PROPOSED OFFSHORE SANDWINNING FOR DEVELOPMENTS WITHIN THE PORT OF DURBAN, KWAZULU NATAL

Environmental Impact Assessment Report

DMR Reference No.: KZN30/5/1/1/2/00070BP

June 2017

Final

Prepared for: Transnet National Ports Authority

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Title and Approval Page

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Executive Summary

This document serves as the Final Environmental Impact Assessment Report for the proposed offshore sandwinning for developments within the Port of Durban.

The Port of Durban is South Africa's premier container port (handling 65% of South Africa's container traffic) and the principal port serving KwaZulu-Natal and the Gauteng region as well as the South African hinterland. The Port handles over 4 700 commercial vessels annually, the highest number in South Africa.

Major growth areas for the Port are seen to be in containers. Container capacity and throughput are often measured in Twenty-foot Equivalent Units (TEUs). In 2002 the Port handled 1.31m TEUs and in 2016 the Port handled 2.62m TEUs, which is double the volume handled 15 years ago. The trend on increased container volumes will continue, however at a lower rate. Over the next 10 years, container demand is expected to grow from 2.6m TEUs to 3.7m TEUs.

The Port of Durban currently has a capacity of 3.4 million TEU, but infrastructure, land and logistics constraints hinder the alignment with the design capacity. Optimisation of the existing facilities is vital to the provision of short term capacity.

In light of the economic importance of the Port of Durban and containerized cargo as well as the current global trends which show increasing vessel sizes, Transnet National Port Authority (TNPA) has recognized the need to prepare for future container growth. As part of this, the Port of Durban has started a process for a phased container capacity expansion programme in order to improve throughput capacity by reconfiguring and rationalising the existing Durban container terminal.

Pier 1 Phase 2 Project is part of the expansion programme and is seen as the key to the provision of medium and long term capacity. Other major expansion projects in the short term include deepening and lengthening of the North Quay, berth reconstruction and deepening at Island View and Maydon Wharf.

As part of these expansions, TNPA has recognized the need for sandwinning of approximately 4.5 million m^3 of offshore material. However, it should be noted that this Scoping and EIA process will concentrate only on the offshore sandwinning activity. The use of the material within the Port will require separate authorization in terms of of the National Environmental Management Act (NEMA) (Act No. 107 of 1998).

Two potential offshore sandwinning sites have been identified. Alternative Site 1 occurs approximately 1.2 km east of the Port of Durban harbour mouth and is approximately 110

hectares in size. Alternative Site 2 occurs south of Alternative Site 1 and is approximately 250 hectares in size.

The proposed offshore sandwinning will be undertaken using a Trailing Suction Dredger, which may either be a Trailing Suction Dredger (TSD) or Trailing Suction Hopper Dredger (TSHD). The excavating and pumping mechanism is the same in each case, but the difference lies in whether the dredger is fitted with its own hoppers to store the dredged material and transport it to the disposal site or not.

The process for seeking authorisation is undertaken in accordance with the EIA Regulations (Government Notice (GN) No. R. 982, R. 983, R. 984 and R. 985 of 04 December 2014), promulgated in terms of Chapter 5 of NEMA, which therefore requires an environmental assessment through a Scoping and EIA process. In terms of the Regulations, the lead decision-making authority is the Department of Mineral Resources. In addition, due to the size of proposed sandwinning area (between 110 hectares and 250 hectares), a Mining Right in terms of the Section 22 of the Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002) is also required.

The EIA Report provides a general description of the status quo of the receiving environment in the project area, and also provides local and site-specific discussions on those environmental features investigated by the respective specialists. The receiving environment is assessed and discussed in terms of the following:

- Climate;
- Geology;
- Bathymetry;
- Oceanography;
- Biogeography;
- Marine Sensitivity;
- Avifauna;
- Water Quality;
- Sediment - Offshore Environment;
- Marine Biota;
- Socio-Economic Environment;
- Maritime Archaeology; and
- Tourism.

The requisite specialist studies identified during the Scoping phase, which were conducted as part of the EIA, included a Marine Impact Assessment and Underwater Heritage Impact Assessment. In addition, technical studies undertaken included a Wave Modelling Study, Sediment Analysis and a Geophysical and Sediment Sampling Survey.

The information obtained from the respective Specialist Studies was incorporated into the EIA report in the following manner:

1. A summary of each specialist study is provided, focusing on the approach to the study, key findings and conclusions drawn;
2. The Specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment;

3. Where relevant, the evaluations performed by the specialists on the alternatives of the project components were included in the comparative analysis to identify the most favourable option;
4. Specialist input was obtained to address comments made by Interested and Affected Parties (IAPs) that related to specific environmental features pertaining to each specialist discipline; and
5. Salient recommendations made by the specialists were taken forward to the EIA Conclusions and Recommendations.

The EIA Report assessed the pertinent environmental impacts that could potentially be caused by the project. Impacts were identified as follows:

- Impacts associated with listed activities for which authorisation has been applied for;
- An appraisal of the project activities and components;
- Issues highlighted by environmental authorities;
- Comments received during public participation;
- An assessment of the receiving biophysical, social, economic and technical environment; and
- Findings from Specialist Studies.

The impacts and the proposed management thereof are discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts. The assessment considered impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices.

The Environmental Management Programme (EMPr) provides a list of mitigation measures for specific elements of the project, which extends beyond the impacts evaluated in the body of the EIA Report. The scope of the offshore sandwinning EMPr is as follows:

- Establish management objectives during the sandwinning operations in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr;
- Provide legislative framework; and

- Describe requirements for record keeping, reporting, review, auditing and updating of the EMPr.

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts associated with the two offshore sandwinning options, Site 1 (of Area 1) was selected as the Best Practicable Environmental Option (BPEO). The reasons for this selection are as follows:

- Higher risks to Maritime Underwater Cultural Heritage sites at Site 2, based on findings of the Underwater Heritage Impact Assessment;
- According to the Marine Impact Assessment, the historical offshore disposal site overlaps the south-eastern corner of Site 2;
- Site 2 (250 hectares) has a much larger footprint compared to Site 1 (110 hectares). Even though this means that the depth of sandwinning at Site 1 (4.1 m) is greater than at Site 2 (1.8 m), the Wave Modelling Study found the impacts to the bathymetry and inshore hydrodynamics to be negligible;
- Availability of adequate sediments;
- It is located within the most cost-effective range; and
- The natural littoral drift brings sediments back into the area.

The no go option is not supported for the following reasons:

- Without infill material, Port Development projects will not be able to take place. This will have a negative socio-economic impact on the Port as it will not be able to compete with international Ports; and
- The above will have a knock-on effect on the economy of eThekwini, KZN and South Africa as a whole.

The EIA Report provides an account of the public participation process that was followed for the EIA phase for the proposed project.

With the selection of the BPEO, the adoption of the mitigation measures include in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions

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List of Abbreviations

BPEO	Best Practicable Environmental Option
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture, Forestry and Fisheries
DCT	Durban Container Terminal
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EDTEA	Department of Economic Development, Tourism and Environmental Affairs
EEZ	Economic Exclusion Zone
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KZN Wildlife
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
GN	Government Notice
GPS	Global Positioning System
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973/1978
MPA	Marine Protected Area
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
MUCH	Maritime Underwater Cultural Heritage
NEMA	The National Environmental Management Act (Act No. 107 of 1998)
NHRA	The National Heritage Resources Act (Act No. 25 of 1999)
NPA	The National Ports Act (Act No. 12 of 2005)
NSBA	National Spatial Biodiversity Assessment
OHS	Occupational Health and Safety
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SOC	State Owned Company
TEMPI	Transnet eThekwini Municipality Planning Initiative

TEU	Twenty-Foot Equivalent Unit
TNPA	Transnet National Ports Authority
TSD	Trailing Suction Dredger
TSHD	Trailing Suction Hopper Dredger
TSS	Total Suspended Solids
UNFCCC	The United Nations Framework Convention on Climate Convention

Definitions of Key Terms

Alternatives	In relation to a proposed activity, alternatives refer to the different means of meeting the general purpose and requirements of the activity, which may include alternatives to: • The property or location where it is proposed to undertake the activity; • The type of activity to be undertaken; • The design or layout of the activity; • The technology to be used in the activity; • The operational aspects of the activity; and • The option of not implementing the activity.
Anthropogenic	Produced or caused by humans.
Bathymetry	The sea bed "topography" derived from measurements of depths of water.
Benthic	Referring to organisms living in or on the sediments of aquatic, estuarine and marine habitats.
Benthos	The sum total of organisms living in, or on, the sediments of aquatic habitats.
Biodiversity	The variety of life forms, including the plants, animals and micro-organisms, the genes they contain and the ecosystems and ecological processes of which they are a part.
Biota	The sum total of the living organisms of any designated area.
Environment	The biophysical, social, economic, cultural, political and historical context within which people live and within which development takes place.
Environmental impact	A change resulting from the effect of an activity on the environment, whether desirable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them.
Environmental impact assessment	Environmental Impact Assessment means a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.
Environmental issue	A concern felt by one or more parties about some existing, potential or perceived environmental impact.
Interested and affected party	Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.
Macrofauna	Animals which are greater than 1 mm.

Offshore	Situated at sea some distance from the shore.
Pollution	The introduction of unwanted components into waters, air or soil, usually as result of human activity; e.g. hot water in rivers, sewage in the sea, oil on land.
Sandwinning	Sandwinning is a form of sand mining usually associated with the dredging of offshore infill material.
Scoping	This refers to the process of determining the spatial and temporal boundaries (the extent) for the EIA and key issues to be addressed in an environmental assessment.
Sediment	Unconsolidated mineral and/or organic particulate material.
Significant impact	An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.
Suspended material	Total mass of material suspended in a given volume of water, measured in mg/l.
Turbidity	Turbidity is the attenuation of light in water caused by the sum of suspended particles and any dissolved chemicals in the water which may alter the passage of light through scattering (generally inorganic and organic particles) and/or absorption (generally particulate or dissolved biological material).
Vulnerable	A taxon is vulnerable when it is facing a medium risk of extinction in the wild in the medium-term future, defined as a 10% probability of extinction within 100 years.

1 DOCUMENT ROADMAP

This document serves as the Final Environmental Impact Assessment (EIA) Report for the proposed offshore sandwinning for developments within the Port of Durban, KwaZulu-Natal (KZN). In order to provide clarity to the reader, a document roadmap is provided below. The document roadmap provides information on the 2014 EIA Regulations as stipulated in Appendix 3 of Government Notice (GN) No. R. 982 (4 December 2014) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) as well as a guide on the content of each chapter. Please note that in some cases more information is provided than required in the EIA Regulations.

