECT LOCATION

Eni proposes to drill up to six deep water wells inside Block ER236, within **two areas of interest**:

- A **northern area of interest** of 1,717.50 km², which is located, at its closest point, approximately 62 km from shore, in water depths ranging between 1,500 m and 2,100 m (Figure 3.1).
- A **southern area of interest** of approximately 2,905 km², which is located, at its closest point, approximately 65 km from shore, in water depths ranging between 2,600 m and 3,000 m (Figure 3.1).

The expected drilling depth would be approximately 3,800 m and 4,100 m from the sea surface, through the seabed, to target depth in the northern area of interest, and around 5,100 m in the southern area of interest. The co-ordinates of the Block ER236 and each area of interest are provided in Table 3.1 and Table 3.2 respectively.

Figure 3.1 *Location of Block ER236, and the Northern and Southern Areas of Interest*

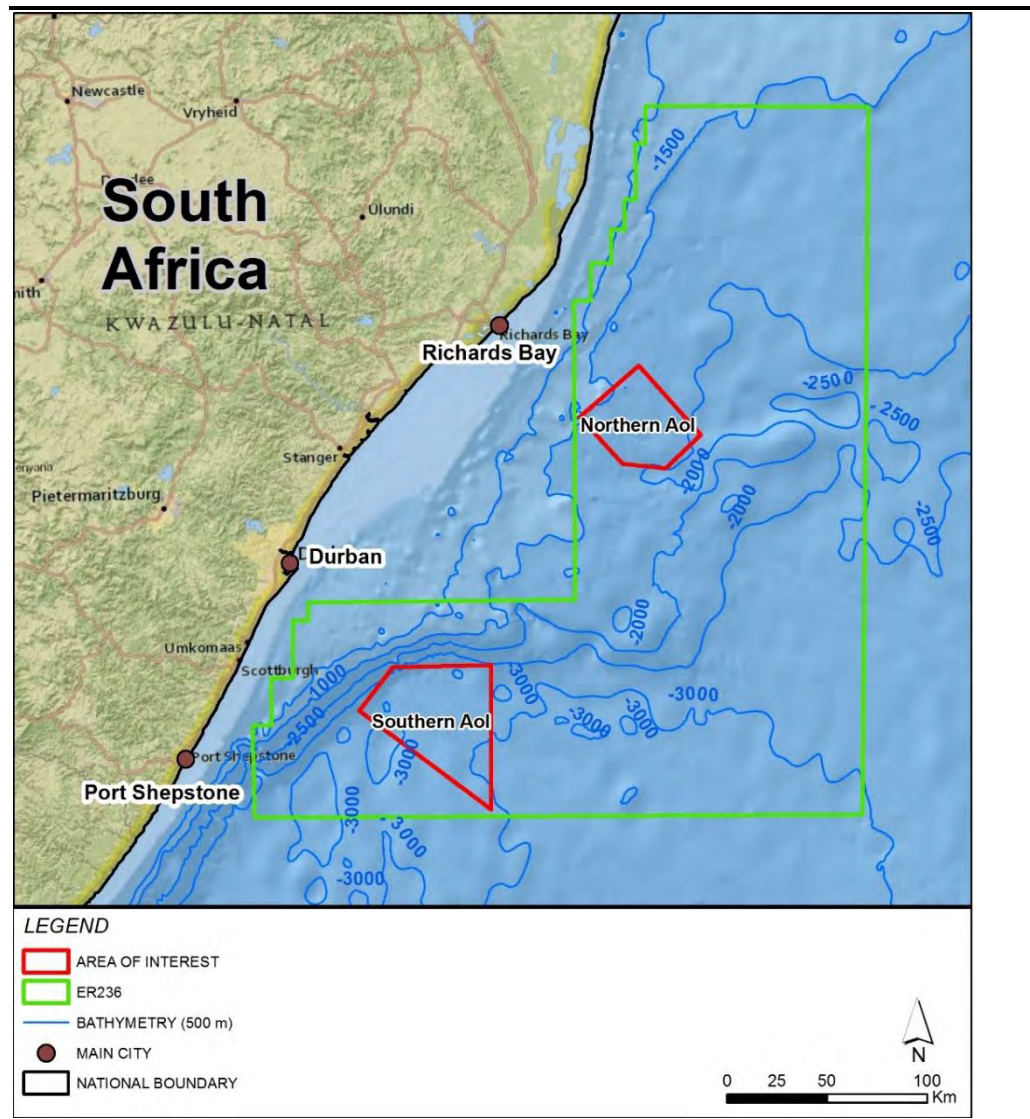


Table 3.1 *Coordinates of the Block ER236 (WGS84 UTM Zone 36S)*

Point	Latitude	Longitude
A	27°48'30"S	32°52'0"E
B	27°48'30"S	34°0'0"E
C	31°0'0"S	34°0'0"E
D	31°0'0"S	30°49'0"E
E	30°35'0"S	30°49'0"E
F	30°35'0"S	30°55'0"E
G	30°22'24,6"S	30°55'0"E
H	30°22'24,72"S	31°2'0"E
I	30°7'0"S	31°2'0"E
L	30°2'0"S	32°30'0"E
M	28°41'18"S	32°30'0"E
N	28°41'18"S	32°35'20"E
O	28°31'4"S	32°35'20"E
P	28°31'4"S	32°41'30"E
Q	28°21'59"S	32°41'30"E
R	28°21'59"S	32°45'40"E
S	28°13'51"S	32°45'40"E
T	28°13'51"S	32°49'0"E
U	27°58'47"S	32°49'0"E
V	27°58'47"S	32°52'0"E

Table 3.2 *Coordinates of the Northern Area of Interest (WGS84 UTM Zone 36S)*

Point	Latitude	Longitude
A	29° 12' 33,341"S	32° 31' 46.013"E
B	28° 58' 47.34"S	32° 49' 32.73"E
C	29°17'28.529"S	33°8'58.59"E
D	29°26'34.962"S	32°58'11.965"E
E	29°25'22.117"S	32°44'46.372"E

Table 3.3 *Coordinates of the Southern Area of Interest (WGS84 UTM Zone 36S)*

Point	Latitude	Longitude
A	30°19' 39.588"E	32° 3' 48.518"E
B	30°58' 35.904"E	32° 3' 25.921"E
C	30°31' 35.022"E	31° 22' 26.396"E
D	30°19' 49.794"E	31° 33' 7.656"E

The Drilling Program and Time Schedule proposed by Eni is to drill at least one exploration well within the northern or southern areas of interest between November 2019 and March 2020.

If the first exploration well shows a hydrocarbon discovery, the Eni Drilling Program and Project Schedule will be updated to include the drilling of up to two exploration drilling wells at different locations and up to three appraisal wells. Unlike the exploration wells, the appraisal wells will be tested and this is described further in this chapter. At the end of operations both kind of wells will be plugged and abandoned ("decommissioned").

The drilling of the exploration and/or appraisal wells will be undertaken as separate campaigns. In the event the exploration and appraisal wells identify a commercial interest for future field development, a further Schedule and Programme for the Development and Production phases will be prepared in a separate EIA process and therefore is not included in this EIA Report.

The drilling of one well is estimated to take approximately 71 days to complete. The time sequence and the number of additional exploration and appraisal wells (up to 6 wells as a maximum total number, including the first well drilled) will be dependent on the results of the first exploration well.

The starting location (within the northern or southern area), as well as the sequence of wells that is subject to the results of the first exploration well, and geology data interpretation, has not been identified yet.

The drillship will be mobilised from either West or East Africa and will enter South African waters either at the Namibian or Mozambican border; as such the longest mobilisation will take in the order of 5 days.

3.5

MAIN PROJECT COMPONENTS

This section describes the main project components and these include the following:

- Deep Water Drillship;
- Exclusion Zone;
- Shore base;
- Supply and stand-by vessels;
- Personnel;
- Crew transfer; and
- Infrastructure and services.

3.5.1

Deep Water Drillship

Various types of drilling vessels are used worldwide in offshore drilling operations, with the type of unit typically dependent on the water depths in which it needs to operate. The alternative drilling vessels types considered are discussed further in *Section 3.9.2*. Due to water depth in each area of interest, it is anticipated that exploratory drilling will be conducted using a deep water drillship. The deep water drillship (*Figure 3.2*) will be kept in position using a dynamic positioning system (DPS) which allows for minimal subsea disturbance due to its ability to operate without moorings. A significant benefit to using a drillship is the ease of mobility as it is a self-propelled vessel with the flexibility to move from location to location without the need of transport vessels. An example of deep water drillship specifications is presented in *Table 3.4* below.

Figure 3.2 Example of a Drillship



Source: Shutterstock, 2017

Table 3.4 **Example Drillship Specifications**

Parameter	Example Drillship
Principal Dimensions / Operating Parameters	
Length	228 m
Breadth	42 m
Depth	19 m
Operational draft	12 m
Transit draft	13 m
Maximum water depth	3,658 m
Maximum drilling depth	10,660 m
Moonpool	25.6 m x 10.26 m
Available Accommodation	200 People on Board (POB)
Storage Capacities	
Active mud	2,000 bbl
Reserve mud	10,000 bbl
Brine water	3,000 bbl
Base oil	3,000 bbl
Bulk mud/cement	34,500 bbl
Drill water	18,000 bbl
Fuel oil	50 000 bbl
Machinery / Equipment / Fittings	
Main generator sets	6 x diesel generators, 9, 900 HP each

Source: Eni, 2015 and Saipem, 2017¹

3.5.2 *Exclusion Zone*

During the drilling operations, there will be a temporary 500 m safety zone around the drillship, which will be enforced by a standby vessel. The safety zone will be described in a Notice to Mariners as a navigational warning. No fishing or marine traffic will be allowed to enter the 500 m safety zone for the duration of drilling operations.

The purpose of the safety zone is to prevent a vessel collision with the drillship during operations. Under the Marine Traffic Act, 1981 (No. 2 of 1981), an “exploration platform” or “exploration vessel” used in prospecting for or mining of any substance falls under the definition of an “offshore installation” and as such it is protected by a 500 m safety zone.

Under the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS, 1972, Part B, Section II, Rule 18), a drillship that is engaged in drilling operations is defined as a “vessel restricted in its ability to manoeuvre”, which requires that power-driven and sailing vessels (e.g. fishing vessels) give way to a vessel restricted in her ability to manoeuvre. Vessels engaged in fishing are required to, so far as possible, keep out of the way of the well drilling operation.

¹ http://www.saipem.com/SAIPEM_en_IT/scheda/Vessels/Saipem+12000.page

An onshore logistics base will be located in either Richards Bay or Durban, on an existing brownfield site (previously developed land) within the Port or the Industrial Development Zone (IDZ). A final decision will be undertaken after a logistic survey in the identified areas.

This base will include the following facilities:

- An open storage area partially equipped with pipe racks for drilling tubular material storage;
- A covered warehouse for drilling material and other minor equipment;
- A shelter for storage of consumables (cement, barite, bentonite); and
- Temporary offices for logistic base personnel (5 to 8 persons).
- Area for storage (less than 90 days) of less than 100 m³ general waste and 80 m³ hazardous waste at any one time.

Wastes will be transported to a licensed waste disposal facility by an appropriately permitted waste management contractor, and will not be stored within the base except for the time strictly necessary for unloading from the ship and loading on the trucks for transport to the disposal site.

The following maximum¹ potential space requirements have been identified:

- Open area/pipe yard: up to 6,000 m²;
- Warehouse: up to 500 m²; and
- Shelter: up to 100 m².

Eni plans to use existing infrastructure at either Richards Bay or Durban Ports to provide the transport, storage and bunkering facilities for the project. They will also utilise the existing bunkering facilities in the Port for the refuelling of the supply and support vessels.

It is anticipated that a temporary mud plant will be required for the mixing of base fluid, brine and solids to obtain the desired density and flow structure of the fluid, as well as for the storage of drilling fluids and completion brines.

The temporary mud plant will be located inside the shore base and will include two 80 m³ storage tanks for brine and mud.

Supply vessels providing fuel, food supplies, water etc. to the drillship would dock at the selected Port, which shall have a mooring area with minimum draft of 6.5 m and length of about 100 m.

¹ These values are the maximum potential values as the maximum storage capacity of the drillship is being investigated in order to reduce onshore requirements.

The location of the heliport at either of the ports, for crew change and MEDEVAC services will be determined once the logistic base location is confirmed.

3.5.4 *Supply and Standby Vessels*

For the duration of the drilling operation, the drillship will be supported by platform supply vessels (PSVs), which are general purpose vessels designed to carry a variety of equipment and cargo. These vessels will supply the drillship three to four times a week with drilling muds, cement and equipment such as casing, drill pipe and tubing. They will also remove waste that must be appropriately disposed of on land. The number of firm PSVs has not yet been defined (it is anticipated that there will be two or three).

A standby vessel (or a PSV in dual mode – supply and standby) will also be available to support the drilling operations during an emergency, including oil containment/recovery and rescue and to supply any specialised equipment necessary in case of an emergency. These vessels are equipped with products, tools and equipment (e.g. installation of booms, skimmers) to be used for immediate response in case of an unwanted oil or chemical spill into the sea.

The standby vessel will also be used to patrol the area to ensure that other vessels adhere to the 500 m exclusion zone around the drillship. The offshore presence of at least one vessel (standby or a PSV) 24/7 is mandatory for the duration of the drilling operations to guarantee immediate support in case of emergency situation (e.g. man overboard, spill containment).

3.5.5 *Personnel*

The shore base will be located either in Richards Bay or Durban and all shore based personnel will reside locally. The majority of on-shore staff to be employed will be local should a locally based logistics company exist and evaluated as suitable for operational logistics support and follow up. If not suitable, expatriate staff expert in drilling operations will integrate with and train inexperienced local staff. Eni representatives will also be located in the Cape Town office.

The drillship will accommodate around 150 to 200 personnel. The majority of staff employed will be expatriates due to the short-term nature of the work and the necessary expertise and required technical skills. In accordance with Eni's guidelines the vessel will be manned as a minimum in compliance with the requirements of the Flag State and the IMO Reg A 890 (21) – Principle of Safe Manning, dated 25 Nov. 1999. In addition, the crew must also be adequate in terms of number and qualifications to safely operate the vessel and to carry out all operations.

The number of personnel on the supply vessels will vary based on vessel size and the types of activities they support. The preferred option is to utilise a local vessel and staff, where possible, for drilling operations service. All workers will be provided with health and safety training and Personal Protective Equipment (PPE) suitable for the types of activities.

3.5.6 *Crew Transfers*

Transportation of personnel to and from the drillship will most likely be provided by helicopter operations from Richards Bay or Durban. The drillship will accommodate around 200 personnel. Crews will generally work in 12 hour shifts in 2 to 4 week cycles. Crew changes will be staggered, and in combination with ad hoc personnel requirements. Thus helicopter operations to and from the drillship will occur on an almost daily basis. The helicopter crew will generally work in 10 hour shifts in 2 to 4 week cycles and in accordance with Eni's Aviation Manual.

3.5.7 *Infrastructure Support and Services*

Freshwater

The project will require seawater and some limited industrial water for making the water based drilling muds for the tophole sections of the well and for rig cleaning. This industrial water will be transported from shore.

The drinking (potable) water for the personnel on the drillship will be either bottled water or provided by a reverse osmosis system. The amount of water used by the project will be managed by implementing Eni's sustainable water management guideline.

Fuel

Estimates for the fuel (marine gas oil) use per day by the drillship and supply vessels during transit, standby and drilling operations are provided in *Table 3.5* below. The estimated total fuel consumption during the mobilisation and drilling phase (approximately 5 days drillship mobilisation and 71 days drilling) by all the project vessels is provided in *Table 3.6*.

Table 3.5 *Estimated Daily Fuel Use by the Drillship and Supply Vessels*

Vessel	Mobilisation	Drilling phase
Drillship (tonnes/day)	90	30
Supply Vessels for Supply Service (tonnes/day/vessel)	10	10
Supply Vessel for Standby Service	4	4

Table 3.6 *Total Estimated Fuel Consumption by the Drillship and Supply Vessels*

Fuel Demand Estimate	Total fuel consumption (tonnes)
Drillship	2,580
Supply Vessel for Supply service	710
Supply Vessel for Standby service	284
Total	3,574

Food Supplies and Local Services

A catering company will provide food and beverages to the offshore vessels. Food selection, quantities, and sourcing will be undertaken with support from the shore base (coordinate local purchases, etc.), it has not as yet been confirmed; however it is likely that the bulk of food will be purchased in either Richards Bay or Durban.

3.6 *PROJECT ACTIVITIES PER PHASES*

Project activities associated with drilling include the following phases:

1. Mobilisation of the supply vessels to Richards Bay or Durban, operation of the shore-based facilities for handling support services needed by the drillship;
2. Drilling of a well (and subsequent 5 additional wells depending on the results of this initial well);
3. Well execution (side track, logging, completion) options;
4. Well testing for appraisal option;
5. Well abandonment (Plug and Abandonment “decommissioning”); and
6. Demobilisation of the drillship, vessel and local logistics base.

All activities will be conducted in conformity with recognised industry international best practice.

3.6.1 *Mobilisation Phase*

Vessel Mobilisation and Site Preparation

The drilling locations will be identified prior to mobilisation of the drillship based on the results of the analysis of seismic data. The drilling locations will be within the identified area of interest.

During mobilisation, the drillship will arrive directly on location from previous country of operation (probably from West Africa or East Africa).

Support vessels could sail directly in convoy with the drillship to site or from the Richards Bay or Durban mooring area.

The drillship will be equipped with navigation equipment for accurate station keeping above the well location (dynamic positioning – using thrusters). Once in position, the drillship will carry out its pre-drilling activities comprising seabed survey; remote operated vehicle (ROV) dive; positioning; beacon placement and dynamic positioning (DP) trials.

Should any obstacles/sensitivities be identified at the drilling location, the well will be relocated to a nearby location where no obstacles/sensitivities are located.

These activities will be followed up with safety checks, drills, communication tests and drilling of the pilot hole. This will take approximately nine days to complete.

3.6.2 *Drilling Phase*

Well Drilling

After mobilisation, the first phase is the drilling phase. The drilling sequence for the exploration drilling is not yet defined as it will depend on the first exploration well results. However, it is currently planned that the drilling of the northern and the southern areas of interest will be undertaken as two separate campaigns.

In order to evaluate and confirm the commercial viability of the reservoir, a vertical well will be drilled to a total depth of approximately 3,800 m and 4,100 m from the sea surface for the wells located in the northern area, and 5,100 m for the well located in the southern area. The expected hydrocarbon for these wells is oil.

A standard well design and programme for subsea well is described below. This will be updated after the completion of seismic interpretation and stratigraphy evaluation by the geologists and petroleum engineers. The final well path will be defined according to the reservoir target and final location of the wellhead at seabed, Eni's preference for drilling exploration wells is a vertical well profile.

During the drilling phase, different drilling bit sizes are used to drill a series of telescoping holes, from the seabed to the total depth of the planned well. The first hole, the outer, is the biggest and called the tophole, while the next inner holes are progressively smaller and smaller as the well depth increases. This continues until the final hole, which is the smallest, reaches the reservoir level. Further details with regard to the section diameters, depths and planned profile of the well are provided in *Figure 3.3* and *Figure 3.4*.

During the drilling process, drilling fluids/muds are pumped down the inside of the drill pipe and exit at the drill bit to optimise drilling operations. For the first sections (tophole) of the well, riserless drilling (i.e. without riser installed) will be carried out with seawater in conjunction with high viscous pills and sweeps. In the bottom sections of the well, riser drilling (i.e. with riser and Blowout Preventer installed on top of the wellhead), will be carried out with either water based mud (WBM), also called water base fluid (WBF), or non-aqueous drilling fluid (NADF). The mud programme will be defined based on final well design and expected rheology.

The main functions of drilling fluids (also referred to as drilling muds) include the following:

- Removal of drilled rock cuttings from the the bottom of the well and from the well bore and transportation of these cuttings to the surface;
- Control of formation pressures and prevention of formation fluids entering the well bore (i.e. 'primary well control');
- Transmission of hydraulic horsepower to the drill bit;
- Provision of hydrostatic pressure as well as chemical stability to the rock to maintain the integrity of the hole and prevent hole collapse;
- Corrosion control of the metal components of the drilling tools; and
- Lubrication and cooling of the drill bit.

The drill bit is connected to surface by a string of hollow tubulars referred to as the drill string. On the rig floor, drill pipes are attached, one by one, to the top of the string as the drill bit advances into the borehole. The action of drilling (creating a hole in the rocks stratigraphy) is obtained by applying weight and rotation to the bit.

The topdrive, installed in the drillship's derrick, advances the drill string into the well, and provides the rotation and weight on bit required to drill. To give additional torque, sometimes a downhole motor is installed at the bottom of the string, whose rotor is connected to the bit. A sophisticated telemetry system is connected to the string and it transmits to surface the drilling parameters (direction, pressure, rotation, weight etc.) to guarantee a full control and safety during the drilling phase.

Once each hole section has been drilled, casing (steel tubulars) is run into the well and cemented in place to secure/seal the hole interval just drilled and to allow for the drilling of the next (smaller) hole section. The cement operation consists of pumping cement down the drill string to the bottom. The cement flows, out the bottom of the casing shoe and back up into the annular space around the casing, the space between the cased hole and open hole. Casing

plus cement is a tested barrier that facilitates the drilling of the next section, allowing to reach the target final depth in the safest way.

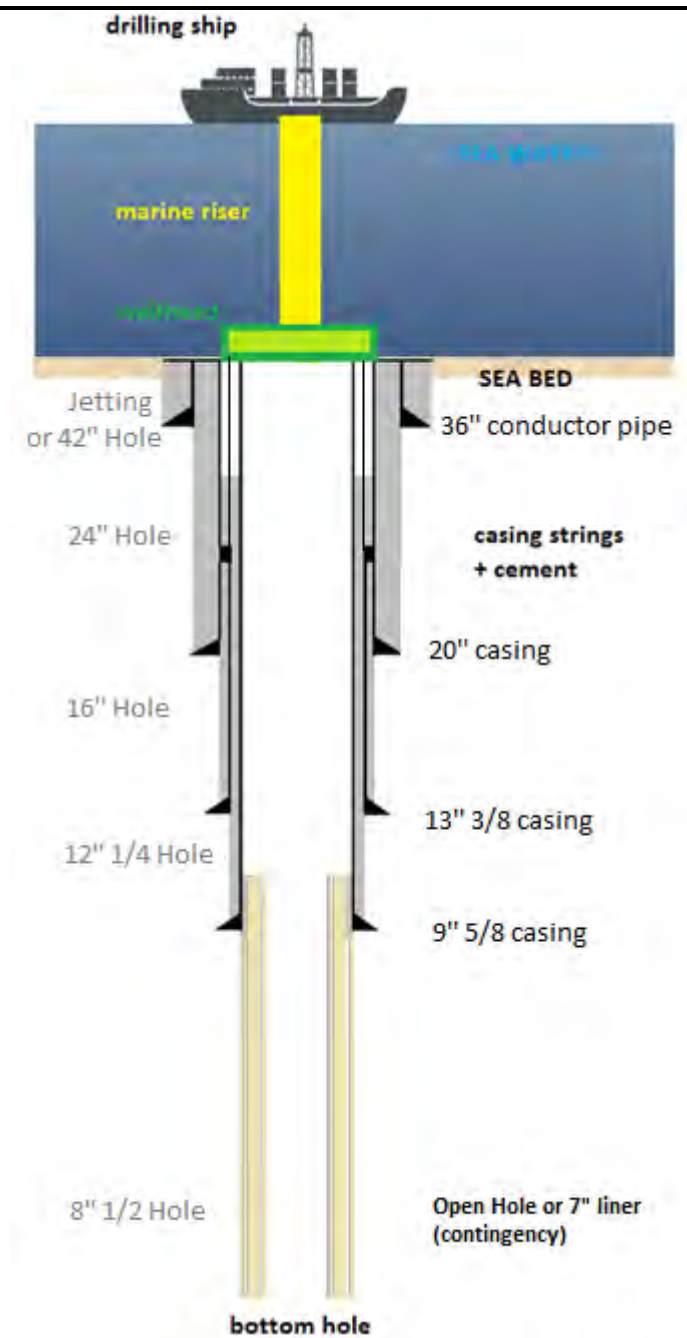
A wellhead is then connected to the surface casing, to have a connection and anchoring point for the following casing head sections and the marine riser. After drilling the first casing interval, a drilling riser, i.e. a hollow tube known as the 'marine riser' is run between the drillship and the wellhead at seabed, so that drilling fluid can be pumped through the drill pipe, out through the drill bit and circulated back up to surface through the marine riser.

During the riserless drilling stage (tophole section drilling), fluid and cuttings are discharged directly on the seabed in immediate proximity of the well.

Following installation of the riser (at the end of tophole section) excess seawater stored in tanks and excess drilling fluids will be discharged overboard. The amount of drill cuttings that will be discharged during the drilling of the planned well are described in *Section 3.7.2*.

The physical and chemical properties of the drilling fluid are constantly monitored and adjusted to suit varying down-hole conditions. These conditions are, in part, due to the variation in formation pressure within the well bore at different depths. In particular, fluid density (or mud weight) is adjusted via weighting materials such as barite.

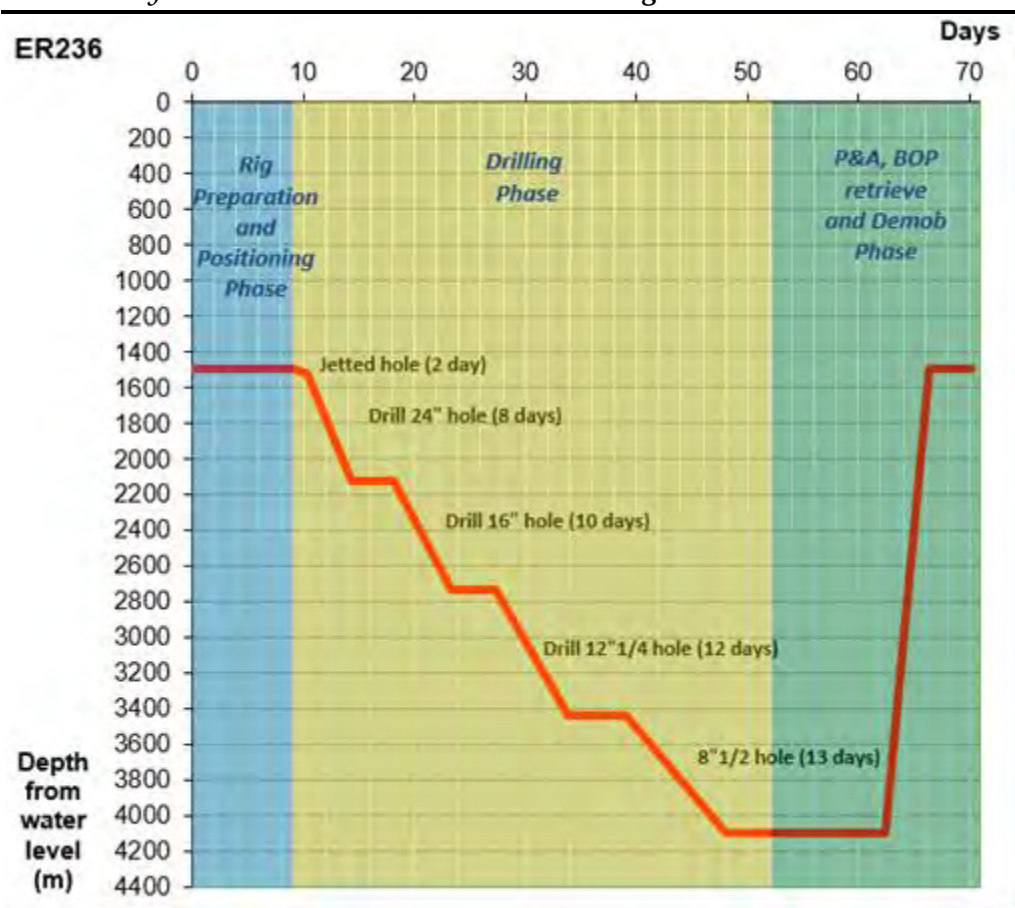
Figure 3.3 *Subsea Well Schematic at the End of Drilling Phase*



Source: ENI, 2018

Note: This drawing is not to scale, in particular for dimension of rig vs equipment and tubulars

Figure 3.4 Preliminary Well Construction Phases vs Drilling Time Schedule



Note: **45 days is the estimated time for the effective drilling phase. 71 days is the estimated overall time for a single well campaign without well testing and mobilisation but including drilling phase, casing runs, cement jobs, logs, BOP run and retrieve.

Source: Eni; 2018

3.6.3 Well Execution Options

Side track

In case of any issues related to stratigraphy (e.g. permeable zones with different pressure gradient, hole instability for fines presence, necessity to increase the inclination of the well to achieve the reservoir target) or problem during the drilling itself (e.g. BHA stuck) a common operation is to drill a sidetrack. A sidetrack usually is a combination of a cement plug, to abandon the current open hole, and the setting of a whipstock in the open hole or above the shoe of the last set casing/liner.

The whipstock is a metal tool that facilitates the re-entry with the drilling string, milling in case the cased hole, and resume drilling in the formation with a different orientation and inclination.

Well Logging

Different sensors are used throughout the drilling operation to measure several parameters in real time: mud weight, formation pressure, temperature, weight on bit, rotation, torque, velocity, hydrocarbon detection, gamma ray, resistivity, gas content in mud, cement bond, casing wear etc.

All those parameters are used to optimize the drilling operations, improve the hole stability and identify different lithology in order to constantly update the mud plan and verify that the geological stratigraphy is the same expected from the seismic data interpretation.

Real time logs are also very important to detect hydrocarbon presence and typology (oil, condensate, gas). This information is provided in real time both from bottom hole (sensor installed in bottom hole assembly) and at surface, where mud samples and cuttings are regularly tested to confirm data interpretation from sensors.

In this way it is possible to immediately detect mud losses, drilling break or influx (kick) of hydrocarbon, in particular in the annulus drilling string-open hole, in order to adopt as soonest the control measure (e.g. increase of mud weight or decreasing rate of penetration) and safely resume/continue operations.

A dedicated run to measure/log the cement bond and consistency in the annuli is performed at the end of each cement job, prior to start drilling operations in the next phase.

Further detailed information is obtained on the physical properties of the rock formations and fluids (water, oil, gas) by means of an open and cased hole logging using sensors introduced down-hole with a wireline cable, or coiled tubing unit.

This operation is usually performed at the end of the drilling phase, after the bottom hole final clean up.

The logging plan is developed in accordance with standard industry best practices. In the case of dry or exploration wells, once a full log of the reservoir section has been undertaken, the well will be plugged and abandoned. The completion phase, if confirmed in case of discovery, will be performed only for appraisal wells.

Well Completion

Well completion and well testing operations will not be conducted during drilling of exploration wells (first wells). However if hydrocarbon is discovered they may be performed after drilling of any appraisal wells.

The completion phase of an oil or gas well takes place after the reservoir formation has been drilled and the production casing cemented. Preliminary completion operations are usually required to clean and condition a wellbore from mud, in order to prepare the well for the following operations.

At the beginning of the completion operations, the wellbore is displaced with a completion brine, necessary to balance the downhole pressure and, at the same time, to complete the removal of mud and solids from the well in order to minimise any potential damage to the formation.

Brine is a particular type of WBM: basically it is a salty water, commonly a mixture of industrial water, NaCl or KCl salt and minor additional chemicals (e.g. corrosion inhibitor, de-foamer). The selection of salt and brine composition will be defined once the hydrocarbon has been discovered in the exploration well and reservoir lithology completely logged.

A specific tubular string, the completion string, is then run in hole. This string can be secondary named well testing or completion strings, if used during well testing or in the case of preparation for further production respectively. This string allows subsea safety, guaranteeing full control of hydrocarbon flow during the testing or production phase.

Subsequently the weighted completion fluid that maintains sufficient pressure and prevents formation fluids from migrating into the hole, is displaced out of the well-bore in order to start the next phase, if required, the well testing phase.

Well Testing Option for Appraisal Wells

As stated previously, well testing may be conducted on the appraisal wells if they present potential commercial quantities of hydrocarbon.

A well test is a temporary completion of a well to acquire dynamic rate through time, pressure, and fluid property data. The well test often indicates how the well will perform when it is subjected to various flow conditions. An analysis is usually performed on the data to determine reservoir parameters and characteristics including pressure, volume, and temperature.

Current testing practices are carried out using modern testing equipment and high resolution pressure data acquisition system, getting the reservoir evaluation objectives depends on the behavior of the formation fluid properties, well completion, and flow assurance situations are only known when testing is carried out.

The well test objectives are to:

1. Determine key technical factors of the reservoir (eg size, permeability and fluid characteristics) and values for use in future drilling.
2. Obtain representative data including reservoir pressure, production rates and sample(s).

While testing, hydrocarbons are sent to a flare boom with a burner to ensure as complete combustion of fluids (including hydrocarbons) as possible. Flaring may be initiated using LNG or similar fuel to ignite the mixture. To ensure that burning can be done downwind of the drillship, more than one flare boom can be used, or the ships positioning may be adjusted. Water misters may be used to mitigate heat exposure on the drillship.

The flow periods and rates will be limited to the minimum necessary to obtain the required reservoir information during the well test. It is anticipated that a maximum well test time for this project will be approximately 20 days.

Downhole sampling, if required, normally consists of recovering reservoir fluids via wireline or through specific tools added directly to the temporary test string. Wireline testing involves running instruments into the borehole on a cable to measure formation pressures and obtain fluid samples. Formation fluids are brought to the surface where the composition can then be analysed.

The following key well testing preventative measures will be implemented during the well testing programme:

- Monitor flare performance to maximise efficiency of flaring operation;
- Ensure sufficient compressed air provided to oil burner for efficient flaring;
- Flare equipment appropriately inspected, certified and function tested prior to operations;
- Flare equipment appropriately maintained and monitored throughout well testing operations;
- The equipment is designed and built to appropriate codes and standards and certified; and
- The appropriate emergency stop mechanisms (Emergency Shut Down devices) are in place to halt testing in case of emergency.

Health, safety and environmental protection are prioritised throughout the drilling process. In particular, there is a specific focus and attention during preparation and operations to avoid any potential accidental events, with related hydrocarbon release or uncontrolled flow from downhole to seabed or at surface (rig floor).

Well control during well operations is a routine function, with each well designed and executed to minimise risk of developing a well control incident. Down-hole conditions, such as shallow gas and high-pressure zones can cause control problems as a sudden variations in well pressure.

A well kick can occur if there is an influx of formation fluids with sufficient pressure to displace the well fluids. The primary well control against a well kick is provided by the maintenance of a sufficient hydrostatic head of weighted drilling mud/completion brine in the well bore to balance the pressures exerted by fluids in the formation being drilled.

Secondary well control is provided by the installation of mechanical device, such as the float collar in the drilling string and the blowout preventer (BOP) at seabed, installed on top of the wellhead after the running and setting of the surface casing.

The BOP effectively closes and seals the annulus if there is a sudden influx of formation fluids into the well bore, by the use of a series of hydraulically /electrically actuated rams. In addition, this device allows the formation fluids to be safely vented or pumped at the surface with the well closed, thereby enabling other methods to be applied to restore a sufficient hydrostatic head of mud on the well bore, for example pumping a higher density volume of mud, the so called 'kill mud'. The capacity and pressure rating of equipment, safety device and the BOP rating exceed the predicted reservoir pressures.

To guarantee operability, effectiveness and correct functioning, the BOP must be function, pressure and inflow tested regularly as per the API/ISO standards. As part of the standard operability procedure, the opening/closing and pressure testing of BOP elements result in the venting of small amounts (order of litres) of water-based hydraulic fluid into the sea. The selection and characteristics of this fluid (fresh water mixed with additives, commonly ethylene glycol) is specified by the BOP manufacturer/vendor and it is selected to guarantee both function of equipment and minimise risk to the environment.

The well control philosophy and procedure, constantly updated by the Eni drilling department, includes the identification and assessment of all well blowout risks.

Once drilling is completed, the well will be plugged and abandoned (P&A). The scope of well abandonment is to protect the environment by effectively sealing off all distinct permeable zones (i.e., the zones of potential hydrocarbons or water inflow penetrated by the well or perforated casing zones), to ensure that formation fluids are isolated, both within the wellbore and in annular spaces, and that their migration among different formations and/or up to seabed is prevented.

At the end of well construction, a cement plug setting job will be performed in both types of wells (exploration and appraisal) and for a successful hydrocarbon discovery or in the case of dry well. The cement plug will be tested according to ISO/API procedures to assure and determine their integrity prior to demobilization from location. If an integrity issue is identified during the pressure or inflow test of plugs, or during the final ROV survey of the wellhead and wellsite, the cement job will be re-done prior to leaving the site.

For exploration wells, the plugging and abandonment job will be final, in that no re-entry of the well is planned. In the event of a discovery, for appraisal wells the cement plug will have a different composition and dimension (length) to allow the capability to re-drill the cement and recover the well for a future development phase.

In both configurations, the cement plugs are suitable to guarantee the effectiveness and integrity of the seal and are configured so that no future intervention and monitoring is required.

In the presence of a single permeable zone, the well will be isolated by means of at least one well barrier (plug). When the formation pore pressure from a permeable zone is expected to exceed the formation fracture pressure anywhere else in the open hole, two well barriers shall be present in order to prevent formation breakdown or underground blowout.

For each distinct permeable zone, two well barriers, referred to as “primary” and “secondary”, shall be present in order to prevent also cross flow to surface or seabed or vice versa. As per industry best practice, the primary well barrier envelope will have a well barrier element set across or above the highest point of potential influx (top permeable zone or top perforations) or as close as reasonably possible to it. The secondary well barrier shall have a well barrier element set in such a way to guarantee the sealing of the permeable zone in case of failure of the first well barrier.

The BOP will be then retrieved to surface and the wellhead will be left in place on the seabed.

In shallow waters, the cut and retrieval of the wellhead is an alternative option for well abandonment of exploration wells, for which no re-entry is expected and interactions may possible but unlikely, with other activities in the area of interest (e.g. demersal fishing activities).

Considering no demersal fishing activities overlap with the Block and that the water depths of both areas of interest are deeper than 1,500 m, there is unlikely to be any interaction with demersal fishing activities and the wellhead will be left on the seabed.

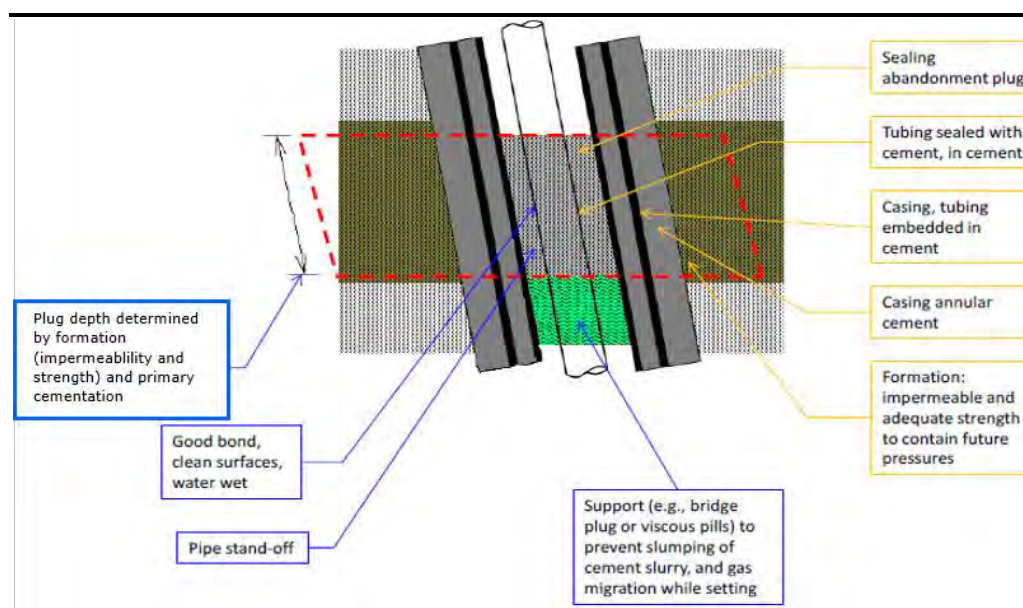
Plug and abandon operations (“decommissioning”) shall be designed and executed in compliance with oil industry good practices and applicable technical standards¹. The final program for well plugging and abandonment will be finalized after the end of drilling phase and log evaluation, in order to maximize the number and composition of plugs sealing in the single or multiple permeable zones discovered.

For deepwater wells the provisional preliminary plug and abandon program, included in the master drilling program, and the final program are usually prepared and revised directly by the drilling technical authority in the Eni Company Headquarters. The final cement plug program, design sequence and composition is revised by the Company drilling department, drilling contractor and cement contractors prior of finalization and execution. The technical program and associated costs to perform the operations are in addition verified by a third party contractor that will evaluate the program from the safety, technical and economic points of view.