Table 1: ***Document Roadmap in relation to GN No. R. 982***

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
1.	Document Roadmap	-	-
2.	Purpose of this Document	-	-
3.	Environmental Assessment Practitioner	3 (a)	Details of – i) the EAP who prepared the report; and ii) the expertise of the EAP, including a curriculum vitae.
4.	Project Background and Motivation	3 (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.
5.	Project Location	3 (b)	The location of the activity including – i) The 21 digit Surveyor General code of each cadastral land parcel; ii) Where available, the physical address and farm name; and iii) Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
		3 (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 – i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is undertaken; and ii) On land where the property has not been

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			defined, the coordinates within which the activity is to be undertaken.
6.	Project Description	3 (d)	A description of the scope of the proposed activity, including – i) All listed and specified activities triggered and being applied for; and ii) A description of the associated structures and infrastructure related to the development.
		3 (g)	A motivation for the preferred development footprint within the approved site.
		3 (t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.
7.	Legislation and Guidelines Considered	3 (e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.
8.	Scoping and EIA Process	-	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 (ii) a motivation for the deviation
9.	Assumptions and Limitations	3 (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.
10.	Need and Desirability	3 (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity within the context of the preferred location.
11.	Alternatives	3 (h)	i) Details of the development footprint alternatives considered.
12.	Profile of the Receiving Environment	3 (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including: iv) The environment attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social,

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			economic, heritage and cultural aspects;
13.	Summary of Specialist Studies	3 (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.
14.	Impact Assessment	3 (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including: 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 – a. can be reversed; b. may cause irreplaceable loss of resources; and c. can be avoided, managed or mitigated. vi) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks. 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. viii) The possible mitigation measures that could be applied and level of residual risk.
		3 (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 - i) A description of all environmental issues and risks that were identified during the environmental impact assessment process; and ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
		3 (j)	An assessment of each identified potentially significant impact and risk, including- (i) Cumulative impacts; (ii) The nature, significance and consequences of the impact and risk; (iii) The extent and duration of the impact and risk; (iv) The probability of the impact and risk occurring; (v) The degree to which the impact and risk can be reversed; (vi) The degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) The degree to which the impact and risk can be mitigated.
15.	Analysis of Alternatives	3 (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including: ix) If no alternative development locations for the activity were investigated, the motivation for not considering such. x) A concluding statement indicating the preferred alternative development location within the approved site.
		3 (n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.
16.	Public Participation	3 (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including: ii) Details of the public participation process undertaken in terms of Regulation 41 of the EIA Regulations (2014) including copies of the supporting documents and inputs; and iii) A summary of the issues raised by Interested and Affected Parties (IAPs), and an indication of the manner in which the issues were incorporated, or the reasons for not including them.
17.	EAP Conclusions and Recommendations	3 (l)	An environmental impact statement which contains - i) A summary of the key findings of the environmental impact assessment: ii) A map at an appropriate scale which superimposes the proposed activity and

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.
		3 (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.
		3 (o)	Any aspects which were conditional to the findings of the assessment either by the Environmental Assessment Practitioner (EAP) or specialist which are to be included as conditions of authorisation.
		3 (q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.
18.	Oath of EAP	3 (s)	An undertaking under oath or affirmation by 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.
19.	References	-	-
Not Applicable		3 (r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.
Not Applicable		3 (u)	An indication of any deviation from the approved scoping report, including the plan of study, including- i) any deviation from the methodology used

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			in determining the significance of potential environmental impacts and risks ii) (ii) a motivation for the deviation
Not Applicable		3 (v)	Any specific information that may be required by the competent authority.
Not Applicable		3 (w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.

The following has also been included in the Appendices to meet the requirements of the 2014 EIA Regulations:

Appendix	Title	Correlation with GN No. R. 982
F	Specialist Studies	Appendix 6
G	Environmental Management Programme (EMPr)	Appendix 4

The new EIA Regulations were gazetted on 7 April 2017. It is noted that in terms of the transitional arrangements stipulated in Regulation 53 of GN No. 326 (7 April 2017), an application submitted in terms of the previous NEMA Regulations of 2014 and which is pending when these new EIA Regulations of 2017 take effect, "*must despite the repeal of those Regulations be dispensed with in terms of those previous NEMA Regulations as if those previous NEMA Regulations were not repealed*".

2 PURPOSE OF THIS DOCUMENT

The purpose of this document is to fulfil all the requirements of an EIA Report, as contemplated in Regulation 23 of GN No. R. 982 (4 December 2014).

According to Appendix 3 of GN No. R. 982 (4 December 2014), the objectives of the EIA process are, through consultation, to:

a) Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
b) Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
c) Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking

process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

d) Determine the -
   i. Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
   ii. Degree to which these impacts-

      aa) Can be reversed;

      bb) May cause irreplaceable loss of resources, and

      cc) Can be avoided, managed or mitigated;

e) Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
f) Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
g) Identify suitable measures to avoid, manage or mitigate identified impacts; and
h) Identify residual risks that need to be managed and monitored.

The Final EIA Report for the proposed offshore sandwinning for developments within the Port of Durban meets the purpose of the EIA, as mentioned above. The document is structured in such a way to address the requirements of the EIA process and to provide the authorities with adequate information to make a decision on the project.

To date, the Scoping phase for the project has been completed. The Final Scoping Report and Plan of Study for the EIA were approved by the Department of Mineral Resources (DMR) who is the Competent Authority in respect to this proposed activities associated with the project (refer to **Annexure B**).

It should be noted that the proposed activity requires a Mining Right in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 22 of 2002). As such, this document aims to fulfil the requirements in terms of the both NEMA and MPRDA.

3 Environmental Assessment Practitioner

Nemai Consulting was appointed by Transnet National Ports Authority (TNPA) as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment and Mining Right process for the proposed offshore sandwinning process for developments within the Port of Durban. In accordance with Section 3(a) of Appendix 3 of GN No. R. 982 (4 December 2014), this section provides an overview of Nemai Consulting

and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts.

The core members of Nemai Consulting that are involved with the Scoping and EIA process for the proposed offshore sandwinning are captured in **Table 2** and their respective Curricula Vitae are contained in **Appendix C**.

Table 2: ***Scoping and EIA Core Team Members***

Name	Qualifications	Duties
Ms D. Naidoo	BSc Eng (Chem)	Project Manager Environmental Engineering
Mr D. Henning	BSc (Hons) Aquatic Health MSc River Ecology	EIA Process Scoping & EIA Reports
Mr C. Chidley	BSc Eng (Civil) BA (Economics, Philosophy) MBA	Environmental Engineering EMPr
Ms K. Robertson	MSc (Env Management)	EIA process

4 PROJECT BACKGROUND AND MOTIVATION

4.1 Overview of the Port of Durban

The Port of Durban is South Africa's premier container port (handling 65% of South Africa's container traffic) and the principal port serving KZN and the Gauteng region as well as the South African hinterland. The Port handles over 4 700 commercial vessels annually, the highest number in South Africa.

Major growth areas for the Port are seen to be in containers. Container capacity and throughput are often measured in Twenty-foot Equivalent Units (TEUs). In 2002 the Port handled 1.31m TEUs and in 2016 the Port handled 2.62m TEUs, which is double the volume handled 15 years ago. The trend on increased container volumes will continue, however at a lower rate. Over the next 10 years, container demand is expected to grow from 2.6m TEUs to 3.7m TEUs.

The Port of Durban currently has a capacity of 3.4 million TEU, but infrastructure, land and logistics constraints hinder the alignment with the design capacity. Optimisation of the existing facilities is vital to the provision of short term capacity.

4.1.1 Economic Importance of the Port of Durban

The need for the expansion within the Port has been triggered by prolonged congestion arising from a capacity crisis in many aspects of port operations. With steady and accelerating economic growth and the lowering of barriers to international trade, there have been increased volumes of seaborne traffic and as a major generator of transport activity and economic generation; the port is a strategic focus area in the eThekwini Municipality.

Economic activity related to the Port of Durban involves direct and indirect port-dependent activity and includes numerous activities and services because ship operations require a wide range of support services (Van Coller *et al.,* 2008). The multiplier effect in terms of value added, jobs and local wealth creation from providing a full range of services to over 4500 ship arrivals a year, is large and highlights the economic importance of the Port to Durban, eThekwini and South Africa.

4.1.2 Importance of Containerised Cargo in the Port of Durban

The Port of Durban can be seen as the premier gateway Port in South Africa and as the South African economy grows, so does the need for a greater capacity to cater for growing freight volumes at the Port. Major growth areas for the Port are seen to be in containers. In 2002 the Port handled 1.31m TEUs and in 2016 the Port handled 2.62m TEUs, which is double the volume handled 15 years ago. The trend on increased container volumes will continue, however at a lower rate. Over the next 10 years, container demand is expected to grow from 2.6m TEUs to 3.7m TEUs.

4.1.3 International Shipping Trends

With the global trend of containerisation, there has been a progressive trend of increasing vessel size. In the 1970s, 1000 and 1500 TEU ships were replaced by 2000+ TEU ships and by the early 1990s, most major shipping lines had ordered 4000+ TEU Panamax vessels. The rate of increase in vessel size accelerated in the 1990s, when shipping lines deployed vessels too large to transit the Panama Canal (Post-Panamax vessels). Vessel sizes are still growing and ships up to 16 000 TEU are expected in the future.

4.2 Motivation

In light of the economic importance of the Port of Durban and containerized cargo as well as the current global trends which show increasing vessel sizes, TNPA has recognized the need to prepare for future container growth. As part of this, the Port of Durban has started a process for a phased container capacity expansion programme in order to improve

throughput capacity by reconfiguring and rationalising the existing Durban container terminal (DCT).

Pier 1 Phase 2 Project is part of the expansion programme and is seen as the key to the provision of medium and long term capacity. Other major expansion projects in the short term include deepening and lengthening of the North Quay, berth reconstruction and deepening at Island View and Maydon Wharf.

As part of these expansions, TNPA has recognized the need for sandwinning of approximately 4.5 million m^3 of offshore material. However, it should be noted that this Scoping and EIA process will concentrate only on the offshore sandwinning activity. The use of the material within the Port will require separate authorization in terms of NEMA. For instance, a separate EIA process was undertaken for the Deepening, Lengthening and Widening of Berths 203 to 205 (NEAS REF NO: DEA/EIA/0000988/2012; DEA REF NO: 14/12/16/3/3/2/275) and thus the use of infill material within the Port for this project is already authorized. However other developments requiring infill material which will be obtained by sandwinning may still require authorisation.

Furthermore, it should also be noted that in terms of the proposed Deepening, Lengthening and Widening of Berths 203 to 205, the EIA process did include offshore sandwinning as part of the scope. As such, specialist studies were undertaken of the proposed site and a preferred site was identified. However, in terms of the 2010 EIA Regulations the Department of Environmental Affairs (DEA) could not authorize activities related to mining and thus the authorisation did not include sandwinning. Further, the 2014 EIA Regulations that were subsequently published require that a separate EIA process be undertaken for the sandwinning activities as DMR is now the competent authority in respect to activities related to mining.

5 PROJECT LOCATION

As per Section 3 (b) and (c) of Appendix 3 of GN No. R. 982 (4 December 2014) the following information regarding the project location is provided in this section:

- A description of the property on which the activity is to be undertaken and the location of the activity on the property;
- The location of the activity including –
  - The 21 digit Surveyor General code of each Cadastral land parcel;
  - Where available, the physical address and farm name; and
  - Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property or properties

- A plan which locates the proposed activity or activities applied for at an appropriate scale, or if it is-

  - A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is undertaken; and
  - On land where the property has not yet been defined, the coordinates within which the activity is to be undertaken.

It should be noted that the proposed mining activity takes place off the east coast of South Africa and thus cadastral information is not available.

Please note that A3 copies of all maps contained in this Section are provided in **Appendix D**.

5.1 Regional and Local Context

Figure 1 and **Figure 2** provide the regional context of the proposed development.

The proposed activity will take place approximately 1 - 2km east of the Port of Durban. Coordinates of the proposed alternative sites are provided in **Table 3**.

Table 3: ***Coordinates of Alternative Sandwinning Sites***

Site	Corner Coordinates
Alternative Site 1	29°51'50.636708"S; 31°4'15.965188"E 29°51'14.072976"S; 31°5'32.66397"E 29°51'22.946862"S; 31°5'37.797436"E 29°52'13.029995"S;31°4'16.328564"E
Alternative Site 2	29°52'13.029995"S;31°4'16.328564"E 29°51'23.708114"S; 31°5'38.205261"E 29°51'54.207095"S; 31°5'54.498875"E 29°52'40.037115"S; 31°4'15.988057"E

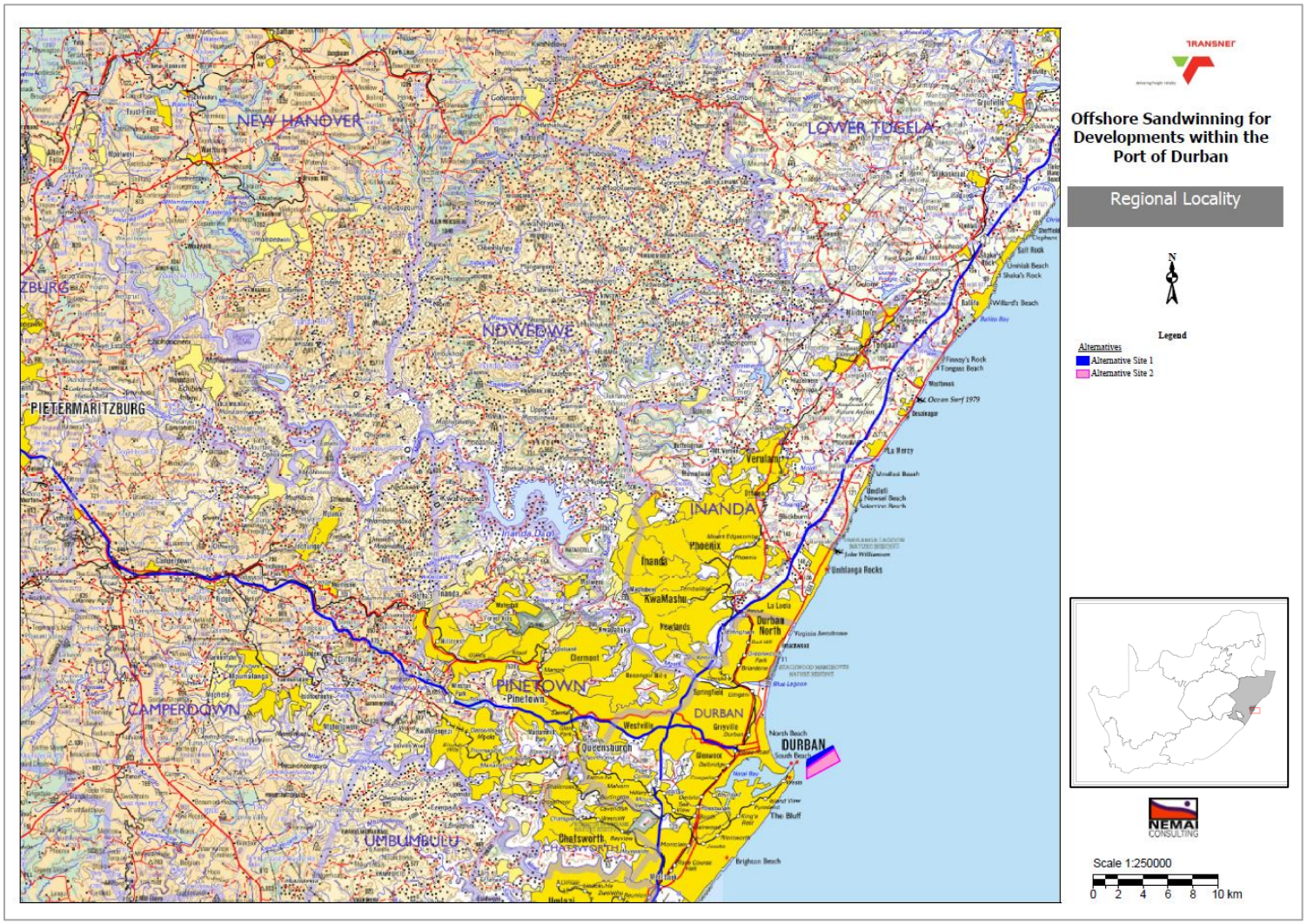


Figure 1: ***Regional Location***

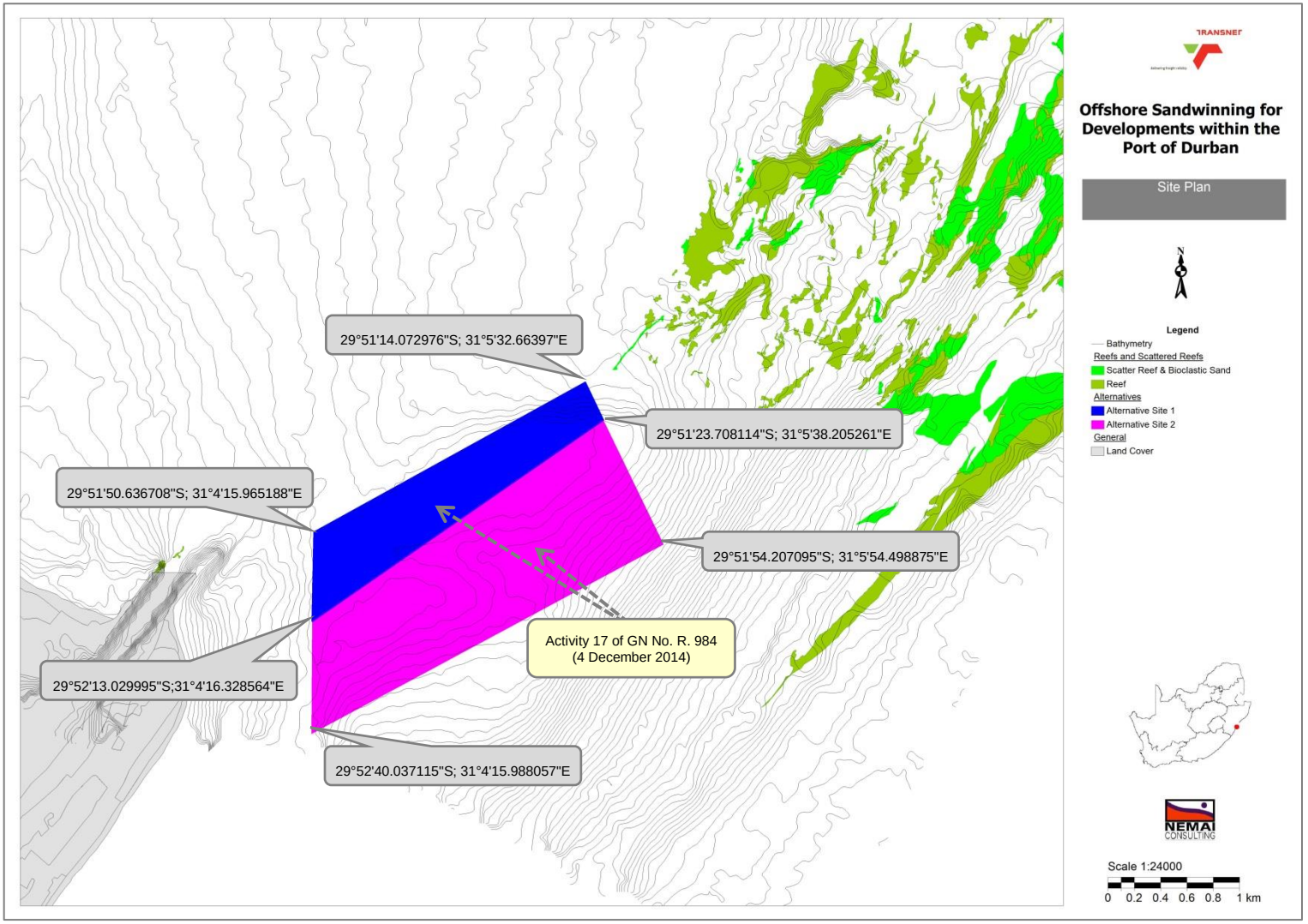


Figure 2: ***Project Location***

6 PROJECT DESCRIPTION

6.1 Volume of Material

Offshore Sandwinning operations will be limited to a total of approximately 4.5 million m^3 of offshore material which is required for developments within the Port.

Two alternative sites were assessed, namely Site 1 and Site 2 which are approximately 110 hectares and 250 hectares in extent, respectively. In order to obtain the required volume of material sandwinning will proceed to a depth of approximately 4.1 m at Site 1 and approximately 1.8 m at Site 2.

6.2 Equipment

The proposed offshore sandwinning will be undertaken using a Trailing Suction Dredger, which may either be a Trailing Suction Dredger (TSD) or Trailing Suction Hopper Dredger (TSHD) (see example in **Figure 3**).

The excavating and pumping mechanism is the same in each case, but the difference lies in whether the dredger is fitted with its own hoppers to store the dredged material and transport it to the disposal site or not.

TSDs and TSHDs are self-propelled ships, equipped with articulated dredging pipes that extend to the sea bottom. They dredge while sailing forward at slow speeds. Dragheads can be active or passive. The active draghead requires additional power in order to drive cutting teeth or high pressure water jets to excavate material and to assist with the formation of the water-solid slurry. Depending on the size of the dredger, dredge depths of up to 100 m have been achieved. They are however unsuitable for dredging close to existing structures or cleaning up corners or smaller pockets.

The weight of the draghead maintains contact with the sea bed. The dredge pumps maintain the required flow that enables the disturbed material to be transported hydraulically as a slurry through the suction lines and the centrifugal pumps, from where it is discharged into the hopper on board or on an accompanying barge. In the hopper, the solids settle out and the material is retained for transport to the disposal site and subsequent placement or dumping. Finer fractions of the dredged material overflow with the excess water from the hopper and settle to the seabed again.

The dredged material is then transported to where it is required (i.e. Port of Durban) and is discharged (note that use of the dredge material within the Port will be subject to separate authorisations and is not included in the scope of this process).

There may be advantages to using separate dump barges rather than the TSHD sailing out to sea in that a pair of large barges could service a single dredger which would thus be able to continue with dredging operations on a more or less continuous basis, rather than to employ its time alternatively in dredging, sailing to and from the disposal site and discharging material.