At the end of the plug and abandonment operations, estimated at eight days prior to demobilization, the well schematic and wellhead location (including casings dimension, length, cement plug dimension and composition, pressure and inflow test results etc.) will be included in a final report submitted to PASA. The associated cost estimation for plug and abandonment operations for a single well in either drilling area of interest is provided in *Annex E*. *Annex E* presents all the cost of abandonment activities.

¹ E.g. but not limited to API RP 96, OGUK and NORSOK D-10

Figure 3.5 *Schematic of Cement Plug at Bottom Hole*



Source: Eni Manual for plug and abandon

3.6.5 *Demobilisation*

On completion of drilling, the drillship and support vessels will leave the well location. A final ROV survey will be performed at seabed to check the condition of the wellsite and seabed.

3.6.6 *HSE Risk Management during Operations*

As a component of Eni's HSE (health, safety, environment) risk management, a comprehensive HSE Policy is in place that includes mobilisation and demobilisation; drilling and completion operations and procedures. Eni is committed to protecting the health, safety and security of its employees and those of its contractors, to ensure that all activities are conducted in a manner that protects the environment and people who are potentially impacted by its operations.

3.7 *PLANNED EMISSIONS AND DISCHARGES, WASTE MANAGEMENT*

This section presents the main sources of emissions to air, discharges to sea and waste that will result from the planned drilling activities and associated operations.

The principle of Eni for waste management is to follow the following Eni waste management hierarchy; in the order of priority: reduce, reuse, recycle, recover, treat, and dispose.

All vessels will have equipment, systems and protocols in place for prevention of pollution by oil, sewage and garbage in accordance with MARPOL 73/78.

A project specific Waste Management Plan (covering all wastes generated offshore and onshore) will be developed in accordance with MARPOL requirements, South African regulations and Eni's waste management guidelines.

Waste disposal sites and waste management facilities will be identified, verified and approved prior to commencement of drilling.

3.7.1 *Emissions to Air*

The principal sources of emissions to air from the proposed drilling campaigns will be from exhaust emissions from power generation on the vessels. For well testing conducted on the appraisal well, emissions will be generated from hydrocarbon flaring for the limited duration of the well test (See Section 3.6.3).

Dynamically positioned vessels have relatively high fuel consumption and consequently high levels of corresponding air emissions. Diesel oil or marine gas oil (MGO), if available, will be used as fuel for all vessels resulting primarily in emissions of carbon dioxide (CO₂), sulphur oxides (SO_x), nitrogen oxides (NO_x) and carbon monoxide (CO). Relative to these pollutants, smaller quantities of non-methane volatile organic compounds (VOCs), methane (CH₄) and particulate matter (PM₁₀/PM_{2.5}) will also be released.

These emissions are released during the normal operation of a marine vessel and have the potential to result in a short-term localised increase in pollutant concentrations. They also contribute to regional and global atmospheric pollution.

Helicopter emissions levels will depend on actual fuel consumption and hence will vary with flying time, payload, weather, speed etc. With those constraints, the helicopter flights have been estimated to use 15 to 20 tonnes of fuel during the drilling phase. The emissions generated from the drilling operation will be controlled through fuel efficiency measures.

As can be seen in *Table 3.7*, it is estimated that approximately 3,599 tonnes of fuel will be used by the proposed drillship, supply vessels and helicopter resulting in approximately 13.08 kt of GHG (CO₂, CH₄, N₂O) emissions being emitted to the atmosphere during the drilling operations.

Table 3.7 *Predicted Total Atmospheric Emissions from Vessels and Helicopters during Drilling Operations*

	Gaseous emission	Drillship	Supply Vessel	Helicopter	Total	CO ₂ equivalent
Consumption (tonnes)		2,580	994	25	3,599	
Emissions (tonnes)	CO ₂	9,355.08	3,604.33	76.20	13,035.61	13,035.61
	CO	1.79	0.69	0.12		
	NO _x	8.62	0.33	0.06		
	N ₂ O	0.07	0.03	6.62E-4	0.10	30.85
	SO ₂	22.65	8.73	0.02		
	CH ₄	0.36	0.14	3.31E-3	0.50	10.47
	VOC	7.65	2.95	0.02		
Total CO₂ equivalent			13,076.92			

Source: Calculated using SANGAEA software <http://www.api-sangea.org/>

All project vessel emissions will comply with requirements set out in the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78).

3.7.2 *Discharges to Sea*

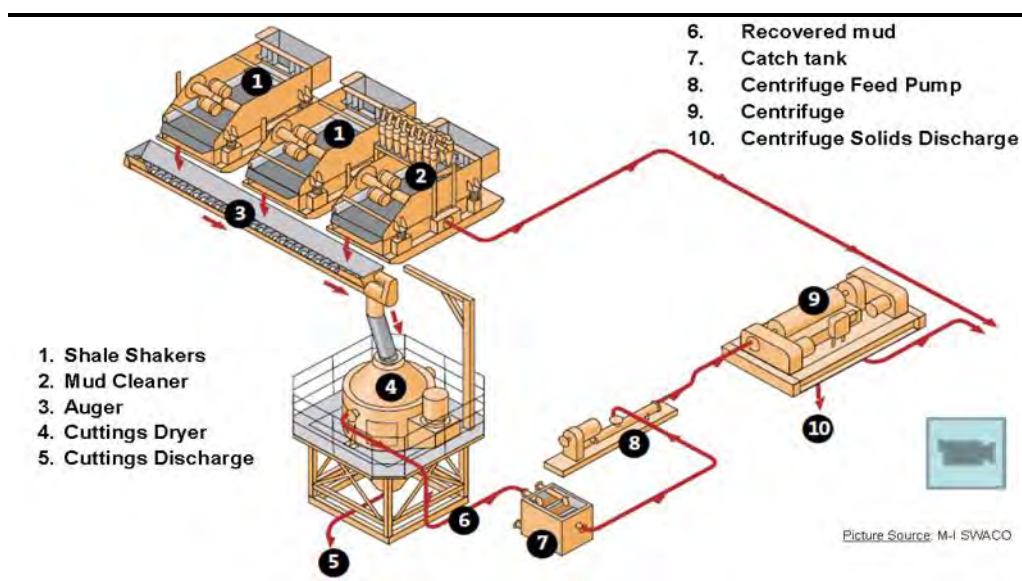
Drill Cuttings and Mud Disposal

For the first sections (tophole) of the well, riserless drilling (i.e. without riser installed) will be carried out with seawater in conjunction with high viscous pills and sweeps.

In the bottom sections of the well, riser drilling (i.e. with riser installed on top of the wellhead and BOP), will be carried out with either water based mud (WBM), also called water base fluid (WBF), or non-aqueous drilling fluid (NADF). The mud programme will be defined based on final well design and expected rheology.

During WBM/ NADF drilling, drilling muds are circulated in a closed loop system which recycles the drilling muds, control the mud weight and properties, and removes the drill cuttings. The returns from downhole (muds and cuttings) are routed to a treatment system (including the shakers, desilter, desander) which will physically separate the drill cuttings from the drilling muds (*Figure 3.6*).

Figure 3.6 Typical Solids Control/Fluid Recovery System



Source: MI-Swaco, 2016

Water Based Muds

Water-Based Muds (WBMs) consist of mixtures of clays, natural and synthetic organic polymers, mineral weighting agents, and other additives dissolved or suspended in freshwater, saltwater or brine (OGP, 2016). These muds are used subsequent to the installation of the riser. The main components of WBMs used on a typical well, their functions and description of their ecotoxicity are provided in *Table 3.8* below.

The selection of mud components and products is a balance between operational necessity to guarantee safe operation and well control and reduce the impact to the environment.

Where technically feasible, Eni is committed to use non-toxic and biodegradable products, minimize the use of non-biodegradable and low-toxicity products, avoid toxic product. In addition Eni is committed to minimize use of new components, favouring the reuse and recycle of mud for different well drilling. The composition and properties of mud will be included in the mud program as an annex to the drilling program.

Table 3.8 *Main Components of Water-Based Muds*

Material	Use	Ecotoxicity
Aluminium stearate	Defoamer	Non-toxic, insoluble
Barite	Weighting agent	Non-toxic, insoluble, non-biodegradable
Bentonite	Viscosifier	Non-toxic, insoluble, non-biodegradable
Calcium carbonate	Bridging, loss of circulation	Non-toxic, insoluble
Caustic soda	pH and alkalinity control	Soluble, corrosive
Cellulose based polymers	Fluid loss control	Insoluble, non-toxic
Citric acid	pH control	Soluble, low toxicity, irritant
Diesel oil pill (< 0.1 % mud volume)	Stuck pipe spotting fluid	Slightly soluble, 96 hr LC ₅₀ >0.1-1000 ppm
Gilsonite (asphalt based)	Lubricant, fluid loss reducer	Low toxicity, slightly soluble
Gluteraldehyde (0.01% mud vol)	Bactericide (biocide)	Noted for its toxic properties, irritant
Lime	Carbonate and CO ₂ control	Slightly soluble, non-toxic, irritant
Organic synthetic polymer blends	Filtrate reducing agent	Non-toxic, 96 hr LC ₅₀ >500 ppm
Potassium chloride	Shale / clay inhibitor	Soluble, non-toxic
Soda ash	Alkalinity, calcium reducer	Soluble, non-toxic
Sodium bicarbonate	Alkalinity, calcium reducer	Soluble, non-toxic
Xanthan gum	Viscosity, rheology	Soluble, non-toxic

Source: OIGP 2016, Neff 2005, Boehm et al. 2001

The WBM will be processed onboard and reused as much as possible in different drilling sections. When spent, WBMs will either be stored onboard and shipped to shore for recycling/disposal facilities or discharged overboard if in accordance with international recommendations and Eni's Waste Management Guidelines. WBM cuttings are discharged overboard if they comply with the following circumstances and standards defined by local, international recommendations and Eni Best practices¹:

- Discharge of cuttings via a caisson in >15 m depth;
- Discharge of cuttings only in water >30 m depth;
- Hg: max 1 mg/kg dry weight in stock barite;

¹ Eni Best Practise for cuttings and mud discharge are in compliance with World Bank IFC HSE guidelines ,Group Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development 2015

- Cd: max 3 mg/kg dry weight in stock barite;
- Maximum chloride contraction must be less the four time the ambient concentration of fresh or brackish receiving water; and
- Ship-to-shore otherwise.

Non-Aqueous Drilling Fluids

Non-Aqueous Drilling Fluids (NADFs): Deep water drilling concepts are technically challenging and require high performance drilling fluids with capabilities exceeding those available from WBM, in particular in terms of prevention of formation of hydrates and preservation of wellbore stability. As a result, NADFs, for which the continuous phase is primarily a non-water soluble base fluid, have also been used extensively by the petroleum industry. Low toxicity mineral oil based fluids, highly refined mineral oils and synthetic fluids (esters, paraffin's and olefins) are generally used as base fluids. The main components of NADFs are provided in *Table 3.9*.

Table 3.9 *Main Components of Non-Aqueous Drilling Fluids*

Material	Description
Base oil	Non-aqueous drilling fluids use base fluids with significantly reduced aromatics and extremely low polynuclear aromatic compounds. New systems using vegetable oil, polyglycols or esters have been and continue to be used.
Brine phase	CaCl ₂ , NaCl, KCl.
Gelling products	Modified clays reacted with organic amines.
Alkaline chemicals	Lime eg Ca (OH) ₂ .
Fluid loss control	Chemicals derived from lignites reacted with long chain or quaternary amines.
Emulsifiers	Fatty acids and derivatives, rosin acids and derivatives, dicarboxylic acids, polyamines.

Source: Adapted from OGP, 2003

An IOGP Group 3 Non Aqueous Base Fluid (NABF) with low to negligible aromatic content will be used for this project. ⁽¹⁾ These fluids are characterised by PAH contents less than 0.001 percent and total aromatic contents less than 0.5 percent. Group III includes synthetic based fluids which are produced by chemical reactions of relatively pure compounds and can include synthetic hydrocarbons (olefins, paraffins, and esters). Base fluids derived from highly processed mineral oils using special refining and/or separation processes (paraffins, enhanced mineral oil based fluid (EMBF), etc.) are also included. In some cases, fluids are blended to attain particular drilling performance conditions (OGP, 2003).

The NADF muds will be processed onboard and reused as much as possible in different drilling sections. When spent, NADF will either stored onboard and shipped to shore for recycling/disposal.

(1) Based on classification by the International Oil and Gas Producers (IOGP).

No spent NADF will be discharged overboard. The NADF drill cuttings will be routed through an additional treatment process, the cuttings dryer (centrifuge type equipment) to maximize the removal of liquid content. Recovered liquid phase will be reused and circulated back in mud loop.

The drill cuttings and the retained NADF will be discharged overboard following treatment in accordance with local and international recommendations and Eni's Waste Management Guidelines. Base fluid retained on cuttings will not exceed limits detailed in *Section 3.7.2*. Solids removal efficiency for each hole section will be monitored to ensure solids control and fluids recovery equipment is operating as designed.

The NADF muds will be recovered, reused and when spent will be stored onboard prior of shipping to shore for recycle/disposal. No spent volume of NADF will be discharged overboard with the exclusion of marginal residual amount adhered to drilling cutting. The NADF retained on the drill cuttings will be discharged overboard with 5% NADF retained on wet cuttings, which is Eni Best Practice¹ and to a better standard than the requirements as defined by IFC (2015):

- Discharge of cuttings via a caisson in >15 m depth;
- Discharge of cuttings only in water >30 m depth;
- Organic Phase Drilling Fluid concentration: maximum residual non aqueous phase drilling fluid (NAF) 6.9% (C16-C18 internal olefins) or 9.4% (C12-C14 ester or C8 esters) on wet cuttings;
- Hg: max 1 mg/kg dry weight in stock barite;
- Cd: max 3 mg/kg dry weight in stock barite; and
- Ship-to-shore otherwise.

The amount of drilling waste discharge estimated for one well is quantified in *Table 3.10* below. Refer to *Section 3.9.2* for a discussion of the alternative methods for cuttings discharge.

¹ Eni Best Practise for cuttings and mud discharge are in compliance with World Bank IFC HSE guidelines ,Group Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development 2015

Table 3.10 *Typical Well Design and Estimated Discharges*

Section	Hole Size (inches)	Casing size (inches)	Proposed Mud Type	Volume of cuttings (m3)	Volume of mud to be disposed of (m3) ^o
1	42"	36"	Seawater and sweeps	100	200 (seabed)
2	24"	20"	Seawater and sweeps	300	700 (seabed)
3	16"	13" 3/8	WBM/NADF	120	WBM Discharged/ recovered; NADF only recovered
4	12"1/4	9" 5/8	WBM/NADF	70	WBM Discharged/ recovered; NADF only recovered
5	8 1/2	Open hole or 7"	WBM/NADF	30	WBM Discharged/ recovered; NADF only recovered
Total	-	-	-	620	900

Note: spent WBM is discharged overboard if in compliance with required specification, while NADF will be recovered and disposed onshore. Final quantity of WBM discharged can be estimated only at end of drilling operations because mud volume will be recycled/re-use in next drilling phase or well as much as possible.

Source: Eni; 2018

Cement

During the initial cementing operation (tophole section), the required cement volume will be pumped into the annular space between the casing and the borehole wall. During cementing of the tophole section, excess cement (maximum of 100 m³) will emerge out of the top of the well and onto the seabed, where it will dissolve into the surrounding water. Excess cement is necessary to guarantee that the conductor pipe and surface casing are cemented all the way to the seafloor. During subsequent cementing jobs excess cement will be returned to the drilling vessel via the riser and discharged overboard.

Offshore drilling operations typically use Portland cements, defined as pulverised clinkers consisting of hydrated calcium silicates and usually containing one or more forms of calcium sulphate. The raw materials used are lime, silica, alumina and ferric oxide. The cement slurry used is specially designed for the exact well conditions encountered. Additives can be used to adjust various properties in order to achieve the desired results. There are over 150 cementing additives available. The amount (concentrations) of these additives generally make up only a small portion (<10 percent) of the overall amount of cement used for a typical well. Usually, there are three main additives used: retarders, fluid loss control agents and friction reducers. These additives are polymers generally made of organic material and are considered non-toxic. When the cementing job is completed, a mechanical and sealing test is performed.

Bilge Water

All deck drainage from work spaces (bilge water) will be collected and piped into a sump tank on board the project vessels to ensure MARPOL 1973/78 Annex I compliance. The fluid will be monitored and any oily water will be processed through a suitable separation and treatment system prior to discharge overboard at a maximum of 15 ppm oil in water.

Sewage

Sewage discharge from the project vessels will meet the requirements of MARPOL 73/78 Annex IV. MARPOL 73/78 Annex IV requires that sewage discharged from vessels be disinfected, comminuted and that the effluent must not produce visible floating solids in, nor cause discoloration of the surrounding water. The treatment system must provide primary settling, chlorination and dechlorination. The treated effluent is then discharged into the sea.

Galley Wastes

MARPOL 73/78 Annex V permits the disposal into the sea of galley waste when the vessel is located more than 3 nautical miles (approximately 5.5 km) from land and the food waste has been ground or comminuted to particle sizes smaller than 25 mm.

Detergents

Detergents used for washing exposed marine deck spaces will be managed as bilge water. The toxicity of detergents varies greatly depending on their composition. Water-based or biodegradable detergents are preferred for use due to their low toxicity.

In certain cases of specific area cleaning, eg marine deck with no contamination of pollutants, using no toxic detergent, direct overboard discharge may be considered.

3.7.3

Land Disposal

A number of other types of wastes generated during the drilling activities will not be discharged at sea but will be transported to shore for disposal. These wastes will be recycled or re-used if possible or transported and disposed of at an appropriate licensed municipal landfill facility or at an alternative approved site.

Where practicable, the following waste types will be recycled or reused onshore:

- Garbage (e.g. paper, plastic, wood and glass) including wastes from accommodation and workshops etc;

- Scrap metal and other material;
- Used oil, including lubricating and gear oil; solvents; hydrocarbon based detergents, possible drilling fluids and machine oil; and
- Drilling fluid, including LTSBM and cuttings, brine from drilling and completion activities.

The following wastes will be disposed of by a licensed waste contractor at licensed waste facilities.

- Drums and containers containing residues (eg lubricating oil) that may have environmental effects;
- Hazardous wastes (eg radioactive materials, neon tubes and batteries);
- Medical waste from treatment of personal onboard the vessel; and
- Filters and filter media from machinery.

At the end of operations, the overboard discharge of hazardous chemicals, bulk cement or any other chemical is not permitted by Eni. The preferred solution for unused chemicals is to return them to the supplier for reuse/recycle in other projects. Should this not be possible these could be managed or disposed as per the above mentioned Eni waste management hierarchy.

3.7.4 Noise Emissions

The main sources of noise from the proposed drilling programme include noise produced by the drillship and supply vessels. The noise characteristics and level of various vessels used in the drilling programme will vary between 130 and 182 dB re 1µPa at 1 m (Simmonds *et al*, 2003; Richardson *et al*, 1995). The particular activity being conducted by the vessels changes the noise characteristics, for example, if it is at idle, holding position using bow thrusters, or accelerating.

3.8 UNPLANNED EMISSIONS AND DISCHARGES

This section presents the main sources of emissions that will result from the unplanned/ accidental events during the drilling activities and associated operations.

3.8.1 *Hydrocarbons and Chemical Spills*

Two of the main types of unplanned/ accidental events that could occur while drilling wells that could result in a discharge of hydrocarbons or chemicals to the marine environment are loss of well containment and single-event/batch spills.

Loss of well containment is a continuous release (in worst situation, with no control and massive release, it is called “well blowout”) which could last for a measurable period of time, while a single-event spill is an instantaneous or limited duration occurrence. Eni is committed to minimising the release of hydrocarbons and hazardous chemical discharge into the marine environment and avoiding unplanned spills.

In case of unplanned/ accidental events, Eni minimises any adverse effects to the environment and plans to accomplish this goal by:

- i) Incorporating oil and chemical spill prevention into the drilling plans; and
- ii) Ensuring that the necessary contingency planning has taken place to respond effectively in the event of an incident.

Eni will develop an Oil Spill Contingency Plan prior to the commencement of the drilling and this plan will be implemented in the event of an unplanned/ accidental release of oil offshore.

In addition, precautions are taken to ensure that all chemicals and petroleum products stored and transferred onshore and offshore are done so in a manner to minimise the potential for a spill and environmental damage in the event of an unplanned/ accidental release.

3.9 *PROJECT ALTERNATIVES*

One of the objectives of an EIA is to investigate alternatives to the project. In relation to a proposed activity “**alternatives**” means different ways of meeting the general purposes and requirements of the proposed activity.

Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014 (as amended), requires that all S&EIR processes must identify and describe alternatives to the proposed activity that are feasible and reasonable. Different types or categories of alternatives can be identified, eg location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives. The ‘No-Go’ or ‘No project’ alternative must also be considered.

Not all categories of alternatives are applicable to all projects. The consideration of alternatives is inherent in the detailed design and the identification of mitigation measures, and therefore, although not specifically assessed, alternatives have been and will continue to be taken into account in the design and EIA processes.

Despite many advances in seismic data acquisition and analysis, currently no alternatives exist to definitively establish the presence of hydrocarbon reserves other than through exploration and appraisal drilling. No activity alternatives have therefore been assessed.

It should however be noted that some pre-drilling activities may be undertaken, including an ROV survey. A summary is provided below of the alternatives considered for this EIA Report.

3.9.1 *Site Locality Alternative*

Drilling Location

Eni is the operator and holds an Exploration Right for Block ER236. Both 2D and 3D seismic surveys have been undertaken over Block ER236 and possible areas of interest identified. Based on the interpretation of the seismic information, Eni have identified two areas of interest covering a limited area of Block ER236, in which they are considering undertaking exploration drilling activities in order to determine the presence and viability of the reserve.

The northern area of interest (1,717.50 km²) is located approximately 62 km offshore of Richards Bay, and the southern area of interest (2,905 km²) approximately 65 km offshore of Port Shepstone.

Although the well locations are still to be finalised based on a number of factors, including further analysis of the seismic data, the geological target and seafloor obstacles. *Chapter 7* considers that the wells could be drilled anywhere within the northern and southern areas of interest.

Onshore Logistics Base

An onshore logistics base will be located either in the Port of Richards Bay or the Port of Durban. The decision between these locations will be dependent on undergoing discussions by Eni with Transnet on the location of the logistics base, with the final decision depending on whether drilling operations start at the northern or southern area of interests. Both locations have been inspected by Eni and both sites are capable of supporting the drilling activities offshore.

This EIA Report will assess the impacts from a logistics base in either Richards Bay or Durban

There are no noticeable differences associated with the location of the onshore logistic base in either Port of Richards Bay or the Port of Durban.

3.9.2 *Technology Alternative*

Drilling Vessel Alternatives

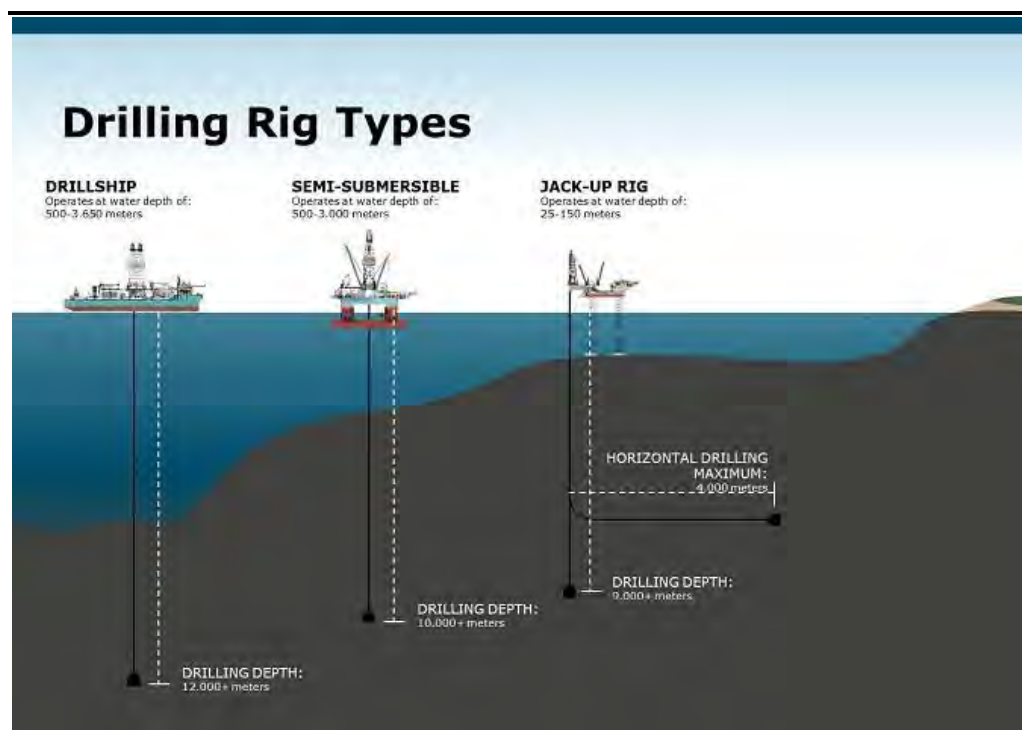
There is a range of drilling vessels available to conduct the drilling of an offshore well. For deep water areas these are restricted to two options; drillships or semi-submersible rigs. *Figure 3.7* shows the options available and the associated operation depths.

As discussed in *Section 3.5.1*, a drillship is commonly kept in position using a DPS which allows for minimal subsea disturbance due to its ability to operate without moorings. A significant benefit to using a drillship is the ease of mobility as it is a self-propelled vessel with the flexibility to move from well to well or location to location without the need of transport vessels. This option does however require greater energy use (and therefore emissions) and the DPS produces greater underwater sound during operation.

A semi-submersible drill rig has to be towed to a site and is either moored to the seabed using a series of anchors. These rigs have a partially submerged structure below the water line. Water is used as a ballast control to maintain flotation and stability. This option will cause greater disturbance to the seabed due to the presence of the moorings, but requires less energy use and produces less underwater sound.

Both drilling units are self-contained units with derrick and drilling equipment, an internal access to the water surface called moonpool, a helicopter pad, fire and rescue equipment and crew quarters. The operations and discharges are similar. Each drilling unit will also require between one to three supply vessels, it is likely that a semi-submersible drill rig will require more support vessels (or more trips by the support vessel to the base) than a drillship, as a drillship has more onboard storage capacity. A drillship is also significantly more mobile than a semi-submersible.

Figure 3.7 Drilling Vessel Alternatives



Source: <http://www.maerskdrilling.com/en/about-us/the-drilling-industry>

Eni's preferred drilling vessel is a drillship due to distance from shore, water depth constraints and its availability, flexibility and ease of mobility.

Selection of Drilling Fluids

Various factors govern the best combination of drilling chemicals used to produce the required drilling mud needed to lubricate the drill bit, maintain well pressure control, and carry cuttings to the surface.

According to the IOGP classifications, the three types of NADF that could be used for offshore drilling can be defined as follows:

- Group I NADF (high aromatic content) - These base fluids were used during initial days of oil and gas exploration and include diesel and conventional mineral oil based fluids. They are refined from crude oil and are a non-specific collection of hydrocarbon compounds including paraffin, olefins and aromatic and polycyclic aromatic hydrocarbons (PAHs). Group 1 NADFs are defined by having PAH levels greater than 0.35%.
- Group II NADF (medium aromatic content) - These fluids are sometimes referred to as Low Toxicity Mineral Oil Based Fluids (LTMBF) and were developed to address the rising concern over the potential toxicity of diesel-based fluids. They are also developed from refining crude oil but the distillation process is controlled such that the total aromatic hydrocarbon concentration is less than Group I NADFs (0.5 – 5%) and the PAH content is less than 0.35% but greater than 0.001%.

- Group III NADF (low to negligible aromatic content) - These fluids are characterised by PAH contents less than 0.001% and total aromatic contents less than 0.5%. They include synthetic based fluids (SBF) which are produced by chemical reactions of relatively pure compounds and can include synthetic hydrocarbons (olefins, paraffins and esters). Using special refining and/or separation processes, base fluids of Group III can also be derived from highly processed mineral oils (paraffins, enhanced mineral oil based fluid (EMBF)). PAH content is less than 0.001%.

A combination of seawater, WBMs and/or NADFs may be used to drill the proposed exploration well. It is anticipated that an IOGP Group III non aqueous base fluid with low to negligible aromatic content will be used for this project in case of NADF choice.

Drill Fluids Disposal Method

Once the riser has been installed on top of the wellhead and drilling fluid (pills, mud, brine) is returned to the rig and treated for reuse (conditioned in weight and rheology properties) in parallel with a solid control system for cuttings. For the discharge of spent mud and drilling fluid namely:

- Re-injection - where spent mud and fluids can be injected into permeable subterranean formations prior to plugging and abandonment of a well or to a dedicated disposal well;
- Offshore treatment and discharge to sea - where spent mud and fluid are discharged overboard from the drilling vessel after undergoing treatment to meet the discharge standards; and
- Onshore disposal and treatment - where drilling fluids are collected and transported for onshore treatment (e.g. re-conditioning properties,) or final disposal.

The drilling fluids (e.g. pills, WBM or NADF mud, brine) cannot be re-injected into the exploration well as this could lead to problems with controlling the well; damaging the formation, reducing the injectivity of the drilled well, and preventing a compliant cement job for plug and abandon. In addition, there are no disposal wells available in the vicinity of Block ER236 for reinjection.

Overboard discharge of spent WBM is an accepted practice for facilities located far offshore and may only take place if in compliance with certain standards (Section 3.7.2). However, spent NADF discharge overboard is not allowed except for the residual amount retained on drilling cuttings after treatment and in compliance with standards.

Compliance with set standards (Section 3.7.2) will be monitored on the drillship by regular sampling and quality testing performed after treatment and prior to discharge overboard. The drillship and supply vessel will have sufficient storage for mud and cuttings that, if even after further treatment standards cannot be met, mud and cuttings will be shipped to the shore for disposal by an Eni approved licensed waste contractor under the terms of Eni's Waste Management Plan.

Drill Cuttings Disposal Method

The solids control /fluid recovery system (Figure 3.6) applies different methods to remove solids (drill cuttings - particles of stone, clay, shale and sand) from the drilling fluid and to recover drilling fluid so that it can be reused. During riserless drilling, using sea water and high viscous sweeps and pills, cuttings are disposed of directly at the seabed.

Once the riser has been installed on top of the wellhead and cuttings can be returned to the rig, there is no standard practice for the treatment and disposal of drill cuttings that is applied worldwide.

As per IOGP (2016) there are three alternatives for the discharge of drill cuttings, namely:

- Offshore treatment and discharge to sea - where cuttings are discharged overboard from the drilling vessel or platform after undergoing treatment by solids control equipment and fluid contaminant reduction system;
- Re-injection - where drill cuttings are ground to fine particle sizes and disposed of, along with entrained drilling fluids, by injection into permeable subterranean formations; and
- Onshore disposal and treatment - where cuttings and the associated drilling fluids are collected and transported for treatment (eg thermal desorption, land farming) if necessary and final disposal by techniques such as land filling, land spreading, injection, or re-use.'

Re-injection is not an option in this location and is generally not possible during exploration drilling (no presence of disposal wells in the area of operations) and as such the two potential disposal options discussed below are either discharge to sea or onshore disposal. Refer to Table 3.11, which documents the advantages and disadvantages of each option.

Offshore Treatment and Discharge to Sea

This option involves discharging the drilling cuttings, after specific treatment, to the marine environment only if in compliance with certain standards. Compliance with set standards (Section 3.7.2) will be monitored on the drillship by regular sampling and quality testing performed after treatment and prior to discharge overboard.

The drillship and supply vessel will have sufficient storage to conduct the sampling and lab analysis. The solids control/fluid recovery process will separate the cuttings from the drilling fluid for re-use.

In particular NADF drill cuttings will be treated to remove drilling fluid for reuse and reduce oil content to less than 5 percent of wet cuttings weight (as low as possible) using a suitable combination of shakers, a centrifuge and/or a cuttings dryer.

The cuttings containing residual fluid are then mixed with sea water and discharged to the sea through a pipe known as a chute (or caisson). The end of the chute is typically located approximately 15 m below the water surface. Unlike the other disposal options, no temporary storage for cuttings is required.

In South Africa, offshore discharge is the accepted method of disposal, if cuttings have been treated and contamination concentrations are below the maximum allowable thresholds. The expected dispersion (fall and spatial extent of the deposition) of discharged cuttings was predicted in the “drilling discharge modelling - drill cuttings dispersion model” study (*Annex D*).

Offshore Pre-Treatment and Onshore Disposal

As per OGP (2003), this option will involve the processing of cuttings onboard the drilling vessel, followed by storage and transportation to shore for disposal. This option will be adopted also where cuttings samples, analysed on board, do not meet the set standards for overboard discharge.

Consequently, there are some aspects of onshore disposal that must be considered when evaluating the viability of this option, advantages and disadvantages of:

- Marine transport (skip and ship, which is common to all potential onshore disposal options);
- Onshore disposal facility option;
- Additional movements of skips on board of vessel with increased risk for workers during lifting operations; and
- Reduced availability on deck space on board for equipment and reduced chemicals and fluids storage capacity; more difficult to allocate materials to guarantee stability of boat.

The potential onshore disposal options include:

- Landfill disposal: Depending on the level of treatment and residual oil content in percentage of dry cuttings, the cuttings will more than likely need to be disposed of at a hazardous landfill site.
- Land-farming: This involves spreading fully treated cuttings followed by mechanical tilling with the addition of nutrients, water and or oxygen as necessary to stimulate biodegradation by naturally occurring oil-degrading bacteria, material is applied several times at the same location. Depending upon the location of the land-farm, a liner, over liner, and/or sprinkler system may be required.
- Re-use (e.g. road construction). Treated cuttings may be used for construction or other alternative uses. If necessary or optimal, cuttings could be further treated prior to re-use, e.g. with thermal-mechanical treatment or bio-remediation.

Table 3.11 Advantages (+) and Disadvantages (-) of Offshore Discharge and Onshore Disposal of Drill Cuttings (adapted from OGP, 2003)

Economics	Operational	Environmental
Offshore Discharge		
<ul style="list-style-type: none"> + Very low cost per unit volume treatment + No potential liabilities at onshore facilities - Potential future offshore liability - Cost for modelling and analysis (eg, compliance testing, dispersion model) - field analysis of cuttings prior of discharge and potential impacts (eg, compliance testing,, field monitoring programmes) 	<ul style="list-style-type: none"> + Simple process with limited equipment needed + No transportation to onshore involved (less movement of skips and supply vessel, less costs) + Limited number of skips on board, easier logistics and deck management + Low power and fuel requirements + Low personnel requirements + Low safety, environment and health risks (eg filling and transport of skips, stability of rig, possible incident and contamination on deck) + Limited or no shore-based infrastructure required - Necessity of cuttings bulk to increase cutting storage capacity prior of treatment process - Drilling speed affected by treatment and discharge processes' speed + Very limited or No weather restrictions - Pre-treatment equipment required - Risk of plugging lines when using drier and washing system - Management requirements of fluid constituents - Continuous analysis of residual cuttings prior to discharge. 	<ul style="list-style-type: none"> + No incremental air emissions + Low energy usage + No environmental issues at onshore sites - Potential for short-term localised impacts on seafloor (benthic community) and water column biology due to chemicals and sediments in the water column and settling on the seafloor
Onshore Disposal		
<p>Marine transport:</p> <ul style="list-style-type: none"> + Waste can be removed from drilling location eliminating future liability at the rig site - Transportation cost can be high for additional navigation of supply vessel and it could vary with distance of shorebase from the drilling location - Transportation may require chartering of additional supply vessels - Additional costs associated with offshore transport equipment (vacuums, augers) cuttings skips or bulk containers) and personnel 	<p>Marine transport:</p> <ul style="list-style-type: none"> - Safety hazards associated with loading and unloading of waste containers on workboats and at the shorebase - Increased handling of waste is necessary at the drilling location and at shorebase - Additional personnel required - Risk of exposure of personnel to aromatic hydrocarbons - Efficient collection and transportation of waste are necessary at the drilling location - May be difficult to handle logistics of cuttings generated with drilling of high rate of penetration large diameter holes - Weather or logistical issues may preclude loading and transport of cuttings, resulting in a shutdown of drilling or need to discharge 	<p>Marine transport:</p> <ul style="list-style-type: none"> + No impacts on benthic community + Avoids seabed and water column possible impacts to environment and biotic sensitivities - Fuel consumption and consequent air emissions associated with transfer of wastes to a shore base - Increased risk of spills in transfer (transport to shore and offloading) - Disposal onshore creates new problems (eg, potential groundwater contamination) - Potential interference with shipping and fishing from increased vessel traffic and increased traffic at the port

Economics	Operational	Environmental
<ul style="list-style-type: none"> - Operational shut-down due to inability to handle generated cuttings will make operations more costly 	<ul style="list-style-type: none"> - Rig stability may be effected in case of bad weather, necessity to additional move equipment and skips on board to guarantee balance 	
<p>Onshore operations:</p> <ul style="list-style-type: none"> + On land transportation costs - Potential future liabilities 	<p>Onshore operations:</p> <ul style="list-style-type: none"> - Onshore transport to site - Safety risk to personnel and local inhabitants in transport and handling - Disposal facilities require long-term monitoring and management - Additional footprint in logistic base for temporary storage of skips 	<p>Onshore operations:</p> <ul style="list-style-type: none"> + Reduces impacts to seafloor and biota - Potential for onshore spills - Air emissions associated with transport and equipment operation -
<p>Land-farming:</p> <ul style="list-style-type: none"> + Inexpensive relative to other onshore options - Requires long-term land lease - Possible necessity of compensative/restoration activities for land use authorisation 	<p>Land-farming:</p> <ul style="list-style-type: none"> - Limited use due to lack of availability of and access to suitable land - Requires suitable climatic conditions - Cannot be used for wastes with high salt content without prior treatment - Necessity to develop specific treatment facilities 	<p>Land-farming:</p> <ul style="list-style-type: none"> + If managed correctly minimal potential for groundwater impact + Biodegradation of hydrocarbons - Air emissions from equipment use and off-gassing from degradation process - Runoff in areas of high rain may cause surface water contamination - May involve substantial monitoring requirements - Limited availability/experience for cuttings management in South Africa
<p>Landfill:</p> <ul style="list-style-type: none"> -Additional pressure on existing landfills - Possible necessity of compensative/restoration activities for land use authorisation 	<p>Landfill:</p> <ul style="list-style-type: none"> -Requires appropriate management and monitoring may have requirements on maximum oil content of wastes - Necessity to develop specific treatment facilities - Land requirements - May be limited by local regulations 	<p>Landfill:</p> <ul style="list-style-type: none"> - Potential groundwater and surface water impacts - Air emissions associated with earthmoving equipment - May be restrictions on oil content of wastes - Limited availability/experience for cuttings management in South Africa

Although the onshore disposal option has the benefit that it does not leave an accumulation of cuttings on the seafloor, it has several disadvantages (e.g. additional pressure on existing landfill sites and potential impacts on vegetation and groundwater) and involves a substantial amount of additional equipment, transportation, and facilities.

The additional transportation requirements to transfer the cuttings to shore increases environmental and safety risks associated with shipping and handling of materials.

Considering the aspects previously discussed, the dynamic nature of the marine environment in each area of interest and in order to limit the footprint for onshore land farming and waste facilities in the area, considering the lack of dedicated facilities for onshore cuttings treatment, according to South African legislation, international best practise and Eni technical guidelines, Eni's preferred option is to treat and discharge cuttings offshore in accordance with the previously defined requirements.

3.9.3 *Design or Layout Alternatives*

Number of Wells

Eni proposes to drill:

- Up to four wells within the northern area of interest: up to two exploration wells and up to two appraisal wells; and
- Up to two wells within the southern area of interest: one exploration well and one appraisal well.

The time sequence and the number of additional exploration and appraisal wells will be dependent on the success of the first exploration well.

Any additional wells will not be drilled at the same time as the first well. This report therefore assesses the impact of drilling of one well within each area of interest.

Scheduling

The drilling of the first exploration well, is planned for some time between November 2019 and March 2020, dependent on drillship availability, amongst a number of other planning requirements. The drilling of one well is estimated to take approximately 71 days to complete. The time sequence and the number of additional exploration and appraisal wells will be dependent on the results of the first exploration well.

Chapter 7 and 8 of this report assess the impact of drilling of one well within each area of interest at any time of the year and therefore seasonality has been considered.

The impact of the No-Go alternative is assessed, in *Chapter 7* of this report, in accordance with the requirements of the EIA Regulations, 2014 (as amended). The No-Go alternative entails no change to the status quo, in other words the proposed exploration drilling activities will not be conducted in Block ER236.

The option not to proceed with exploration or appraisal drilling will leave the areas of the potential drilling sites in their current environmental state, with the oil/gas potential remaining unknown.

This alternative is in contravention of Operation Phakisa's aim to implement South Africa's policies and programmes better, faster and more effectively, and to unlock the economic potential of South Africa's oceans. The government, through Operation Phakisa, is seeking to grow the country's ocean economy through several industrial sectors, including the promotion of the oil and gas sector.