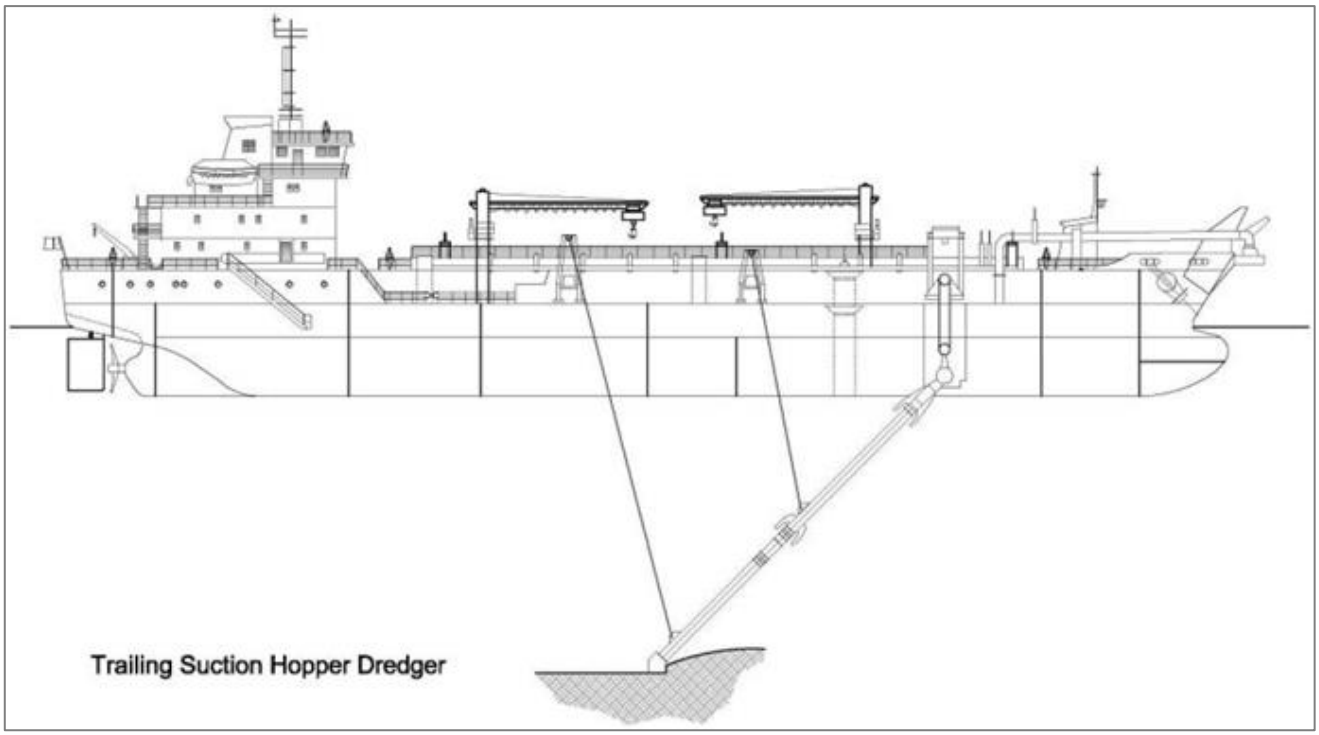


Figure 3: ***Examples of a TSHD***

6.3 Disposal of Dredged Material

TSHDs are flexible and can operate independently of other equipment and, since they are self-propelled, are able to transport the dredged material over long distances. Once fully loaded, the vessel sails to the unloading or placement site where the dredged material is offloaded. Depending on the type of project, the dredged material will be offloaded/discharged in one of three ways:

- Material is either deposited at the placement site by opening the hatches in the bottom of the ship;
- It may be pumped ashore through pipelines, which may be submerged or floating; or
- The material may be propelled by heavy duty pumps into the air, a process known as rainbowing.

The method of offloading or discharging is directly related to the type of project and will thus be established as part of the projects where the infill material will be required.

6.4 Dredging Times

Although sandwinning will occur for a number of developments within the Port, these will not overlap and thus only one dredger will be required at a time at the offshore sandwinning site.

An overview of one typical dredging cycle is provided in **Table 4**.

Table 4: Typical Dredging Cycle Times for 2,700 m^3 TSHD

Description	Time
Sailing Distance at Sea	0.91 hours
Turning Time	0.25 hours
Dredging Time	1.50 hours
Dredging cycle time (not including time spent in the Port of Durban)	2.66 hours

The sailing distance at sea for a round trip to Alternative Site 1 is approximately 5.5 nautical miles, as shown conservatively in **Figure 4**. For a return trip sailing time of 0.91 hours, an average vessel speed for the route shown in **Figure 4** of approximately 6 knots is assumed.

A review of a considerable number of TSHD units of widely differing sizes, provides a general correlation that the pumping rate is designed to fill the hopper in between 45 to 60 minutes when dredging light silt or sand. For a 2700 m^3 hopper capacity TSHD dredger filled in 1.5 hours, the rate would be 1800 m^3/hour.

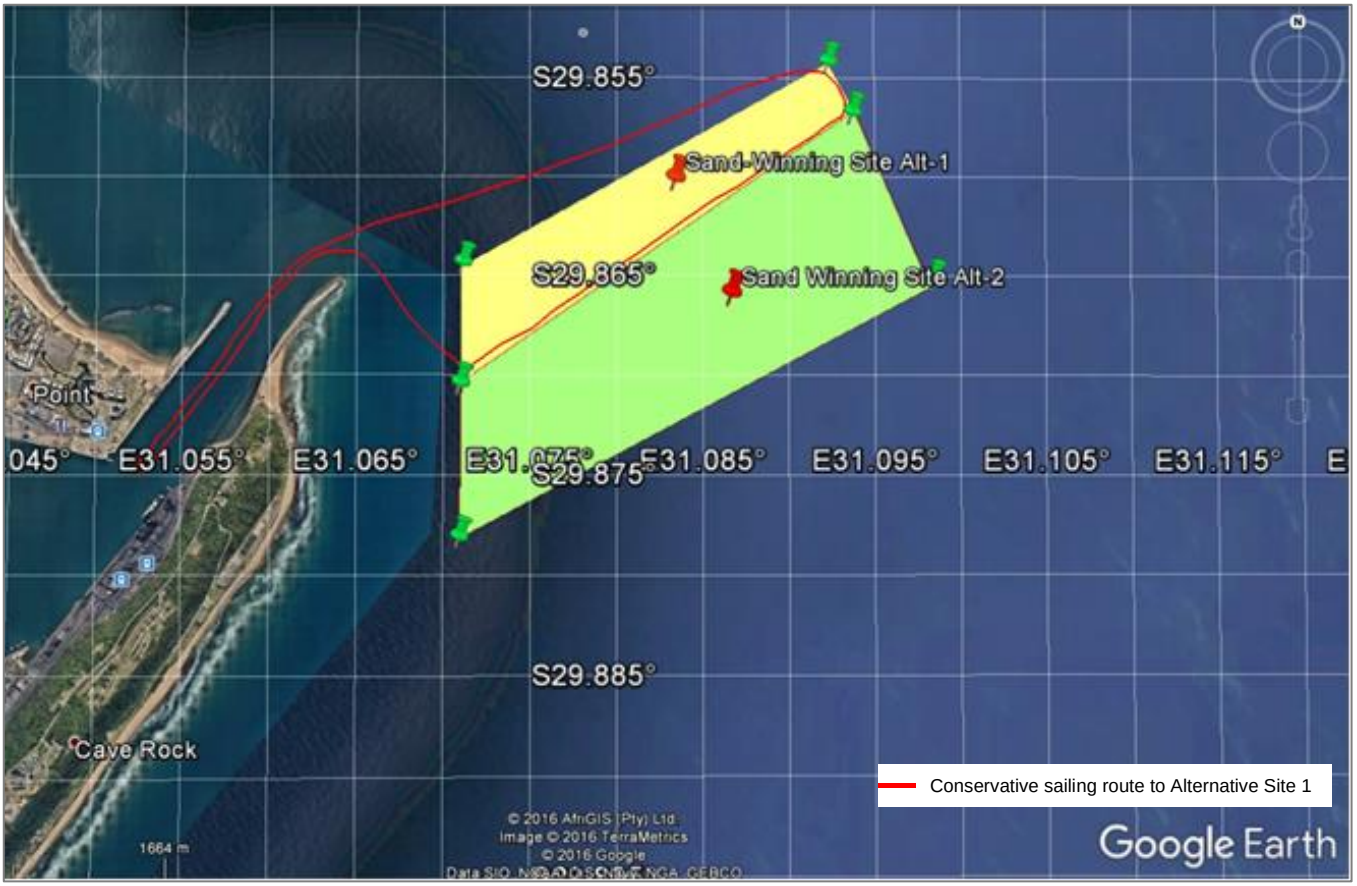


Figure 4: ***Conservative sailing route (red line) to Alternative Site 1***

6.5 Monitoring Measures

In general, a number of monitoring requirements will be undertaken as part of the offshore sandwinning process, which includes the following:

- A Global Positioning System (GPS) record must be kept of the route followed by the hopper. This record must include:
  - Time of departure from the Port;
  - Route followed by the vessel to sandwinning site (GPS track);
  - Time of arrival at sandwinning site;
  - Position of the vessel at the time of starting sandwinning activities;
  - Heading and speed of the vessel at the time of starting to sandwinning activities;
  - Position of the vessel at the time of completion of the sandwinning Activities;
  - Heading and speed of the vessel at the time of completion of sandwinning Activities;
  - Route followed by the vessel on the way back to the Port from the sandwinning site (GPS track); and

- The daily track plot must be recorded electronically.

- The hoppers must have load indicator equipment on board to ensure that the hopper doors are not leaking and that no part of the load is being deposited anywhere other than in the Port.
- A matrix of the site must be set up to ensure there is even dredging distribution.
- The volumes of dredged material must be recorded.

6.6 Associated Infrastructure and Services

There is no associated infrastructure and services required for the proposed offshore sandwinning activity. Existing services will be used within the Port, where necessary. In addition, due to the nature of the proposed activity, no specific construction camp for offshore sandwinning will be in place. Instead, management of site camps, ablutions, and landside waste will be authorised as part of the respective Port development activities.

6.7 Location of Proposed Activities

All activities, as listed in the EIA Listing Notices, related to the offshore sandwinning take place at the site described in **Table 5** (refer to **Section 5**).

Table 5: ***Listed Activity Triggered and Location***

GN & Activity	Description	Location
GN No. R. 984 (4 December 2014), Activity 17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	Refer to the locality maps contained in **Figure 1** and **Figure 2**.

7 LEGISLATION AND GUIDELINES CONSIDERED

7.1 Overview of Legislation

Some of the pertinent environmental legislation that has bearing on the proposed activity is discussed below and aims to satisfy Section 3(e) of Appendix 3 of GN No. R. 982 (4 December 2014).

7.2 The Constitution

7.2.1 Summary

The Constitution of the Republic of South Africa, Act 108 of 1996, is the supreme law of the land and provides amongst others the legal framework for legislation regulating coastal management in general. It also emphasises the need for co-operative governance. In addition, the Environmental clause in Section 24 of the Constitution provides that:

> *"Everyone has the right –*
>
> *a.) to an environment which is not harmful to their health or well-being;*
>
> *b.) to have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:*
>
> *I. Prevent pollution and ecological degradation;*
> *II. Promotes conservation;*
> *III. Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development"*

7.2.2 Significance

The Constitution provides the overarching framework for sustainable development. It provides for protection of natural resources while promoting economic and social development.

7.3 The National Environmental Management Act (Act No. 107 of 1998)

7.3.1 Summary

The proposed offshore sandwinning requires authorisation in terms of NEMA and the EIA will be undertaken in accordance with the 2014 EIA Regulations that consist of the following:

- EIA procedures - GN No. R. 982;
- Listing Notice 1 - GN No. R. 983;
- Listing Notice 2 - GN No. R. 984; and
- Listing Notice 3 - GN No. R. 985.

The project triggers activities under Listing Notice 2, and thus needs to be subjected to a Scoping and EIA process. The listed activities are explained in the context of the project in **Table 6**.