The assessment of potential "No-Go" impacts in Chapter 7 reflects the significance the No-Go option as Negative, Moderate, due to the following reasoning:

- No positive, local, economic impact in term of procurement (direct and indirect), taxes (royalties and other taxes) and salary paid to direct employees and suppliers employees.
- No potential to diversify the South African energy mix or consider the possibilities that may be realised if the project proceeded (and a viable hydrocarbon source was discovered).
- Sustained (or even increased) reliability on importation from other countries depending on the growing demand.

By implementing the recommended mitigation measure (i.e. proceeding with the exploration activities), the residual impact is likely to be a Moderate positive significance (as per Table 7.27)- this is due to the benefits associated with obtaining knowledge regarding the viability and extent of available reserves that may be exploited at a later stage. Such an understanding is likely to have a national reach and attract investment opportunities leading to further economic development.

4.1 OVERVIEW

The objective of this *Chapter* is to establish the characteristics of the existing biophysical and socio-economic conditions in the Project Area. The baseline serves as the reference point against which changes can be predicted and monitored.

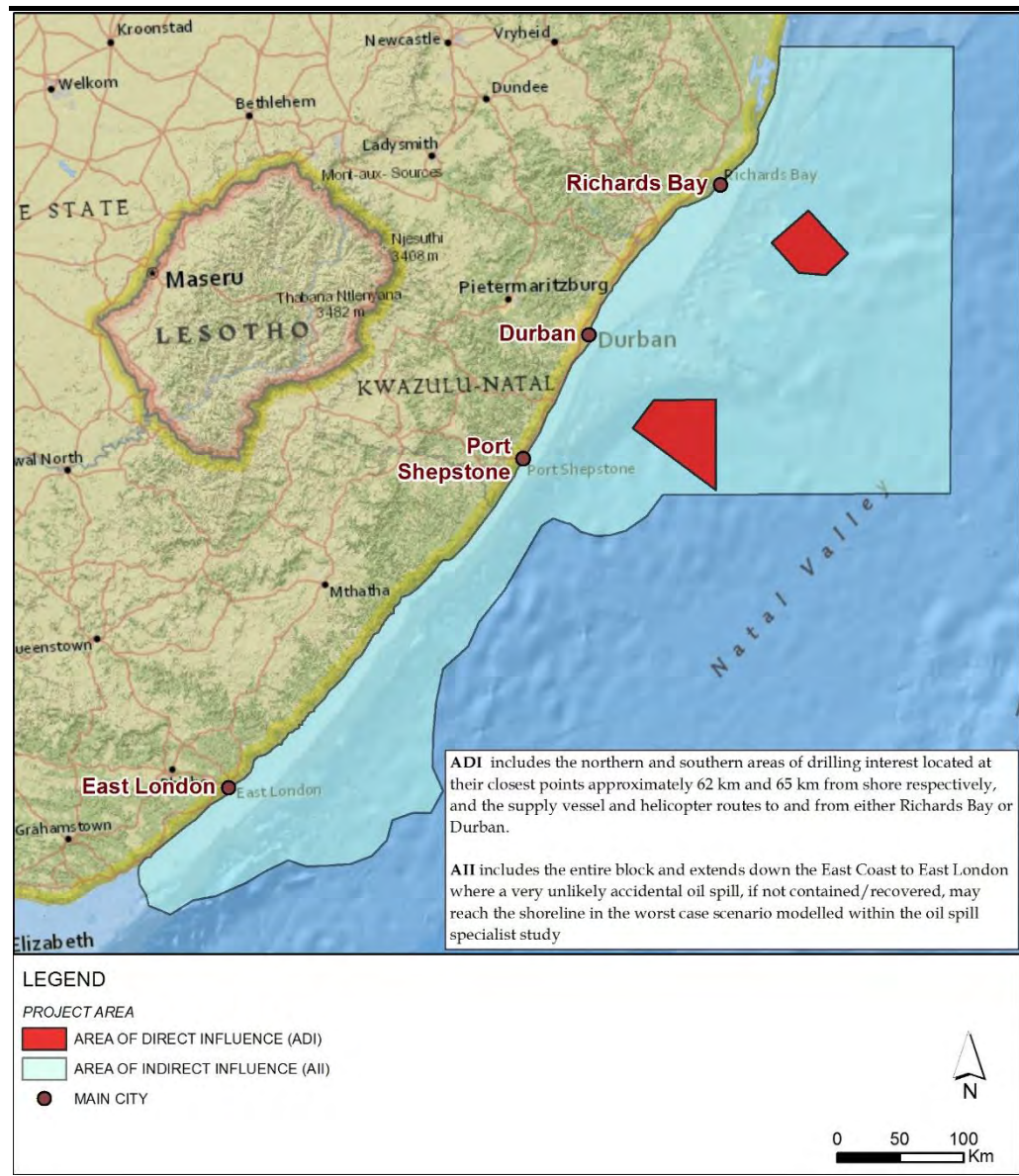
This *Chapter* presents the baseline conditions in the Project Area. The baseline was determined through a review of existing information, which includes previous projects that have occurred in the surrounding blocks, municipal documents, and social websites as referenced at the end of this document. Further to this, a Marine Ecology Assessment, a Fisheries Study and an Underwater Cultural Heritage Assessment (*Annex D*) were independently conducted to determine the baseline conditions of the Project Area.

4.2 PROJECT AREA

The Project Area comprises of the various biophysical and socio-economic conditions receptors that may be affected both directly and indirectly by the project activities described below. The Project Area is separated into **Area of Direct Influence (ADI)** and **Area of Indirect Influence (AII)** (*Figure 4.1*) depending on the source and causes of the impacts and these will vary in extent depending on the type of receptor affected.

The Project Area is offshore of the KwaZulu-Natal (KZN) coast, between St Lucia and East London and includes the entire Block ER236. The ADI includes the northern and southern areas of drilling interest (*Section 4.2*), located at their closest points approximately 62 km and 65 km from shore respectively, and the supply vessel and helicopter routes to and from either Richards Bay or Durban. The AII includes the entire block and extends down the East Coast to East London where an accidental oil spill, if not contained/recovered, may reach the shoreline in the worst case scenario modelled within the oil spill specialist study.

Figure 4.1 A Map showing the Project Area, including ADI and AII



*Climate Change**Greenhouse Gas (GHG) Emissions in South Africa*

Concern over increasing amounts of greenhouse gases in the atmosphere and their potential to influence global climate change has produced a number of initiatives, including the United Nations Framework Convention on Climate Change in 1992. The stated objective of the UNFCCC is to achieve stabilisation of the concentrations of greenhouse gases in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

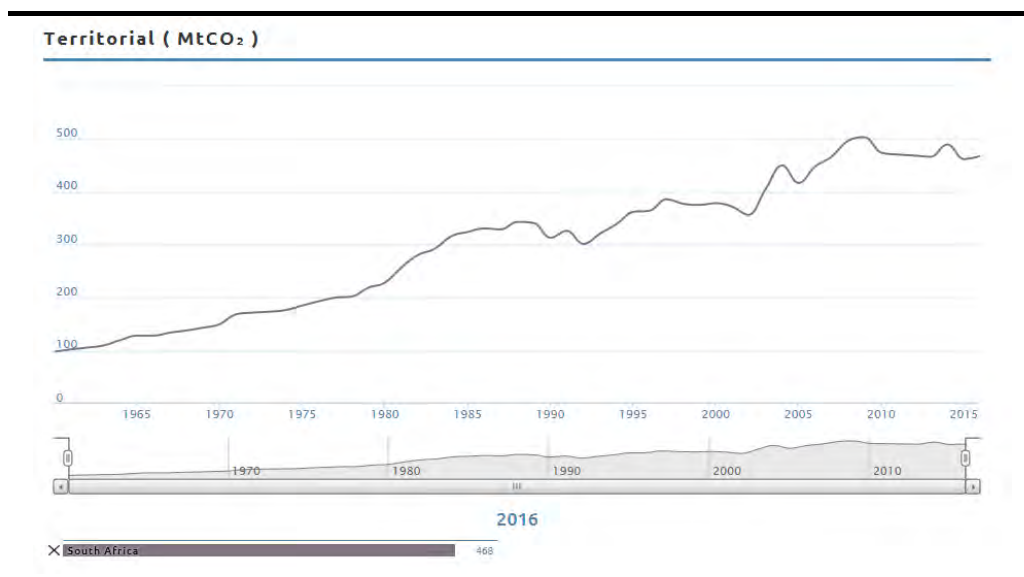
After 2001, public communication of the results of South Africa's initial communication to the UNFCCC drove a strong adaptation and mitigation action agenda both in national policy development and in UNFCCC negotiations. The South African Government ratified the UNFCCC in August 2002. Thereafter, South Africa's policymakers and academics have worked together quite closely on climate change. In 2005, the work was evidenced by interlinked science and policy plenary sessions at the National Climate Change Summit, 'Climate Action Now'. Key policies that resulted include the National Climate Change Response White Paper and South Africa's Second National Communication under the United Nations Framework Convention on Climate Change (SNC) (WIREs Clim Change, 2014). In November 2016, South Africa became a Party to the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), 2015.

Climate change constitutes a key concern in South Africa. Mean annual temperatures have increased by at least 1.5 times the observed global average of 0.65°C over the past five decades and extreme rainfall events have increased in frequency (WIREs Clim Change, 2014).

The South African economy is highly dependent on fossil fuels and the country can be judged to be a significant emitter due to the relatively high values that can be derived for emissions intensity and emissions per capita (DEAT, 2004).

South Africa has high per capita emissions compared with other countries on the African continent and, to some extent, globally. As a result, climate change mitigation has been a focus for a number of years. Current per capita CO₂ emissions are high (8.3 tonnes/person) as compared with other countries on the African continent and, to some extent globally (average 4.8 tonnes/person) and as a result, climate change mitigation has been a focus for a number of years. The current total annual CO₂ emissions in South Africa are 468 Mt of CO₂ (Global Carbon Atlas, 2018, WIREs Clim Change, 2014, *Figure 4.2*).

Figure 4.2 *Total Greenhouse Gas Emissions for South Africa (Mt of CO₂)*



Source: Global Carbon Atlas, 2018

Potential Impacts of Climate Change

The South African Country Studies Programme identified the health sector, the agriculture sector (particularly maize production), plant and animal biodiversity, water resources, and rangelands as areas of highest vulnerability to climate change with the need to be targeted for adaptation measures (DEAT, 2004).

According to Madzwamuse (2010), increased temperatures, reduced rainfall and water scarcity will significantly affect South African agricultural systems. Major impacts include reduction for land suitable for both arable and pastoral agriculture, the reduction in the length of the growing season and a decrease in yields, particularly along the margins of semi-arid and arid areas.

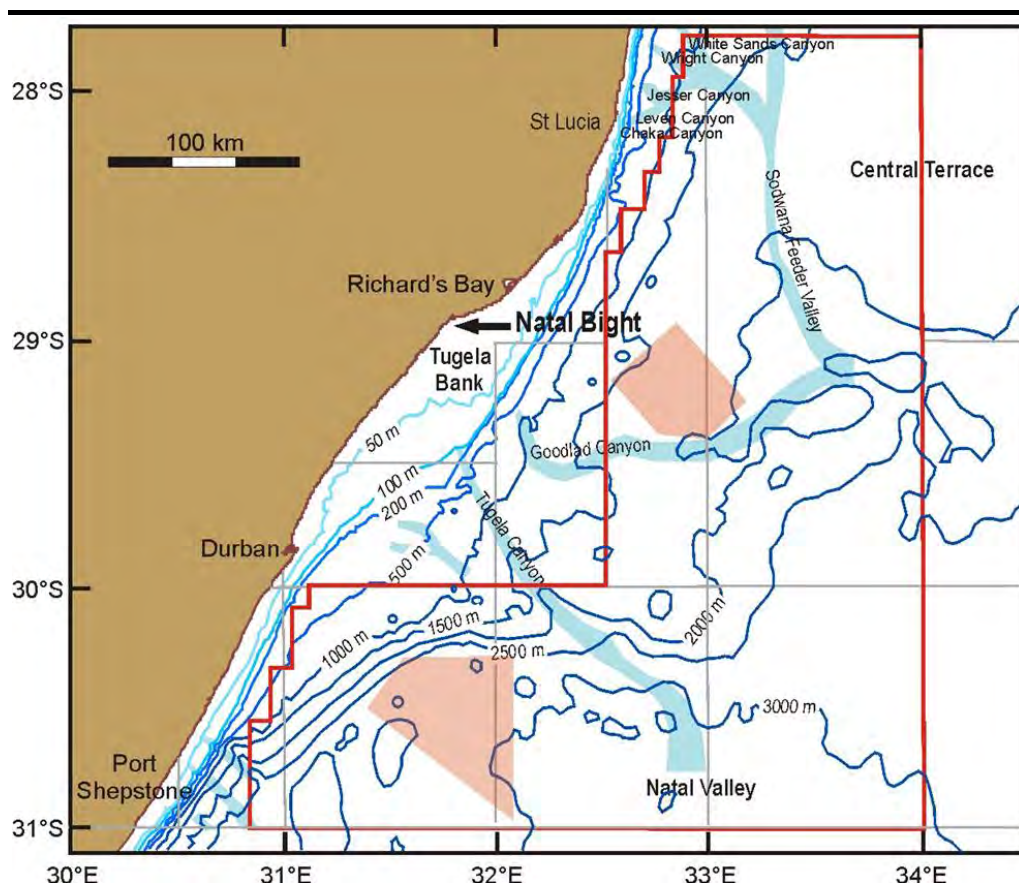
Biodiversity is important for South Africa because of its role in maintaining functional ecosystems, its economic value for tourism and its supporting role in livelihoods. Climate change impacts can lead to the loss of important ecosystems with high significance for local communities and national economies.

Water resources can also be highly impacted by climate change effects leading to changes in hydrological resources resulting in water stress and scarcity and therefore impact to ecosystem services.

Bathymetry and Sediments

The orientation of the coastline along the East Coast is relatively uniform, and north-northeast trending. A significant topographical feature is the Natal Bight, a coastal indentation between Cape Vidal and Durban (Figure 4.3).

Figure 4.3 *Bathymetry of the South African East Coast*



Note: Shown on the figure are Block ER236 (red polygon), the northern and southern areas of interest for drilling (orange shading) and features and places mentioned in the text. The positions of submarine canyons and feeder valleys (blue shading) as identified in Lombard *et al.* (2004) are also indicated.

Source: Pisces, 2018

The majority of the East Coast region has a narrow continental shelf and a steep continental slope. The Tugela Bank, located along the KZN coast between 28° 30' S and 30° 20' S, is a prominent feature on the continental shelf. Here the continental shelf widens to 50 km offshore, the maximum width reached along the East Coast (Lutjeharms *et al.*, 1989) and the continental slope is more gentle (Martin & Flemming, 1988). To the south, the continental margin descends into the Natal Valley, while to the north-eastwards it develops into the Central Terrace (Figure 4.3).

The Tugela Bank is interrupted by two canyons: the large and prominent Tugela Canyon, which is deeper than the smaller Goodlad Canyon (also referred to as 29°25' S). The northern area of interest for well drilling lies east of the Natal Bight in >1,500 m water depth. The southern area of interest lies off Port Shepstone in > 2,600 m water depth, to the south of the Tugela Canyon. Neither canyon is overlapped by either area of drilling interest.

A further canyon is located to the south of the Bank where the continental shelf narrows and the continental margin descends into the Natal Valley (adjacent to Port Shepstone).

There are limited data on the Goodlad Canyon features; however, it is reported to start as a small 20 m deep valley (Martin & Flemming, 1988) deepening to 250 m while becoming a 50 km wide, shallow valley at a depth of 1,400 m. The gradient of the canyon walls are less steep than those of the Tugela Canyon and limited tributaries occur (Young, 2009). No information specific to the Goodlad Canyon could be sourced (Pisces, 2018).

The Tugela and Goodland canyons differ significantly from those located in northern KZN. Firstly, the canyon heads lack the amphitheatre-shaped head morphology. Secondly, they are located at far greater depth than the Sodwana Feeder Valley and lack connectivity to the shelf, and finally, they show no significant tributary branches (Wiles *et al.*, 2013).

The Tugela Bank is the major sedimentary deposition centre of the KZN continental shelf, being characterised by fluvial deposits of Tugela River and Mgeni River origin. Sediment dispersal in the Bight is controlled by the complex interaction of shelf morphology, the Agulhas Current, wave regime, wind-driven circulation, sediment supply and the presence of the semi-permanent gyre. The seabed is thus sedimentary in nature but varies in the degree to which it is consolidated (CBD, 2013).

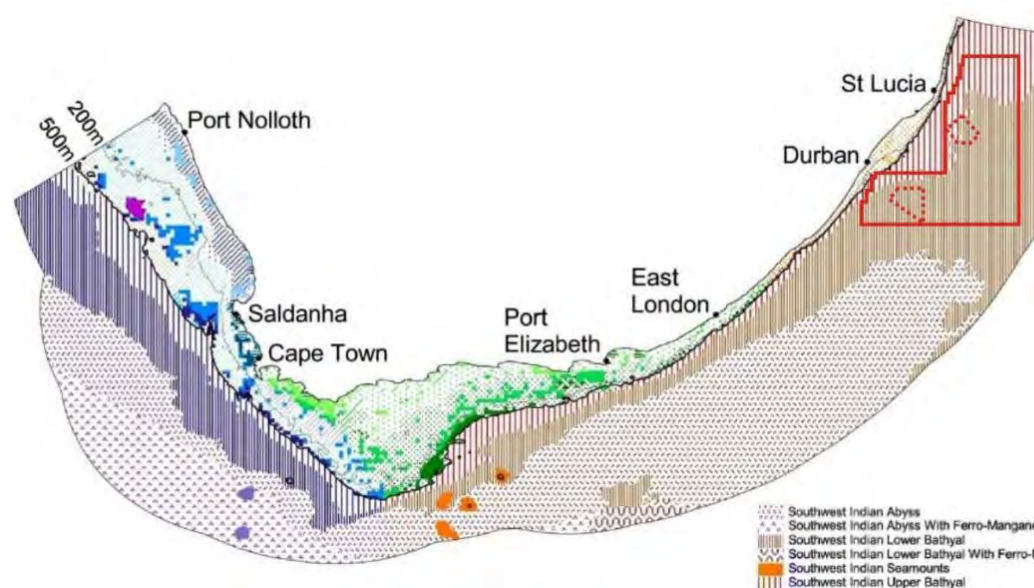
North of Durban, the shelf region is dominated by terrigenous sand (0.063 to 2 mm), with patches of gravel (>2 mm) occurring throughout the area. Areas on the mid-shelf contain sediments comprising up to 60 percent terrigenous mud. Two large mud depo-centres are found off the Tugela River mouth, while a smaller one is located off St Lucia. These mud depo-centres are a rare environment along the east coast of South Africa, comprising only about 10 percent of the shelf area (Demetriades & Forbes, 1993). The muds and their associated elevated organic contents provide habitat dominated by benthic and deposit feeders that favour muddy sediments and turbid waters. Despite being primarily a soft-sediment habitat, low profile beachrock outcrops (Fennessy, 1994a, 1994b; Lamberth *et al.*, 2009) occur just offshore of the 50 m contour off Durban and around the 200 m contour off Richard's Bay.

South of Durban, sand dominates both the inshore and offshore surficial sediments, although a substantial gravel component is present on the middle and outer shelf to as far as Port St Johns, occurring as coarse lag deposits in areas of erosion or non-deposition. Traces of mud are present on most areas of the shelf, although significant mud depo-centres are absent.

The Agulhas Current and/or waves affect the sediment bedform patterns on the KZN continental shelf. North and south of the Tugela Bank, the Agulhas Current generates active dune fields at the shelf edge (Flemming & Hay, 1988). In contrast, sediments on the shelf area of the Tugela Bank to a depth of 100 m are affected mostly by wave action (CSIR, 1998). South of the Ilovo River the inner shelf comprises sand sheets, while sand ribbons and streamers occur on the mid-shelf comprises, with gravel pavements dominating the outer shelf.

The outer shelf is dominated by gravels of shell-fragment and algal-nodule origin (Heydorn *et al.*, 1978). Outer shelf sediments are influenced solely by the strong Agulhas Current, forming large-scale subaqueous dunes with a southwesterly transport direction. Subaqueous dunes in the inner and mid shelf are prone to current reversals (Uken & Mkize, 2012). The northern area of interest for well drilling comprises Southwest Indian Upper and Lower Bathyal benthic habitats, whereas Southern Indian Lower Bathyal benthic habitat dominates in the southern area of interest (*Figure 4.4*). Both have been assigned an ecosystem threat status of 'least threatened' in the SANBI 2011 National Biodiversity Assessment (Sink *et al.*, 2011) reflecting the great extent of these habitats within the South African Exclusive Economic Zone (EEZ) (*Figure 4.5*).

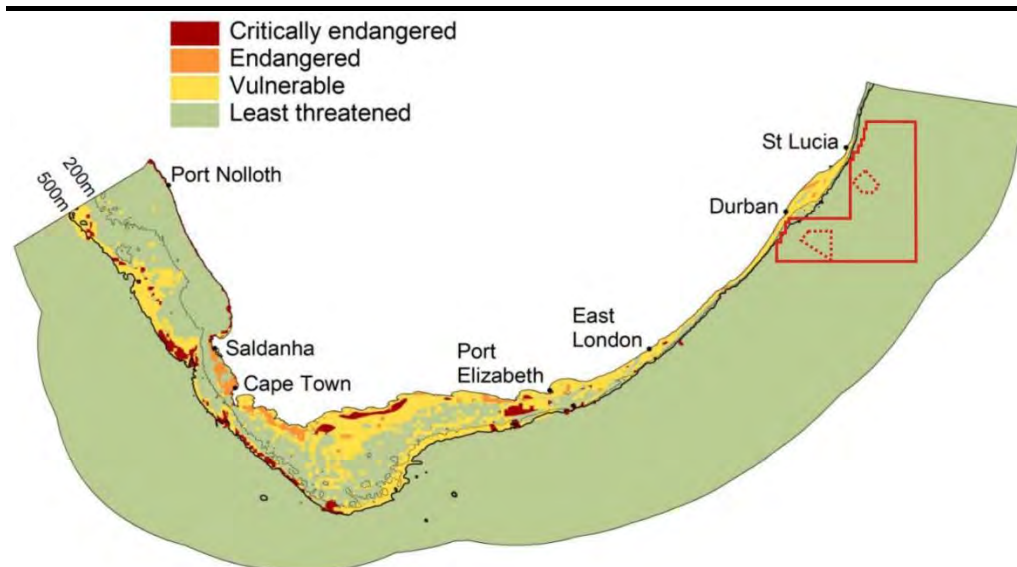
Figure 4.4 Coastal and Benthic Habitat Types off the South African East Coast



Note: Shown on the Figure are Block ER236 (red polygon) and the areas of interest for well drilling (red dotted line)

Source: Adapted from Sink *et al.* 2012 in Pisces, 2018

Figure 4.5 *The Ecological Threat Status of Coastal and Offshore Benthic Habitat Types off the South African East Coast*



Note: Shown on the Figure are Block ER236 (red polygon) and the areas of interest for well drilling (red dotted line)

Source: Adapted from Sink *et al.* 2012 in Pisces, 2018

Water Masses and Circulation

The oceanography of this coast is almost totally dominated by the warm Agulhas Current that flows southwards along the shelf edge (Schumann, 1998) (Figure 4.6). The main source of the Agulhas Current is from recirculation in a South-West Indian Ocean subgyre.

Further contributions to the Agulhas Current come from the Mozambique Current and the East Madagascar Current in the form of eddies that act as important perturbations to the flow (Lutjeharms, 2006). It flows southwards at a rapid rate following the shelf edge along the East Coast, before retroflecting between 16° and 20° E (Shannon, 1985). It is a well-defined and intense jet some 100 km wide and 2,300 m deep (Schumann, 1998; Bryden *et al.*, 2005). Current speeds of 2.5 m/s or more have been recorded (Pearce *et al.*, 1978).

Where it meets the northern part of the Tugela Bank near Cape St Lucia, the inertia of the Agulhas Current carries it into deep water. This generates instability in the current (Gill & Schumann, 1979) resulting in meanders and eddies (Pearce *et al.*, 1978). Three eddy types have been identified in the Agulhas Current (Gründlingh, 1992), refer to Table 4.1.

Table 4.1 Eddy Types Identified in the Agulhas Current

Type	Description
Type I	These are meanders that comprise smaller shear/frontal features to a depth of at least 50 m, which dissipate over a period of days
Type II	These are meanders comprising the large clockwise loops generated within the Natal Bight. These loops are explained below: <ul style="list-style-type: none"> • The extremely transient Natal Pulse occurs when meanders move in a southward flow offshore, enabling sluggish and occasional northward flow to develop close inshore (Schumann, 1988); • The larger Natal Gyre is a clockwise circulation cell that extends from Durban to Richard's Bay, resulting in northward flow inshore (Pearce, 1977a, 1977b).
Type III	These are meanders, which are the larger meanders that originate north of St Lucia.

Source: Pisces, 2018

South of Durban, the continental shelf again narrows and the Agulhas Current re-attaches itself as a relatively stable trajectory to the coast, until off Port Edward it is so close inshore that the inshore edge (signified by a temperature front) is rarely discernible (Pearce, 1977a). At Port St Johns, however, there exists a semi-permanent eddy, which results in a northward-flowing coastal current and the movement of cooler water up the continental slope onto the centre of the very narrow shelf (Roberts *et al.*, 2010). Further south, when the Agulhas Current reaches the wider Agulhas Bank and where the continental slopes are weaker, it starts to exhibit meanders, shear edge eddies and plumes of warm surface waters at the shelf edge, before retroflecting eastwards as the Agulhas Return Current to follow the Subtropical Convergence (Lutjeharms, 2006) (Figure 4.6).

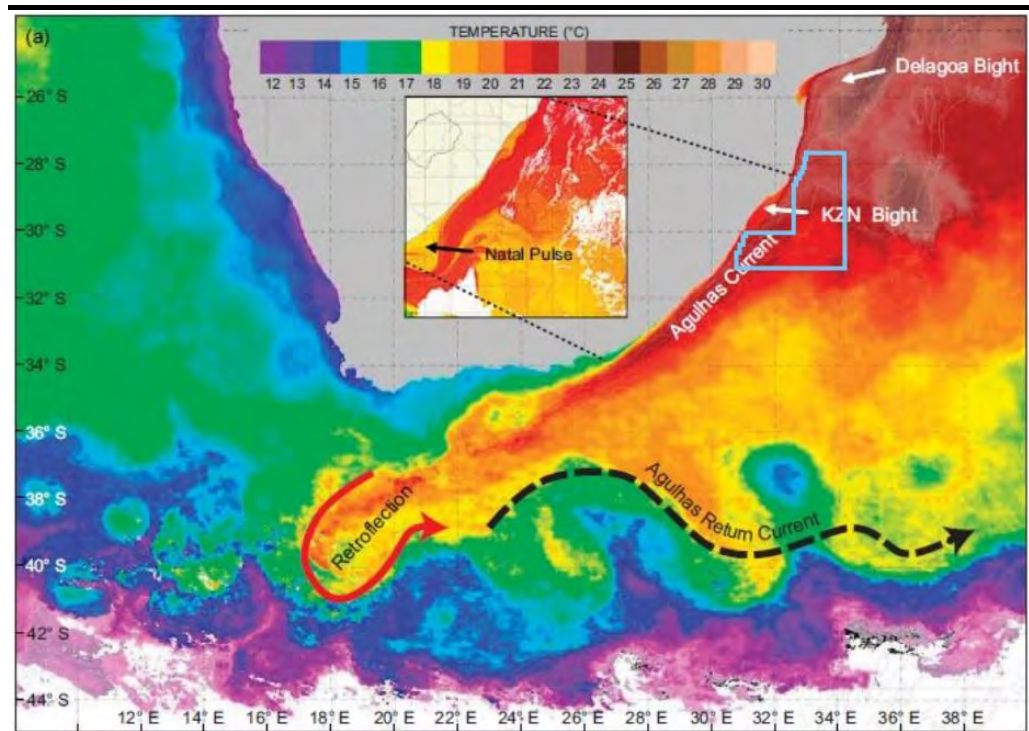
In common with other western boundary currents, a northward (equatorward) undercurrent, termed the Agulhas Undercurrent, is found on the continental slope of the East Coast at depths of between 800 m and 3,000 m (Beal & Bryden, 1997).

As the Agulhas Current originates in the equatorial region of the western Indian Ocean, its waters are typically blue and clear, with low nutrient levels and a low frequency of chlorophyll fronts. On the Tugela Bank however, nutrient concentrations are characterised by short-term temporal variations, but are higher than in areas where the continental shelf is narrower (Carter & d'Aubrey, 1988).

This is attributed in part, to the topographically induced upwelling that occurs in the area because of the bathymetric arrangement of the Natal Bight (Gill & Schumann 1979; Schumann 1986; Lutjeharms *et al.*, 1989). The cold nutrient-rich upwelled waters are a source of bottom water for the entire Natal Bight (Lutjeharms *et al.*, 2000a, b). However, from all other perspectives, the Bight may be considered a semi-enclosed system (Lutjeharms & Roberts, 1988) as the strong Agulhas Current at the shelf edge forms a barrier to exchanges of water and biota with the open ocean.

The location of the area of interest is offshore and to the east of the Tugela Banks, which suggests that nutrient concentrations will be comparatively low.

Figure 4.6 *The Predominance of the Agulhas Current in Block ER236*



Note: Shown on the Figure is Block ER236 (pale blue outline)

Source: Adapted from Roberts *et al.* 2010 in Pisces, 2018

The surface waters are a mix of Tropical Surface Water (originating in the South Equatorial Current) and Subtropical Surface Water (originating from the mid-latitude Indian Ocean). Surface waters are warmer than 20°C and have a lower salinity than the Equatorial Indian Ocean, South Indian Ocean and Central water masses found below. Surface water characteristics, however, vary due to insolation and mixing (Schumann, 1998).

Seasonal variation in temperatures is limited to the upper 50 m of the water column (Gründlingh, 1987), increasing offshore towards the core waters of the Agulhas Current where temperatures may exceed 25° C in summer and 21° C in winter (Schumann, 1998). Temperatures decrease further offshore of the core waters, and thus across most of the Block ER236.

Winds and Swells

The main wind axis off the KZN coast is parallel to the coastline, with north-north-easterly and south-south-westerly winds predominating for most of the year (Schumann & Martin, 1991) and with average wind speeds around 2.5 m/s (Schumann, 1998) (Figure 4.7 and Figure 4.8)

In the sea areas off Durban, the majority of swells are from the South and South-southwest, with the largest attaining in excess of 7 m. During summer and autumn, some swells also arrive from the east (*Figure 4.9*). The less regular weather patterns affecting the East Coast (eg low pressure cells present NE of Durban, cut-off low pressure cells and tropical cyclones) strongly influence the wave climate, resulting in swells in excess of 10 m (Hunter 1988; Schumann 1998). The giant waves (>20 m high) that are at times encountered within the Agulhas Current (Heydorn & Tinley, 1980), arise from the meeting of the south-westerly swells and the southerly flowing Agulhas Current, and may be a navigation hazard at times.

In the AII along the South Coast, westerly winds predominate in winter, frequently reaching gale force strengths. During summer, easterly wind directions increase markedly resulting in roughly similar strength/frequency of east and west winds during that season (Jury, 1994). The strongest winds are observed at capes, including Agulhas, Infanta, Cape Seal, Robberg and Cape Recife (Jury & Diab 1989). Calm periods are most common in autumn (CCA & CSIR 1998).

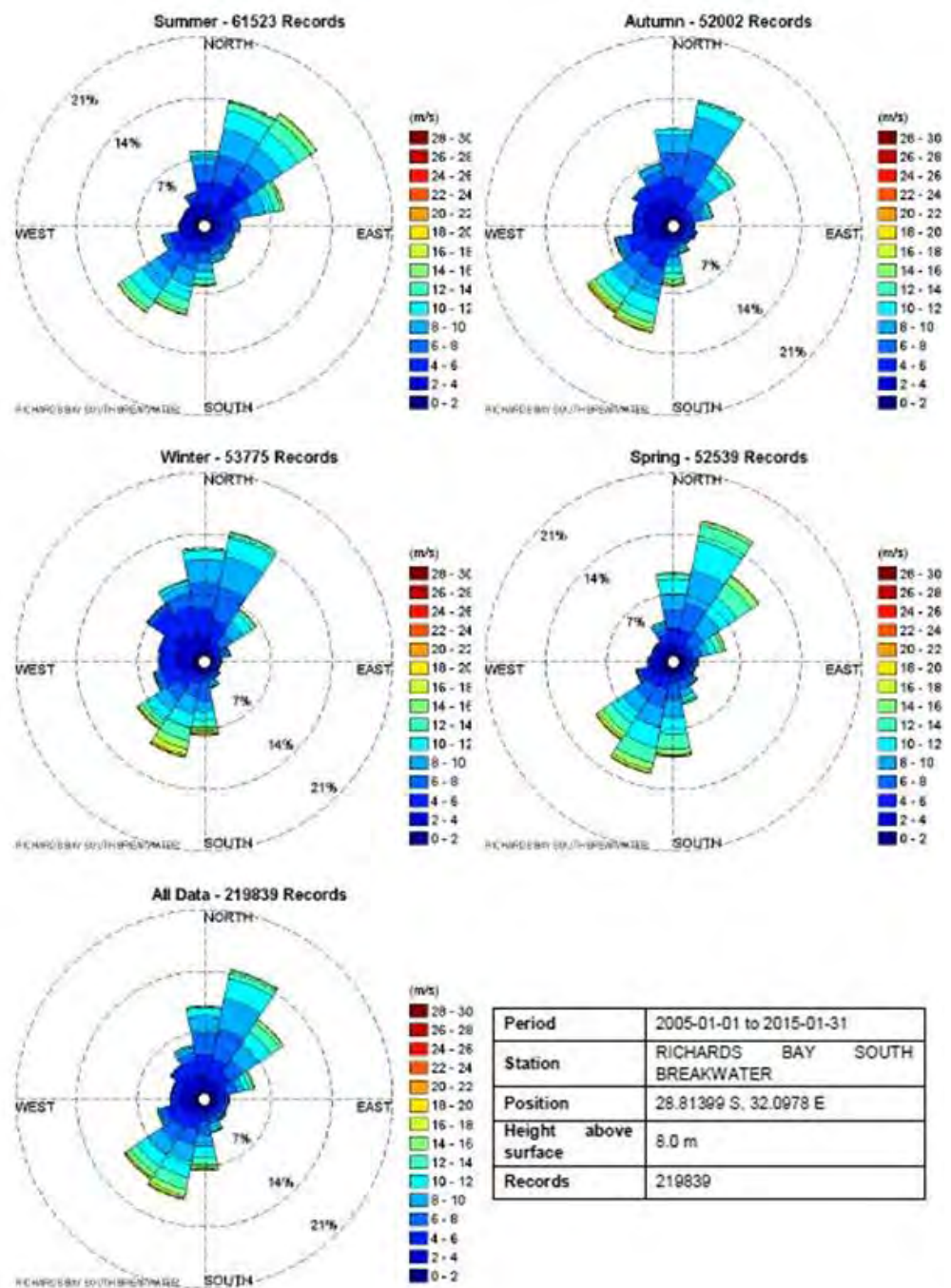
Wind-driven upwelling occurs inshore along the South Coast, especially during summer when easterly winds prevail (Schumann *et al.* 1982; Walker 1986; Schumann 1998). Such upwelling usually begins at the prominent capes and progresses westwards (Schumann *et al.* 1982; Schumann 1988), and can result in temperature changes of up to 8° C within a few hours (Hutchings 1994).

Intensive upwelling of Indian Ocean Central Water occurs periodically over the shelf and shelf edge, along the inner boundary of the Agulhas Current (Schumann 1998). This process is primarily due to frictional interactions between the Agulhas Current and bottom topography (Hutchings 1994), and is most intense at the eastern boundary of the South Coast, where the cold bottom layer breaks the surface. Such shelf-edge upwelling largely defines the strong thermocline and halocline topography of the Agulhas Bank region, particularly in summer.

A cool ridge of upwelled water that extends in a north-east (NE) – south-west (SW) direction over the mid-shelf regions between the shelf-edge upwelling and inshore waters close to the coast (Swart & Largier 1987; Boyd & Shillington 1994; Schumann 1998), dividing the waters of the Agulhas Bank into the two-layered structure in the inshore region and a partially mixed structure in the eastern offshore region.

On the South Coast, the majority of waves arrive from the south-west quadrant (Whitefield *et al.* 1983), dominating wave patterns during winter and spring (Carter & Brownlie, 1990). Waves from this direction frequently exceed 6 m (Swart & Serdyn 1981, 1982) and can reach up to 10 m (Heydorn 1989). During summer, easterly wind-generated ‘seas’ occur (Heydorn & Tinley 1980; Heydorn 1989; Carter & Brownlie 1990).