Table 6: ***Explanation of Listed Activity triggered by the proposed project***

GN No. R.	Activity	Description as per GN	Applicability to the Project
GN R. 984 of 4 December 2014	17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	TNPA has recognized the need for sandwinning of approximately 4.5 million m^3 of offshore material which will be required as part of developments within the Port Two alternative sites were assessed, namely Site 1 and Site 2, which are approximately 110 hectares and 250 hectares in extent, respectively.

The wording of the above activity in the new 2017 EIA Regulations does not influence the proposed offshore sandwinning.

Note:

The use of offshore material in the Port of Durban will require a separate authorisation process. The activities included in this application only relate to mining/sandwinning from the offshore site.

Furthermore, due to the nature of the proposed activity, no specific construction camp for offshore sandwinning will be required.

7.3.2 Significance

The proposed offshore sandwinning requires authorisation in terms of NEMA and the 2014 EIA Regulations. As the activity in question is contained in Listing Notice 2, a Scoping and

EIA process is required. In addition, as the activity relates to extraction of a mineral (offshore sand/fill material), the competent authority is DMR.

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

7.4.1 Summary

The purpose of the MPRDA is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. This Act defines mining as "any operation or activity for the purposes of winning any mineral on, in or under the earth, water or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto".

In terms of the MPRDA, as amended, a mining permit applies when the mineral in question can be mined in 2 years and the area does not exceed 5 hectares. For larger areas a **mining right** will need to be applied for.

Important definitions of the MPRDA include:

> ***'Land'*** *which includes the surface of the land and the sea, where appropriate.*

> ***'Mine'*** *when used as a verb, means any operation or activity for the purposes of winning an mineral on, in, or under the earth, water, or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto.*

> ***'Mineral'*** *means any substance, whether in solid, liquid or gaseous form, occurring naturally in or on the earth or in or under water and which was formed by subjected to a geological process and includes sand, stone, rock, gravel, clay, soil and any minerals occurring in residue stockpiles or residue deposits but excludes –*
>
> *a.) water, other than water taken from land or sea for the extraction of any mineral*
>
> *b.) petroleum; or*
>
> *c.) peat*

Based on the above definitions, offshore sandwinning is a mining activity.

GN 762 of 25 June 2004 of the MPRDA provides for exemptions of organs of state from certain provisions of this Act. This notice exempts TNPA from the provisions of Sections 16, 20, 22 and 27 of MPRDA in respect of any activity to remove any material for the construction and maintenance of dams, **harbours,** roads and railway lines.

However, Section 106(2) of the MPRDA was amended as follows: "*Despite subsection (1), the organ of state so exempted must submit relevant environmental reports required in terms of Chapter 5 of the National Environmental Management Act, 1998, to obtain an environmental authorisation*."

7.4.2 Significance

Based on the above, a mining right will be required to mine material from an offshore sandwinning area. TNPA is exempt from certain provisions of the MPRDA however an EIA process in terms of NEMA is still required. Based on this, an application for Environmental Authorisation has been submitted to DMR. In addition, an application in terms of Section 22 of MPRDA was also submitted.

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

7.5.1 Summary

The National Environmental Management: Integrated Coastal Management Act (Act No 24 of 2008) aims to promote the coastal environment as well as to ensure that development and use of natural resources within the coastal zone is socially and economically justifiable and ecologically sustainable.

An important definition is that of coastal waters:

> *Coastal waters means –*
>
> *a.) marine waters that form part of the internal waters or territorial waters of the Republic referred to in Sections 3 and 4 of the Maritime Zones Act (Act No 15 of 1994); and*
>
> *b.) subjection to Section 26, any estuary.*

As can be seen in **Figure 5**, the territorial zone is the area 12 nautical miles from the baseline. The proposed offshore sandwinning site is less than 1 nautical mile from the Port of Durban and thus falls within the territorial zone and within the definition of coastal waters.

Figure 5: ***Maritime Zones (Celliers et al., 2009)***

The Act has authority over coastal waters, and an Organ of State that is legally responsible for controlling or managing any activity on or in coastal waters (marine waters that are part of South Africa's internal or territorial waters, and estuaries). Coastal water must be controlled or managed in the interests of the whole community and according to South Africa's obligations (responsibilities) under international law.

In addition to coastal waters, the proposed activity also falls within the areas known as coastal public property and the coastal zone (refer to **Figure 6**).

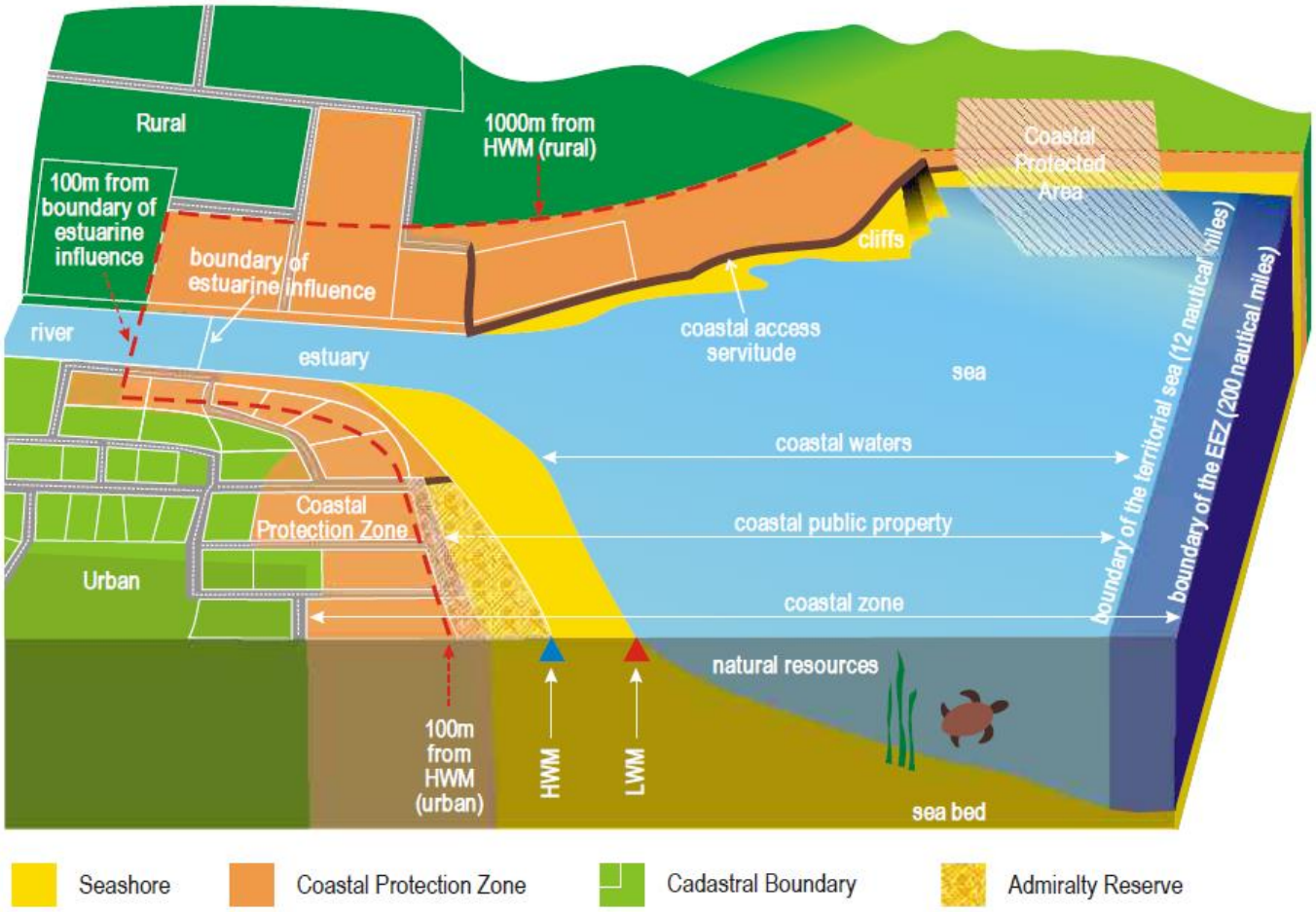


Figure 6: ***The Coastal Zone of South Africa (Celliers et al., 2009)***

The Act stipulates that the State, in its capacity as the public trustee of all coastal public property must ensure that coastal public property is managed, protected, conserved and enhanced in the interests of the whole community and also should take whatever reasonable legislative measures it considers necessary to conserve and protect coastal public property for the benefit of present and future generations.

The definition of Coastal Public Property (Section 7 of the Act) is as follows:

Coastal Public Property:

(a) coastal waters;

(b) land submerged by coastal waters, including—

(i) land flooded by coastal waters which subsequently becomes part of the bed of coastal waters; and

(ii) the substrata beneath such land;

(c) any island, whether natural or artificial, within coastal waters, but excluding—

(i) any part of an island that was lawfully alienated before this Act commenced; or

(ii) any part of an artificially created island (other than the seashore of that island) that is proclaimed by the Minister to be excluded from coastal public property;

(d) the seashore, but excluding—

(i) any portion of the seashore below the high-water mark which was lawfully alienated before the Sea-Shore Act,") 935 (Act No. 21 of 1935) took effect or which was lawfully alienated in terms of that Act and which has not subsequently been re-incorporated into the seashore; and

(ii) any portion of a coastal cliff that was lawfully alienated before this Act took effect and is not owned by the State;

(e) the seashore of a privately owned island within coastal waters; 20

(f) any admiralty reserve owned by the State;

(g) any state-owned land declared under section 8 to be coastal public property; or

(h) any natural resources on or in—

*(i) any coastal public property of a category mentioned in paragraph (a) to (8**)1** 25*

(ii) the exclusive economic zone, or in or on the continental shelf as contemplated in sections 7 and 8 of the Maritime Zones Act. 1994 (Act No. 15 of 1994), respectively: or

(iii) any harbour, work or other installation on or in any coastal public property of a category mentioned in paragraphs (a) to (h) that is owned by an organ of state.

Even though coastal public property is managed in the interest of the general public, in some instances the Minister may grant a coastal lease or concession to allow for some activities to take place on coastal public property, e.g. for a mariculture facility, pipeline or cable servitude. The Act specifies that no person may occupy any part of, or site on, construct or erect any building, road, barrier or structure on or in coastal public property unless under the authority of a coastal lease or concession.

No person may claim exclusive rights (private rights) to use any coastal resource that is part of, or derives from coastal public property, unless such a person:

- Is empowered to do so by national legislation;
- Is authorised to do so in terms of a coastal concession awarded by the Minister; or

- Is authorised to do so in terms of an authorisation issued under the Marine Living Resources Act (Act No. 18 of 1998).

7.5.2 Significance

No specific authorisation is required in terms of this Act as no Dumping at Sea or Coastal Water Discharge Permit is required. In addition, should sandwinning be authorised it would be in terms of National Legislation (NEMA and MPRDA) and thus the rights to the land would be *empowered to do so by national legislation.* However, the Scoping and EIA process will ensure that the DEA: Oceans and Coasts is involved throughout the process and that their requirements for the process are included in the EIA documentation. In addition, the EIA assesses the impacts to coastal water and coastal public property to ensure that these areas are managed in line with this Act.