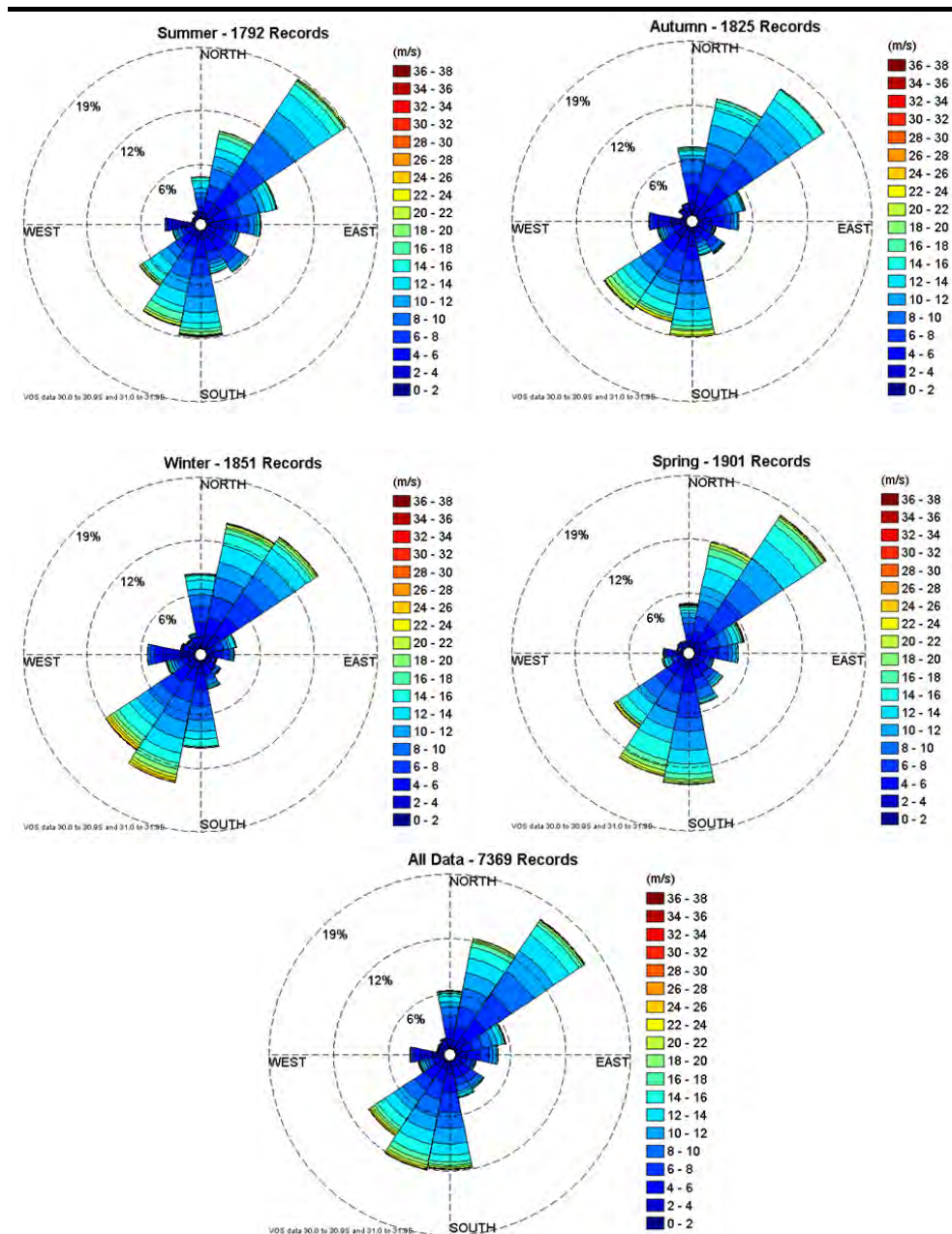
Figure 4.7 VOS Wind Speed vs Wind Direction for Richards Bay Breakwater (28.8°S and 32.1° E)



Source: 1960-02-15 to 2012-04-13; 4,515 records in Pisces, 2018

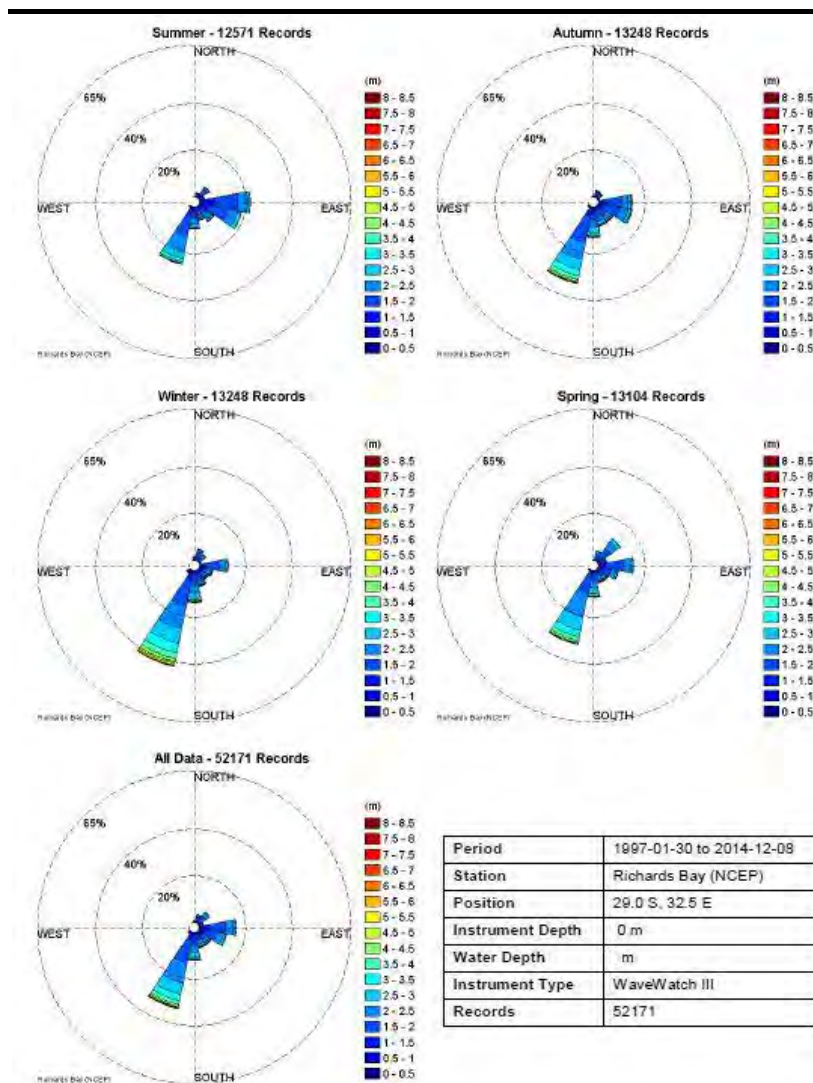
Figure 4.8

VOS Wind Speed vs Wind Direction for Port Shepstone (30.0° to 30.9° S and 31.0° to 31.9° E)



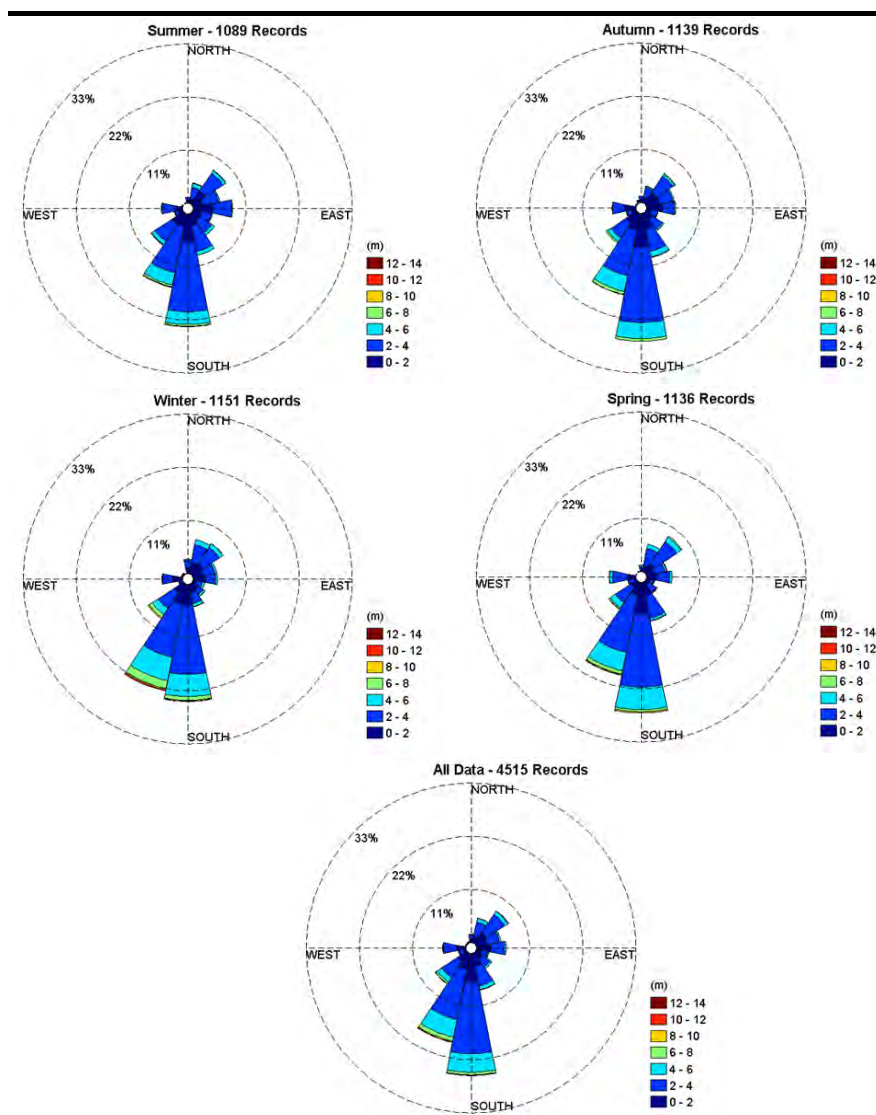
Source: CSIR 1960-02-15 to 2012-04-13; 7,369 records in Pisces, 2018

Figure 4.9 *VOS Wave Height (Hmo) vs Wave Direction for a Deepwater Location Offshore of Richards Bay (29.0°S and 32.5° E)*



Source: CSIR 1960-02-15 to 2012-04-13; 7,369 records in Pisces, 2018

Figure 4.10 VOS Wave Height (Hmo) vs Wave Direction for Port Shepstone (30.0° to 30.9° S and 31.0° to 31.9° E)



Source: CSIR 1960-02-15 to 2012-04-13; 4,515 records in Pisces, 2018

Nutrients

Nutrient inputs on the Tugela Banks are thought to originate from a combination of an upwelling cell off Richards Bay, the Tugela River and a cyclonic lee eddy off Durban. The marine nutrients are derived from a topographically-induced upwelling cell just south of Richards Bay (Gill & Schumann, 1979; Schumann, 1988; Lutjeharms *et al.*, 1989). The cold nutrient-rich upwelled waters are a source of bottom water for the entire Natal Bight (Lutjeharms *et al.*, 2000a, b), but the quantity and regularity of this nutrient supply remains unknown. The cyclonic eddy incorporates enrichment, retention and concentration mechanisms and together with the upwelling and elevated phytoplankton production in the north of the Bight (Lutjeharms *et al.*, 2000b), creates the necessary conditions for enhanced survivorship of early larvae and juveniles of pelagic spawners (Beckley & van Ballegooyen, 1992; Hutchings *et al.*, 2003).

River discharge also has profound effect on physical, chemical and biological processes in coastal waters, and in KZN the effect of catchment-derived nutrient supply onto the Tugela Banks is thought to be pronounced given that nutrient supply from upwelling events is limited (Lamberth *et al.*, 2009). The importance of localised fluvial processes (under normal flow, reduced flow and flood events) in driving marine food webs has recently received much research attention (DWAF, 2004; Lamberth *et al.*, 2009; Turpie & Lamberth, 2010).

Nutrient inputs into the coastal environment through river runoff are predicted to stimulate phytoplankton and zooplankton production and ultimately the larval, juvenile and adult fish that depend on them as a food source. Proposed impoundments on the Tugela River may thus have cascade effects on ecosystem functioning of the Tugela Banks, with far-reaching consequences for the sustainability of local fisheries (commercial and subsistence).

The turbid, nutrient-rich conditions are also important for the life-history phases (breeding, nursery and feeding) of many demersal and pelagic species. The area harbours the only commercial shallow-water prawn trawl fishery in the country and is thus of considerable socio-economic importance to KZN.

4.3.3 Biological Environment

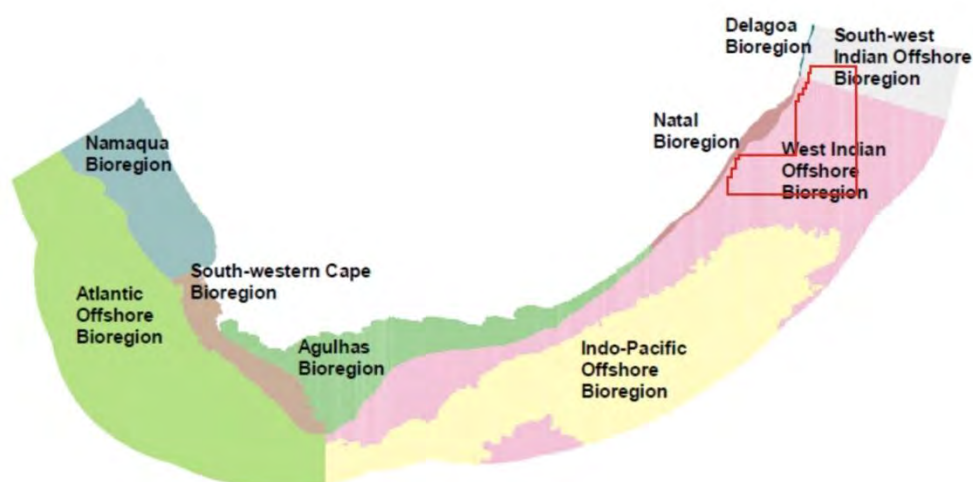
Biogeographically, Block ER236 and the area of interest falls into the West Indian Offshore bioregion (*Figure 4.11*) (Lombard *et al.*, 2004). The offshore areas comprise primarily deep water benthic habitats and the water body. Due to limited opportunities for sampling, information on the pelagic and demersal communities of the shelf edge, continental slope and upper and lower bathyal are largely unknown.

Consequently, much of the information on the baseline environment provided below relates to the inshore (shallow waters prior to where the shelf of the Thukela Bank starts dropping off, on average less than 50 m water depth) and continental shelf (water depths less than 200 m¹) regions, which fall within the Natal Bioregion (*Figure 4.11*).

The benthic communities within these habitats are generally ubiquitous throughout the southern African East Coast region, being particular only to substratum type and/or depth zone. They consist of many hundreds of species, often displaying considerable temporal and spatial variability. The biological communities 'typical' of each of these habitats are described briefly below, focusing both on dominant, commercially important and conspicuous species, as well as potentially threatened or sensitive species, which may be affected by the proposed project.

¹ The shelf break occurs at approximately the 200 m isobath with a relatively steep slope towards the sea.

Figure 4.11 *The South African Inshore and Offshore Bioregions in Relation to Block ER236*



Note: Shown on the Figure is Block ER236 (red polygon)

Source: Adapted from Lombard *et al.* 2004 in Pisces, 2018

Phytoplankton and Ichthyoplankton

The nutrient-poor characteristics of the Agulhas Current water are reflected in comparatively low primary productivity in KZN inshore areas, with chlorophyll *a* concentrations ranging between 0.03 and 3.88 µg/l (Carter & Schleyer, 1988; see also Coetzee *et al.*, 2010).

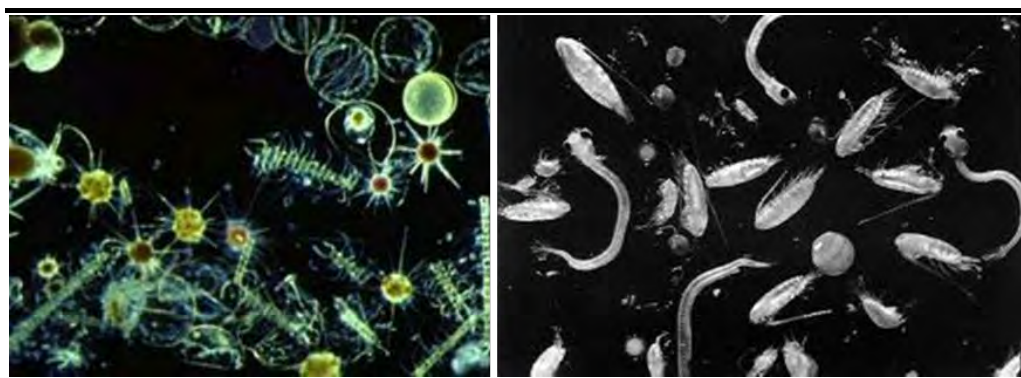
Further offshore and in Block ER236, the pelagic environment is characterised by very low productivity, with the low variability in water-column temperature resulting in very low frequency of chlorophyll fronts. Phytoplankton, zooplankton and ichthyoplankton (fish eggs) abundances in Block ER236 are thus expected to be extremely low.

In contrast, on the Tugela Bank, short-term increases in productivity are associated with localised upwelling (Oliff, 1973). Continental shelf waters support greater and more variable concentrations of zooplankton biomass (Figure 4.11) than offshore waters (Beckley & Van Ballegooyen, 1992), with species composition varying seasonally (Carter & Schleyer, 1988). Copepods represent the dominant species group in shelf waters (Carter & Schleyer, 1988), although chaetognaths are also abundant (Schleyer, 1985).

The nutrient-poor characteristics of the Agulhas Current water are reflected in comparatively low primary productivity along the Eastern Cape Coast, with mean chlorophyll *a* concentrations averaging between 1-2 mg/m³ over the whole year in the top 30 m of the water column. Chlorophyll *a* concentrations vary seasonally, being minimal in winter and summer (<1 - 2 mg/m³), and maximal (2 - 4 mg/m³) in spring and autumn (Brown, 1992).

Along the eastern half of the South Coast (the area off and north of Port Elizabeth) phytoplankton concentrations are usually higher than further west (the Agulhas bank and surrounding area), comprising predominantly large cells (Hutchings 1994). This eastwards increase in *chlorophyll a* concentrations determines the increase in the biomass of mesozooplankton from approximately 0.5 to approximately 1.0 g C/m² in the west to approximately 1.0 to approximately 2.0 g C/m² further east. Dense swarms of euphausiids dominate this zooplankton component, and form an important food source for pelagic fishes (Cornew *et al.* 1992; Verheye *et al.* 1994).

Figure 4.12 *Phytoplankton and Zooplankton Associated with Upwelling Cells on the Tugela Bank.*



Source: left, photo: hymagazine.com, right, photo: mysciencebox.org)

Ichthyoplankton

Pilchard (*Sardinops sagax*) eggs occur, primarily, in waters less than 200 m, outside Block ER236, along the Eastern Cape and the southern KZN coast with the onset of the “sardine run” between May and July (Anders, 1975; Connell, 1996). The sardine and other clupeid eggs persist in inshore waters throughout winter – spring, before disappearing in early summer as the shoals break up and move northwards and further offshore (Connell, 2010). Recent evidence suggests that the inshore areas of the KZN coast may also function as a nursery area for these small pelagic species during the winter months (Connell, 2010; Coetzee *et al.*, 2010) as freshwater flows from the large rivers serve as cues for spawning and the recruitment of juveniles (Lamberth *et al.*, 2009). Anchovy (*Engraulis japonicus*) eggs were reported in the water column during December as far north as St Lucia (Anders, 1975).

Numerous other fish species (eg squaretail kob and various sciaenids (snapper, sin croaker, bearded croaker) use the Tugela Banks as a nursery area due to suitable food sources and protection from predators in the turbid water (Fennesy, 1994a). For example, juvenile squaretail kob and snapper kob are seasonally abundant as a bycatch in the shallow-water prawn fishery from January to March, before moving from their feeding areas on the trawling grounds to low reef areas where their diet changes to include more teleosts (Fennessey, 1994a).

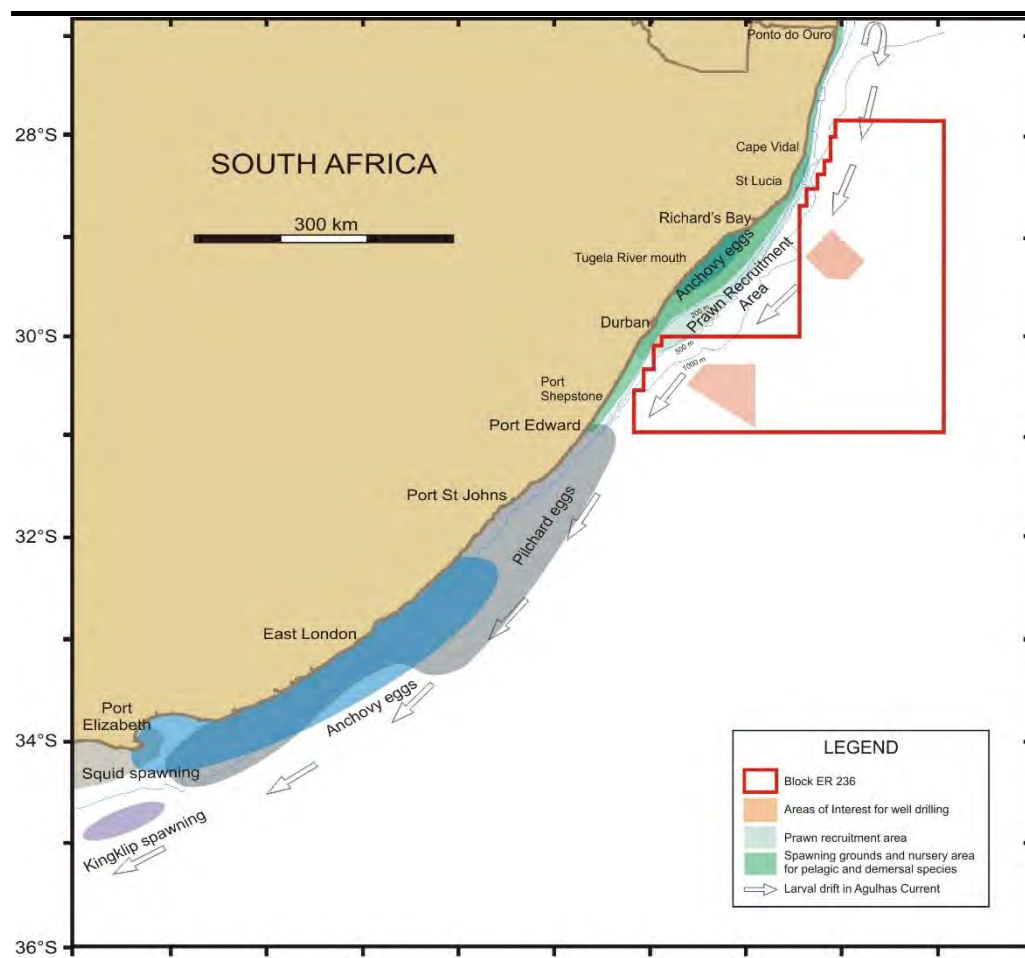
The Tugela Banks are also known to serve as a nursery area for the endangered scalloped hammerhead shark, slinger and black mussel cracker (CBD, 2013), and five species of dasyatid rays (Fennessy, 1994b).

The Banks serve as a spawning area for (amongst others) bull shark, sand tiger shark, black mussel cracker and king mackerel and migration route for sardine ('sardine run') (Haupt, 2011; Harris *et al.*, 2011; Sink *et al.*, 2011; Ezemvelo KZN Wildlife, 2012; CBD, 2013). Numerous linefish species (eg dusky kob *Argyrosomus japonica*, elf *Pomatomus saltatrix* and garrrick *Lichia amia*) undertake spawning migrations along the inshore areas of the coast into KZN waters during the winter months (Van der Elst, 1976, 1981; Griffiths, 1988; Garratt, 1988).

Many of the species listed have been identified as either 'threatened' by IUCN (2017) or listed as priority species for conservation due to over-exploitation (Sink & Lawrence, 2008).

Following spawning during spring and summer (November to April), the eggs and larvae are subsequently dispersed southwards by the Agulhas Current (Connell, 2010) (*Figure 4.13*), with juveniles occurring on the inshore Agulhas Bank (Van der Elst, 1976, 1981& Garret, 1988). Likewise ichthyoplankton is confined primarily to waters less than 200 m, with larval concentrations varying between 0.005 and 4.576 larvae/m³. Concentrations, however, decrease rapidly with distance offshore (Beckley & Van Ballegooyen, 1992). The area of interest is in water depths of more than 500 m and therefore ichthyoplankton abundance is likely to be low. As can be seen in *Figure 4.13*, the area of interest is offshore of major fish spawning and migration routes.

Figure 4.13 Major Fish Spawning, Nursery and Recruitment Areas along the KZN Coast in Relation to Block ER236



Note: Shown on the Figure on Block ER236 (red polygon) and the areas of interest (orange squares)

Source: Pisces, 2018

Fish

Pilchards (*Sardinops sagax*) are a small pelagic shoaling species typically found in shelf water between 14 °C and 20 °C. Spawning occurs on the Agulhas Bank during spring and summer (November to April). During the winter months of June to August, the penetration of northerly-flowing cooler water along the Eastern Cape coast and up to southern KZN effectively expands the suitable habitat available for this species, resulting in a 'leakage' of large shoals northwards along the coast in what has traditionally been known as the 'sardine run'. The cool band of inshore water is critical to the 'run' as the sardines will either remain in the south or only move northwards further offshore if the inshore waters are above 20 °C.

The shoals can attain lengths of 20 to 30 km and are typically pursued by Great White Sharks, Copper Sharks, Common Dolphins (Figure 4.16, right), Cape Gannets and various other large pelagic predators (www.sardinerun.co.za, O'Donoghue *et al.*, 2010a, 2010b, 2010c).

The sardine run occurs along the continental shelf (overlapping with the spawning area indicated in *Figure 4.13*) inshore of Block ER236 and the area of interest.

A high diversity of pelagic Teleosts (bony fish) and Chondrichthyans (cartilaginous fish) are associated with the numerous inshore reefs and shelf waters inshore of Block ER236, in the AII. Many of the fishes are endemic to the Southern African coastline and form an important component of the commercial and recreational line fisheries of KZN.

The fish most likely to be encountered on the shelf, beyond the shelf break and in the offshore waters of Block ER236 are the large migratory pelagic species, including various tunas (*Figure 4.14*, left), billfish (*Figure 4.14*, right) and sharks (the great white shark (*Carcharodon carcharias*) and the whale shark (*Rhincodon typus*), many of which are identified as either 'threatened' by IUCN (2017) or listed as priority species for conservation primarily due to overfishing. Tuna and swordfish (*Xiphias gladius*) in particular 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.

Figure 4.14 *Large Migratory Pelagic Fish that Occur in Offshore Waters*



Note: Longfin Tuna (Left) and Blue Marlin (Right)

Source: www.samathatours.com; www.osfimages.com

Fennessy (2016) reports on demersal fish communities across the KZN Bight to depths of 575 m. The fish communities were dominated by the Sparidae (five species), Triglidae (four species), Acropomatidae (three species), Macrouridae (eight species). Information on other neritic and demersal fish and megabenthic invertebrates beyond 600 m depth and in the drilling areas of interest is sparse and no definitive description of these communities can be accurately provided for Block ER236.

Coelacanth

Coelacanth are a rare order of demersal fish that includes two species of the genus *Latimeria*: the West Indian Ocean coelacanth (*Latimeria chalumnae*) (also known as the African coelacanth), which is primarily found near the Comoro Islands off the east coast of Africa, and the Indonesian coelacanth (*Latimeria menadoensis*).

Until recently, African coelacanths were thought to only occur in depths of 120 to 300 m, in the sediment-poor, steep volcanic drop-off caves of the Comoros Islands, to the east of Mozambique. However, the discovery of a group of coelacanths in the relatively shallow waters (90 to 140 m depth) of a submarine canyon off the Greater St Lucia Wetland Park (GSLWP) World Heritage Site in November 2000 (Venter *et al.*, 2000), demonstrated otherwise.

Since then, captures have been made in bottom trawls and deep-set gillnets off the coasts of Kenya (De Vos & Oyugi, 2002) and Tanzania (Nyandwi, 2006; Benno *et al.*, 2006) where of a series of 10 to 15 m high terraces between 70 and 140 m depth (Benno *et al.*, 2006) has been observed in the north, and submarine depressions interpreted as canyons have been observed at depths of 400 m in the south (Nyandwi, 2010). In contrast, those fish caught off East London (1938), Mozambique (1991: Bruton *et al.*, 1992), Madagascar (1995: Heemstra *et al.*, 1996; also 1997, 2001) and Kenya (2001: De Vos & Oyugi, 2002) were reported to have been captured over predominantly sandy, low-relief seabed.

From the pioneering studies in the Comoros by Hans Fricke and associates, it was predicted that coelacanths have a narrow habitat-tolerance range, namely:

- They require caves and overhangs in steep drop-offs in which to shelter;
- They are sensitive to temperatures above 21°C;
- Being slow swimmers (approximately 5 cm/s), they avoid strong currents;
- They require water with a high oxygen concentration; and
- They emerge from their cave shelters at night to hunt, typically in deeper water.

Following the coelacanth discovery off the GSLWP, numerous bathymetric and submersible surveys have been undertaken as part of the African Coelacanth Ecosystem Project (ACEP). Together with the discoveries of coelacanths from other areas, the surveys revealed that coelacanths:

- Appear to be more widely distributed than originally thought;
- Are more tolerant of variations in temperature, oxygen, light and depth than initially perceived;
- Exhibit a broader tolerance range of different structural habitats than concluded from Comoran data, and on the East African coast appear to favour submarine canyons; but
- Are not necessarily present where these conditions are met, suggesting population size in the GSWLP may be lower than formerly predicted.

The results of the studies conducted as part of the ACEP are summarised below.

Multibeam bathymetric surveys were undertaken off the Maputaland coast, with the objective of defining potential coelacanth habitats within submarine canyons in the area (Ramsay & Miller, 2006). A total of 23 submarine canyons, were identified along the northern KwaZulu-Natal coastline.

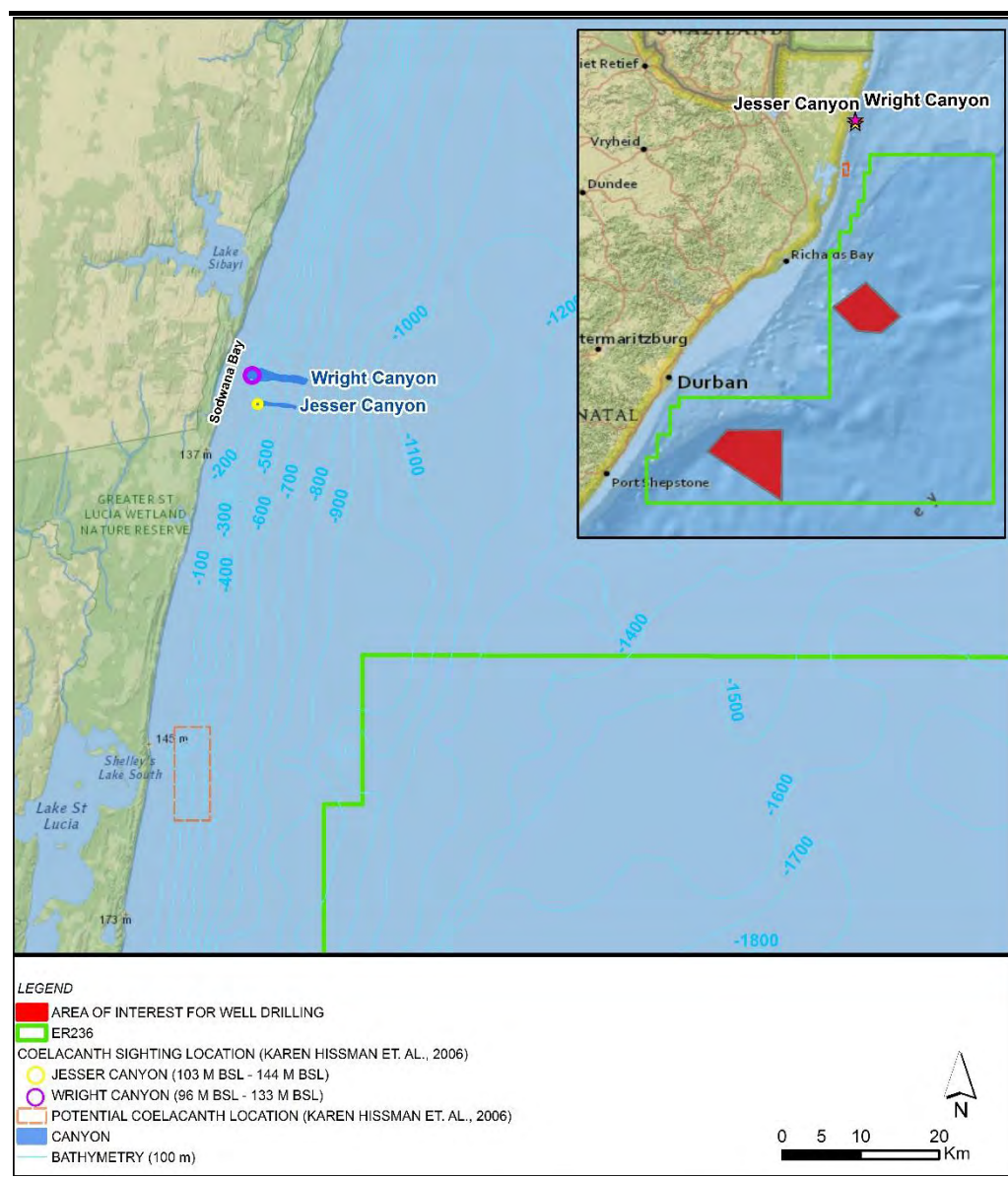
The canyon heads breach the relatively narrow (2 to 4 km) shelf at depths of 90 to 120 m, and their thalwegs (bottoms) have depths of several hundred metres. The northern margins of the canyon heads are typically steeper and more stable than the southern margins. Stratified sedimentary rock outcrops occur as cliffs and intermittent sandy terraces at depths of between 40 to 130 m.

Dissolution of the sedimentary rock during geological periods of lower sea level resulted in the formation of caves and overhangs below the steep canyon edge (approximately 100 m depth) and along the canyon walls down to 160 m (Ramay & Miller, 2006). In terms of canyon morphology, the terraces located at 110 to 130 m below current sea level are thought to be optimal coelacanth habitats.

In contrast, canyons occurring in close proximity to active subaqueous dune fields are thought to be suboptimal habitats for coelacanths, as excessive sediment movement is expected to result in slumping along unstable canyon margins, with the erosive effect of sediments likely having a negative impact on coelacanth populations through destruction of their preferred cave habitats. Despite these canyon habitats in the GSLWP differing considerably from those of the volcanic Comoros, overhangs and caves occur in both areas, providing sheltered habitats for coelacanths to occupy during the day.

Data from the Comoros, which indicated that coelacanths live in deep cool water, led to an initial expectation that coelacanths in the Maputaland canyons would be numerous, assuming that those found in the shallow canyon heads were representative of a deeper, more extensive population. However, the coelacanths sighted off Sodwana Bay were confined to the narrow belt (90 to 140 m depth) in the canyons where caves, overhangs or broken boulder areas offering shelter were abundant (*Figure 4.15*). Coelacanths occurred singly or in groups of up to seven individuals in the caves, and although they showed site fidelity, they appear to use several different caves within their home range. The sizes of home ranges in the canyons off the GSLWP have not been defined, but individuals are known to move the 4 km distance between the Jesser and Wright canyons in the Sodwana Canyon complex (Hissman *et al.*, 2006). In the Comoros, a home range might extend for about eight kilometres. Some of the Sodwana Feeder Valley coelacanths are known to be resident within the canyon habitat for at least four years. Aggregations of these fish in caves are not thought to be a seasonal occurrence.

Figure 4.15 Location of the Jesser and Wright Canyons, in the Sodwana Canyon Complex, where *Coelacanths* were discovered



Green *et al.* (2006) used pre-existing bathymetric data sets and geo-referenced charts to identify further potential canyons on the southeast African continental shelf and slope. They concluded that further coelacanth habitats could be expected on the continental shelf off the Port Shepstone to Port St Johns stretch of coastline (the expected southernmost limit to coelacanth distribution) and on the outer shelf area between Olumbe and Porto Amelia, and Pemba, Nacala, Mossuril and Vilanculos in northern Mozambique. These areas are characterised by a high density of submarine canyons, and based on the regional geological setting, good cave development in the canyon heads is expected. Although off Tanzania submarine canyons seem to be less well developed, the sparse data identified canyon features off Mtwara, Lindi and Mchinga. In Madagascar, submarine canyons occur off the west coast at Toliara (where a coelacanth was found) and north of Morondava.

The normal temperature range for coelacanths in the Comoros, South Africa and Indonesia is 15-20°C. The upper threshold limit for coelacanths is thought to be 22 to 23 °C (Fricke *et al.*, 1991), although fish have been sighted resting in caves at a temperature above 24°C.

The optimum temperature for oxygen uptake in coelacanths is 15°C (Hughes & Itazawa, 1972), with higher temperatures resulting in respiratory distress. The Sodwana Feeder Valley coelacanths would thus be expected to occur at depths beyond 200 m, but as there appear to be fewer adequate shelters beyond 140 m, their occurrence within caves in the 90 to 140 m depth range may be due to a necessity to remain quiescent in order to keep metabolic rate and oxygen consumption low (Roberts *et al.*, 2006). South African coelacanths can tolerate a (tidally induced) temperature range of 6 °C within a single day. Off the Maputaland coast, the 16 to 20 °C isotherms typically lie at between 100 to 140 m depth, which is approximately 100 m shallower than in the Comoros (200 to 300 m). The shallowest depth at which a coelacanth has been recorded was at 54 m, below an overhang in a deep reef complex on the shelf south of Diepgat Canyon (Hissmann *et al.*, 2006; Roberts *et al.*, 2006) south of Sodwana Bay. This occurrence was, however, coincident with a significant upwelling event, when temperatures at this depth decreased to 17 to 19 °C (Roberts *et al.*, 2006).

Surface dissolved oxygen levels off the GSLWP were found to be in the order of 3.6 ml/l. A shallow oxygen minimum (a characteristic found throughout most of the South-West Indian Ocean) occurred at between 100-250 m depth, where levels dropped to 3.2 ml/l. Immediately below this oxygen minimum layer, concentrations increased again to resemble those at the surface before declining with depth to 3.2 ml/l at 1,000 m. The minimum oxygen layer thus corresponds with the depths at which the Sodwana Feeder Valley coelacanths occur (Roberts *et al.*, 2006; Hissmann *et al.*, 2006). Off the Comoros, the shallow oxygen minimum of 2.9 ml/l occurs between 200-320m, which likewise corresponds to depths at which coelacanths occur there.

Coelacanths are nocturnal drift hunters, feeding opportunistically on benthic, epibenthic and mesopelagic fish and cuttlefish found in their deep reef and volcanic slope habitats. No attempts of coelacanths feeding on species considered potential prey have been observed off Sodwana Bay, although the density and diversity of fish at the canyon edges and within the caves is high (Hissmann *et al.*, 2006). Transmitter tracking experiments off Sodwana Bay indicated nocturnal activity between 70 to 130 m, which was at or above the depth of the daytime refuges, and the depth at which potential prey species were most abundant.

The abundance of planktivorous species along the Kwazulu-Natal canyon margins are indicative of the topographic upwelling that drives primary production in the canyon habitat. Other shoaling and commercially important sparids such as slinger, *Chrysoblephus puniceus*, Englishman, *Chrysoblephus anglicus*, Scotsman, *Polysteganus praeorbitalis*, and blueskin, *P. caeruleopunctatus*, as well as large predatory fish, including serranids, were also reported (Sink *et al.*, 2006).

These fish are all thought to constitute potential prey for coelacanths. The known coelacanth habitat in South Africa thus supports a greater density of large, transient and resident fish than their habitat in the Comoros, where the distribution of prey species has been cited as a factor limiting the distribution and abundance of the coelacanth (Bruton & Armstrong, 1991; Fricke & Plante, 1988; Fricke & Hissmann, 2000). The biomass of fish in the Sodwana Feeder Valley canyons habitat is estimated to be three to four times higher than in similar coelacanth habitat in the Comoros (Heemstra *et al.*, 2006b).

Block ER236 in perspective

Block ER236 overlaps with two canyon systems (Figure 4.3), namely the Tugela and Goodlad Canyons, in which the deeper portions of the feeder canyon lie in close proximity to the southern and northern areas of interest. It should be noted that the areas of interest do not overlap with canyons and no drilling activities will take place in the canyons.

The Tugela Canyon is an example of a large submarine canyon restricted to the mid-lower continental slope. Unlike those off the GSLWP, this canyon lacks connection to the upper continental slope and shelf. The canyon head is located at approximately 600 m depth with the thalweg ending in the Natal Valley at approximately 2,800 m (Wiles *et al.*, 2013). Sporadic high relief basement outcrops occur in the canyon head, with terraces developing along the western canyon wall beyond depths of approximately 1,500 m. With increasing distance from the continental shelf, and increasing depth, the canyon increases in width and relief. The Tugela Canyon therefore differs significantly in morphology from those in northern KwaZulu-Natal, where coelacanths have been reported. Firstly, the canyon head lacks the amphitheatre-shaped head morphology. Secondly, it is located at far greater depth to the Sodwana feeder valley canyons, and finally, it shows no significant tributary branches (Wiles *et al.*, 2013). Although terraces are present and may provide shelter in the form of caves and overhangs, they occur at depths (>1,500 m) well beyond those at which coelacanths have been recorded to date.

Information on the Goodlad (29°25' S) Canyon is sparse. It is reported to start as a small 20 m deep valley (Martin & Flemming, 1988) deepening to 250 m while becoming a 50 km wide, shallow valley at a depth of 1,400 m. It emerges from the Thukela Cone at 2,320 m (Goodlad, 1986). The gradient of the canyon walls are less steep than those of the Tugela Canyon and limited tributaries occur (Young, 2009).

Other than the study by Roberts *et al.* (2006) on the Maputaland Coast, there are currently no data available on temperature or dissolved oxygen on, or beyond the shelf edge. Extrapolating these temperature and dissolved oxygen data to the Tugela Canyon region suggests that temperatures in the canyon heads at depths of 600 m they are likely to be <10 °C, with dissolved oxygen concentrations of <3.4 ml/l.

Although the oxygen concentrations would be suitable for coelacanths, the declining water temperatures beyond 600 m depths are well below the known tolerance for coelacanths (15 °C).

Together with the fact that these canyons lack connectivity to the shelf, and suitable food sources are likely to be limited at those depths, this suggests that the Tugela and Goodlad Canyons are unlikely to offer suitable habitat for coelacanths.

Reef Communities (coral reef)

The subtidal shallow reefs of the East Coast range from rich, coral-encrusted sandstone reefs in the north to the more temperate rocky reefs further south. To the north of Block ER236, the Maputaland Coral Reef system, which extends from Kosi Bay to Leven Point (27°55'40"S, 32°35'40"E), constitute the southernmost coral-dominated reefs of Africa (UNEP-WCMC, 2011). South of the iSimangaliso Wetland Park (St Lucia), reef habitat is provided by rock outcrops, although both hard and soft corals still occur.

Both reef types are characterised by diverse invertebrate and ichthyofaunal biota of Indo-Pacific origin (*Figure 4.16*, left). The coral reef habitat also provides shelter and a food source for the highly diverse Indo-Pacific reef fish community. Both the coral-dominated reefs off Sodwana Bay (to the north of Block ER236) and the sandstone reefs off Durban and the KZN South Coast (inshore of Block ER236) are popular amongst divers for their wealth of invertebrate and fish diversity.

Figure 4.16 *The Reefs of KZN and the Annual Sardine Run*



Source: www.sa-venues.com; www.sea-air-land.com

The marine mammal fauna of the East Coast comprise between 28 and 38 species of cetaceans (whales and dolphins) known (historic sightings or strandings) or likely (habitat projections based on known species parameters) to occur there (Findlay, 1989; Findlay *et al.*, 1992; Ross, 1984; Peddemors, 1999; Best, 2007) (Table 4.2). Seals occur only occasionally in the form of vagrant Cape fur seals (*Arctocephalus pusillus pusillus*) (CSIR, 1998).

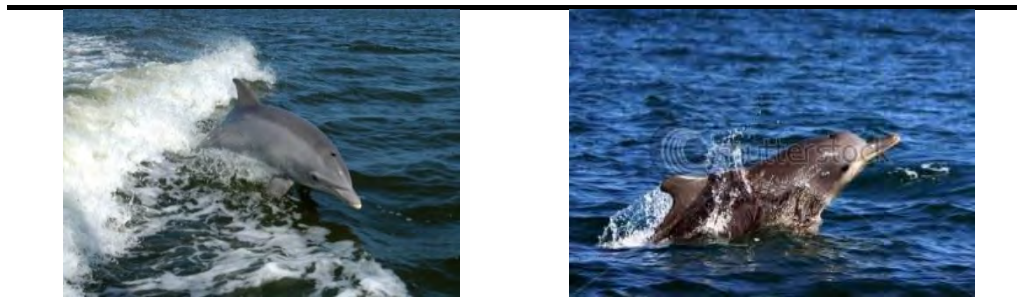
The offshore areas have been particularly poorly studied in which case almost all available information from deeper waters (>200 m) is based on historic whaling records, and information on smaller deep water species is particularly poor.

There are 36 species of cetaceans that are likely to be found within Block ER236. Of the 36 species, according to the South African Red List Assessment, the Antarctic Blue whale (*Balaenoptera musculus intermedia*) is 'critically endangered', the Indo-Pacific humpback dolphin (*Sousa chinensis*), fin whale (*Balaenoptera physalus*) and sei whale (*Balaenoptera borealis*) are considered 'endangered' and the Ifafi-Kosi Bay sub-population of the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), Sperm whale (*Physeter macrocephalus*) and the inshore population of Bryde's whale (*Balaenoptera brydei*) are considered 'vulnerable' (Child *et al.*, 2016). Altogether nine species are listed as 'data deficient' underlining how little is known about cetaceans, their distributions and population trends (Pisces, 2018).

The distribution of whales and dolphins on the East Coast can be split largely into those associated with the continental shelf and those that occur in deep, oceanic waters. Species from both environments may, however, be found to be associated with the shelf (200 to 1,000 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 kilometres. The most common species within the Block ER236 (in terms of likely encounter rate not total population sizes) are likely to be the common bottlenose dolphin (*Tursiops truncatus*, Figure 4.17, left), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), short-finned pilot whale (*Globicephala macrorhynchus*), Indo-Pacific humpback dolphin (*Sousa chinensis*, Figure 4.17, right) and humpback whale (Figure 4.18, left).

Cetaceans comprised two basic taxonomic groups: the mysticetes (filter-feeding baleen whales) and the odontocetes (toothed predatory whales and dolphins). Due to large differences in their size, sociality, communication abilities, ranging behaviour and acoustic behaviour, these two groups are considered separately.

Figure 4.17 *The Bottlenose Dolphin and the Indo-Pacific Humpback Dolphin*



Source: www.fish-wallpapers.com; www.shutterstock.com

Baleen whales that are found in the offshore waters of the East Coast include the blue, fin, sei, minke, dwarf minke, inshore Bryde's, Pygmy Right, Humpback and Southern Right whale. Most of these species occur in deeper pelagic waters, with only occasional visits into the shallower shelf waters. These species show some degree of migration either to, or through, Block ER236 when en route between higher-latitude feeding grounds (Antarctic or Subantarctic) and lower-latitude breeding grounds.

As whales follow geographic or oceanographic features, the northward and southward migrations may take place at different distances from the coast, thereby influencing the seasonality of occurrence at different locations. Due to the complexities of the migration patterns, the species of key stakeholder concern (humpbacks and southern right whales) are discussed in further detail below.

Humpback whales (*Megaptera novaeangliae*)

Humpback whales (Figure 4.18, left) are known to migrate between their Antarctic feeding grounds and their winter breeding grounds in tropical waters. The main winter concentration areas for humpback whales on the African east coast include Mozambique, Madagascar, Kenya and Tanzania on the east coast. During this migration they use subtropical coastal areas as important migratory corridors and exhibit a widespread seasonality in occurrence along the South African east coast (Best, 2007).

Humpback whales and their migration patterns have been studied for a number of years, showing a strong bimodal seasonality in the presence of humpback whales on South Africa's eastern coast, with peaks in abundance in June/ July and September corresponding with their northward and southward migration respectively (Findlay *et al.* 2011). However, in 2013, a study by Banks made observations of migrations extending further north than previously recorded, with most reaching southern African waters around April, continuing through to September/October when the southern migration begins and continues through to December and as late as February (Banks, 2013).

Cow-calf pairs are typically the last to leave southern African waters on the return southward migration, although considerable variation in the departure time from breeding areas has been recorded (Barendse *et al.*, 2010).

As indicated in Banks (2013), the highest concentrations of humpback whales in or near Block ER236 can be expected in June to July and October to December. Humpback whales are least likely to be present in or near Block ER236 from February to March.

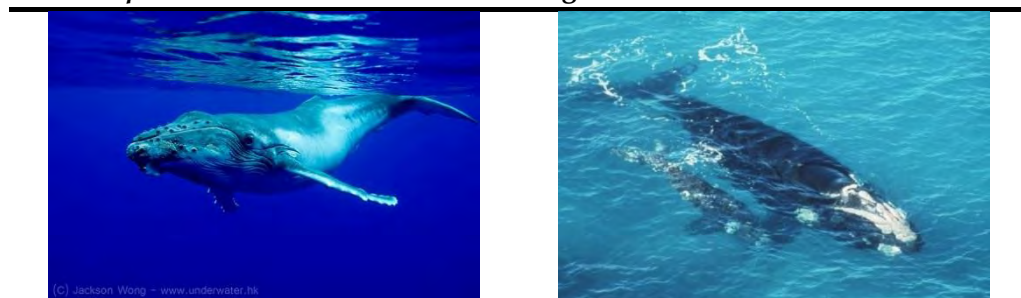
Southern Right whales (*Eubalaena australis*)

The Southern African population of Southern Right whales (Figure 4.18, right) historically extended from Southern Mozambique (Maputo Bay) (Banks *et al.*, 2011) to Southern Angola (Baie dos Tigres) and is considered a single population within this range (Roux *et al.*, 2015). Winter concentrations have been recorded along the Southern and Eastern Coasts of South Africa as far north as Maputo Bay, with the most significant concentration currently on the South Coast between Cape Town and Port Elizabeth. They typically occur in coastal waters off the South Coast between June and November, although animals may be sighted as early as April and as late as January. They migrate to the southern African sub-region to breed and calve, inhabiting shallow coastal waters in sheltered bays (90 percent were found less than 2 km from shore; Best, 1990; Elwen & Best, 2004).

While in local waters, Southern Right whales are found in groups of 1 to 10 individuals, with cow-calf pairs predominating in inshore nursery areas. From July to October, animals aggregate and become involved in surface-active groups, which can persist for several hours. Southern Right whales will pass through Block ER236 in July and August and again on their southward migration in October/November.

Figure 4.18

The Humpback Whale and the Southern Right Whale



Source: www.divephotoguide.com; www.aad.gov.au

Odontocetes

The Odontocetes 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 1.9 m long (Spinner dolphin) to 17 m (bull sperm whale).

Table 4.2 Marine Mammals Likely to be Encountered in Block ER236

Common Name	Species	Shelf	Offshore	Seasonality	Likely encounter freq.	IUCN Conservation Status (South Africa Red List Assessment, 2014)	Global IUCN Status
Delphinids							
Common bottlenose dolphin	<i>Tursiops truncatus</i>	Yes	Yes	Year round	Monthly	Least Concern	Least Concern
Indo-Pacific bottlenose dolphin	<i>Tursiops aduncus</i> -Ifafa-Kosi Bay subpopulation	Yes		Year round	Weekly	Vulnerable	Data Deficient
	<i>Tursiops aduncus</i> -Ifafa-False Bay subpopulation	Yes		Year round	Weekly	Near threatened	Data Deficient
	<i>Tursiops aduncus</i> -Seasonal subpopulation	Yes		Year round	Monthly	Data Deficient	Data Deficient
Common (short-beaked) dolphin	<i>Delphinus delphis</i>	Yes	Yes	Year round	Monthly	Least Concern	Least Concern
Common (long-beaked) dolphin	<i>Delphinus capensis</i>	Yes		Year round	Monthly	Least Concern	Data Deficient
Fraser's dolphin	<i>Lagenodelphis hosei</i>		Yes	Year round	Occasional	Least Concern	Least Concern
Pan tropical Spotted dolphin	<i>Stenella attenuata</i>	Yes	Yes	Year round	Occasional	Least Concern	Least Concern
Striped dolphin	<i>Stenella coeruleoalba</i>		Yes	Year round	Occasional	Least Concern	Least Concern
Spinner dolphin	<i>Stenella longirostris</i>	Yes		Year round	Occasional	Data Deficient	Data Deficient
Indo-Pacific humpback dolphin	<i>Sousa chinensis</i>	Yes		Year round	Monthly	Endangered	Vulnerable
Long-finned pilot whale	<i>Globicephala melas</i>		Yes	Year round	<Weekly	Least Concern	Data Deficient
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>		Yes	Year round	<Weekly	Least Concern	Data Deficient
Killer whale	<i>Orcinus orca</i>	Occasional	Yes	Year round	Occasional	Least Concern	Data Deficient
False killer whale	<i>Pseudorca crassidens</i>	Occasional	Yes	Year round	Monthly	Least Concern	Data Deficient
Risso's dolphin	<i>Grampus griseus</i>	Yes (edge)	Yes	Year round	Occasional	Least Concern	Least Concern
Pygmy killer whale	<i>Feresa attenuata</i>		Yes	Year round	Occasional	Least Concern	Data Deficient
Sperm whales							
Pygmy sperm whale	<i>Kogia breviceps</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
Dwarf sperm whale	<i>Kogia sima</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
Sperm whale	<i>Physeter macrocephalus</i>		Yes	Year round	Occasional	Vulnerable	Vulnerable
Beaked whales							
Cuvier's	<i>Ziphius cavirostris</i>		Yes	Year round	Occasional	Least Concern	Least Concern
Arnoux's	<i>Berardius arnuxii</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient

Common Name	Species	Shelf	Offshore	Seasonality	Likely encounter freq.	IUCN Conservation Status (South Africa Red List Assessment, 2014)	Global IUCN Status
Southern bottlenose	<i>Hyperoodon planifrons</i>		Yes	Year round	Occasional	Least Concern	Least Concern
Hector's	<i>Mesoplodon hectori</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
Strap-toothed whale	<i>Mesoplodon layardii</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
Longman's	<i>Mesoplodon pacificus</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
True's	<i>Mesoplodon mirus</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
Gray's	<i>Mesoplodon grayi</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
Blainville's	<i>Mesoplodon densirostris</i>		Yes	Year round	Occasional	Data Deficient	Data Deficient
Baleen whales							
Antarctic minke	<i>Balaenoptera bonaerensis</i>	Yes	Yes	>Winter	Monthly	Least Concern	<u>Near Threatened</u>
Dwarf minke	<i>Balaenoptera acutorostrata</i>	Yes		Year round	Occasional	Least Concern	Least Concern
Fin whale	<i>Balaenoptera physalus</i>		Yes	MJJ & ON	Occasional	Endangered	Endangered
Antarctic Blue whale	<i>Balaenoptera musculus intermedia</i>		Yes	MJJ	Occasional	Critically Endangered	<u>Critically Endangered</u>
Sei whale	<i>Balaenoptera borealis</i>		Yes	MJ & ASO	Occasional	Endangered	Endangered
Bryde's (inshore)	<i>Balaenoptera brydei (subspp)</i>		Yes	Year round	Occasional	Vulnerable	<u>Least Concern</u>
Pygmy right	<i>Caperea marginata</i>	Yes		Year round	Occasional	Least Concern	Data Deficient
Humpback	<i>Megaptera novaeangliae</i>	Yes	Yes	AMJJASOND	Daily	Least Concern	Least Concern
Southern right	<i>Eubalaena australis</i>	Yes		JJASON ¹	Daily	Least Concern	Least Concern

Source: Pisces, 2018

¹ Codes are referring to the months names starting from J=January to D=December

Turtles

Five species of sea turtles occur along the East coast of South Africa: the green turtle (*Chelonia mydas*), olive ridley (*Lepidochelys olivacea*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*) and loggerhead (*Caretta caretta*).

Loggerheads and leatherbacks nest along the sandy beaches of the northeast coast of KZN, South Africa, as well as southern Mozambique during summer months. These loggerhead and leatherback nesting populations are the southern-most in the world (Nel *et al.*, 2013). Even though these populations are smaller (in nesting numbers) than most other populations, they are genetically unique (Dutton *et al.*, 1999; Shamblin *et al.*, Submitted) and thus are globally important populations in terms of conservation of these species.

Satellite tracking of female loggerhead and leatherback turtles during inter-nesting periods revealed that loggerheads remained close to the shore (within the boundaries of the iSimangaliso Wetland Park) (Figure 4.19) between nesting events (Figure 4.19), whereas leatherbacks travelled greater distances (more than 300 km) and beyond the borders of the MPA. Consequently, the offshore extension of the MPA has recently been approved in order to include a greater portion of the core range of inter-nesting leatherbacks and provide better protection.

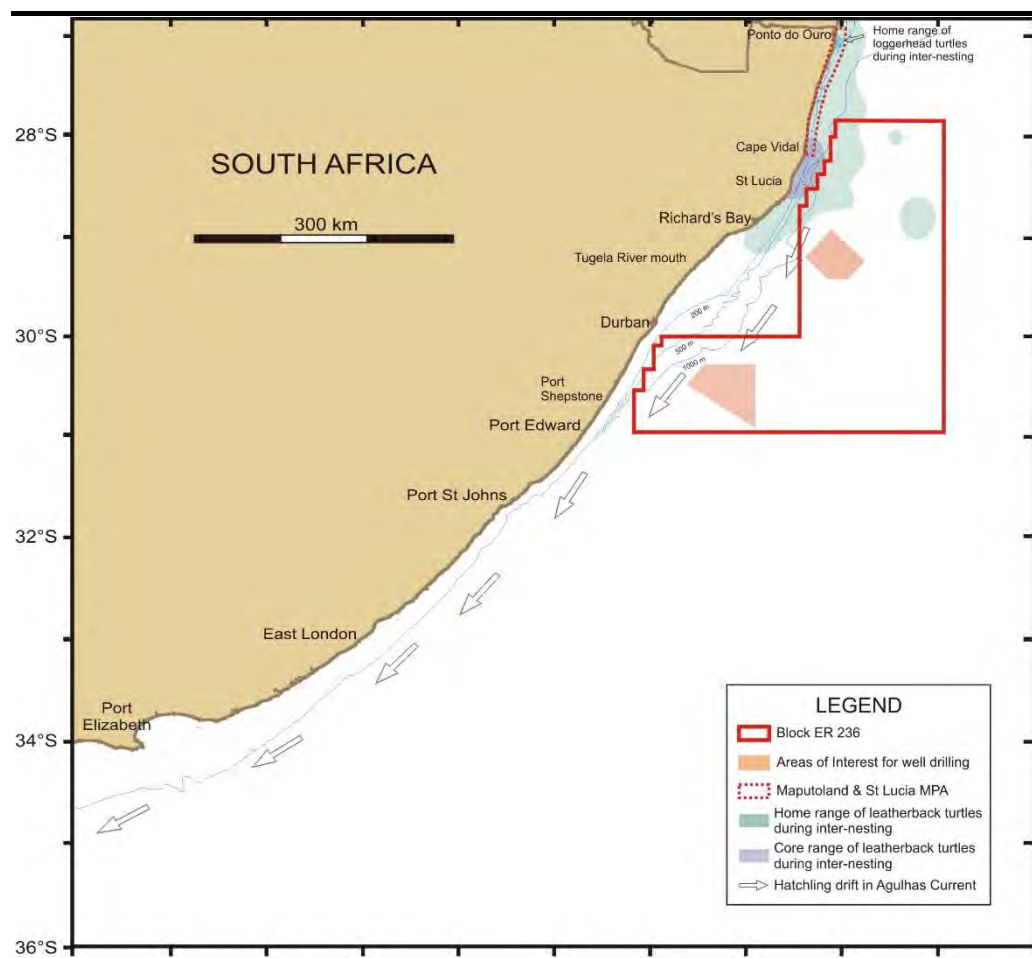
The inshore regions of the northern portion of Block ER236, coincide with the inter-nesting migrations for leatherbacks, but the drilling area of interest lies offshore of the inter-nesting range. Both species are thus likely to be encountered in Block ER236 during their foraging migrations.

Loggerhead and leatherback females come ashore to nest from mid-October to mid-January each year. They crawl up the beach and deposit an average of approximately 100 (loggerheads) or approximately 80 (leatherback) eggs in a nest excavated with their hind flippers. The eggs incubate for two months and hatchlings emerge from their nests from mid-January to mid-March. The mean hatching success for loggerheads (73 percent) and leatherbacks (76 percent) on the South African nesting beaches (de Wet, 2013) is higher than reported at other nesting sites globally. Nevertheless, eggs and emerging hatchlings are nutritious prey items for numerous shoreline predators, resulting in the mean emergence success and hatchling success being slightly lower than the hatching success. However, emergence and hatchling success for both species is similarly higher in South Africa than reported at other nesting beaches as mortality is largely limited to natural sources due to strong conservation presence on the nesting beach, which has reduced incidents of egg poaching and female harvesting to a minimum (Nel, 2010).

The production of both loggerhead and leatherback hatchlings is thus remarkably high in South Africa, making the nesting beaches in northern KZN some of the most productive (relative to nesting numbers) in the world.

In the IUCN Red listing, the hawksbill turtle is described as 'Critically Endangered', the green turtle is 'Endangered' and Leatherback, Loggerhead and Olive Ridley are 'Vulnerable' on a global scale. Leatherback and loggerhead turtles are thus in the highest categories in terms of need for conservation in CITES (Convention on International Trade in Endangered Species), and CMS (Convention on Migratory Species). As a signatory of CMS, South Africa has endorsed and signed two sister agreements specific to the conservation and management of sea turtles (these are the Africa-Atlantic and Indian Ocean South East Asia Memoranda of Understanding). South Africa, as a nation, is therefore committed to the protection of all species of sea turtles occupying its national waters, whether they are non-resident nesters (loggerhead and leatherback turtles) or resident foragers (hawksbill and green turtles; Oceans and Coast, unpublished data). In addition to protection of sea turtles and their habitat in the St. Lucia and Maputland Marine Reserves, sea turtles are protected in South Africa under the Marine Living Resources Act (1998).

Figure 4.19 *The Home and Core Ranges of Loggerheads and Leatherbacks during Inter-Nesting*



Note: Shown on the Figure are the Marine Protected Area (spotted red line) and the areas of interest (orange polygons) within Block ER236 (red line).

Source: Oceans and Coast, unpublished data

Seabirds

The East Coast provides few suitable breeding sites for coastal and seabirds with only three species (Grey-headed gull, Caspian tern and Swift tern) recorded to breed regularly along the coast (CSIR, 1998). In the offshore environment of Block ER236, the birds most likely to be encountered are the pelagic migrant species such as albatross, petrels and shearwaters. Encounter rates are likely to be higher during winter months and during the inshore sardine 'run', when many of the pelagic species come inshore to follow the shoals northwards up the coast (O'Donoghue *et al.*, 2010a, 2010b, 2010c). Coastal species may be encountered in the inshore areas Block ER236, particularly in the vicinity of larger estuaries (Richards Bay, St Lucia).

In the AII along the South Coast South, 60 species are likely to occur. South Coast seabirds can be categorised into three categories: 'breeding resident species', 'non-breeding migrant species' and 'rare vagrants' (Shaughnessy 1977; Harrison 1978; Liversidge & Le Gras 1981; Ryan & Rose 1989). Fifteen species breed within the South Coast region (Table 4.3), including Cape Gannets (Algoa Bay islands), African Penguins (Algoa Bay islands), Cape Cormorants (a small population at Algoa Bay islands and mainland sites), White-breasted Cormorant, Roseate Tern (Bird and St Croix Islands), Swift Tern (Stag Island) and Kelp Gulls.

Table 4.3 Breeding Resident Seabirds Present along the South Coast

Species name	Common name	Global IUCN Status
<i>Haematopus moquini</i>	African black oystercatcher	<u>Least Concern</u>
<i>Spheniscus demersus</i>	African Penguin	Endangered
<i>Phalacrocorax carbo</i>	Great Cormorant	Least Concern
<i>Phalacrocorax capensis</i>	Cape Cormorant	<u>Endangered</u>
<i>Phalacrocorax neglectus</i>	Bank Cormorant	Endangered
<i>Phalacrocorax coronatus</i>	Crowned Cormorant	<u>Near Threatened</u>
<i>Phalacrocorax lucidus</i>	White-breasted Cormorant	Not assessed
<i>Morus capensis</i>	Cape Gannet	<u>Endangered</u>
<i>Larus dominicanus</i>	Kelp Gull	Least Concern
<i>Larus cirrocephalus</i>	Greyheaded Gull	Least Concern
<i>Larus hartlaubii</i>	Hartlaub's Gull	Least Concern
<i>Hydroprogne caspia</i>	Caspian Tern	<u>Least Concern</u>
<i>Sterna bergii</i>	Swift Tern	Least Concern
<i>Sterna dougallii</i>	Roseate Tern	Least Concern
<i>Sterna balaenarum</i>	Damara Tern	<u>Vulnerable</u>

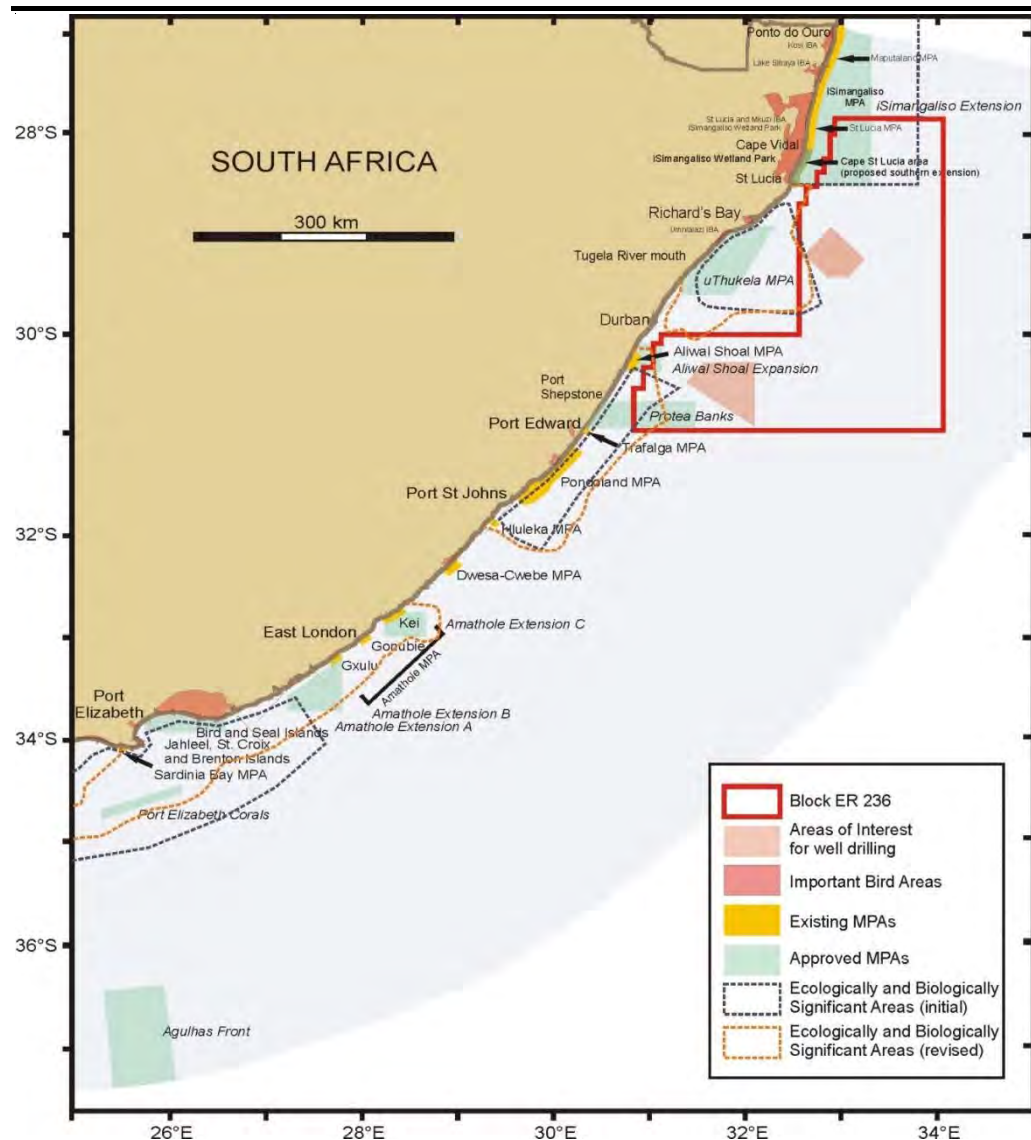
Source: adapted from CCA & CMS 2001; IUCN Red List (<https://www.iucnredlist.org/>), 2018

4.3.4 Marine Protected Areas

There are a number of protected areas within the projects potential AII although no existing protected areas fall within the project's ADI.

Figure 4.20 shows the existing and recently approved (24 October 2018, Department of Environmental Affairs, www.sanbi.org) marine protected areas in relation to the ADI (i.e. the drilling areas of interest) and the AII (includes the entire Block ER236 and extends down the East Coast to East London). This figure also shows the location of the initial and revised Ecologically and Biologically Significant Areas (EBSAs).

Figure 4.20 *Protected/Potentially Sensitive Areas in Relation to Block ER236*



Note: Shown on the Figure are Important Bird Areas (IBAs), recently approved and existing Marine Protected Areas (MPAs) and the initial and revised Ecologically and Biologically Significant Areas (EBSAs) within the Exclusive Economic Zone (grey shading) off KwaZulu-Natal coast in relation to Block ER236 (red polygon) and the proposed areas of interest for well drilling (orange shading). Seasonal whale occurrence, seabird roosting areas and turtle nesting areas are also illustrated.

Please note as of 16 November 2018 that the recently approved MPAs coordinates have not been confirmed.

Source: Pisces, 2018

Declared Marine Protected Areas (MPA's) in the Area of Indirect Influence (AII)

In the AII, there are three recently approved MPAs, iSimangaliso Extension MPA, uThukela Banks MPA and Protea Banks MPA. None of the recently approved and existing MPA's overlap with the drilling areas of interest (Figure 4.).

iSimangaliso Extension MPA

This recently approved MPA stretches 150 km from the Mozambique boundary to approximately 1 km south of Cape Vidal. The iSimangaliso Wetland Park Maputaland and St Lucia Marine Reserves, together with the proposed southward extension of the St Lucia MPA are components of the iSimangaliso MPA, and form the iSimangaliso Wetland Park (Figure 4.).

The area off St Lucia was selected as an MPA because it is an important area for leatherback turtles, which nest on adjacent beaches and forage offshore with tracking data reflecting turtle habitat use well beyond the three nautical mile (approximately 5.5 km) boundary of the existing St Lucia and Maputaland MPAs. Threatened seabirds drive the importance of remaining areas although linefish of conservation concern also contribute to importance of the area.

This MPA protects a large number of turtle nesting sites; the migration of whales, dolphins and whale-sharks offshore; coelacanths in the submarine Sodwana canyons; and a considerable number of waterfowl associated with the iSimangaliso Wetland Park, including large breeding colonies of pelicans, storks, herons and terns.

Aliwal Shoal MPA

The Aliwal Shoal MPA is situated on the south coast between Umkomaas and Ocean View. The purpose of this MPA is to specifically protect and conserve the Aliwal Shoal and the fish stocks associated with it; to promote and regulate eco-tourism activities and scientific research in a way that does not adversely affect the marine environment and the biodiversity of the Aliwal Shoal Marine Protected Area and to prescribe penalties for contraventions (Government Gazette 26433, 2004)

uThukela Banks MPA

This recently approved coastal and offshore MPA is located between the Mlalazi and Seteni estuary. The purpose of this MPA is to protect coastal habitats including sandy beaches, rocky shores and estuaries as well as offshore habitats including the soft sediment and reef systems, submarine canyons, the shelf edge and slope ecosystems (Government Gazette 39646, 2016).

Protea Banks MPA

The Protea Banks Marine Protected Area is an offshore Area in the 20m to 3,000m depth range with the southern portion lying adjacent to the existing Trafalgar Marine Protected Area. The purpose of this MPA is to conserve and protect submarine canyons, deep reefs, cold water coral reefs and other habitats of the shelf edge and slope (Government Gazette 39646, 2016).

Other Declared MPAs in the Area of Indirect Influence (AII)

Other declared MPAs in the AII include the Amathole MPA (in the vicinity of East London) and the Dwesa-Cwebe, Hluleka and Pondoland MPAs (located on the Wild Coast) (*Figure 4.*).

Other Offshore Protection Areas in the Area of Indirect Influence

Hope Spots

Hope Spots are defined by Mission Blue of the Sylvia Earle Alliance as special conservation areas that are critical to the health of the ocean. The first six Hope Spots were launched in South Africa in 2014 and include Aliwal Shoal in KZN, Algoa Bay, Plettenberg Bay, Knysna, the Cape Whale Coast (Hermanus area) and False Bay in the Western Cape. Of these, the Aliwal Shoal Hope Spot is located adjacent to the southwestern corner of Block ER236, approximately 250 km southwest of the area of northern interest for well drilling and approximately 75 km inshore and west of the southern area of interest.

iSimangaliso Offshore: World Heritage Site

The iSimangaliso Wetland Park is recognised as a wetland of international importance under the Ramsar Convention and has been designated a World Heritage Site in terms of the World Heritage Convention Act (No. 49 of 1999). The iSimangaliso Wetland Park covers an area on 324 441 ha, including 230 km of coastline from Kosi Bay (bordering Mozambique) to south of Maphelane and approximately 5.5 km out to sea.

The Park is governed by the National Environmental Management Protected Areas Act (No. 57 of 2003), and under Section 48(1) no person may conduct commercial prospecting or mining activities within a World Heritage Site. In addition, Section 50(5) states that no development is permitted in a World Heritage Site without prior written approval from the management authority, namely iSimangaliso Wetland Park Authority.

Ecologically and Biologically Significant Areas (EBSAs)

Following application of the Conservation on Biological Diversity's (CBD) Ecologically or Biologically Significant marine Areas (EBSA) criteria, a number of areas around the South African coast were identified as potentially requiring enhanced conservation and management. These were presented at the CBD regional workshop for the description of marine EBSAs in the Southern Indian Ocean (July/ August 2012) (CBD 2013).

Three Ecologically or Biologically Significant Areas (EBSAs) have been proposed and inscribed for the East Coast under the Convention of Biological Diversity (CBD) (CBD 2013), namely Protea Banks and the Sardine Route, the Natal Bight and the Delagoa Shelf Edge.

Following new research conducted in the area since the original description of these EBSAs, the boundaries, names, descriptions and criteria ranks have recently been updated. No specific management actions have as yet been formulated for these EBSAs, although the uniqueness of the areas contributed to the development of the recently approved offshore MPAs (Pisces, 2018).

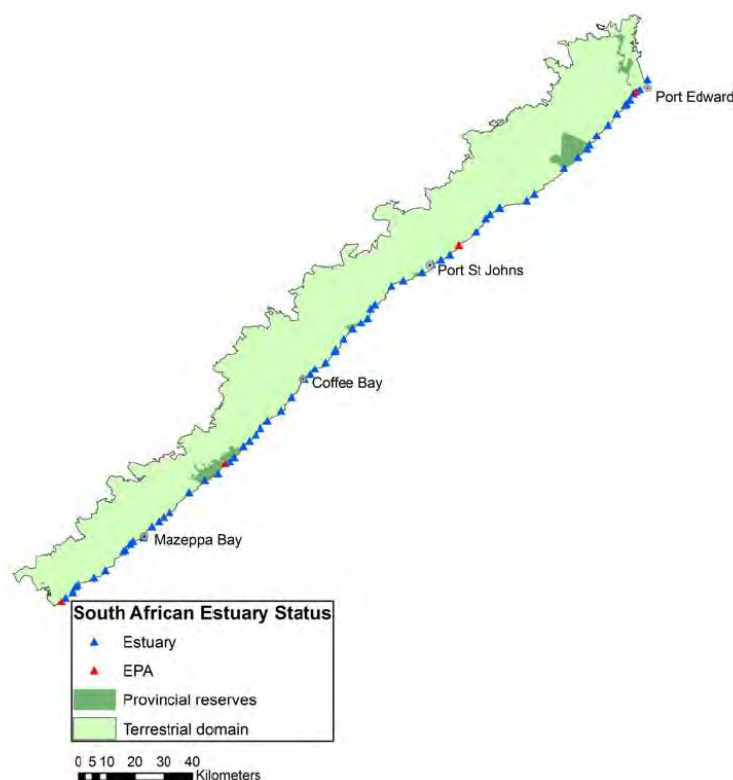
4.3.5 *Other Sensitive Environments in the Area of Indirect Influence*

Estuaries

There are some 188 estuaries located along the East Coast region, between Gonubie (near East London) and Isipingo (near Durban). *Figure 4.21* below shows the location of estuaries and estuary protected areas (EPAs) located along the 'Wild Coast', within the Eastern Cape coastal region. These are included as they could potentially be impacted in the event of an accidental event.

Estuarine environments are considered valuable habitats, as they provide essential ecosystem services, such as nursery functions to coastal fisheries, freshwater flows to the marine environment, replenishment of nutrients and organic material to coastal habitats, flood and sea storm protection, carbon sequestration, safe bathing areas and cultivation of plants for biofuels without freshwater (Van Niekerk & Turpie, 2012). They are also considered to be resilient systems by nature, because their dynamic nature means that fauna and flora that inhabit these ecosystems are generally adapted to living in conditions of extreme change. As such, those species that can tolerate the estuarine environment are often very successful and abundant in their chosen environment (e.g. sand/mud prawns, mullet and bottom feeding fish or fish that eat plankton).

Figure 4.21 *Estuaries along the Wild Coast. The Estuaries in Red are Estuary Protected Areas (EPAs)*



Source: Reyers & Ginsburg, 2005.

A large proportion of the Estuaries along the East Coast (particularly those found along the 'Wild Coast' ⁽¹⁾) have been identified nationally as being of high biodiversity and ecological importance (ie the Mngazana and Mbashe estuaries). This relates to the pristine nature of many of the estuaries found along this coastline. In particular, Mngazama estuary (found along the 'Wild Coast') has been rated in the top 20 estuaries in South Africa, while another nine have been rated within the top 50 estuaries in South Africa (Reyers & Ginsburg, 2005). *Table 4.4* provides a list of the key estuaries of the 'Wild Coast' in terms of their overall conservation importance.

Table 4.4 *Key Estuaries of the Wild Coast*

Estuary	Type	Size (ha)
Mngazana	Permanent	224.9
Mbashe	Permanent	132
Mtata	Permanent	168.8
Mzimvubu	River mouth	151
Xora	Permanent	150.6
Nxaxo/Ngqusi	Permanent	159.5
Great Kei	Permanent	222.4
Mzamba	Permanent	70.94

(1) The 'Wild Coast' is a section of the coast of the Eastern Cape, South Africa. The region stretches from East London in the south to the border of KwaZulu-Natal in the north.

Estuary	Type	Size (ha)
Mtentu	Permanent	52.93
Qora	Permanent	89.63
Mtakatye	Permanent	116.8
Mdumbi	Permanent	76.07
Mntafufu	Permanent	24.07
Mbotyi	Temporary	50.39
Nqabara	Permanent	109.7
Qolora	Temporary	22.9
Mtamvuna	Temporary	63.53
Mnenu	Temporary	90.52
Ntlonyane	Temporary	41.34
Msikaba	Permanent	15.13

Limited research has been undertaken in recent years to determine the biodiversity make-up of the estuaries found within this coastal region. In this regard, the National Biodiversity Assessment (Van Niekerk & Turpie, 2012) acknowledges that existing research is outdated and that new studies urgently need to be undertaken in a once-off effort that is comparable with that of earlier surveys. Despite this, a short summary of the key biophysical elements associated with the Mngazana Estuary (one of the key estuaries located in the proposed Transkei area), is provided below.

Mngazana Estuary

The Mngazana Estuary is a permanently open estuary that is located south of Port St Johns, along the Eastern Cape coastline. The full length of the estuary is approximately six kilometres, subject to tidal exchanges (USAID, 2005). The estuary itself is regarded as one of the most important estuaries in the Eastern Cape, as it forms part of a 140 hectare stand of mangroves, which have been identified to comprise the third largest stand in South Africa.

The Mngazana Estuary is host to a diverse number of both invertebrate and fish communities. This includes temperate, tropical and subtropical species, predominating in the lower, middle and head reaches, respectively (De Wet 2004). Three species of Red Data listed crabs were identified in the estuary (Sgwabe *et al.*, 2004). Over 100 species of birds have been recorded, including rare species such as the Mangrove kingfisher (Sgwabe *et al.*, 2004). The vegetation of the Mngazana Estuary comprises a number of plant communities, with the mangrove swamp as the main feature. There is also sea-grass and salt-marsh communities, with dune forests along the east bank of the estuary mouth.

The project is located off the coast of the KwaZulu-Natal (KZN) Province, and will be supported by an onshore logistics base in either the Port of Richards Bay or the Port of Durban.

Most of the activities associated with the project will take place offshore, with the exception of activities associated with the onshore logistics base. During routine operations, the socio-economic impacts of the project (both positive and negative) will be limited as most of the activity will take place offshore.

As such, this socio-economic baseline is focused on the local municipalities in which the logistics base may be located, eThekweni Metropolitan Municipality and the City of uMhlathuze Local Municipality. These municipalities are considered the ADI. The AII includes the local municipalities along the coastline from the City of uMhlathuze Local Municipality to the Buffalo City Local Municipality, listed in *Table 4.5*. A summary of high-level indicators for these municipalities is included in *Annex D*. *Figure 4.22* and *Figure 4.23* present the municipalities in KZN and the Eastern Cape.

In the event of an accidental spill, effects may be felt along the East Coast through KZN and the Eastern Cape, which could affect marine and coastal-based livelihoods such as fisheries, (both commercial and subsistence) and the tourism sector. A description of the fisheries sector is included in *Section 4.4.3*, and further information around tourism is presented in *Section 4.4.2*.

Table 4.5 *Local Municipalities within the AII*

Local Municipalities in KZN	Local Municipalities in Eastern Cape
uMfolozi Local	Mbizana Local
uMlalazi Local	Ingquza Hill Local
Ray Nkonyeni Local	King Sabata Dalindyebo Local
Umdoni Local	Nyandeni Local
Umzumbe Local	Port St Johns Local
KwaDukuza Local	Great Kei Local
Mandeni Local	Mbhashe Local
	Mnquma Local

Figure 4.22 KZN Municipalities



Source: ERM, 2018

Figure 4.23 Eastern Cape Municipalities



Source: ERM, 2018

4.4.1 Baseline Description of Local Municipalities

Administrative Structure

The Provincial government is responsible for providing the strategic vision and framework for the Province. They are responsible for ensuring cooperation and collaboration between municipalities and that each municipality performs their respective functions. In turn, each of the District Municipalities is responsible for the preparation of a spatial development framework and for the overall provision of services and infrastructure within their District. The district municipalities are further divided into local municipalities.

Local municipalities are responsible for developing an Integrated Development Plan (IDP), which is aligned with the strategic vision of the province, and sets out a road map for achieving local socio-economic development.

Provincial Context

The project is located off the coast of the KZN Province, the third smallest province in South Africa, covering an area of 94,361 km². KZN has the second largest population of the South African provinces, with a total of 11,065,240 people.

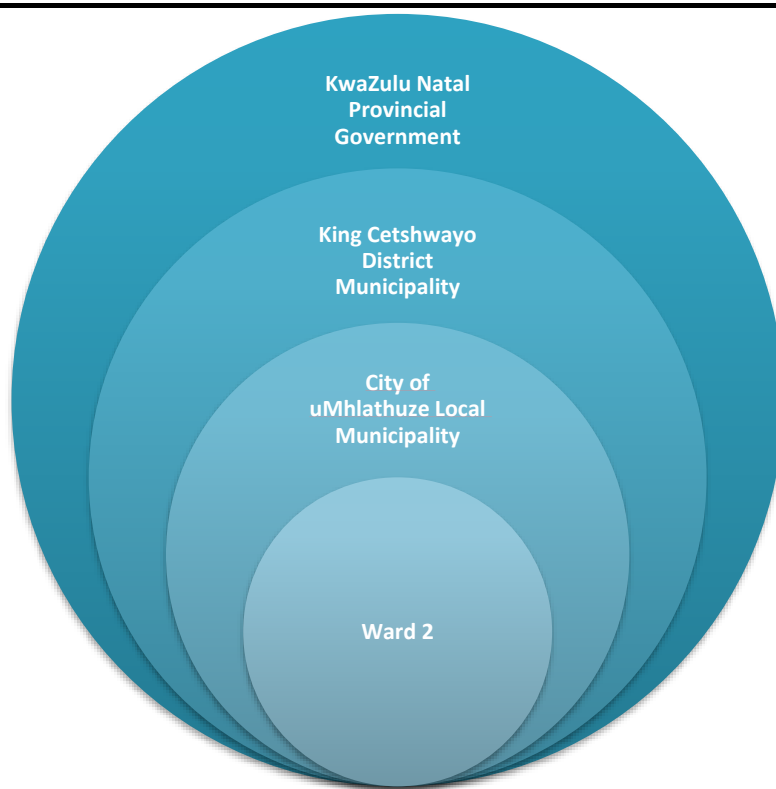
It borders Mpumalanga and the Free State on the west and the Eastern Cape to the south west. It also borders, Lesotho, Swaziland and Mozambique. Pietermaritzburg is the capital city, whilst Durban is the largest city, and considered the economic centre of the Province. Other major cities and towns in KZN include Richards Bay, Port Shepstone, Newcastle, Escourt, Ladysmith and Richmond. *Figure 4.22* shows the municipalities within the province.