7.6 The National Environmental Management Waste Act (Act No. 56 of 2008)

7.6.1 Summary

The National Environmental Management Waste Act (Act No. 56 of 2008) regulates waste management in order to protect the health and environment of South African citizens. This is achieved through pollution prevention, institutional arrangements and planning matters, national norms and standards and the licensing and control of waste management activities.

This Act contains activities listed in Categories A and B that would require licensing from the provincial or national authorities and Category C activities which need to be managed in terms of the relevant Norms and Standards.

However the proposed activity does not include any waste management activities

7.6.2 Significance

No authorisation will be required in terms of this Act, as the project is not associated with any listed waste management activities.

7.7 The National Water Act (Act No. 36 of 1998)

7.7.1 Summary

The National Water Act (Act No. 36 of 1998) regulates the surface and subsurface water of South Africa. Water is considered a scarce commodity and should therefore be adequately protected. Amongst other, this Act deals with the protection of water sources, water uses, water management strategies and catchment management, dam safety and general powers and functions.

The purpose of the Act is to ensure that South Africa's water resources are protected, used, developed, conserved, managed and controlled. The National Water Act includes the definition of a Water Resource as well as an Estuary.

> *The National Water Act definition for a **Water Resource** includes:*
>
> *1.) A Watercourse;*
>
> *2.) Surface Water;*
>
> *3.) An Estuary; and*
>
> *4.) An Aquifer*

> *The National Water Act definition for an estuary is:*
>
> *A partially or fully enclosed body of water –*
>
> *a.) which is open to the sea permanently or periodically; and*
>
> *b.) within which the sea water can be diluted to an extent that is measurable with fresh water drained from the land.*

7.7.2 Significance

The Act does not deal with the management of coastal waters. As mentioned previously the infill material will be obtained from an offshore site, which is governed by a separate process.

7.8 The Marine Living Resources Act (Act No 18 of 1989)

7.8.1 Summary

The Marine Living Resources Act (MLRA) (Act No. 18 of 1989) aims to provide for the conservation of the marine ecosystem, the long term sustainable utilisation of marine living resources, the orderly access to exploitation, utilisation and protection of certain marine living resources and to provide for the exercise of control over marine living resources in a fair and equitable manner to the benefit of all citizens of South Africa. These aims are directly dependent on the healthy functioning of estuaries and thus the impacts of developments on estuaries as well as Marine living resources needs to be ascertained.

The MLRA applies to all persons on, or in South African waters.

South African Waters includes the seashore, internal waters, territorial waters, the exclusive economic zone and such waters as tidal lagoons and tidal rivers in which the rise and fall of the water level takes place as a result of the tides.

7.8.2 Significance

The main implication of this Act is the sustainable utilisation of marine resources, which is the fundamental aim of the EIA process for activities within the coastal waters.

7.9 The Sea Birds and Seals Act (Act No. 46 of 1973)

7.9.1 Summary

The Sea birds and Seals Act (Act No. 46 of 1973) provides protection for various seabirds along the South African coast including estuaries.

7.9.2 Significance

The main implication of this Act is the protection of seabirds. Impacts on seabirds were assessed as part of the Marine Impact Assessment.

7.10 The National Environmental Management: Biodiversity Act (Act No 10 of 2004)

7.10.1 Summary

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) was promulgated for the management and conservation of South Africa's biodiversity through the protection of species and ecosystems and the sustainable use of indigenous biological resources.

7.10.2 Significance

The main implication of this Act is the protection of biodiversity. Impacts of the proposed activity on biodiversity were assessed as part of the Marine Impact Assessment.

7.11 The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

7.11.1 Summary

The aim of the National Environmental Management: Protected Areas Act (Act No 57 of 2003) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a protected environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

7.11.2 Significance

The area identified for sandwinning is not in a protected area and therefore this Act is not applicable.

7.12 The National Heritage Resources Act (Act No. 25 of 1999)

7.12.1 Summary

The National Heritage Resources Act (NHRA) (Act No. 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources.

In terms of Section 38 of this Act, certain listed activities require authorisation from provincial agencies:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50 m in length;

(c) any development or other activity which will change the character of a site—

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent.

This Act protects both buildings and shipwrecks that are older than 60 years old. A permit may be required from South African Heritage Resource Agency (SAHRA) should the need arise to disturb or damage any historic shipwrecks. Refer to the findings of the Underwater Heritage Impact Assessment.

Other relevant legislation which incorporates submerged archaeological sites is described in the following acts:

- Merchant Shipping Act, 1951 (Act No, 57 of 1951);
- Customs and Excise Act, 1964 (Act No 91 of 1964); and
- Legal Succession to the South African Transport Services Act, 1989 (Act No 9 of 1989).

The above legislation mainly deals with the sites of shipwrecks and with shipwrecks and their contents without any reference to any cultural or historical value. Only the NHRA specifically acknowledges the value of shipwrecks in terms of cultural or historical context.

> *Specifically, Section 35 (1) states that "The protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of the South African Heritage Resource Agency (SAHRA)".*

7.12.2 Significance

Due to the large footprint of the offshore sandwinning sites an Underwater Heritage Impact Assessment was undertaken to determine any impacts to heritage resources such as shipwrecks.

7.13 The National Ports Act (Act No 12 of 2005)

7.13.1 Summary

The National Ports Act (NPA) (Act No. 12 of 2005) is the primary piece of legislation regulating the Port sector in South Africa. It specifically deals with the modernisation and efficient operation of South African ports. TNPA must regulate and control development, in accordance with the approved Port Development Framework, integrate biophysical, social and economic issues in all forms of decision making and ensure sustainable and transparent planning processes, in consultation with stakeholders.

> *"To promote the development of effective and productive South African ports Industry that is capable of contributing to the economic growth and development of South Africa"*

Section 69 of the NPA deals with the protection of the environment and requires that TNPA achieves a balance between the protection of the environment and the establishment, development and maintenance of Ports as well as ensuring the sustainable and transparent

Port planning processes are undertaken when formulating any Port Development Framework. Amongst others the NPA requires that TNPA regulate and control pollution within the port limits.

7.13.2 Significance

TNPA is required by the NPA to promote economic development of the Port and as such developments within the Port require sandwinning for infill material.

7.14 The Occupational Health and Safety Act (Act No 85 of 1993)

7.14.1 Summary

The Occupational Health and Safety Act (Act No.85 of 1993) provides for the health and safety of people at work as well as the health and safety of persons using plant and machinery.

7.14.2 Significance

Transnet will be required to meet the requirements of this Act during the offshore sandwinning.

7.15 The KZN Conservation Management Act (Act No 9 of 1997)

7.15.1 Summary

The KZN Conservation Management Act (Act No 9 of 1997) provides for the establishment of the KZN Conservation and prescribes its powers, duties and functions which include:

- Direct Nature conservation management; and
- Direct Protected areas management.

This is currently carried out by Ezemvelo KZN Wildlife (EKZNW).

7.15.2 Significance

EKZNW does not have a mandate within the coastal waters as the proposed activity does not occur within a protected area. However, EKZNW was involved in the EIA process for the project.

7.16 Draft National Action List for Screening of Dredged Material

7.16.1 Summary

The Draft National Action List for the Screening of Dredged Material Proposed for Marine Disposal (Notice 867 of 9 December 2011) was published in terms of Section 73 of the

National Environmental Management Integrated Coastal Management Act (Act No. 24 of 2008). The Action List is a mechanism that allows managers and regulatory authorities to reach an informed decision on the suitability of material proposed for disposal in the marine environment.

7.16.2 Significance

The National Action List should be used to identify management options for sediment proposed for dredging in South African ports.

7.17 Policy, Programmes and Plans

7.17.1 eThekwini Integrated Development Plan

The Municipal Systems Act, 2000 (Act No. 32 of 2000) requires that local government structures prepare Integrated Development Plans (IDPs) to serve as tools for facilitation and management of development. The IDP (2011) highlights the Port of Durban as an economic investment area that requires major investment. The development of the Port as an economic, manufacturing and trading hub and its promotion as a gateway Port to the east is prioritised. However, the IDP also highlights the importance of balancing the physical, social and economic benefits of the coastal area.

7.17.2 Significance

Developments within eThekwini should be aligned with eThekwini Integrated Development Plan (IDP). The EIA process for the sandwinning project has taken into account the IDP.

7.17.3 Offshore Marine Protected Area Project

Only 0.4% of South Africa's mainland marine territory is protected within Marine Protected Areas (MPAs) and most offshore habitat types are unprotected. The offshore expansion of South Africa's MPA network is a national priority. A collaborative five-year Offshore Marine Protected Area project was undertaken to support the identification of a network of potential offshore spatial management measures including MPAs. The network aims to represent offshore biodiversity, protect vulnerable marine ecosystems, contribute to fisheries sustainability, support the management of bycatch, and provide for research and monitoring. The implementation of offshore spatial management measures can secure remaining healthy offshore habitats, prevent further habitat damage, support stock recovery, and the sustainability of our fisheries and advance integrated ecosystem based management of South Africa's marine territory.

The closest focus area to the study site was the Tugela Banks area which is approximately 45 km north east of the proposed offshore sandwinning sites. The area was identified as a zoned Marine Protected Area and Industry. Unprotected pelagic and seabed habitats (such as Natal shelf muds and gravels and submarine canyons) warrant protection in this area

which has complex sedimentary patterns and complex oceanography. This area is highly productive and serves as a nursery area for many species. This focus area was also identified by finescale planning conducted in KZN through the SeaPlan project led by EKZNW.

7.17.4 Significance

The proposed project footprint does not form part of any offshore marine protected focus area, however, the principles outlined by the MPA will be considered in the sandwinning application.

7.17.5 The South African National Spatial Biodiversity Assessment: Marine Component

This report presents a spatial assessment of the conservation status of selected marine biodiversity patterns in South Africa, at a national scale. It addresses a subset of marine species, and broad scale intertidal and subtidal habitats (within South African waters, to the Exclusive Economic Zone - EEZ). The report is useful for improving biodiversity management in the marine environment.

The report noted a number of MPAs and the closest of the MPAs include the Aliwal Shoal Controlled Zone, Aliwal Shoal Crown Area Restricted Zone and Aliwal Shoal Produce Restricted Zone, which are approximately 44 km's south west of the proposed sandwinning sites.

7.17.6 Significance

While the proposed project footprint does not form part of any offshore MPA, the principles to protect a MPA will be considered in the sandwinning application.

7.18 Guidelines

The following guidelines were used in the preparation of this report.

- Assessment of alternatives and impacts (Guideline 5) in support of the EIA Regulations, Department of Environmental Affairs and Tourism, Pretoria (DEAT, 2006);
- Celiers, L., Breetzke, T., Moore, L., and Malan, D. 2009. A User-friendly Guide to South Africa's Integrated Coastal Management Act. DEA and SSO Engineers and Environmental Consultants, Cape Town, South Africa;
- Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005. Integrated Environmental Management Guideline Series (DEAT, 2005a);
- Guideline 4: Public Participation, in support of the EIA Regulations. Integrated Environmental Management Guideline Series (DEAT, 2005b);

- Guideline on Alternatives: NEMA Environmental Impact Assessment Regulations (prepared by the Western Cape Department of Environmental Affairs and Development Planning, 2006);
- Guideline on Need and Desirability, NEMA Environmental Impact Assessment Regulations Guideline and Information Document Series. Department of Environmental Affairs and Development Planning (DEADP, 2009);
- Integrated Environmental Management Information Series, in particular Series 2 – Scoping (DEAT, 2002);
- Guideline for Environmental Management Plans (Lochner, P. 2005);
- Guideline for determining the scope of specialist involvement in EIA processes (Münster, 2005);
- Guideline for involving biodiversity specialists in EIA processes (Brownlie, 2005);
- Guideline for involving heritage specialists in EIA processes (Winter & Baumann, 2005);
- Guideline for the review of specialist input in EIA processes (Keatimilwe & Ashton, 2005);
- PIANC Dredging and Port Construction around Coral Reefs (UNEP, 2010);
- Environmental Considerations for Port and Harbour Developments. (World Bank, 1990);
- IAPH. Guidelines for environmental Planning and Management in Ports and Coastal Area Developments (COPSEC, 1989);
- UK Marine SACs Project. Task 2.1: Recreational User Interactions. Framework for Reviewing and Managing Potential Recreational Impacts on Annex I and II Features Within UK Marine Special Areas of Conservation. (ABP Research, 1999);
- UK Marine SACs Project. Task 2.2: Port and Harbour Operations. Good Practice Guidelines for Ports and Harbours Operating Within or Near UK Marine Special Areas of Conservation. (UK CEED, 1999); and
- Guidelines for Port Environmental Management (Paipai, 1999).

7.19 International Conventions & Other Legislation

The following international conventions, commissions and regulations were also taken into account where necessary:

- 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);
- 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);
- Convention on Biological Diversity (1992).
- Carriage of Goods by Sea Act, 1986 (No. 1 of 1986);
- Hazardous Substances Act, 1983 and Regulations (No. 85 of 1983);
- Marine Traffic Act, 1981 (No. 2 of 1981);
- Marine Pollution (Control and Civil Liability) Act, 1981 (No. 6 of 1981);
- Marine Pollution (Prevention of Pollution from Ships) Act, 1986 (No. 2 of 1986);
- Marine Pollution (Intervention) Act, 1987 (No. 65 of 1987);
- Maritime Safety Authority Act, 1998 (No. 5 of 1998);
- Maritime Safety Authority Levies Act, 1998 (No. 6 of 1998);
- Maritime Zones Act 1994 (No. 15 of 1994);
- Merchant Shipping Act, 1951 (No. 57 of 1951);
- Mine Health and Safety Act, 1996 (No. 29 of 1996);
- National Nuclear Energy Regulator Act, 1999 (No. 47 of 1999);
- 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).

8 SCOPING AND EIA PROCESS

8.1 EIA Listed Activities (4 December 2014)

The proposed offshore sandwinning activity includes certain activities that require authorisation in terms of NEMA. The process for seeking authorisation is undertaken in accordance with the EIA Regulations (GN No. R. 982, R. 983, R. 984 and R. 985 of 4 December 2014), promulgated in terms of Chapter 5 of NEMA.

Activity 17 of GN No. R. 984 (4 December 2014) is triggered by the proposed offshore sandwinning and hence a Scoping and EIA process is required.

8.2 Competent Authority

In terms of the 2014 EIA Regulations, the lead decision-making authority for the Scoping and EIA is the DMR as the activity in question is mining related.

8.3 Application Form

The Application for Environmental Authorisation (EA) in terms of NEMA for the proposed activity was submitted to DMR on 15 August 2016 and the Reference Number KZN30/5/1/1/2/00070BP was received. Refer to **Appendix A** for a copy of the Application Form.

8.4 Formal Process

The environmental assessment process is divided into two phases, namely: 1) Scoping and 2) EIA. An outline of the Scoping and EIA process for the proposed offshore sandwinning is provided in **Figure 7**.

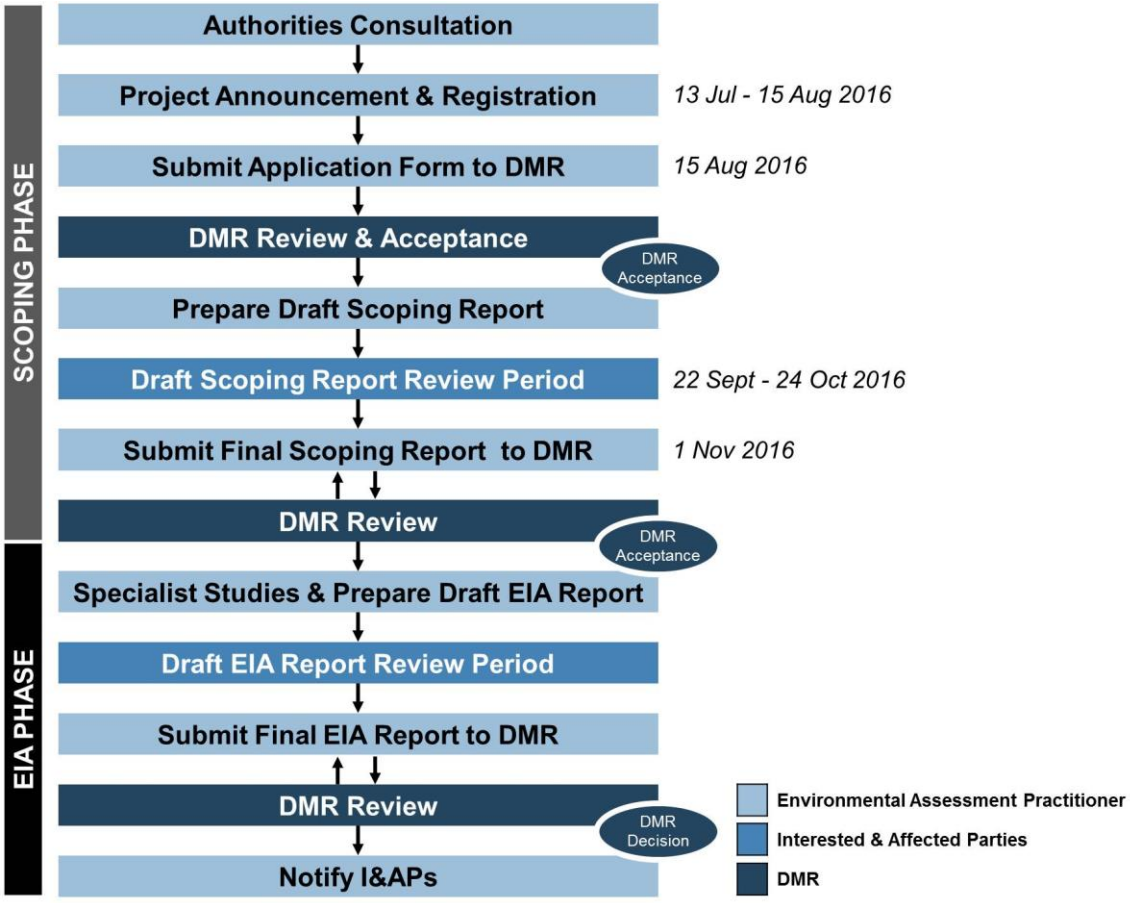


Figure 7: Scoping and EIA Process

8.4.1 Scoping Phase

The purpose of Scoping, which constitutes the first phase of the formal EIA process, is as follows:

1. Introduce the proposed project to all Interested and Affected Parties (IAPs);
2. Engage with IAPs to allow for participation in the process that is transparent, cooperative, informative and robust. Allow for informed decision-making with regard to the EIA process;
3. Identify the significant issues and impacts to be investigated further during the execution of the EIA phase;
4. Consider suitable and feasible alternatives for achieving the project's objectives; and
5. Determine the scope of the ensuing EIA phase in terms of specialist studies, public participation, assessment of impacts and appraisal of alternatives.

The following milestones have been reached for the Scoping Phase:

- Project announcement (via onsite notices, newspaper notices and distribution of a Background Information Document) in July 2016;
- Period for registration as an IAP from 13 July to 15 August 2016;
- An Application Form for Scoping and EIA, in terms of the 2014 EIA Regulations, was submitted to DMR on 15 August 2016;
- A Draft Scoping Report, which conformed to Appendix 2 of GN No. R. 982 (4 December 2014) of NEMA was compiled in September 2016. This document included the following salient information (amongst others):
  - A Scoping-level impact assessment to identify potentially significant environmental issues for detailed assessment during the EIA phase;
  - Screening and investigation of feasible alternatives to the project for further appraisal during the EIA phase; and
  - A Plan of Study, which explains the approach to be adopted to conduct the EIA for the proposed activity. This included *inter alia* the Terms of Reference for the identified Specialist Studies.
- Notification of the review of the Draft Scoping Report was provided in September 2016. The Draft Scoping Report was lodged for public and authority review from 22 September to 24 October 2016;
- A Public Meeting was held on 5 October 2016 to present the Draft Scoping Report;
- A Comments and Response Report was compiled (which was updated during the execution of the Scoping process), which summarised the issues raised by IAPs and the project team's response to these matters;
- The Final Scoping Report was submitted to DMR on 1 November 2016; and
- The Final Scoping Report was approved by DMR on 17 January 2017.

8.4.2 EIA Phase

The EIA phase, which constitutes the second phase of the formal EIA process, serves to follow from the Scoping phase and provides the following:

- A detailed description of the proposed development and location;
- A description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- The methodology of the stakeholder engagement process will be described;
- The updated Comments and Responses Report and Stakeholder Database is provided as an appendix to the EIA Report;
- A description of the need and desirability of the proposed development and the identified potential alternatives to the proposed activity;
- A summary of the methodology used in determining the significance of potential impacts;
- A description and comparative assessment of the project alternatives;
- A summary of the findings of the specialist studies (Copies of all specialist reports appended to the EIA report);
- A detailed assessment of all identified potential impacts;
- A list of the assumptions, uncertainties and gaps in knowledge;
- An opinion by the consultant as to whether the development is suitable for approval within the proposed site;
- An EMPr that complies with Appendix 4 of GN No. R. 982; and
- Any further information that will assist in decision making by the authorities.

8.4.2.1 Alignment with the Plan of Study

The Plan of Study, which was contained in the Scoping Report and was approved by DMR, explained the approach to be adopted to conduct the EIA for the proposed project. The manner in which the EIA Report addresses the requirements of the Plan of Study is shown in **Table 7**.

Table 7: ***Alignment of EIA Report with Plan of Study***

Plan of Study Requirement	EIA Report Reference
Assess pertinent environmental issues identified during Scoping through: 1) Applying an appropriate impact assessment methodology; 2) Conducting specialist studies; 3) Obtaining technical input; and 4) Identifying suitable mitigation measures.	• Section 12 • Section 13 • Section 14
Assessment of feasible alternatives.	• Section 15
Specialist studies to be completed in accordance with Terms of Reference.	• Section 13

Plan of Study Requirement	EIA Report Reference
	• Appendix F
Public participation to include the following: • Update the IAP Database; • Notification – Approval of Scoping Report; • Convene public meetings; • Compile and maintain a Comments and Response Report; • Allow for the review of the Draft EIA Report; and • Notification of DMR's Decision.	• Section 16
EIA Report to satisfy the minimum requirements stipulated in Appendix 3 of GN No. R. 982 (4 December 2014).	• Section 1
Authority Consultation.	• Section 16

8.4.2.2 Impact Prediction

The potential environmental impacts associated with the proposed project were identified through an appraisal of the following:

- Proposed footprint of the project activity, which included a desktop evaluation with a Geographical Information System (GIS) and aerial photography, as well as site investigations;
- Activities associated with the proposed sandwinning operations;
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes;
- Input received during public participation from IAPs;
- Findings of specialist studies;
- Legal and policy context; and
- Cumulative impacts.