The tourism industry plays an important part the KZN economy with popular destinations including the coastal towns along the coast, as well as the mid-lands and the Drakensberg Mountains.

King Cetshwayo District Municipality and the City of uMhlathuze Local Municipality

The Port of Richards Bay is located in the City of uMhlathuze Local Municipality (uMhlathuze Local Municipality), which falls into the King Cetshwayo District Municipality (KCDM). The KCDM is one of the eleven district municipalities within the KZN Province. It has a total of five local municipalities namely: City of uMhlathuze, Umlalazi, Nkandla, uMfolozi and Mthonjaneni Local Municipalities (King Cetshwayo District Municipality IDP, 2018/19 – 2021/22). The onshore logistics base will be located in Ward 2. *Figure 4.24* shows the administrative structure of the respective levels of government.

Figure 4.24 Administrative Structure



Source: uMhlathuze Municipality SDF, 2017/2018; Ward Delimitation 2016

KCDM is located in the north eastern region of KZN, covering a total of 8,213 km². It has the third highest population in the KZN Province with an estimated total of 971,135 people. The District is home to the largest deep water port on the African continent, namely the Port of Richards Bay.

The Port of Richards Bay handles over 75 million tons of cargo per annum, which is double the capacity of the Port of Durban to the south. In light of the above, the Port of Richards Bay has played a significant role in developing the manufacturing sector in the region, thus enabling it to be a large contributor to the economy and gross geographic product (uMhlathuze Municipality SDF, 2017/2018).

However, the KCDM has various challenges, including rural communities which are poverty stricken, a lack of basic services such as water and sanitation and unemployment (uMhlathuze Municipality SDF, 2017/2018).

Population Demographics

The uMhlathuze Local Municipality has a population of 410,465 people according to the 2016 community survey (StatsSA). This number has grown by 22.73 percent since the last census in 2011.

Using the survey conducted in 2011, it was calculated that the uMhlathuze Municipality has a household size of approximately 3.95 people for an estimated total of 103,915 households (uMhlathuze Municipality SDF, 2017/2018). Comparative information around the population for the district and local municipality is provided in *Table 4.6*.

Table 4.6 *Population Summary*

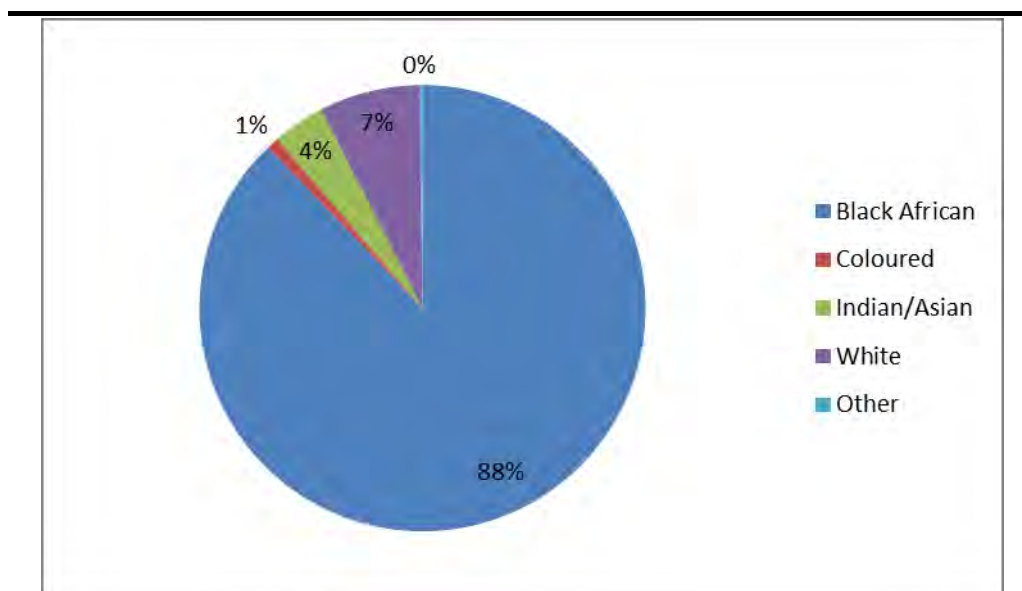
Year	Administrative Area Name	Size	Population	Growth Percentage
2011	King Cetshwayo District Municipality	8,213 km ²	907,519	
2011	City of uMhlathuze Local Municipality	1,233 km ²	334,459	
2016	King Cetshwayo District Municipality	8,213 km ²	971,135	7.01
2016	City of uMhlathuze Local Municipality	1,233 km ²	410,465	22.73

Source: uMhlathuze Municipality SDF, 2017/2018

According to the 2011 census, Black Africans are the majority population group making up 87.7 percent of the population. White people make up 7.3 percent, while the other population groups make up the rest as shown in *Figure 4.25*.

isiZulu is the dominant language spoken in the uMhlathuze Local Municipality with 78.7 percent speaking the language (StatsSA, 2016).

Figure 4.25 *Ethnic Composition in the City of uMhlathuze Local Municipality*



Source: StatsSA 2016

Local Economy and Livelihoods

The uMhlathuze Local Municipality and KCDM economies are both primarily driven by the Port of Richards Bay, which is one of the two largest and busiest ports on the African continent. This area contributes a total of 16.7 percent towards the KZN Gross Domestic Product (GDP).

The main activities being undertaken in the uMhlathuze Local Municipality include large-scale industrial activities including coal terminals, aluminium smelters, as well as mining, paper mills, forestry, production of materials handling equipment and fertiliser and special chemicals production (uMhlathuze Municipal IDP, 2012/2017).

Unemployment

The unemployment rate in the uMhlathuze Local Municipality is estimated to be 40 percent (uMhlathuze Municipal IDP, 2012/2017). This comprises people who are unemployed but seeking employment, as well as those who are not seeking employment. According to the IDP, the unemployment issue is as a result of the lack of skills, which is largely attributed to the apartheid regime where a system was created that excluded the majority of the population from receiving quality education, but directed them to semi-skilled or unskilled labour instead (uMhlathuze Municipal IDP, 2012/2017).

Education

An uThungulu (KCDM) Quality of Life Survey conducted in 2009 illustrated that a larger percentage of the population was noted to have reached secondary education (30.52 percent). Only 22.41 percent reached grade 12 and a smaller 8.45 percent make it to tertiary level education (uMhlathuze Municipal IDP, 2012/2017). A pattern is seen in the District where the level of education decreases whilst the demand for skills increases.

Social Infrastructure and Services

Water and Sanitation

The City of uMhlathuze receives funding from the Municipal Infrastructure Grant (MIG). This funding is used for water (70 percent) and sanitation (30 percent) services. This funding, however, was found to be ineffective in improving sanitation services in the area. A total of 86.37 percent of the households in the uMhlathuze Local Municipality has access to basic RDP ⁽¹⁾ level water services, whereas 57.91 percent have access to basic level sanitation services.

(1) Reconstruction and Development Programme (RDP)

Waste

An estimated 53.5 percent of households have their waste removed by the local authority or a private company at least once a week. There is a large number of households that rely on their own refuse dumps, (38.4 percent) and a small percentage relies on communal dump alternatives (2.6 percent) (StatsSA, 2016).

Energy

The uMhlathuze Local Municipality has no backlog of households waiting for services in terms of energy supply in the area. The regulator has enforced a grid code, which provides guidelines and rules governing how Municipalities are to create and maintain electrical infrastructure assets. All energy distributors are to comply with the Distribution Grid Code as part of their licence (uMhlathuze Municipal IDP, 2012/2017).

Health

Within the uMhlathuze Local Municipality, there are four hospitals and 23 health clinics. The IDP identified a need for additional health facilities in remote Traditional Authority areas.

The KCDM had an HIV prevalence of 38.5 percent in 2012 in the age groups 15 to 45 years, up from 33.4 percent the previous year (District Health Plan 2015/2016). This is significantly higher than the prevalence rate in KZN (25 percent) and South Africa (18 percent). The uMhlathuze Local Municipality IDP notes that there is a lack of clear and reliable data regarding HIV/ AIDS at a local municipal level, but that it is clear that it is a serious problem.

It is further noted that the Tuberculosis (TB) cases in both the KCDM and the uMhlathuze Local Municipality are high, with TB being the leading cause of death in the KCDM (District Health Plan 2015/2016).

eThekweni Metropolitan Municipality

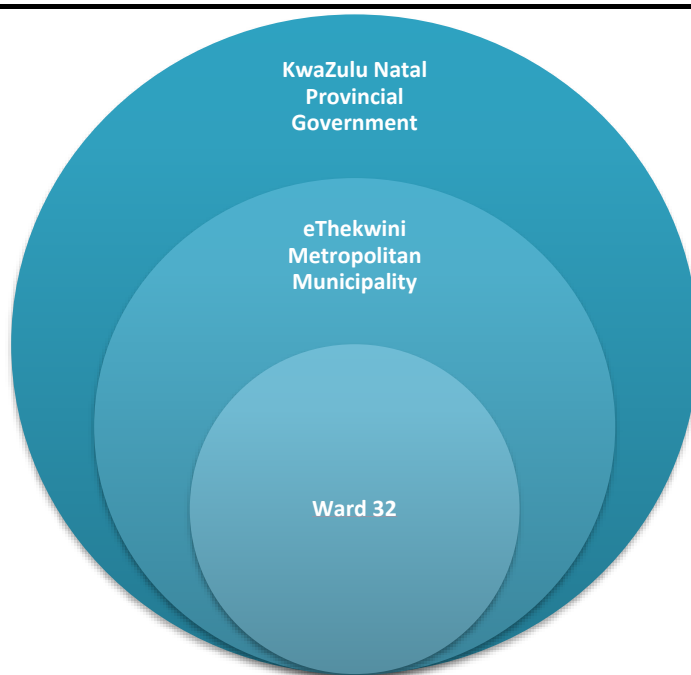
Administrative Structure

The onshore logistics base for the project may be situated in the Port of Durban, which is located in the eThekweni Metropolitan Municipality, Ward 32. *Figure 4.26* shows the administrative structure of the respective levels of government.

eThekweni Metropolitan Municipality (eThekweni Municipality) is a category A municipality which is located on the East Coast of South Africa, occupying an area of approximately 2,297 km² and comprises a population of 3,555,868 people (eThekweni Municipality IDP, 2016/2017).

eThekwini Metropolitan is bordered by three district municipalities namely: iLembe to the north, uGu to the south and uMgungundlovu to the west (SDF, 2016/2017). It is characterised by its hilly topography and many gorges and ravines. It also houses one of Africa's most well managed and busiest ports, the Port of Durban. Durban is the largest city in KZN with just over one third of its total population, and it is the third largest city in the country (StatsSA, 2016).

Figure 4.26 *Administrative Structure*



Source: eThekwini Municipality IDP, 2016/2017; eThekwini Ward Map - 2011 Ward Boundary

Population Demographics

The population of eThekwini Municipality is approximately 3,555,868 people (eThekwini Municipality IDP, 2016/2017). The population is spread in such a way that the most concentrated region is the central and north planning regions. The outer west region however, which comprises the largest surface area (approximately 78,438 ha) only houses 11 percent of the total Municipality's population. The northern region houses 33 percent of the Municipality's population, and the central region houses 34 percent of the total population (eThekwini Municipality SDF, 2016/2017).

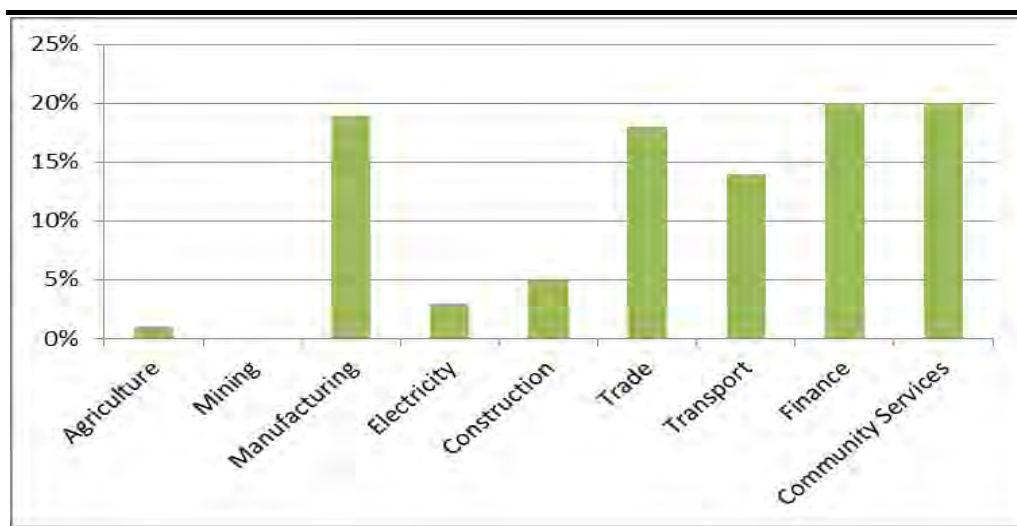
The gender profile in the eThekwini Municipality represents a larger percentage of females (51 percent) to males (49 percent). The majority of the population falls within the 0- 29 age range, whereas the 60 - 70 age range constitutes a very small percentage of the population (eThekwini Municipality SDF, 2016/2017).

Local Economy and Livelihoods

According to the Quarterly Labour Force Survey by Statistics South Africa, the eThekweni municipal region was recorded to have the lowest unemployment rate in the second quarter of 2015 with only 16 percent of the region being unemployed (eThekweni Municipality IDP, 2016/2017). This region employs approximately 9 percent of the national population. Currently, eThekweni Metropolitan makes up 57.1 percent of the Provincial Gross Domestic Product (GDP), and 1 percent of the national GDP (eThekweni Municipality IDP, 2016/2017).

The sectors contributing the most to the eThekweni Municipality economy is the Finance and Community Services sectors (20 percent each), with Agriculture contributing the least with 9.1 percent (eThekweni Municipality IDP, 2016/2017). *Figure 4.27* below illustrates the sectoral composition of the GDP in the eThekweni Metropolitan Municipality.

Figure 4.27 *Sectoral Composition of GDP in 2014: eThekweni Metropolitan Municipality*

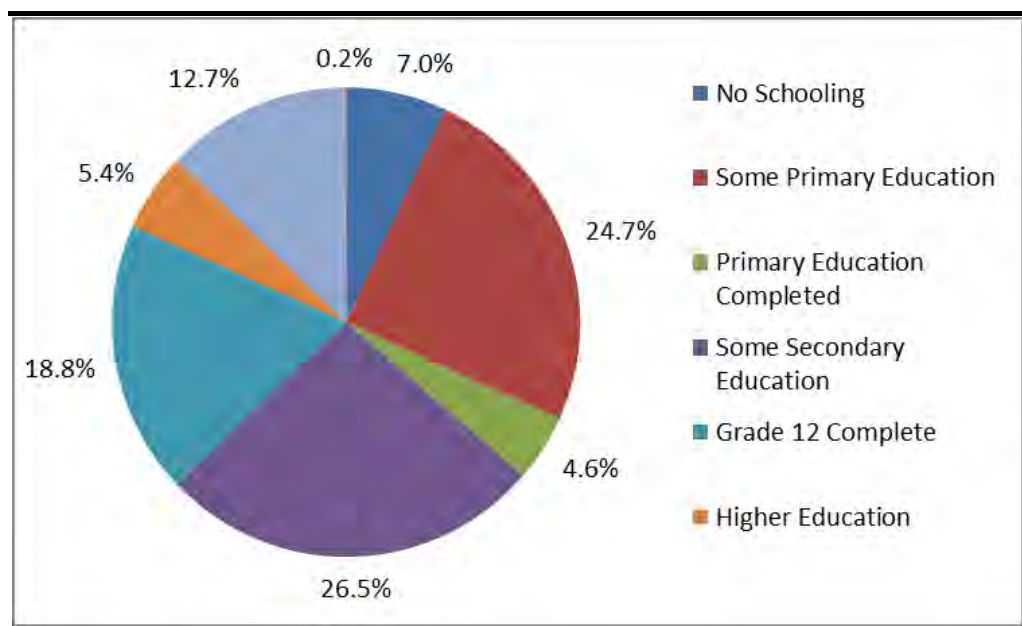


Source: eThekweni Municipality IDP, 2016/2017

Education

According to the eThekweni Spatial Development Framework (2016/2017), 29 percent of the eThekweni Metropolitan Municipality has some secondary education, while, only 8 percent has tertiary level education. *Figure 4.28* below illustrates the educational breakdown within the eThekweni Municipality.

Figure 4.28 Education Profile within eThekweni Metropolitan Municipality



Source: eThekweni Municipality SDF, 2016/2017

Social Infrastructure and Services

Water and Sanitation

Approximately 933,121 households were recorded to have access to water services in 2014/2015 at the Municipality. This marks 98.65 percent coverage across the region. The eThekweni Municipality currently maintains and manages 327 water storage facilities.

Energy

The portion of houses with no connection to electricity has decreased by 6.1 percent between the period of 2011/2012 and 2014/2015. The eThekweni Municipality aims to sustain this growth through the maintenance and handling of 152 major substations within the derestriction. In addition, the Municipality manages 31 waste water treatment plants, and 300 pump stations which have enabled it to reduce the sanitation backlog by 24 percent over a 5 year period.

Health

The prevalence of HIV/ AIDS in the eThekweni Municipality is high, as it is in the rest of South Africa (18 percent) and KZN (25 percent). Tuberculosis (TB) is recognised as the leading opportunistic infection amongst HIV positive persons with approximately two thirds of HIV infected persons co-infected with TB.

In 2009 a total of 43,739 new and retreatment cases (both HIV positive and HIV negative) were registered in the eThekweni Municipality, making it one of the districts with the highest number of TB cases in South Africa. However the treatment rate in the eThekweni Municipality is high and treatment rates have improved from 70.8 percent in 2011 to 79.5 percent in 2013 (eThekweni Municipality IDP).

Key challenges relating to health service provision in the eThekweni Municipality are:

- High rate of HIV/AIDS and TB.
- High teenage pregnancy rate.
- Sexual abuse in children less than sixteen years.
- Abuse of chemical substances (drugs and alcohol). Lobby for change in the legislative framework.
- High incidence of injuries and trauma.
- Inequitable distribution of resources towards an urban bias.
- Only 66 percent of eThekweni residents have access to primary level care facility within a 5km access distance.
- Primary Health Care services are considered an unfunded mandate for the municipality however there are ongoing negotiations to improve funding.
- The number of Environmental Health Practitioners (EHPs) remains below the expected norms, however, the municipality has a multi-year funding plan to increase these numbers starting with the employment of 35 EHPs in the 12/13 financial year.
- Challenges with professional ethics and management capacity.

4.4.2

Tourism

Tourism is an important sector in the South African economy, and directly contributed 2.9 percent to South African gross domestic product (GDP) in 2016 (StatsSA). The tourism sector employed 686,596 people in 2016, 4.4 percent of South Africa's 15.8 million workers (StatsSA).

Tourism plays an important role in the local economy along the East Coast of South Africa. People are attracted to the pristine coastal areas and much what draws people to the coast is the recreational activities associated with the coastal and marine environment, such as fishing, surfing, driving.

Tourism along the Kwa-Zulu Natal coast is well established and tourism infrastructure such as accommodation and restaurants are in place and easily accessible.

In contrast, tourism along the Wild Coast is underdeveloped, and challenges to the tourism sector include poor road quality (especially the access roads from the N2 to the various Wild Coast destinations) and a lack of accommodation (Fuller Frost & Associates, 2010). It is recognised that there is potential for tourism development along the coast and that the protection of natural assets is important in promoting tourism. Travel and tourism employed 32,917 people directly in the Eastern Cape in 2014 (<https://www.ujuh.co.za/eastern-cape-tourism-industry-is-boosted-by-domestic-travellers/>).

Block ER236 is located from 20 km offshore and the Area of Interest is over 60 km offshore. The project will have a limited impact of tourism activities during routine operations. There is a possibility that the offshore recreational boat-based fishing activities could be affected if they travel offshore and into Block ER236.

Tourism in the Area of Direct Influence

eThekweni Municipality

Tourism is a key contributor to local economic development. Local communities have been recognised to play an important part in the tourism development, since, in most cases, they are the major supplier of goods and services to tourists (eThekweni Municipality, 2014).

The Tourism in eThekweni report (eThekweni Municipality, 2014) estimated the number of tourist arrivals in Durban to be 15.5 million visitors in 2012. Of those visitors, 260 009 were foreign overnight tourists and 175 428 were foreign day visitors. Furthermore, 1.9 million of these visitors were domestic overnight trips, while 13.1 million were domestic day trips (eThekweni Municipality, 2014).

UMhlathuze Local Municipality

The tourism sector has been identified as a priority area for economic development in the uMhlathuze Local Municipality. The main tourism assets that have been identified for potential contribution to the local economy include the beaches, various events, preservation of heritage sites, conservation areas and the estuary south of the Port. The region has been recognised as a provincial tourism priority and the IDP recognises that there is potential to develop the sector in the future. However, the IDP does acknowledge that there is limited opportunity to support economic growth while considering the needs for conservation and development.

uMfolozi Local Municipality

The tourism sector has been identified as an economic development area for the Richards Bay Industrial Development Zone (RBIDZ), which falls into this Municipality. The main tourism assets in the municipality include the rich coastal forests, nature reserves, and culture and heritage sites. The N2 is a major tourism route that connects areas in the north such as Lake St. Lucia, to Margate towards the South. The Municipality has identified additional developments that can contribute to the sector such as eco –tourism and the Hluhluwe-uMfolozi Game Reserve. The IDP notes that the tourism sector is an important contributor to the GDP of the Local Municipality.

uMlalazi Local Municipality

The tourism sector is being promoted due to the vast historical and cultural significance in the municipality. The main tourism assets include the famous Zulu Heritage Route R66, pristine beaches, natural rain forest and Zulu heritage, which can contribute to the long-term development of the sector. The IDP notes that the tourism sector has great potential for growth and the municipality has identified the need to improve and develop the tourism sector.

KwaDukuza Local Municipality

The location of the Municipality is considered to a contributing factor to the development of the tourism sector as it is located between two port cities, Durban and Richards Bay. The location provides for the development of multiple tourism initiatives based on the coastal assets.

The main tourism assets include the blue flag beaches, recreational activities, tourism events estuary areas, forested areas and heritage sites. The IDP notes that the recreational activities are a key driver for tourism in the municipality. It further states that the sector is growing in the local economy and is central to long-term growth.

Mandeni Local Municipality

The tourism sector is considered to contribute to the local economy in this Municipality due to its strategic location along the N2 National Development Corridor and trade route mid-way between the provincial economic hubs of Durban and Richards Bay. The main tourism assets includes the Tugela River, Quarry stones, nature reserves and the Indian Ocean. The municipality includes a long stretch of coastal land with economic potential for eco – tourism, commercial and industrial development. The IDP notes that the municipality has potential to develop the sector in the long term and has opportunities for industrial development with the Dube Trade Port and the Richards Bay SEZ.

Ray Nkonyeni Local Municipality

The tourism sector is considered to be one of the main features of the local economy which includes services, agriculture and manufacturing. The main tourist assets include beaches, good infrastructure and urban centres such as Margate and Port Shepstone. The Municipality has a number of beaches that meet international standards as accredited blue flag beaches (managed in South Africa by WESSA). The entire coast line along the South Coast is a primary tourism attraction, thus largely driving the Municipality's economy. While the Oribi Gorge provides more organised and well marketed products and services in the Municipality, it is Margate that contributes the most towards Municipal tourism from a revenue perspective, approximately 37 percent (SDF, 2017). Margate has many holiday resorts, holiday homes and tourist related establishments, and consequently consists of more holiday makers than residents. It has been noted that the tourism occupancy demand is seasonal where summer receives an 80 percent occupancy, autumn 79 percent, spring accounts for 70.8 percent, and winter receives 72.2 percent occupancy (SDF, 2017).

Umdoni Local Municipality

The Municipality is considered a tourism hub of the south coast which contributes to economic development. The key tourist assets include estuaries, dunes, sandy beaches and rocky shores. The IDP notes that the tourism sector is considered a large contributor to employment, poverty reduction and protection of the natural and cultural heritage of the Municipality.

Umzumbe Local Municipality

The tourism sector is concentrated largely within the coastal towns, which over time have become popular destinations. The main tourist assets included rich history, popular tourism destinations and natural features. According to the IDP, the Municipality is considered to be able to contribute to the economic development of small businesses and that the natural resources should be protected from harm and ensure continued use while balancing development needs.

Tourism in the Area of Indirect Influence – Eastern Cape

Mbizana Local Municipality

The tourism sector has been identified as undeveloped in the Municipality and is considered a key economic driver in the future. The main tourist assets include the unique cultural attributes, natural attractions and layers of heritage in the region. The IDP notes that the tourism sector has been identified as a priority area in the Local Economic Development Strategy. It further notes that there are plans to attract investors to invest in the Municipality for sustainable job creation and further develop the sector.

Ingquza Hill Local Municipality

The Municipality has potential for developing a community based tourism industry due to its unique attractions. The Wild Coast represents an international destination potential, provided the infrastructure, accessibility and safety/security environment are improved. The tourism industry, which is potentially the major contributor to the trade output, remains poorly developed and underexploited. The recent adoption of a Tourism Sector Plan represents a milestone towards the implementation of a turnaround strategy in this sector.

Port St Johns

The main tourist assets in the Municipality include natural features such as hills, dunes, rivers, and the mountainous terrain that meet picturesque beaches. The IDP notes that the town of Port St Johns is considered to have potential for development in the service industry, tourism and government sectors.

Nyandeni Local Municipality

The Municipality has a 20 km coastal belt, which stretches from Mthatha Estuary in the southwest to Mnenu Estuary in the northeast. The main tourism assets include the forests, areas designated for nature conservation, estuaries, wildlife and Hluleka Game Reserve. The IDP notes that there is high tourism potential, especially for eco- tourism. Poor roads and a lack of accommodation are currently a challenge.

King Sabata Dalindyebo Local Municipality

The tourism sector in the region includes tourist attractions like Coffee Bay and Hole-in-the-Wall. The coastal area has been identified as a tourism node of the municipality. The main tourism assets include the coastal forests, dune and mangrove forests as well as a pristine wild coast. The Nelson Mandela and Mvezo Museum have potential for tourism in the area. The IDP notes that there are various initiatives that seek to develop the sector such as the Kwatshezi Development Plan has been crafted to reshape the Coffee-Bay and make it an attractive destination.

Great Kei Local Municipality

The tourism sector is geographically concentrated on the coastal area and is marketed through a well-established brand. The main tourism assets include heritage sites, coastal areas and variety of businesses. The IDP notes that the tourism sector should be developed further.

Mbhashe Local Municipality

The main tourist assets in the Municipality are the heritage sites and the main routes leading heritage sites. Heritage sites include the graves of deceased Kings, forts and other memorials. The poor condition of the roads limits visits by tourists and has been noted in the IDP as an area to develop the tourism sector further and contribute to long-term economic development.

Mnquma Local Municipality

The Municipality is strategically located along N2 and is a gateway to the Wild Coast. The main tourist assets include the beaches, rocky shores, estuaries, and dunes and coastal vegetation, Bawa Falls, Gcuwa Dam, and Cebe Campsite, walking trails connecting Kei Farm, Qolorha, and Jacaranda Ship Wreck in Ngcizele. The IDP notes that due to the multiple attractions the tourism sector can contribute to the local economy.

Ndlambe Local Municipality

The tourism sector is focused on providing a safe destination for tourists. The main tourists assets are the nature reserves, game reserves, beach and marine, hunting, agri-tourism, and farm stays. Heritage-based attractions include buildings heritage, art and literature.

The IDP notes that the region has significant environmental value that needs to be protected and that can contribute to future tourism development.

4.4.3

Fisheries

South Africa has a coastline that spans two ecosystems over a distance of 3,623 km, extending from the Orange River in the west on the border with Namibia, to Ponta do Ouro in the east on the Mozambique border.

The western coastal shelf has highly productive commercial fisheries similar to other upwelling ecosystems around the world, while the East Coast is considerably less productive but has high species diversity, including both endemic and Indo-Pacific species. South Africa's commercial fisheries are regulated and monitored by DAFF (previously managed under the Department of Environmental Affairs: Directorate: Marine and Coastal Management). All fisheries in South Africa, as well as the processing, sale in and trade of almost all marine resources, are regulated under the Marine Living Resources Act, 1998 (No. 18 of 1998) (MLRA).

Approximately 14 different commercial fisheries sectors currently operate within South African waters. In summary, the sector comprises the following:

- 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-directed purse-seine fishery targeting pilchard (*Sardinops ocellatus*), anchovy (*Engraulis encrasicolus*) and red-eye round herring (*Etrumeus whitheadii*).
- Highly migratory tuna and tuna-like species are caught on the high seas and seasonally within the South African waters by the pelagic long-line and pole fisheries. Targeted species include albacore (*Thunnus alalunga*), bigeye tuna (*T. obesus*), yellowfin tuna (*T. albacares*) and swordfish (*Xiphias gladius*).
- The traditional line fishery targets a large assemblage of species close to shore including snoek (*Thyrsites atun*), Cape bream (*Pachymetopon blochii*), geelbek (*Atractoscion aequidens*), kob (*Argyrosomus japonicus*), yellowtail (*Seriola lalandi*) and other reef fish.
- Crustacean fisheries comprise a trap and hoop net fishery targeting West Coast rock lobster (*Jasus lalandii*), a line trap fishery targeting the South Coast rock lobster (*Palinurus gilchristi*) and a trawl fishery based solely on the East Coast targeting penaeid prawns, langoustines (*Metanephrops andamanicus* and *Nephropsis stewarti*), deep water rock lobster (*Palinurus delagoae*) and red crab (*Chaceon macphersoni*).
- Other fisheries include a mid-water trawl fishery targeting horse mackerel (*Trachurus capensis*) predominantly on the Agulhas Bank, South Coast and a hand-jig fishery targeting chokka squid (*Loligo vulgaris reynaudii*) exclusively on the South Coast.

In addition to commercial sectors, recreational fishing occurs along the coastline comprising shore angling and small, open boats generally less than 10 m in length. The commercial and recreational fisheries are reported to catch over 250 marine species, although fewer than 5 percent of these are actively targeted by commercial fisheries, which comprise 90 percent of the landed catch.

Most commercial fish landings must take place at designated fishing harbours. For the larger industrial vessels targeting hake, only the major ports of Saldanha Bay, Cape Town, Mossel Bay and Port Elizabeth are used. There are more than 230 ⁽¹⁾ small-scale fishing communities on the South African coastline, ranging in size from small villages to towns. Small-scale fisheries commonly use boats but occur mainly close to the shore.

Description of Commercial Fishing Sectors and Fisheries Research Surveys

The fishing sectors that overlap with Block ER236 or may potentially be affected by the project activities are described in this section.

(1) DAFF. 2016. Small-Scale Fisheries. A guide to the small-scale fisheries sector. <http://small-scalefisheries.co.za/wp-content/downloads/SSF%20Booklet%20English.pdf>

Large Pelagic Long Line

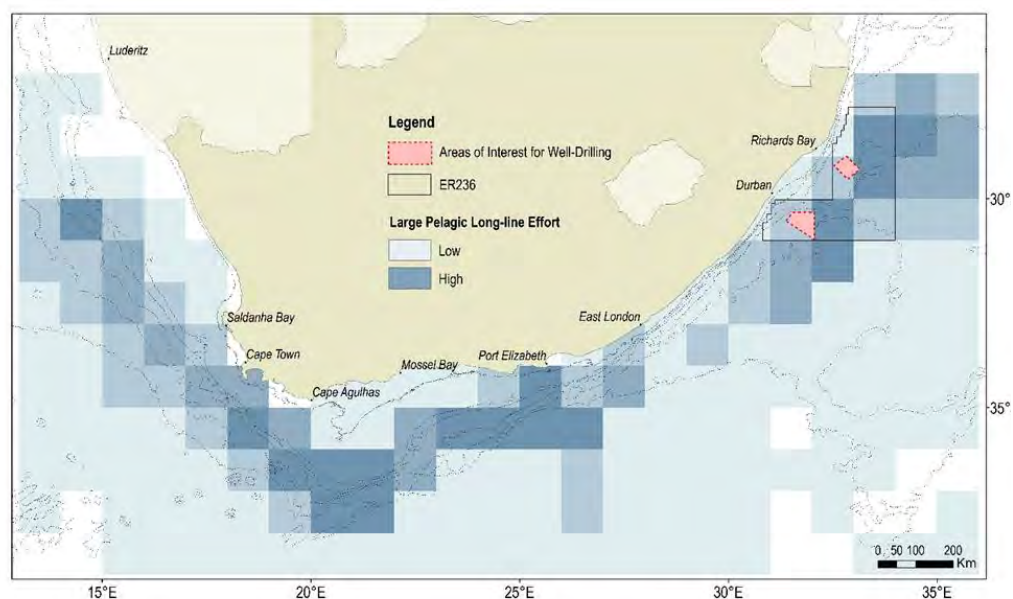
Highly migratory tuna and tuna-like species are caught on the high seas and seasonally within the South African Exclusive Economic Zone (EEZ) by the pelagic long-line and pole fisheries. Targeted species include albacore (*Thunnus alalunga*), bigeye tuna (*T. obesus*), yellowfin tuna (*T. albacares*) and swordfish (*Xiphias gladius*).

Tuna, tuna-like species and billfishes are migratory stocks and are therefore managed as a “shared resource” amongst various countries under the jurisdiction of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Indian Ocean Tuna Commission (IOTC). In the 1970s to mid-1990s the fishery was exclusively operated by Asian fleets (up to 130 vessels) under bilateral agreements with South Africa. From the early 1990s these vessels were banned from South African waters and South Africa went through a period of low fishing activity as fishing rights issues were resolved. Thereafter a domestic fishery developed and 50 fishing rights were allocated to South Africans only.

These rights holders now include a small fleet of local long-liners, although the fishery is still undertaken primarily with Japanese vessels fishing in joint ventures with South African companies. There are currently 30 commercial large pelagic fishing rights issued and 21 vessels active in the fishery.

The fishery operates extensively within the South African EEZ, primarily along the continental shelf break and further offshore. As indicated in *Figure 4.29*, the Block ER236 coincides with the spatial distribution of pelagic long-line fishing effort.

Figure 4.29 *Spatial Distribution of National Pelagic Long-line Fishing Effort*



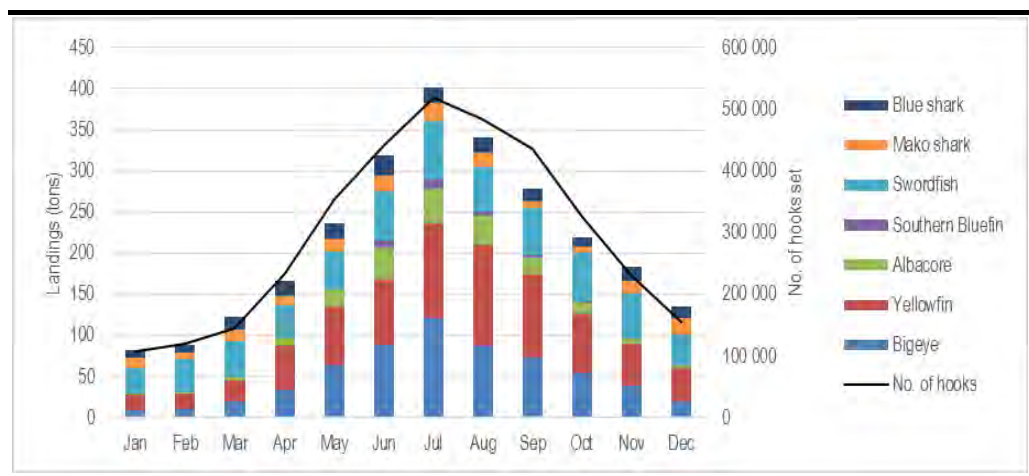
Note: The fishing effort is expended by the long-line sector targeting large pelagic species in relation to ER236 and the proposed areas of interest

Source: Capmarine, 2017

The fishery operates year-round with a relative increase in effort during winter and spring (Figure 4.30). Catch per unit effort (CPUE) variations are driven both by the spatial and temporal distribution of the target species and by fishing gear specifications.

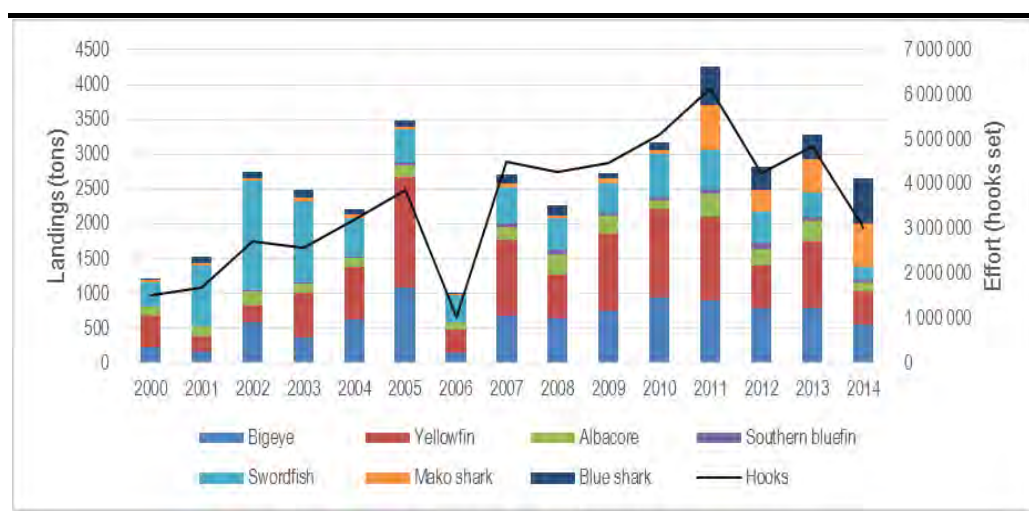
Variability in environmental factors such as oceanic thermal structure and dissolved oxygen can lead to behavioural changes in the target species, which may in turn influence CPUE (Punsly and Nakano, 1992). During the period 2000 to 2014, the sector landed an average catch of 4,527 tons and set 3.55 million hooks per year. Catch and effort figures reported by the fishery for the years 2000 to 2014 are shown in Figure 4.31

Figure 4.30 *Intra-Annual Variation of Catch and Effort Recorded by the Large Pelagic Long-Line Sector (Average Figures for the Period 2000 - 2014)*



Source: Capmarine, 2017

Figure 4.31 *Inter-Annual Variation of Catch Landed and Effort Expended by the Large Pelagic Longline Sector (2000 - 2014).*



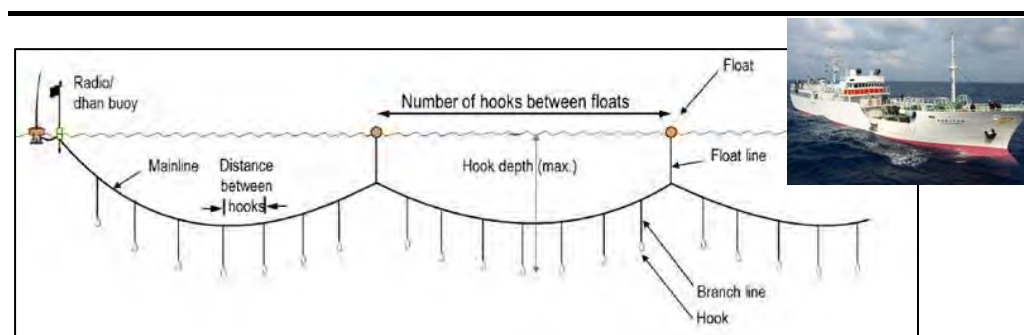
Source: Capmarine, 2017

Gear consists of monofilament mainlines of between 25 km and 100 km in length which are suspended from surface buoys and marked at each end (see *Figure 4.32*). As gear floats close to the water surface, it can present a potential obstruction to surface navigation.

The main fishing line is suspended about 20 m below the water surface via dropper lines connecting it to surface buoys at regular intervals. Up to 3,500 baited hooks are attached to the mainline via 20 m long trace lines, targeting fish at a depth of 40 m below the surface. 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 dhan buoy and radar reflector, which marks the line position for later retrieval.

Lines are usually set at night, and may be left drifting for a considerable length of time (up to 18 hours) before retrieval, which is done by means of a powered hauler at a speed of approximately one knot. During hauling, vessel manoeuvrability is severely restricted and, in the event of an emergency, the line may be dropped and hauled in at a later stage.

Figure 4.32 *Typical Configuration of Long-Line Gear Targeting Pelagic Species (Left)*



Note: This figure also includes a photograph of mainline with dropper line and trace line (upper right) and photograph of typical high seas long-line vessel (upper right).

Source: Capmarine, 2017

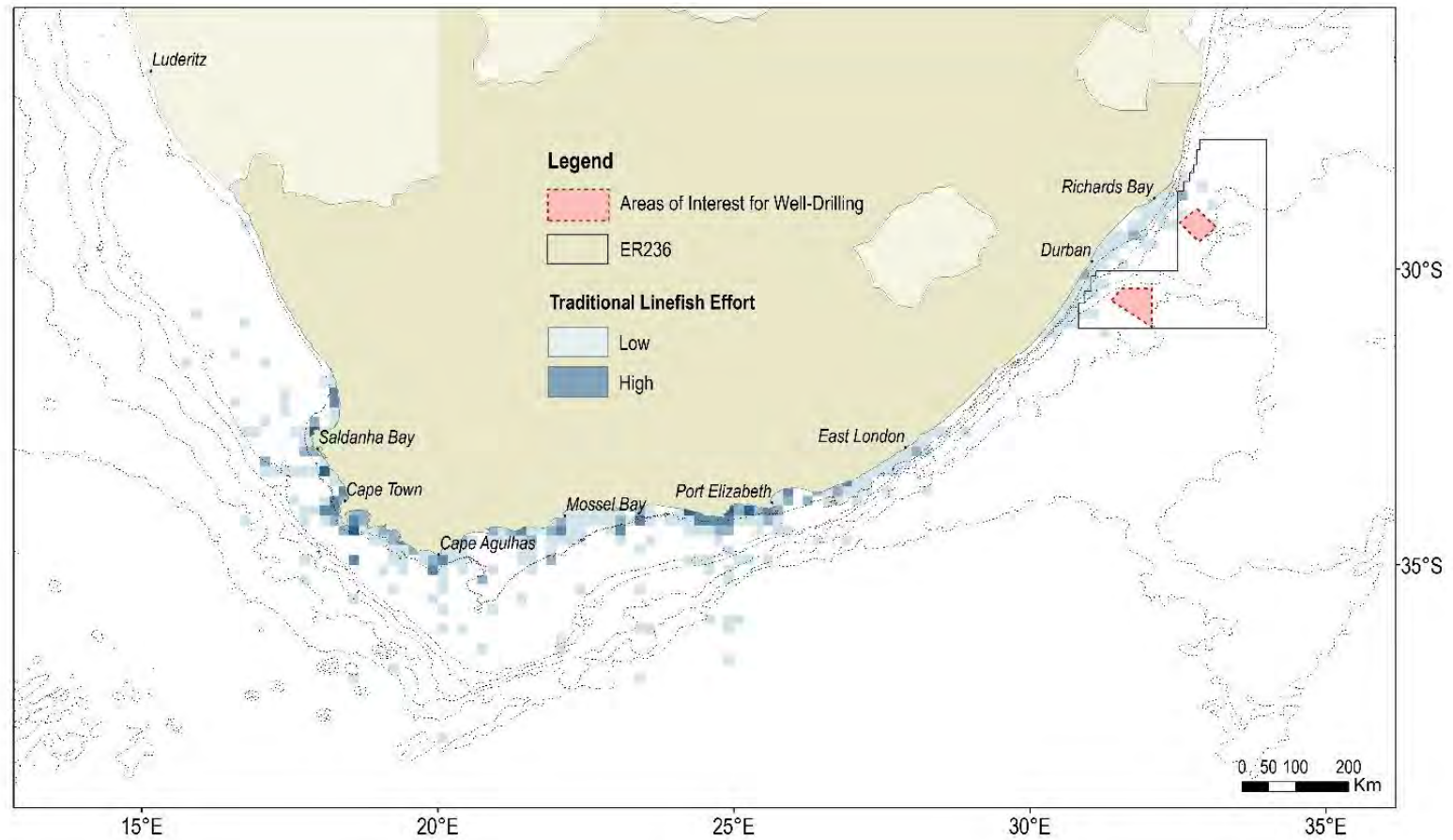
Traditional Line Fish

The traditional line fishery is the country's third most important fishery in terms of total tons landed and economic value. It is a long-standing, nearshore fishery based on a large assemblage of different species. Within the Western Cape the predominant catch species is snoek (*Thyrsites atun*) while other species such as Cape bream (hottentot) (*Pachymetopon blochii*), geelbek (*Atractoscion aequidens*), kob (*Argyrosomus japonicus*) and yellowtail (*Seriola lalandi*) are also important. Towards the East Coast the number of catch species increases and includes resident reef fish (*Sparidae* and *Serranidae*), pelagic migrants (*Carangidae* and *Scombridae*) and demersal migrants (*Sciaenidae* and *Sparidae*). The fishery is widespread along the country's shoreline from Port Nolloth on the West Coast to Cape Vidal on the East Coast (*Figure 4.33*).

Effort is managed geographically with the spatial effort of the fishery divided into three zones. Most of the catch (up to 95 percent) is landed by the Cape commercial fishery, which operates on the continental shelf from the Namibian border on the West Coast to the Kei River in the Eastern Cape. 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. comm¹). The spatial distribution of line-fishing effort coincides with inshore areas of Block ER236.

¹ Mr C. Wilke (christopherW@daff.gov.za) is the chief technician at DAFF and is the principle contact for linefish data collation.

Figure 4.33 *Spatial Distribution of Fishing Effort Expended by Traditional Line-Fish Sector*



Source: Capmarine, 2017

Crustacean Trawl Fishery

South Africa's crustacean trawl fishery operates exclusively within the province of KZN. The fishery consists of inshore and offshore sectors, which differ according to their targeted species, areas of operation and gear types. The fishery is managed using a Total Applied Effort (TAE) strategy, which limits the number of vessels permitted to fish on the inshore and offshore grounds. There are currently five vessels operating within the inshore grounds with another two vessels restricted to working in the offshore grounds only.

The KZN prawn trawler fleet comprises steel-hulled vessels ranging in length from 25 to 40 m and up to a Gross Registered Tonnage (GRT) of 280 tons. All are equipped with GPS, echosounders, radar and VHF/SSB radio. Most vessels are single otter trawlers, deploying nets from the stern or side at a speed of two to three knots. Trawl net sizes range from 25 m to 72 m footrope length, with a minimum mesh size of 60 mm. The duration of a typical trawl is four hours. Trip lengths range from three to four weeks and vessels may carry a crew of up to 20.

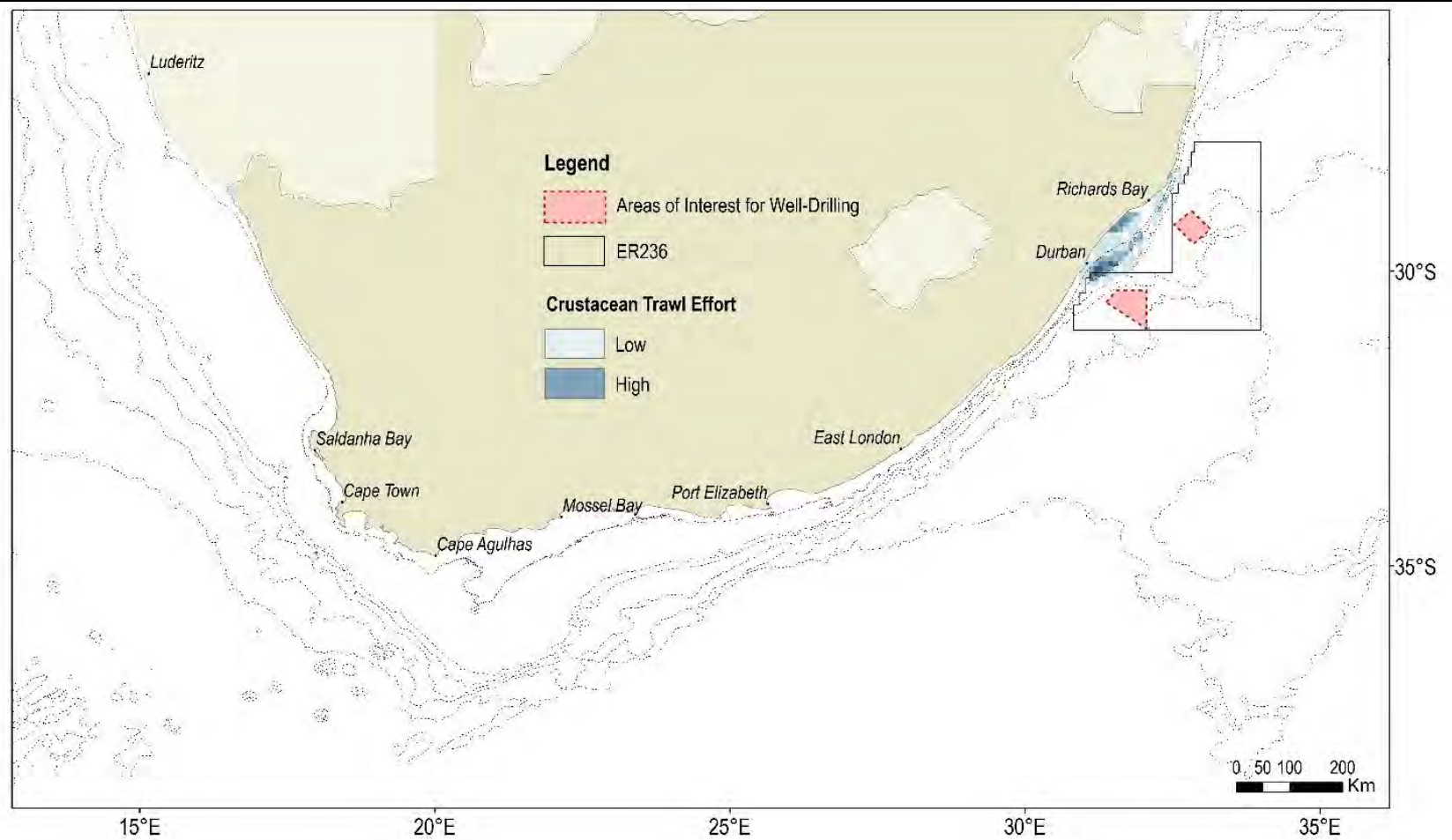
The inshore fishery is based on white prawns (*Fennereopenaeus indicus*), tiger prawns (*Penaeus monodon*) and brown prawns (*Metapenaeus monoceros*) which occur on the shallow water mud banks along the north-eastern coast of KZN. There are few areas within the habitat distribution of penaeid prawns that are suitable for trawling due to the steep drop off of the continental shelf on the East Coast. The inshore fishery operates on the Tugela Bank in water depths of up to 50 m and within 10 nautical miles (approximately 18.5 km) of the shore. There is a seasonal closure of the Tugela Bank grounds in order to minimise high bycatch levels, therefore trawlers operate only within these inshore grounds during the period March to August. During summer months activity shifts northwards towards St Lucia, where the fishery targets bamboo prawns (*Penaeus japonicus*) in addition to the previously-mentioned species. The prawn species on which the inshore fishery is based are fast-growing and are dependent on estuarine environments during the early phase of their life cycle. As juveniles, they recruit onto the mud banks where they mature and reproduce. The catch composition within the fishery typically comprises 20 percent prawn species, while approximately 10 percent of the remainder of the catch is also retained for its commercial value and includes crab, octopus, squid, cuttlefish and linefish. The remainder of the catch is discarded.

The deep water fishery operates between water depths of 100 m and 600 m from Amanzimtoti in the south to Cape Vidal in the north, covering approximately 1,700 km² along the edge of the continental shelf. The boundary between the delimitation of offshore and inshore fisheries is about seven nautical miles (12.9 km) from the shore.

Offshore trawling takes place year-round. Targeted species include pink (*Haliporoides triarthus*) and red prawns, langoustines (*Metanephrops andamanicus* and *Nephropsis stewarti*), red crab (*Chaceon macphersoni*) and deep water rock lobster (*Palinurus delagoae*). Catches are packed and frozen at sea and landed at the ports of Richards Bay or Durban.

Figure 4.34 indicates the location of fishing grounds in relation to the Block ER236. There is a potential overlap of the crustacean trawl fishery with the Block ER236.

Figure 4.34 *Spatial Distribution of Effort Expended by the Crustacean Trawl Fishery*



Source: Capmarine, 2017

Small-Scale Fisheries

Small-scale fishers fish to meet food and basic livelihood needs, and may be directly involved in harvesting, processing and distribution of fish for commercial purposes. These fishers traditionally operate on nearshore fishing grounds, using traditional low technology or passive fishing gear to harvest marine living resources on a full-time, part-time or seasonal basis. Fishing trips are usually a single day in duration and fishing/harvesting techniques are labour intensive.

The equipment used by small scale fishers includes rowing boats in some areas, motorized boats on the south and west coast and simple fishing gear including hands, feet, screw drivers, hand lines, prawn pumps, rods with reels, gaffs, hoop nets, gill nets, seine/trek nets and semi-permanently fixed kraal traps. Small-scale fishers are an integral part of the rural and coastal communities in which they reside and this is reflected in the socio-economic profile of such communities. In the Eastern Cape and KwaZulu-Natal, small-scale fishers live predominantly in rural areas.

Small-scale fisheries 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 Department of Agriculture Policy for the Small Scale Fisheries Sector in South Africa 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 recommends five basket areas as shown in *Table 4.7*.

Table 4.7 *Small-scale Fishery “Basket” Areas*

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

The small scale fishery sector operates in “nearshore” waters (not likely to extend beyond 3 nm from the coast (approximately 5.5 km) and, therefore, would not directly coincide with the proposed drilling areas.

Small-scale fisheries are divided up into four categories, namely:

- Subsistence linefishery;
- Kosi Bay traditional trap;
- Illegal gill and seine net; and
- Beach invertebrates.

Each of these are described in more detail below.

Subsistence Linefishery

Subsistence fisheries refer to fisheries where people harvest fish or other marine organisms in close proximity to where they live as a means to meet their basic needs of food security (Branch *et al.* 2002). Generally these fishers’ fish along the sea or estuary shore and they cannot afford vessels of any type. Gears are often old, second-hand or home-made rods and reels or hand-lines and the fishers usually collect their own bait (such as mussels, red bait, mole crabs or sand prawns). These fishers seldom catch enough fish to sell and most fish caught are for personal or family consumption to supplement their diet. In occurrences where large catches are made, the surplus may be sold or bartered.

Clark *et al.* (2002) estimated that there were approximately 21,641 households along the KZN coast involved in subsistence fishing. However this is believed to be a substantial overestimate as Dunlop (2011), showed that “true” subsistence linefishers made up a relatively small percentage (3-6 percent) of the total number of shore fishers, which was estimated at approximately 65,000 in 2010 (Dunlop 2011), ie the best estimate is between 2,000 and 4,000 subsistence linefishers. Approximately 2,500 people from 23 KZN communities participate in seven types of fisheries. In 2012, through established local fishing co-management structures, formal applications were received for fishing rights (exemption permits) for 938 subsistence linefishers from 12 recognised subsistence fishing communities including: Kosi Bay, Mabibi, Mbila/Sodwana Bay, Sokhulu, Nhlabane/Mbonambi, Port Durnford, Mpembeni, Amatikulu, Nonoti, Umgababa, Mfazazana/Mthwalume and Nzimakwe/Port Edward.

In terms of the annual amount of food harvested, it is estimated that the subsistence shore fishery harvests approximately 23 t of linefish in the marine and estuarine environments per annum (Mkhize 2010, Kyle 2013c, WIOFish 2013). Based on the estimates made by Dunlop (2011), the total subsistence linefish catch for the seashore was in the region of 16 t per annum.

Due to the nature of the subsistence shore fishery and the fact that many participants are not formally permitted, total effort is extremely difficult to estimate. Based on the results from Dunlop (2011) best estimates for the marine subsistence shore linefishery would be between 24,000 and 48,000 fisher-days per annum.

Limited information is available regarding the economic value of the subsistence linefishery. Reported value of the total annual catch ranges from R150,000 (Mkhize 2010) to R920,000 (based on figures cited in WIOFish 2013).

Kosi Bay Traditional Trap

Traditional traps are used in the Kosi lakes system extending from just inside the estuary mouth into the Makhawulani, Mpungwini and Nhlanga lakes. These traps have been in operation in the Kosi Lakes for many generations. The traps are semi-permanent and are constructed to direct fish into a basket from which they cannot exit. The traps mostly target fish that move at night from the lakes to the ocean. They are caught in the baskets during the night and are speared and removed by the fishers in the morning.

There are approximately 150 fishers active in the fishery (WIOFish 2013). In 2012 there were an estimated 64 392 fish caught in the traps weighing approximately 66 t (WIOFish 2013). Fishers obtained approximately R50 per kg for their catch in 2012 (WIOFish 2013). The total income from the catch would therefore be approximately R3.3 million.

Rocky Shore and Sandy Beach Invertebrate Fishery

Small-scale/subsistence fishers living along the KZN and Wild Coast collect a variety of organisms including both mobile and sessile invertebrates living on intertidal rocks and sandy beaches. Harvesters living south of the iSimangaliso Wetland Park collect mostly mussels off the rocks and there is some illegal collection of rock lobsters (*Panulirus* spp). There are approximately 300 fishers in the iSimangaliso Wetland Park but this may be an over-estimation as fishers may collect more than one type of target organism. Invertebrate collectors living along the remainder of the KZN coast number approximately 256 and the number of illegal lobster fishers is unknown.

Total catches (2011) for the various components of the small-scale invertebrate fishery as reported in WIOFish (2013) are mangrove crabs (8 043 kg), ghost crabs (200 kg), mole crabs (100 kg), mixed invertebrates (1700 kg) and mussels (9000 kg).

A total of 470 small-scale intertidal fisher exemption permits were applied for in 2013. The number has been steadily increasing since 2007. The increase can indicate either new entrants to the fishery or higher compliance by existing fishers of the interim fishery regulations.

Fishers have few costs except for the purchase of collection tools such as knives, scrapers, screwdrivers and hoes and, in some cases, transport to their fishing grounds. The real value of this fishery was that it often offered the ability for some of the poorest people living along the coast to collect good quality food, especially in the time before substantial social grants.

Illegal Gill and Seine Net

Illegal gill and seine-netting has been taking place in a number of KZN rivers, estuaries and freshwater impoundments since at least the early 1950s (Mann 1995, 2003, Kyle 1999, 2003). Monofilament gill-net is set along estuary margins, across estuary channels, into estuarine lakes or across river channels targeting a range of different fish species. The length of net can be between 10 and 1000 m and from 2 to 4 m wide. Most netting was carried out on foot but more recently and particularly in larger estuaries such as Lake St Lucia, primitive home-made boats are used to set the nets. The seine-nets used in this fishery range from properly made nets with a weighted footrope, a buoyed float-line and a bag with a cod-end, to simple pieces of shade cloth that are dragged through the water.

Seine-netting is an active method of fishing normally done by swimming the net out and pulling it into shore during the day with the main target being swimming prawns (*Penaeidea*). This should not be confused with the legal beach seine and drag net fisheries. Many of the people involved in these net fisheries are unemployed/ rural people living in close proximity to estuarine systems. However, as it is an illegal fishery, much of the netting now being carried out is commercially motivated and well organised by poaching syndicates with fish buyers coming into rural areas with freezers in vehicles to purchase the fish and/or prawns which are then sold at nearby and distant markets.

The main estuarine systems where illegal gill-netting is taking place include Kosi Bay, Lake St Lucia, Umfolozi/Msundusi, Lake Nhlabane, Richards Bay Harbour, Mhlatuze, Umlalazi, Amatikulu/Nyoni, Tugela, Zinkwazi, Umgeni and Durban Harbour (Beckley *et al.* 2000). Due to its illegal nature, estimates of total catch from this fishery are not available.

During 2012 EKZNW anti-poaching patrols removed and destroyed a total of approximately 26 km of illegal gill and seine-nets from Lake St Lucia, as well as 56 boats. Many more kilometres of netting were removed from other estuaries.

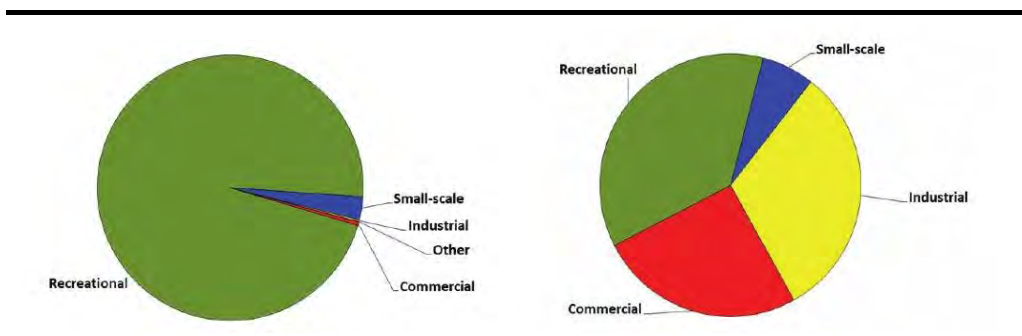
Recreational Fishery

The recreational sectors that are active off the KZN coastline comprise shore-based, estuarine and boat-based line fisheries as well as spearfishing. Net fisheries for recreational purposes include cast, drag and hoop net techniques. Overall, recreational fisheries account for the most fishers in the province.

In terms of catches, the industrial fisheries contribute the most to the total catch for KZN but this is followed closely by the recreational fisheries and commercial fisheries (see *Figure 4.35*).

A description of each is presented below with information derived from the special publication on KZN's marine and estuarine fisheries produced by the Oceanographic Research Institute (2014), in conjunction with Ezemvelo KwaZulu-Natal Wildlife (EKZNW).

Figure 4.35 *Proportion of fishers that contribute to overall participation in KwaZulu-Natal (left) and proportion of fisheries that contribute to total catch in KwaZulu-Natal (right) (ORI, 2014)*



Shore-Based Line Fishery

Shore-based fishing (angling), is a recreational activity that takes place from the shoreline, using a hook and line. The fishery is open access and widely distributed along the entire KZN coastline (Dunlop & Mann 2012). This makes it accessible to a wide variety of communities, ranging from subsistence fishers to recreational/social and competitive anglers (Dunlop & Mann 2012). Shore-based fishing has a long-standing historical presence in the province, and easy access and relatively low gear and entry costs make recreational shore fishing the largest marine fishery in KZN in terms of the number of participants (Brouwer *et al.* 1997; McGrath *et al.* 1997; Dunlop 2011). In 2009/10, the total number of recreational shore anglers active in the fishery was estimated at between 41,283 and 68,087 anglers (Dunlop & Mann 2012). It was also estimated that between 8,463 and 13,958 shore anglers (20.5%) visit KZN annually from other provinces or countries (Dunlop & Mann 2012).

A wide variety of fish species are targeted, including shad (*Pomatomus saltatrix*), karanteen (*Sarpa salpa*) and blacktail (*Diplodus capensis*), with a limited amount of overlap in the species captured from the shore and in the offshore boat-based linefishery (Dunlop & Mann 2012). Catch per unit effort (CPUE) for the KZN shore fishery in 2009/10 was approximately 0.82 fish per angler-day or 0.32 kg per angler-day (Dunlop & Mann 2012). This amounts to approximately 263 t of fish per annum based on the estimates of total shore angling effort and CPUE (Dunlop & Mann 2012).

Total shore angling effort was calculated to be 779,382 to 843,702 angler-days per annum in 2009/10 (Mann *et al.* 2008; Dunlop & Mann 2012).

The most recent economic survey of the KZN shore fishery was conducted by Dunlop (2011) in 2009-10. Based on the estimated total catch of 263 t and the wholesale (first point of sale) value of linefish at that time (ie approximately R30/kg), the total value of the catch was estimated at R7.9 million.

Estuarine Linefishery

Estuaries are highly productive and dynamic ecosystems providing an important nursery habitat for juvenile fish and feeding grounds for some adult species. Recreational estuarine fishing in KZN occurs in four major estuarine systems, namely Durban harbour (Guastella 1994, Pradervand *et al.* 2003), Richards Bay harbour (Everett & Fennessy 2007, Beckley *et al.* 2008), Lake St Lucia (Mann *et al.* 2002) and Kosi Bay (James *et al.* 2001). Anglers predominantly use light tackle to fish from the estuary shore and from small boats in water depths not exceeding 25 m in harbours and seldom exceeding 5 m in St Lucia and Kosi Bay.

The overall participation in the KZN recreational estuarine fishery as a whole is estimated to be 50 000 anglers (Lamberth & Turpie 2003). Catch composition varies according to location but consists of spotted grunter, dusky kob (*Argyrosomus japonicus*), Natal stumpnose, mullet (*Mugilidae*), riverbream/perch (*Acanthopagrus vagus*) and a variety of other species. In 2012, EKZNW recorded an overall shore-based CPUE for the estuarine fishery of 0.06 fish.angler-1.hour-1 (Maggs *et al.* 2013). Total annual recreational catch retained in the four major systems is approximately 85,000 fish (approximately 103 t) (James *et al.* 2001, Mann *et al.* 2002, Pradervand *et al.* 2003, Everett & Fennessy 2007, Beckley *et al.* 2008) and total recreational angling effort in the four major estuarine systems is approximately 850,000 angler hours per year (James *et al.* 2001, Mann *et al.* 2002, Pradervand *et al.* 2003, Everett & Fennessy 2007, Beckley *et al.* 2008). Fish may not be sold; however, based on the estimated total catch and the value of fresh fish of approximately R40/kg (2014, first point of sale), the landed catch is worth R4.1 million. Lamberth and Turpie (2003) estimated the overall economic contribution of the estuarine shore-based recreational sector in KZN at R84.5 million per year.

Boat-Based Fishery

The marine recreational boat-based fishery comprises various types of vessels from paddleskis (also known as fishing-skis) to large harbour-based vessels >10 m. However, the most common vessel used for recreational offshore fishing along the KZN coast is the skiboat. Skiboats are compact, trailer-able, beach-launched vessels 5-10 m long, usually powered by twin outboard engines and are more affordable, fuel efficient and cheaper to run than large, harbour-based vessels (Penney *et al.* 1999).

These vessels are launched at beach launch sites and from harbours and give access to most offshore areas along the KZN coast (Dunlop & Mann 2013). Due to the recreational nature of the fishery, a large range of fishing gear is used depending on the target species.

When bottom fishing for reef fish, sturdy fibreglass rods and Scarborough type reels are preferred, very similar to those used by commercial fishers. When targeting game fish (the most commonly targeted species), expensive graphite trolling rods fitted with multiplier reels will be used while trolling lures or live bait are used at varying depths depending on the species being targeted. A wide variety of pelagic and demersal reef fish species are caught (approximately 78 species), including yellowfin tuna (*Thunnus albacares*), slinger (*Chrysoblephus puniceus*), dorado (*Coryphaena hippurus*), black musselcracker (*Cymatoceps nasutus*), eastern little tuna (*Euthynnus affinis*), blue emperor (*Lethrinus nebulosus*), chub mackerel (*Scomber japonicus*) and Englishman (*Chrysoblephus anglicus*) (Dunlop & Mann, 2013). There is considerable overlap in the species captured between the recreational, charter and commercial sectors of the offshore boat-based linefishery (Dunlop & Mann 2013).

The total number of recreational boat fishers participating in the KZN offshore boat-based linefishery was estimated at between 7,662 and 9,991 anglers in 2009/10, operating from an estimated 2,448 to 3,192 boats (Dunlop & Mann 2013). In addition, there are a minimum of 650 active participants in the paddleski fishery annually (Mann *et al.* (2012). CPUE during a 2009/10 survey was 8.58 fish per boat outing, or 15.0 kg per boat outing and the total annual catch was estimated at 457 t per annum (261,132 fish per annum) (Dunlop & Mann 2013).

During 2012 there were approximately 26,913 recreational boat launches undertaken for the purpose of recreational fishing along the KZN coast (Mann *et al.* 2013) with an addition estimated number of 6,685 paddleski launches made annually (Mann *et al.* 2012).

The most recent economic survey of the KZN recreational boat-based linefishery was conducted by Dunlop (2011). Based on the estimated total catch of 457 t and the wholesale (first point of sale) value of linefish at that time (ie approximately R30/kg), the total value of the catch was approximately R13.7 million.

Cast Net Fishery

This recreational fishery is active in the shallow regions of estuaries, harbours and the intertidal zone of beaches (WIOFish 2013) with a quota system of cast net licences that are endorsed by EKZNW for use on specific estuaries. Fishermen operate from the shore, throwing a small circular net, weighted at the circumference, in such a way that the cast net spreads out on the water and sinks, entrapping fish.

In 2012, 1,233 annual cast net permits and an additional 113 temporary permits were issued in KZN (ICS 2013). The total fishing effort in KZN is unknown.

A total of 182 cast netters were encountered on 102 EKZNW shore patrols conducted in 2012 (ICS 2013). The potential economic value of this fishery is unknown as there is no information on total catch.

Drag Net Fishery

This small recreational fishery is conducted in estuaries using a drag net to capture juveniles of several penaeid prawn species (WIOFish 2013). A vessel may not be used (Tomalin 1995). In 2012, a total of 169 drag net permits were issued, and an additional 155 permits purchased in the previous year were still valid in 2012 (ICS 2013).

There is no reliable catch information for this fishery, but total annual catch is estimated to be less than 100 kg (ORI, 2014). Catches made in this fishery may not be sold and are mainly used for bait.

Hoop Net Fishery

This recreational fishery targets small baitfish and squid in harbours and estuaries of KZN (Tomalin 1995). Animals are collected using a net that is attached to a hoop at the end of a pole. The fishery was suspended from 2005 to 2009, but in 2010, hoop net permits were again sold in KZN (ICS 2013). Based on permit sales at KZN post offices, a total of 302 fishers bought 81 annual and 221 temporary hoop net permits in 2012. A further 77 hoop net permits sold in 2011 were also still valid in 2012 (ICS 2013). There is no information on fishing effort. The potential economic value of this fishery is unknown as there is no information on total catch.

4.4.4 Recreational Coast and Ocean Uses

Recreational use of the East Coast and Wild Coast marine environment involves both consumptive and non-consumptive uses. The former involves coastal and boat-based users removing marine resources for their own consumption (e.g. recreational fishing, refer to *Section 4.4.3* for a description of recreational fishing), while the latter involves users making use of the marine environment without removing any marine resources from the area.

Consumptive Uses

Consumptive uses of marine resources along the East Coast includes recreational shore and boat-based anglers (Brouwer *et al.*, 1997), spearfishers (Mann *et al.*, 1997), divers collecting subtidal invertebrates, and exploiters of intertidal organisms. The recreational use of marine resources along the East Coast and Wild Coast typically occurs within inshore waters in the vicinity of coastal towns and holiday resorts, and is closely linked to tourism.

As the northern area of interest is located a minimum of 62 km offshore and the southern area of interest a minimum of 65 km offshore, it is unlikely that the proposed exploration drilling activity will interfere with onshore recreational users. There is however a possibility that the offshore recreational boat-based fishing activities could be affected if they travel offshore and into the Block ER236.

Non-Consumptive Uses

Non-consumptive utilisation of the marine environment along the East Coast and the Wild Coast includes water sports such as surfing, boat sailing, power boating, diving, and nature watching and beach recreation. The use of the coastal and marine environment is a big driver for tourism along the coast (as described in *Section 4.4.1*).

As noted above, Block ER236 is located from 20 km offshore and thus sailing/boating activities are unlikely to occur within Block ER236. However, there is a possibility of encountering sailing vessels passing into or out of South African waters.

4.4.5 *Marine Traffic*

A large number of vessels navigate along the East Coast on their way around the southern African subcontinent. The majority of this boat traffic, including commercial and fishing vessels, remains relatively close inshore on the East Coast. North- and south-bound cargo vessels usually remain over the mid-shelf (100 m isobath). In contrast, tankers and bulk carriers remain further offshore, unless needing to move inshore to avoid extremely rough conditions that develop in the Agulhas Current. Block ER236 may overlap with the routes taken by tankers and bulk carriers. The supply vessels may interact with the inshore vessel traffic due to the collection of supplies from the Port of Richards Bay or the Port of Durban. Important East Coast commercial harbours include Port Elizabeth, East London, Durban and Richards Bay.

4.4.6 *Underwater Cultural Heritage*

South Africa has a rich and diverse underwater cultural heritage. Located on the historical trade route between Europe and the East, South Africa's rugged and dangerous coastline has witnessed more than its fair share of shipwrecks and maritime dramas in the last 500 years. At least 2,400 vessels are known to have sunk, grounded, or been wrecked, abandoned or scuttled in South African waters since the early 1500s. This does not include the, as yet unproven, potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions along the South African east coast.

In addition to historical shipwrecks, the record of South Africa's long association with the sea is much broader and extends far back into prehistory.

This element of our maritime and underwater cultural heritage is represented around the South African coast by thousands of pre-colonial shell middens and large numbers of tidal fish traps, which reflect prehistoric human exploitation of marine resources since the Middle Stone Age, more than 150,000 years ago. Another, until recently, largely unacknowledged and unexplored aspect of our maritime and underwater cultural heritage are pre-colonial terrestrial archaeological sites and palaeolandscapes which are now inundated by the sea.

Submerged Prehistory

Global sea levels have fluctuated substantially on at least three occasions during the last 500,000 years. As with modern sea level change, these changes have been the result of increased and decreased polar glaciation tied to global climatic patterns. The dropping of sea levels was caused by the locking up in the polar ice caps of huge quantities of seawater as global temperatures cooled. The most extreme recent sea level drop occurred between circa 20,000 and 17,000 years ago when at the height of the last, Weichselian glaciation, the sea was more than 120m lower than it is today (Van Andel 1989).

The lower sea levels of the Weichselian (c. 115,000 - 11,700 years ago) and earlier Saalian (c. 352,000 - 130,000 years ago) and Mindel (c. 478,000 - 424,000 years ago) glaciations would at times have “added a large coastal plain to the South African land mass” (Van Andel 1989:133) where parts of the continental shelf were exposed as dry land. This would have been most pronounced on the wide Agulhas Bank off the southern Cape coast, but would also have occurred along the narrow continental shelves on South Africa’s west and east coasts. It is estimated that this exposed continental shelf may have represented a new area of land as much as 80,000km² in extent during the successive glacial maxima (Fisher *et al* 2010). *Figure 4.36* below gives an indication of the extent of the continental shelf exposure during the second to last glaciation.

Figure 4.36 Possible extent of the South African Continental Shelf c. 137,000 Years Ago during the Saalian glaciation



Source: Franklin *et al*, 2105

Note: Approximate location of Kleinsee marked by the red star.

The exposed continental shelf was quickly populated by terrestrial flora and fauna, and also by our human ancestors who were dependant on these resources. As a result, for periods numbering in the tens of thousands of years on at least three occasions during the last 500,000 years our ancestors inhabited areas of what is now seabed around the South African coast. This means that a large part of the archaeological record of the later Middle and early Late Stone Age is located on the continental shelf and is now “inundated and for all practical purposes absent from [that] record” (Van Andel 1989:133-134).

Shipwrecks

On Christmas Day 1497, the coast in the vicinity of what is now Durban was sighted by a small Portuguese fleet under the command of Vasco da Gama and named Terra Natalis in commemoration (Axelson 1973). Da Gama’s was the first European maritime incursion into the Indian Ocean and his success in reaching of India four months later laid the foundation for more than 500 years of subsequent European maritime activity in the waters of the south western Indian Ocean.

The Portuguese and other European nations who followed their lead into the Indian Ocean joined a maritime trade network that was thousands of years old and in which east and south east Africa was an important partner.

This trade spanned the Indian Ocean and linked the Far East, South East Asia, India, the Indian Ocean islands and Africa. Archaeological evidence from Africa points to an ancient trade in African products – gold, skins, ivory and slaves – in exchange for beads, cloth, porcelain, iron and copper. The physical evidence for this trade includes Persian and Chinese ceramics excavated sites on African Iron Age like Khami, Mapungubwe and Great Zimbabwe (see Garlake 1968, Huffman 1972, Chirikure 2014), glass trade beads found in huge numbers on archaeological sites across eastern and southern Africa (Wood 2012).

There is shipwreck evidence on the East African coast for this pre-European Indian Ocean trade (for example Pollard *et al* 2016) and clear archaeological and documentary evidence that this trade network extended at least as far south as Maputo in Mozambique. This suggests that there is the potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions to exist along the South African east coast and offshore waters.

European maritime activity along the KwaZulu-Natal (KZN) coast was, until the establishment and expansion of colonial settlement in the Cape and Natal colonies, largely transitory in nature, with most maritime traffic transiting these waters, en route elsewhere. There were, nevertheless, from the very start, numerous shipping casualties along the adjacent coast, the earliest recorded on the KZN coast being the Sao Joao, a Portuguese nau wrecked at Port Edward in 1552, south of Block ER236 (Axelson 1973; Burger 2003).

As is clear from the available shipwreck records for the KZN coast, the bulk of these casualties occurred close inshore, with relatively few of the recorded losses occurring in deeper waters, further from the coast. Reasons for this are varied but include the fact that early European shipping, with rudimentary charts and navigational technology, would have hugged the coast. The later presence of a port at Durban would have drawn vessels sailing in deeper waters in towards the coast - during World War I, for example, when Durban became an important port for taking on coal bunkers - where shipping hazards are greater than further offshore (Ingpen 1979).

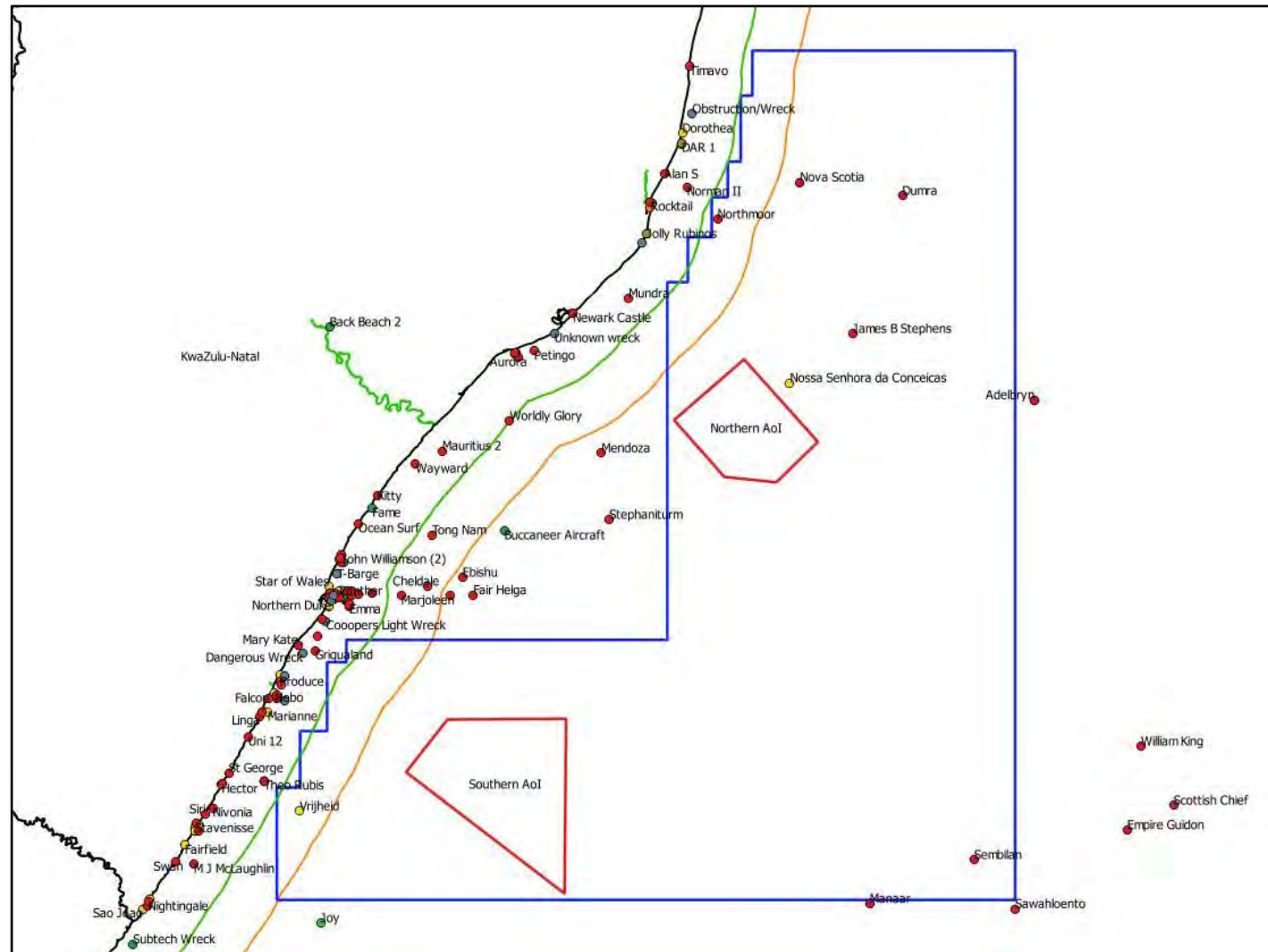
In the broader study area defined for this assessment, there are records of seven maritime losses. Based on their given positions none of these wrecks are located within either of the two Areas of Interest for exploration drilling, although the level of confidence in the available positions is generally low.

All but two of the wrecks are 20th century losses related to German and Italian U-boat activity in the approaches to the Mozambique Channel during World War II. The remaining two wrecks are sailing vessels that date from the second half of the 19th century.

The details of the seven known wrecks are as follows:

- Dumra – British motor vessel, 5 June 1943;
- James B Stephens - merchant steamship, 8 March 1943;
- Northmoor - steam cargo vessel, 17 May 1943;
- Nossa Senhora da Conceicas - Portuguese vessel (possible slave ship), 29 May 1869;
- Nova Scotia - passenger steamship, 28 November 1942;
- Sembilan - Dutch steamship, 17 April 1943; and
- Vrijheid - Dutch brig, 30 April 1883.

Figure 4.37 Locations of Shipwrecks off the East Coast of South Africa



Note: The limit of South African territorial waters and the maritime cultural zone are shown in green and orange respectively. The positions of the seven wrecks discussed in the report below are shown within the study area defined by the limits of Block ER236.

In its response to the draft Scoping report, SAHRA mentioned the possibility that the wreck of the steamship *Waratah*, which went missing without a trace in 1909, may be in the study area. The last reported sighting of a vessel believed to be the *Waratah* took place in very heavy weather on the evening of 26 July 1909, roughly 180 miles south of Durban. Other reports suggested she sank off the Mbashe River in the former Transkei, and bodies and wreckage possibly associated with the *Waratah* were found as far south as Mossel Bay (Smith 2009). Although there was speculation at the time of her disappearance that the *Waratah* was disabled and afloat, searches of the sea both the north and south of the coast of the former Transkei found no trace of her. It is most likely that the *Waratah* sank in the area she was last seen, in the vicinity of the Mbashe River, although recent geophysical surveys have not located the wreck (Brown, 2016). It is unlikely that the wreck is located within the proposed Areas of Interest for the exploration drilling.

As stated above, however, gaps in South Africa's underwater cultural heritage record mean that the potential does exist for currently unknown or unrecorded wrecks to be present within the study area.

4.4.7 *Mineral and Petroleum Prospecting and Exploration Rights and Activities*

Exploration activities are being undertaken in neighbouring oil and gas blocks including the following Exploration Rights:

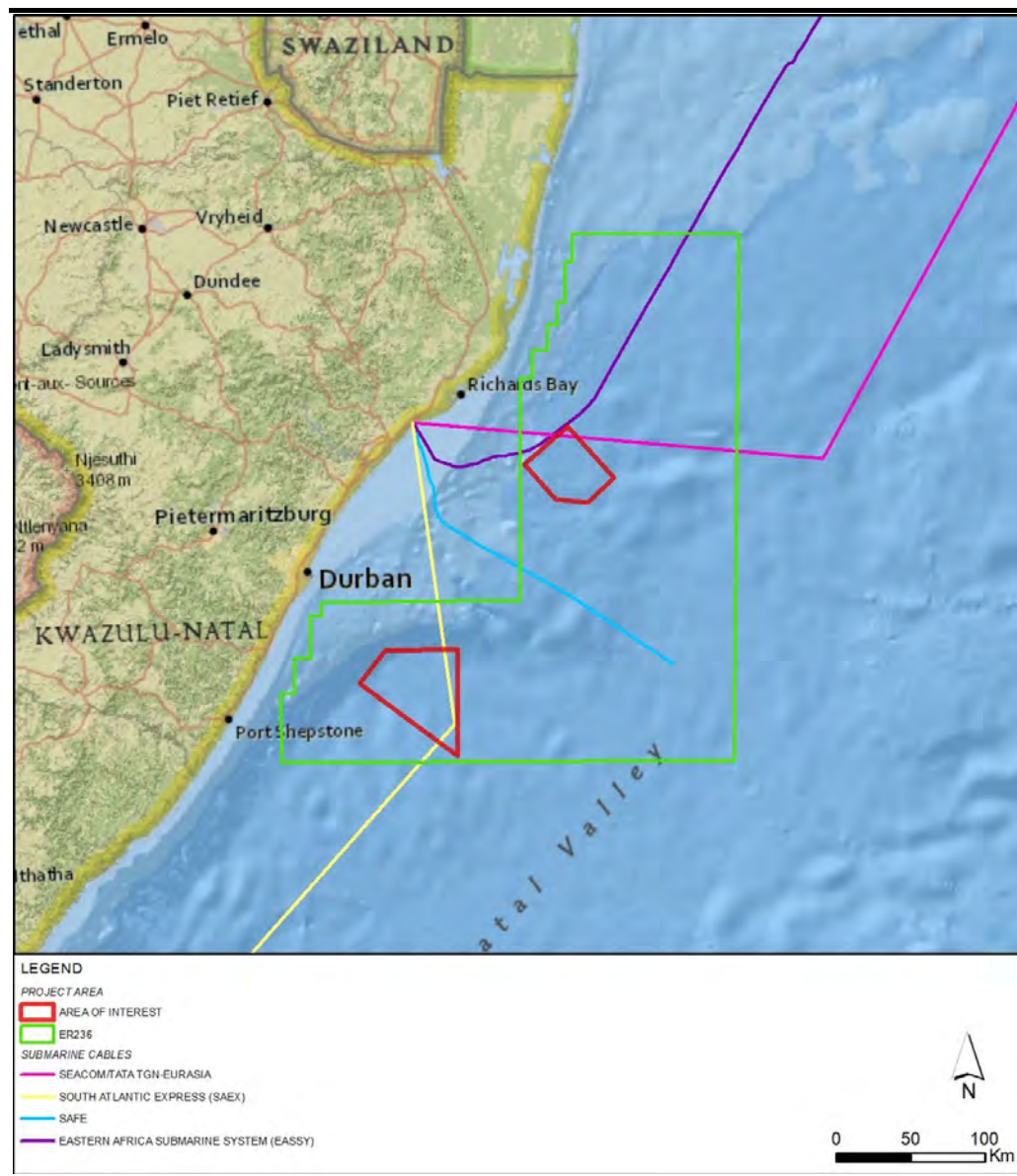
- Tugela South operated by EMEPSAL to the north-west.
- DeepWater Durban operated by EMEPSAL to the south.
- Silverwave deepwater block to the east.

No mineral prospecting activities are currently being undertaken within Block ER236, which is situated in deep water. Although some mineral prospecting has taken place in South African waters, commercially viable ore has not been found.

4.4.8 *Submarine Cables*

There are a number of submarine telecommunications cable systems in South African waters (*Figure 4.38*). The SAExpress, SAFE, EASSy and Seacom cables land at Mtunzini, located approximately 40 km south of Richards Bay. All four cables pass through Block ER236.

Figure 4.38 Submarine Cables



Source: SEACOM, 2018

Table 4.8 Summary of Key Sensitivities

Feature	Description
Seabed features and benthic habitat	<ul style="list-style-type: none"> The northern area of interest for well drilling lies offshore, east of the Natal Bight in >1,500 m water depth. <u>There is no overlap with canyons for areas of drilling interest.</u> No drilling will be undertaken within the canyon. The Goodlad Canyon lacks connectivity to the shelf and are thought to be too deep to be able to provide suitable habitat or food sources for coelacanths and therefore it is unlikely that coelacanths will be found in this canyon. In the northern area of interest for well drilling, Southwest Indian Upper and Lower Bathyal benthic habitats (habitats occurring on the seabed) are found, whereas Southern Indian Lower Bathyal benthic habitat dominates in the southern area of interest, both of which have been assigned an ecosystem threat status of 'least threatened' in the SANBI 2011 National Biodiversity Assessment. The benthic communities within these habitats are generally the same throughout the southern African East Coast region, differing only by seabed type and/or depth zone.
Coelacanths	<ul style="list-style-type: none"> Coelacanths are a rare order of fish known to inhabit canyons in the western Indian Ocean. They were recorded in a submarine canyon off St Lucia in November 2000 (Venter <i>et al.</i>, 2000). Coelacanths were also recorded off Sodwana Bay at depths ranging between 90 to 140 m in the canyons where abundant shelter was offered by structures such as caves, overhangs or broken boulder areas (Hissman <i>et al.</i>, 2006). The <u>deeper portions of the</u> Tugela and Goodlad Canyons lie in close proximity to the southern and northern areas of interest for drilling respectively. Together with the fact that these canyons lack connectivity to the shelf, and suitable food sources are likely to be limited at the depths of these canyons, it is suggested that the Tugela and Goodlad Canyons are unlikely to offer suitable habitat for coelacanths. Additionally, no drilling will be done within canyons.
Deep Water Corals	<ul style="list-style-type: none"> The occurrence of deep water corals in Block ER236 and the areas of interest are unknown.
Whales and Dolphins	<ul style="list-style-type: none"> There are 36 species of whales and dolphins (cetaceans) that are likely to be found within Block ER236. Of the 36 species, the Antarctic Blue whale is 'critically endangered', the Indo-Pacific humpback dolphin, fin whale and sei whale are considered 'endangered' and the Ifafi-Kosi Bay sub-population of the Indo-Pacific bottlenose dolphin, Sperm whale and Bryde's whale (inshore population) are considered 'vulnerable' in the IUCN South African Red Data book List Assessment. The most common species within the area of interest (in terms of likely encounter rate, not total population sizes) are likely to be the common bottlenose dolphin, Indo-Pacific bottlenose dolphin, short-finned pilot whale and humpback whale. ER236 lies within the migratory route of Humpback (Least Concern) and Southern Right (Least Concern) whales, <u>but the area of drilling interest lies further offshore from this migratory route</u> <ul style="list-style-type: none"> Southern right whales will pass through Block ER236 in July and August and again on their southward migration in October/November. Humpbacks have a bimodal distribution off the East coast, most reaching southern African waters around April, continuing through to September/October when the southern migration begins and continues through to December and as late as February. The calving season for Humpbacks extends from July to October, peaking in early August.

Feature	Description
Marine Turtles	<ul style="list-style-type: none"> Five species of turtle are known to occur along the East Coast: leatherback, which is most frequently sighted, and the loggerhead, green, olive ridley and hawksbill turtles. In the IUCN Red listing, the hawksbill turtle is described as 'Critically Endangered', green turtle is 'Endangered' and leatherback, loggerhead and olive ridley are 'Vulnerable' on a global scale. Both the leatherback and the loggerhead turtle nest on the beaches of the northern KZN coastline (St Lucia, iSimangaliso) between mid-October and mid-January. Hatchlings are born from mid-January through to mid-March when the Agulhas Current is warmest. Once hatchlings enter the sea, they move southward following the Agulhas Current and are thought to remain in the southern Indian Ocean gyre for the first five years of their lives. The inshore regions of the northern portion of Block ER236, coincide with the inter-nesting migrations for leatherbacks, but the area of interest lies outside of the inter-nesting range. Leatherback and loggerheads are likely to be encountered in Block ER236 during their foraging migrations.
Marine Protected Areas (MPAs)	<ul style="list-style-type: none"> Block ER236 overlaps with the <u>iSimangaliso MPA, Uthukela Banks MPA and Protea Banks MPA</u>. There is no overlap of the areas of interest for drilling with <u>recently approved</u> MPAs. It should be noted that sections of the original Block ER236 which overlapped with the existing iSimangaliso and Aliwal Shoal MPA's were relinquished during the Exploration Right renewal process in 2016.
Fish spawning, nursery and recruitment areas	<ul style="list-style-type: none"> The areas of interest are offshore of the major fish spawning and migration routes and ichthyoplankton abundance is likely to be low. The sardine run along the Eastern Cape coast and up to southern KZN is inshore of the area of interest. Pilchard eggs are inshore of the area of interest.
Large Pelagic Long Line Fishing	<ul style="list-style-type: none"> The area of interest overlaps with the long line fishing area which targets primarily tuna but also swordfish.
Marine Traffic	<ul style="list-style-type: none"> The Project Area may overlap with the routes taken by tankers and bulk carriers. The supply vessels may interact with the inshore vessel traffic due to the collection of supplies from the Port of Durban or Richard's Bay. Important East Coast commercial harbours include Port Elizabeth, East London, Durban and Richards Bay.
Recreational users	<ul style="list-style-type: none"> The recreational use of marine resources along the East Coast typically occurs within inshore waters in the vicinity of coastal towns and holiday resorts.

5.1 PUBLIC PARTICIPATION OBJECTIVES

Public consultation is an inclusive and culturally appropriate process, which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration. It allows stakeholders to understand the risks, impacts and opportunities of the project in order to achieve positive outcomes.

The Public Participation Process is designed to provide information to and receive feedback from I&APs throughout the EIA process, thus providing organisations and individuals with an opportunity to raise concerns, make comments and suggestions regarding the proposed project. By being part of the assessment process, stakeholders have the opportunity to influence the project layout and design, input into mitigation measures and technical solutions as well as the Plan of Study for the EIA Report.

The main objectives of public participation are:

- To ensure that adequate and timely information is provided to those potentially affected by the project;
- To provide these groups with sufficient opportunity to voice their opinions and concerns; and
- To ensure that comments are received in a timely manner so that they can be taken into account in project decisions.

5.2 LEGISLATIVE CONTEXT

Public participation with regards to EIA's in South Africa is determined by the principles of the National Environmental Management Act (NEMA) (Act 107 of 1998, as amended) and elaborated upon in 'GN 657: Guideline 4: Public Participation' (Department of Environmental Affairs, 2017), which states that: *"Public participation process" in relation to the assessment of the environmental impact of any application for an environmental authorisation, is defined in terms of National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) as a process by which potential interested and affected parties are given opportunity to comment on, or raise issues relevant to, the application."*

Public participation is required for an Environmental Authorisation process in terms of the EIA Regulations GN R.982 (December 2014, as amended).

Section 23, sub regulation (1)(a) of the NEMA EIA Regulations as amended in 2017 states that:

“The application must within 106 days of the acceptance of the scoping report submit to the competent authority –

(b) a notification in writing that the [environmental impact report inclusive of any specialist] reports, and an EMPr, will be submitted within 156 days of [acceptance of the scoping report] receipt of the application by the competent authority, as significant changes have been made or significant new information has been added to the environmental impact assessment report or EMPr, which changes or information was not contained in the reports consulted on during the initial public participation process contemplated in sub regulation (1)(a), and that the revised environmental impact assessment report or EMPr will be subjected to another public participation process of at least 30 days.”

Section 21(2) states that- *“Subject to regulation 46, and if the findings of the scoping report is still valid and the environmental context has not changed the submission of a scoping report as contemplated in sub regulation (1) need not be complied with –*

(a) in cases where a scoping report was accepted as part of a previous application for environmental authorisation and the application has lapsed or was refused because of insufficient information;

(b) on condition that regulation 16 is complied with and that such application is accompanied by proof that registered interested and affected parties, who participated in the public participation process conducted as part of the previous application, have been notified of this intended resubmission of the application prior to submission of such application;”

In line with the above, ERM commenced the new EIA process with the submission of an amended application form and the release of the Draft EIA Report for comment. All I&APs registered on the stakeholder database received notification of the new EIA process that was initiated. Details regarding stakeholder notifications have been provided in Table 5.1 below.

Table 5.1 details the public participation tasks that have been undertaken by ERM.

Table 5.1 **Public Participation Tasks**

Activity	Description and Purpose
Pre-Application Activities (2017)	
Preparation of a preliminary stakeholder database	A preliminary database was compiled of authorities (local and provincial), Non-Governmental Organisations, neighbouring landowners and other key stakeholders (refer to <i>Annex B of the final Scoping Report</i>). This database of registered I&APs was maintained and updated during the ongoing EIA process.
Preparation and Distribution of a Background Information Document (BID)	BIDs (in English) were distributed via email/post to all I&APs on the stakeholder database on the 15 September 2017. See <i>Annex B of the final Scoping Report</i> . The BID provides an introduction to the project and the EIA process.
Advertisement of the project	<p>The project was advertised in four newspapers with distribution around Durban, and Richards Bay. The newspapers and dates of distribution were as follows:</p> <ul style="list-style-type: none"> • The Mercury – 18 September 2017 • The Zululand Observer – 18 September 2017 • Ilanga (advert in isiZulu) – 21 September 2017 • Isolezwe (advert in isiZulu) – 21 September 2017 <p>See proof of advertisement in <i>Annex B of the final Scoping Report</i>.</p>
Erection of Site Notices	<p>Site notices were placed at the following locations: eThekweni Municipality libraries:</p> <ul style="list-style-type: none"> • Durban North; • Durban Central Lending; • Amanzimtoti; • Warner Beach; • Isipingo Beach; • Umkomaas; and • Tongaat Beach. <p>uMhlathuze Local Municipality:</p> <ul style="list-style-type: none"> • Richards Bay Municipality; and • Richards Bay Library. • Entrance to the Port of Richards Bay.
Development of an Initial Comments and Response Report	All comments received during the initial consultation period were recorded into a Comments and Response Report. Refer to <i>Annex C of the final Scoping Report</i> .

Activity	Description and Purpose
Scoping Phase (January to March 2018)	
Release of draft Scoping Report for Public Comment	<p>On 22 January 2018, the draft Scoping Report was released for public comment and was made available online and in the following libraries:</p> <ul style="list-style-type: none"> • Durban Public Library • Richards Bay Public Library • Port Shepstone Public Library <p>On the same day, an advert was published in four newspapers; The Mercury (in English) and Isolezwe (in Zulu) with distribution around Durban, and The Zululand Observer and Ilanga Newspaper (in Zulu), with distribution around Richards Bay. Notifications were also sent to all stakeholders on the database.</p> <p>The comment period started on 22 January 2017 and ended on 1 March 2018. All comments received by 5 March 2018 were included in the final Scoping Report.</p> <p>*It should be noted that an earlier version of the Draft Scoping Report was released for comment on 27 October 2017. Due to a change in project scope, a notification was sent out on 7 November 2017 to notify stakeholders that the report would be re-released for a full 30 day comment period in early 2018.</p>
Public Engagement Meeting	<p>A total of three public engagement meetings were held in the following locations:</p> <ul style="list-style-type: none"> • Richards Bay (The Richards Hotel) – 6 February 2018 • Durban (Tropicana Hotel) - 7 February 2018; and • Port Shepstone (Port Shepstone Country Club) – 8 February 2018. <p>Stakeholders were notified about the public meetings through the notification distributed on 22 January 2018. A reminder to stakeholders about the public meetings was distributed on 5 February 2018.</p> <p>These meetings were held to present the proposed project and solicit input from stakeholders into the scoping process. As a result of the concerns raised during the public meetings, the Non-Technical Summary (NTS) of the Scoping Report was revised and translated into isiZulu. The isiZulu version of the NTS was then placed on the project website on 22 February 2018. The public comment period was then extended for a week from 22 February 2018 to give the public an opportunity to comment on the isiZulu version of the NTS.</p> <p>An additional (fourth) follow up meeting was held, upon request of the South Durban Community Environmental Alliance (SDCEA) on 28 February 2018 at the Austerville Community Hall with the presence of an isiZulu language translator. ERM had prepared and distributed a letter of response to the follow up meeting with SDCEA attendees.</p> <p>This letter aimed to address issues raised during the Durban public meeting (on 7 February 2018), which were not responded to in detail during the meeting due to time constraints.</p>

Activity	Description and Purpose
	<p>As a result of the concerns raised during the meeting of 28 February, the comment period was further extended until 5 March 2018 to enable the public to comment on the letter of response prepared.</p> <p>Presentation, attendance registers and meeting notes were included in <i>Annex B of the final Scoping Report</i>.</p>
Submission of final Scoping Report	Notification that the final Scoping Report was submitted to PASA was distributed to stakeholders on 9 March 2018.
EIA Phase (March to September 2018)	
Notification of open house meetings	<p>Ahead of the release of the Draft EIA Report, on 28 May 2018, registered I&APs were notified that open house meetings would be held in the week of 11 to 15 June 2018. Due to unforeseen delays in the preparation of the Draft EIA Report, stakeholders were notified on 4 June 2018 that the open house meetings had been postponed.</p> <p><u>Five Open house meetings occurred from 3 – 10 October 2018. The meetings were held in Port Elizabeth, East London, Richards Bay, Durban and Port Shepstone. All Registered I&AP's were notified of the meetings through emails sent on 17 September 2018 (refer to Annex B of the Final EIA Report). SMS notifications were also sent to I&AP's (refer to Annex B of the Final EIA Report).</u></p>
Notify of lapse of EIA Application	On 13 August 2018 all registered I&APs were sent a notification informing them that the EIA Application had lapsed, and that Eni intend to initiate a new draft EIA process for the project.
EIA Phase under New EIA Application	
Release of draft EIR and EMP for Public Comment	<p>On 25 September 2018, an English version of the Draft EIA Report and EMPr was released for public comment and was made available online and in the following libraries:</p> <ul style="list-style-type: none"> • <u>Durban Public Library;</u> • <u>Richards Bay Public Library;</u> • <u>Port Shepstone Public Library;</u> • <u>Austerville Public Library;</u> • <u>East London Public Library; and</u> • <u>Linton Grange Library (Port Elizabeth).</u> <p><u>English, isiZulu and isiXhosa versions of the Non-Technical Summary were made available at the open house meetings and on the project website. An email notification letter was sent to all registered I&APs on the stakeholder database (refer to Annex B of the Final EIA Report). This letter informed I&APs that a new EIA Application was submitted to PASA and that the draft EIA process had recommenced, and invited I&APs to comment on the Draft EIA Report.</u></p> <p><u>Newspaper adverts were placed in several newspapers (notifying stakeholders of the availability of the Draft EIA Report for review and inviting them to open house meetings (refer to Annex B of the Final EIA Report). All comments received, along with responses have been included in the Comments and Responses Report in the Final EIA Report (refer to Annex B of the Final EIA Report).</u></p> <p><u>Newspaper adverts were published during the week of 17 September 2018 as follows:</u></p> <p><u>English Adverts were published in:</u></p>

Activity	Description and Purpose
	<ul style="list-style-type: none"> • <u>The Daily Dispatch in East London;</u> • <u>The South Coast Herald in Port Shepstone;</u> • <u>The Herald in Port Elizabeth;</u> • <u>The Mercury in Durban and</u> • <u>The Zululand Observer in Richards Bay.</u> <p><u>isiZulu adverts were published in:</u></p> <ul style="list-style-type: none"> • <u>Ilanga and</u> • <u>Isolezwe</u> <p><u>An isiXhosa advert was published in:</u></p> <ul style="list-style-type: none"> • <u>Pondo News in Eastern Cape</u> <p><u>SMS notifications with directions to the project website, where the Draft EIA Report was available and reminders to submit comments on the Draft EIA Report were sent to I&AP's on 09 October 2018 (refer to Annex B of the Final EIA Report for a screenshot of the site website).</u></p> <p><u>Upon requests made by participants at the open-house meetings in KZN, the EIA Report was translated into isiZulu and the commenting period was subsequently extended by three weeks to conclude on 8 November 2018. This information was communicated to I&AP's via email on 18 October 2018 and via SMS notifications 19 October 2018 (refer to Annex B of the Final EIA Report).</u></p>
Open House Meetings	<p><u>Open house meetings were held during the EIA phase comment period, in order to communicate the findings of the EIA process to stakeholders. Open House meetings were held at the following locations:</u></p> <ul style="list-style-type: none"> • <u>The Boardwalk Hotel in Port Elizabeth on 03 October 2018;</u> • <u>The Beach Hotel in East London on 04 October 2018;</u> • <u>The Premier Inn Hotel in Richards Bay on 08 October 2018;</u> • <u>The Gooderson Tropicana Hotel in Durban on 09 October 2018;</u> • <u>The Venture Inn Hotel in Port Shepstone on 10 October 2018.</u> <p><u>As requested at the Scoping Phase meetings, three isiZulu translators were present at meetings in KZN during the EIA phase public meetings. An isiXhosa translator was present at the meetings in the Eastern Cape. A summary of key concerns, comments and queries and general observations from open house meetings are recorded in Section 5.5. Summary of Comments Raised During the EIA phase and the Comments and Responses Report (refer to Annex B of the Final EIA Report).</u></p>
Notification of Environmental Authorisation	<p><u>I&APs will be notified of the Environmental Authorisation and the statutory appeal period.</u></p>

5.4

FEEDBACK FROM OPEN HOUSE MEETINGS

A summary of feedback from the open house meetings is presented below, refer to Annex B for a detailed account of the meeting proceedings. Comments recorded at the meetings (either on comment sheets or through post-it notes available at each poster) have been captured in the Comments and Responses Report, together with a response from the project team (Annex B).

5.4.1

Port Elizabeth

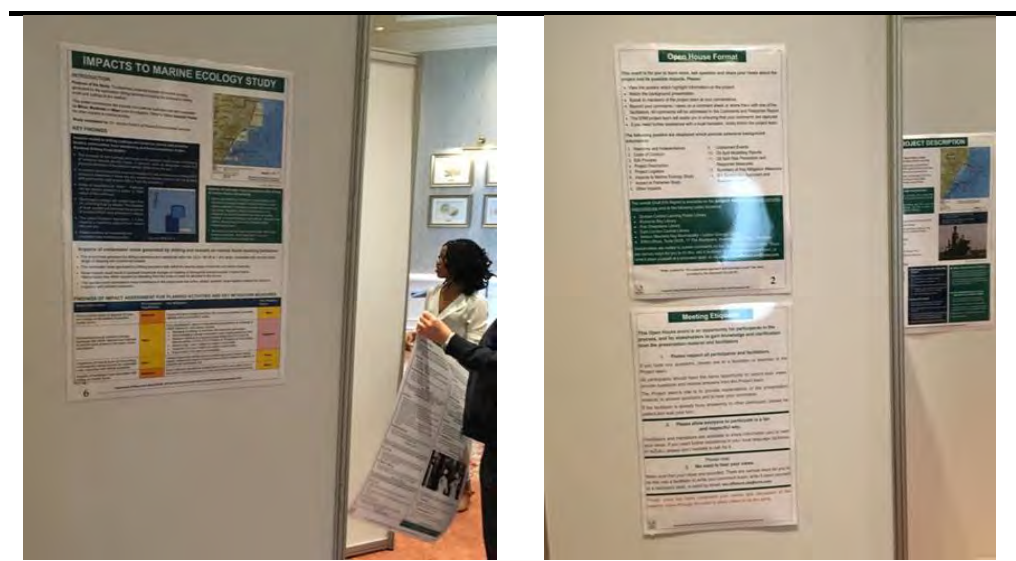
Date: 03 October 2018

Time: 15:00 – 18:00

Venue: The Boardwalk Hotel, Summerstrand

Project information posters were arranged around the conference room in such a way as to facilitate ease of movement for participants between posters. Four ERM representatives were positioned around the room and were available to engage with stakeholders, provide feedback on the findings of the EIA Report and answer questions. Comments were recorded by the ERM team and have been responded to in the Comments and Responses Report – Open House Meetings (Annex B). An isiXhosa translator was on standby to facilitate the dissemination of information in Xhosa, if required. Eni specialists were also available to answer technical questions relating to drilling. The meeting was poorly attended (refer to attendance register in Annex B).

Figure 5.1 *Posters at the Open House Meeting in Port Elizabeth*



Source: ERM, 2018

5.4.2

East London

Date: 04 October 2018

Time: 15:00 – 18:00

Venue: The Beach Hotel, Beacon Bay

Project information posters were arranged around the conference room in such a way as to facilitate ease of movement for participants between posters. Four ERM representatives were positioned around the room and were available to engage with stakeholders, provide feedback on the findings of the EIA Report and answer questions. Comments were recorded by the ERM

team and have been responded to in the Comments and Responses Report – Open House Meetings (Annex B). An isiXhosa translator was on standby to facilitate the dissemination of information in Xhosa, if required. . Eni specialists were also available to answer technical questions relating to drilling. The meeting was poorly attended (refer to attendance register in Annex B).

Figure 5.2 *Posters at the Open House Meeting in East London*



Source: ERM, 2018

5.4.3 *Richards Bay*

Date: 08 October 2018

Time: 15:00 – 18:00

Venue: The Premier Hotel, Meer en See

Project information posters were arranged around the conference room in such a way as to facilitate ease of movement for participants between posters. Five ERM representatives were positioned around the room and were available to engage with stakeholders, provide feedback on the findings of the EIA Report and answer questions. Three isiZulu translators were available to facilitate the dissemination of information in isiZulu. Eni specialists were also available to answer technical questions relating to drilling

The meeting was well attended (refer to attendance register in Annex B). Initially participants were able to view the posters, ask questions and provide comment. The meeting was, however, disrupted by a group of attendees who requested that a formal presentation be made to meeting attendees, and that the EIA Report be translated into isiZulu. While no presentation was given by the project team; after discussions, Eni and Sasol agreed to have the EIA Report translated into isiZulu ⁽¹⁾. Comments were recorded by the ERM team and have been responded to in the Comments and Responses Report – Open House Meetings (Annex B).

Figure 5.3 *Participants at the Open House Meeting in Richards Bay*



(1) The isiZulu version of the EIA was made available to the public on 25 November 2018.



Source: ERM, 2018

5.4.4

Durban

Date: 09 October 2018

Time: 15:00 – 18:00

Venue: The Gooderson Tropicana Hotel, South Beach

Project information posters were arranged around the conference room in such a way as to facilitate ease of movement for participants between posters. Seven ERM representatives were positioned around the room and were available to engage with stakeholders, provide feedback on the findings of the EIA Report and answer questions. Three isiZulu translators were on standby to facilitate the dissemination of information in isiZulu, if required. Eni specialists were also available to answer technical questions relating to drilling.

The meeting was well attended (refer to attendance register in Annex B). Initially participants were able to view the posters, ask questions and provide comment. The meeting was, however, disrupted by a group of attendees who requested that the meeting be moved to a bigger venue and a formal presentation be made to meeting attendees. Participants thereafter requested a question and answer session with representatives of Eni, Sasol and ERM, to which the project team agreed. The project team introduced themselves, and a number of xenophobic remarks were directed toward the Eni team from Italy. Attendees were given an opportunity to ask questions, however, when the project team attempted to provide responses they were interrupted by singing, jeering and the voicing of objections to the project (and the oil and gas sector in general). It was noted that the songs contained lyrics which suggested violent intent. The crowd was calmed down by ERM's facilitator and the question session continued. Comment and questions were recorded

by the ERM team and have been responded to in the Comments and Responses Report – Open House Meetings (Annex B).

Figure 5.4 *Participants at the Open House Meeting in Durban*



Source: ERM, 2018

5.4.5 *Port Shepstone*

Date: 10 October 2018

Time: 15:00 – 18:00

Venue: Venture Inn Hotel, Umtentweni

Project information posters were arranged around the conference room in such a way as to facilitate ease of movement for participants between posters.

Five ERM representatives were positioned around the room and were available to engage with stakeholders, provide feedback on the findings of the EIA Report and answer questions. Three isiZulu translators were available to facilitate the dissemination of information in isiZulu. Eni specialists were also available to answer technical questions relating to drilling.

The meeting was well attended (refer to attendance register in Annex B). Participants were able to view the posters, ask questions and provide comment. Attempts by a group of stakeholders to disrupt the meeting were unsuccessful as the majority of the meeting attendees were engaged with the project team and wished to continue with the open house meeting.

Figure 5.5 *Participants at the Open House Meeting in Port Shepstone*



Source: ERM, 2018

A summary of comments and concerns raised during the open house meetings is presented in Section 5.5.

5.5 SUMMARY OF STAKEHOLDER CONCERNS

5.5.1 Summary of Comments Raised during the Scoping Phase

All comments received from Interested and Affected Parties (I&APs) during the Scoping consultation period were recorded in the Comments and Response Report (CRR) (refer to *Annex B* of the final Scoping Report).

ERM and Eni jointly, provided responses to the comments and issues raised by I&APs where possible during the respective public meetings. ERM responded on questions on the scoping phase and the EIA process and Eni provided technical responses related to drilling activities. A summary of the key issues raised can be seen below.

Table 5.2 below provides information on key comments and questions raised by the stakeholders during the public engagement period and meetings held.

Table 5.2 Summary of Key Comments Raised during the Draft Scoping Report Consultation

Topic	Issue
The stakeholder engagement process	Stakeholders felt that the stakeholder engagement process is not inclusive of all affected areas along the coast. Furthermore, the methods used to notify the public of the project and public meetings were regarded as insufficient.
The scoping phase having excluded certain environmental issues from the EIA process	Stakeholders raised questions regarding the potential impacts that the proposed project will have on the marine environment. Stakeholders were concerned that these impacts have not being included in the scoping report and have been overlooked.
The role of ERM and the independence of the specialists	There were concerns raised about the role of ERM and the independence of the specialists from the client (Eni) and whether the report findings would not be biased towards Eni.
Employment opportunities	Stakeholders were interested in knowing whether there would be job opportunities available for the local communities from the project and whether training would be provided where necessary for skilled labour.
Maritime Heritage	The South African Heritage Resources Agency raised a concern that the exploration drilling activities could disturb cultural heritage material present on the seabed, particularly historical shipwrecks.
Impact of accidental oil spill on marine-based livelihoods	Stakeholders were concerned over the impact of an oil spill on marine based livelihoods in the area.
Impact of accidental oil spill on worker health and safety	Stakeholders were concerned that due to the drill site being located a significant distance offshore, which by implication makes timeous intervention in event of mishap very problematic and the consequences to worker health and safety.

Topic	Issue
Impact of drilling on MPAs	Stakeholders raised concerns over the impact of exploration drilling on the MPAs.
Response time to a spill	Stakeholders raised concerns about the capacity of South Africa to respond to a spill timeously and wanted to know how Eni will respond to an event and who is the responsible.

5.5.2

Summary of Comments Raised during the EIA Phase

All comments and concerns received from Interested and Affected Parties (I&APs), stakeholders and commenting authorities during the EIA phase have been recorded in the Comments and Response Report (CRR) (refer to Annex B of the Final EIA Report). Table 5.3 below provides information on key comments and questions raised by the stakeholders during the EIA phase.

Table 5.3 *Summary of Key Comments Received During the EIA Phase*

Topic	Issue
<u>Oil and Gas Exploration in South Africa</u>	<p><u>Stakeholders have questioned why the South African Government is pursuing oil and gas exploration in the Country, as they feel there should be a shift away from fossil fuels in favour of renewable energy. Stakeholders raised concern that the project (and oil and gas extraction) would lead to an increase in greenhouse gas emissions.</u></p> <p><u>Concern was expressed the oil and gas extraction would compromise South Africa's ability to meet biodiversity targets and impact the expansion of Marine Protected Areas.</u></p> <p><u>Many stakeholders noted that they were against oil and gas exploration South Africa.</u></p>
<u>EIA Process</u>	<p><u>There was a concern among some stakeholders that the EIA process did not facilitate participation, citing the following:</u></p> <ul style="list-style-type: none"> <u>The public comment period for the Draft EIA Report (30 days, extended to 45 days) was not long enough for them to engage the content of the EIA Report.</u> <u>A public meeting would have been preferred over the open house format.</u> <u>The location of the open house venue in Durban central was not accessible and there should have been a meeting in the community.</u> <u>The EIA must be made available in isiZulu, not just the non-technical summary.</u> <u>The specialists were not available at the open house meeting.</u> <u>The details of the open house meeting were not adequately advertised.</u>
<u>Marine Pollution</u>	<ul style="list-style-type: none"> <u>Stakeholders were concerned about the impact of drilling fluids and muds on water quality and they wanted details of the chemical composition of these discharges.</u> <u>Stakeholders were concerned about wastes generated during the drilling operations and how these would be managed</u>

<u>Topic</u>	<u>Issue</u>
<u>Potential Impacts on Marine Ecology</u>	<ul style="list-style-type: none"> • <u>Stakeholders questioned if the precautionary principle had been followed in the EIA process as there seemed to be unknowns in the marine baseline information.</u> • <u>Stakeholders were concerned that no primary or in situ baseline data has been collected and included in the baseline chapter of the EIA Report.</u> • <u>Stakeholders raised concerns about the validity of the baseline as 20 new MPAs were approved on the 24 October which was after the Draft EIA Report had been released.</u> • <u>Stakeholders were concerned that the impact of alien species from ballast water had not been assessed.</u> • <u>Stakeholders were concerned that the conservation status of marine fauna was out of date and not adequately considered.</u> • <u>Stakeholders were concerned that there was insufficient information in the baseline about the Natal Bight and Critical Biodiversity Areas.</u> • <u>Stakeholders were concerned about the impact of underwater noise from both exploration drilling (the subject of this EIA Report) and seismic surveys (not part of this EIA Report) on marine fauna.</u> • <u>Stakeholders were concerned that risks to marine species and MPAs in the event of an oil spillage not properly assessed.</u> • <u>Stakeholders wanted to understand if any post drilling monitoring of the marine environment and the condition of the wellhead was planned/ required after the well had been plugged and abandoned.</u>
<u>Potential Impacts on Marine Based Livelihoods</u>	<p><u>Stakeholders raised concern that the project was going to result in restricted access to fishing grounds and fish stocks, leading to a loss of income and unemployment.</u></p> <p><u>Stakeholders felt that the project would result in the pollution on the beaches, causing a decrease in beach trading and tourism.</u></p> <p><u>Stakeholders noted that they would not benefit from the project, but only get poorer.</u></p>
<u>Risks of an Oil Spill</u>	<ul style="list-style-type: none"> • <u>Stakeholders were concerned about the risk of drilling in a strong current, deep waters and extreme weather and if drilling had ever taken place in similar conditions.</u> • <u>Stakeholders were concerned that a risk of oil spillage was not adequately evaluated and reported on in the Draft EIA Report.</u>

<u>Topic</u>	<u>Issue</u>
<u>Oil Spill Modelling</u>	<ul style="list-style-type: none"> Stakeholders were concerned that the Oil Spill modelling undertaken as part of the Draft EIA Report has serious limitations, such as: <ul style="list-style-type: none"> i) The model does not use local content or variability to verify the outputs of the modelling thus the scientific interpretation of the outputs are flawed; ii) The consideration of the surface-wind and currents response of any spills seems to be missing; iii) There is no mention of the Natal Pulse, which is pertinent oceanographic feature, in which its presence can be further exacerbated by the onshore winds, causing very dynamic conditions and scenarios; iv) Retention of hydrocarbons within the KZN Bight and the potential impacts to the uThukela Marine Protected Area have not been considered; v) If hydrocarbons are entrained into the Port St Johns Eddy, this gives a high probability of oil reaching the coastline in the Eastern Cape. The oil spill modelling report does not sufficiently take the mesoscale cyclonic circulations into account. Stakeholders questioned if the new seismic data and optimized calculations influenced the modelling results and if PRDW and ERM reviewed the seismic data.
<u>Impacts of a potential spill</u>	<p>Concerns were raised regarding SA's capability to respond to a spill and the potential effects of a spill on the marine environment, fauna and flora. Stakeholders relayed concerns regarding the oil and gas operations in other countries such as Nigeria.</p> <p>Many stakeholders who objected to the project felt that the likelihood of a catastrophic spill was high, and that it would result in the destruction of the marine and coastal environment, and consequently the loss of income for those in fishing and tourism sectors.</p>
<u>Oil Spill Contingency Plan</u>	<ul style="list-style-type: none"> Stakeholders were concerned that the National Oil Spill Contingency Plan (NOSCP) is incomplete and therefore SA would not be able to appropriately manage a spill. Stakeholders requested that they were allowed to review and comment on the Oil Spill Contingency Plan and that it should be made available in the Final EIA Report. Stakeholders also requested information regarding the dispersants use plan and chemical properties of these dispersants.
<u>Potential Impacts on Health</u>	<p>A number of stakeholders (who did not understand that project activities would take place offshore) raised concerns that emissions from the project would impact on air quality and add to health problems in their community.</p>
<u>Insurance and Financial Provision</u>	<p>Stakeholders were concerned if there were adequate financial provisions and insurance in place to manage a spill</p>
<u>Project Location and Number of Wells</u>	<ul style="list-style-type: none"> Stakeholders requested clarification if drilling would only take place in the drilling areas of interest or if drilling would be authorized for the entire Block. Stakeholders requested clarification about the number of wells that will be drilled and how many will be authorized.

<u>Topic</u>	<u>Issue</u>
No-Go Alternative	Stakeholders ask for clarification of why the no-go assessment considered the benefits of the production phase and the rest of the report did not take this into consideration.