The Scoping exercise aimed to identify significant environmental impacts for further consideration and prioritisation during the EIA stage. Note that "significant impacts" relate to whether the effect (i.e. change to the environmental feature / attribute) is of sufficient importance that it ought to be considered and have an influence on decision-making. During Scoping the impact prediction was executed on a qualitative level, where the main impacts where distilled by considering factors such as the nature, extent, magnitude, duration, probability and significance of the impacts.

During the EIA stage a detailed assessment was conducted to identify all impacts, which were evaluated via contributions from IAPs, the project team and requisite Specialist Studies, and through the application of the impact assessment methodology contained in **Section 14.1.6.** Suitable mitigation measures are proposed to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and are included in the EMPr (**Appendix G**).

9 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to the EIA:

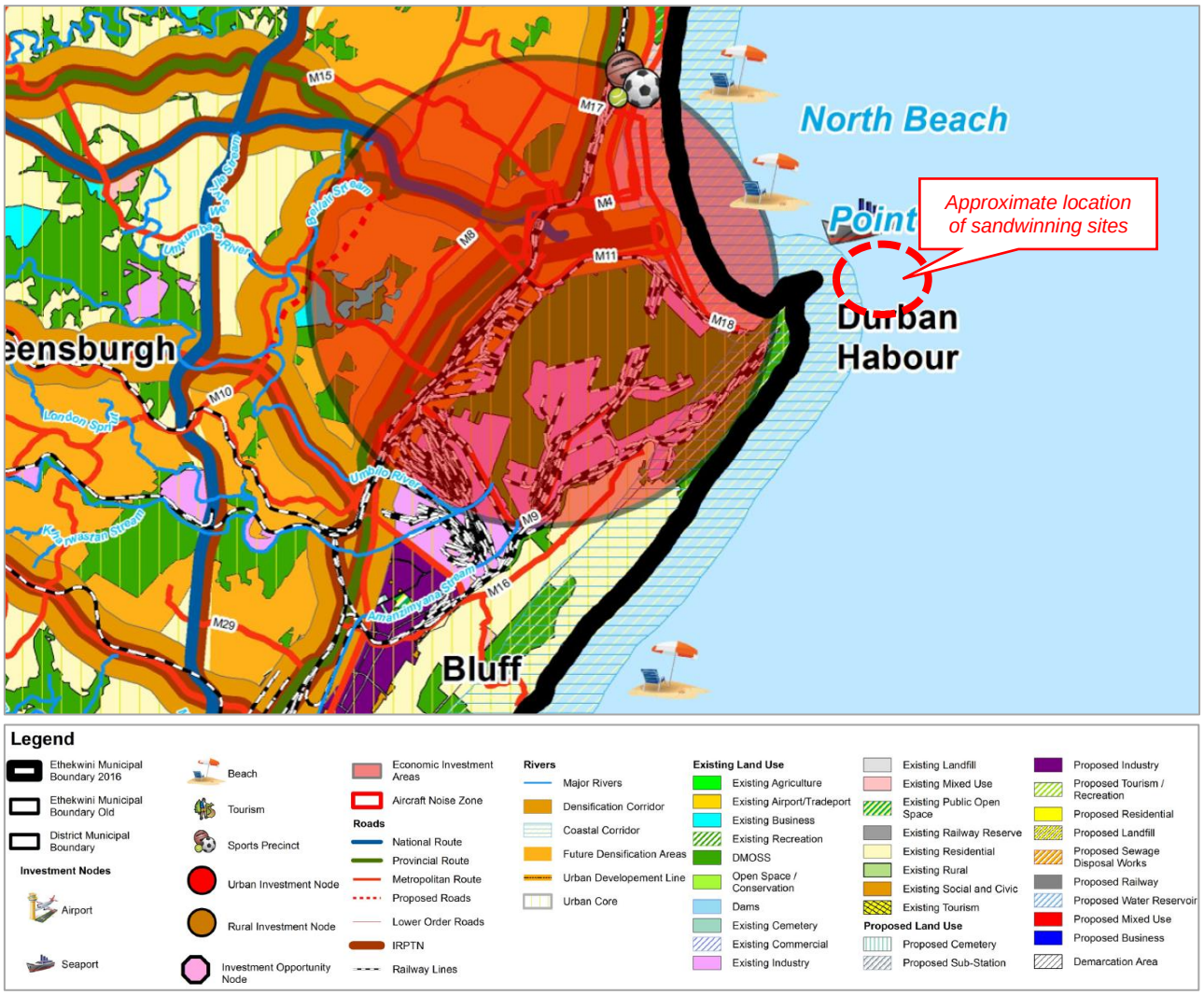
- The GIS versions of data available for the public are assumed to be the latest information provided by the Departments (such as SANBI).
- The Scoping and EIA is confined to the scope of works within the proposed site boundary (i.e. related to offshore sandwinning). The scope of work related to the use of the dredged material is not included and may require separate authorisation;
- Regardless of the analytical and predictive method employed to determine the potential impacts associated with the project, the impacts are only predicted on a probability basis. The accuracy of the predictions is largely dependent on the availability of environmental data and the degree of understanding of the environmental features and their related attributes;
- The Berth 203 to 205 Expansion EIA process included offshore sandwinning as part of the scope. As such, specialist studies were undertaken of the proposed sites and a preferred site was identified. However, in terms of the 2010 EIA Regulations, DEA could not authorize activities related to mining and thus the authorisation did not include sandwinning. Whilst these updated specialist studies relating to the full scope of sandwinning (approximately 4.5 million m^3) are included as part of this EIA process, the site visits undertaken by the specialists occurred in 2012 as part of the Berth 203 to 205 Expansion EIA. However, the reports of the specialist studies were updated in 2016 to focus specifically on the alternative sandwinning sites.
- Refer to the respective specialist studies for the associated assumptions and limitations.

10 NEED AND DESIRABILITY

In terms of Section 3(f) of Appendix 3 of GN No. R. 982 of 4 December 2014, this section discusses the need and desirability of the project. The format contained in the Guideline on Need and Desirability (DEA&DP, 2009) has been used in **Table 8**.

Table 8: ***Need and Desirability***

No.	Question	Response
	NEED ('timing')	
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed	The proposed offshore sandwinning does not occur on land and therefore there is no associated land use. According to the 2016/17 eThekwini SDF (refer to excerpt contained below), Site1 and Site 2 partially occur in the coastal corridor.

No.	Question	Response
	to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	Further, the proposed sites do not occur within a MPA or within Marine Focus Area identified by SANBI.
		
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	The offshore sandwinning of material is required at this point in order to allow developments within the Port of Durban. Data from the Transnet eThekwini Municipality Port Initiative (TEMPI) which is a joint planning initiative between Transnet and the eThekwini Municipality, suggests that the upgrades within the Port are necessary in order to meet current and future demand.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate).	The proposed offshore sandwinning does not occur on land and therefore there is no associated land use. According to the 2016/17 eThekwini SDF (refer to excerpt contained below), Site1 and Site 2 partially occur in the coastal corridor. The sandwinning is necessary for developments within the Port of Durban.

No.	Question	Response
		The Port of Durban is identified by SDF as a strategic economic area. The offshore sandwinning project is both a local and national priority.
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	Not applicable as no new services are required for the proposed activity.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	Not applicable as the activity occurs offshore. However the sandwinning will allow developments within the Port of Durban. There will be no implications on infrastructure planning of the municipality.
6.	Is this project part of a national programme to address an issue of national concern or importance?	The National Development Plan for 2030 makes mention of new plans developed by Transnet to address the capacity issues within the Port of Durban. The offshore sandwinning project is necessary for developments within the Port of Durban, which is of national importance.
DESIRABILITY ('placing')		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	The activity was assessed to ensure limited environmental impacts and hence it is the BPEO for the site. The BPEO is determined in **Section 15** and is based on a comparative analysis of the feasible alternatives.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and SDF as agreed to by the relevant authorities?	The activity occurs offshore.
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	Information from the Offshore Marine Protected Area project was taken into account however the proposed project footprint does not form part of any offshore marine protected focus area. The approval of this application will not compromise any existing management priorities as the sites considered are not within any MPAs.
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	The proposed footprint is within close proximity to the Port and has the required infill material. As such, location factors favour this use.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	The Marine Impact Assessment, Underwater Heritage Impact Assessment and Wave Modelling Study have concluded that there are no impacts on sensitive environmental features at the preferred site if the mitigation measures are implemented.
12.	How will the development impact on people's health and wellbeing (e.g. i.t.o. noise, odours, visual character and sense of place, etc.)?	No impacts to people's health or well-being are anticipated.
13	Will the proposed activity or the land use associated with the activity applied for, result in	Not applicable as the activity occurs offshore.

No.	Question	Response
	unacceptable opportunity costs?	
14	Will the proposed land use result in unacceptable cumulative impacts?	Not applicable as the activity occurs offshore. Cumulative impacts were assessed in **Section 14.4**.

11 ALTERNATIVES

11.1 Screened Alternatives - Area 1 and Area 2

A previous study undertaken by the Council for Geoscience in 2001 identified two potential offshore sandwinning sites, namely Area 1 and Area 2 (shown in **Figure 8**). Note that the alternative offshore sandwinning sites assessed as part of the EIA are located within Area 1 only. Area 1 and Area 2 were investigated as part of previous projects and the following was determined:

- The Bathymetry in Area 1 varies from 19 to 32 m depth and from 18 to 23 m in Area 2.
- The seafloor in Area 1 is dominated by two discrete sand mounds which occupy much of the site. The presence of shallow pinnacles immediately to the northeast of the site and the presence of patches of scattered reef in the site indicate that the site is probably underlain by reef and covered with a thin veneer of sand. The average thickness of unconsolidated sediment in Area 1 is estimated at 3.6 m but ranges from 0 m on the reef outcrops to a maximum of 9.5 m. In contrast, Area 2 is characterised by uniform bathymetry that dips gently towards the northeast. No rocky features are evident in Area 2. Sediment thickness at this site ranges between 2.5 to 11.2 m, averaging 5.2 m.
- Grab and core sampling undertaken indicated that sediments in Area 1 are on the whole coarser grained, have a higher gravel content, lower interstitial mud content, significantly lower calcium carbonate content, and significantly higher “compact” densities than those in Area 2. Coarse sediment will decrease the amount of fine suspended sediment and therefore minimise turbidity and deposition of fine sediment on nearby reef habitat.
- Area 2 (the northernmost site) was found to be largely pristine.
- From an underwater heritage perspective, the coastline section where Area 2 is located witnessed the majority of the region’s shipwrecks. A high number of magnetometer hits seen in this area during previous studies may well indicate the spreading, through time, of the remains of these wrecks. In addition, it is a sandy area that experiences large sediment deposits from the Umgeni River (Miller and

Leuci, 2001). These sediment deposits assist in covering possible underwater heritage sites.

- A shipwreck known as Stuart's Wreck may occur in the southern part of Area 1.

Based on this information, Area 2 was screened out and was not assessed as a feasible alternative. Area 1 was further subdivided into Site 1 and Site 2, as discussed in **Section 11.2**.

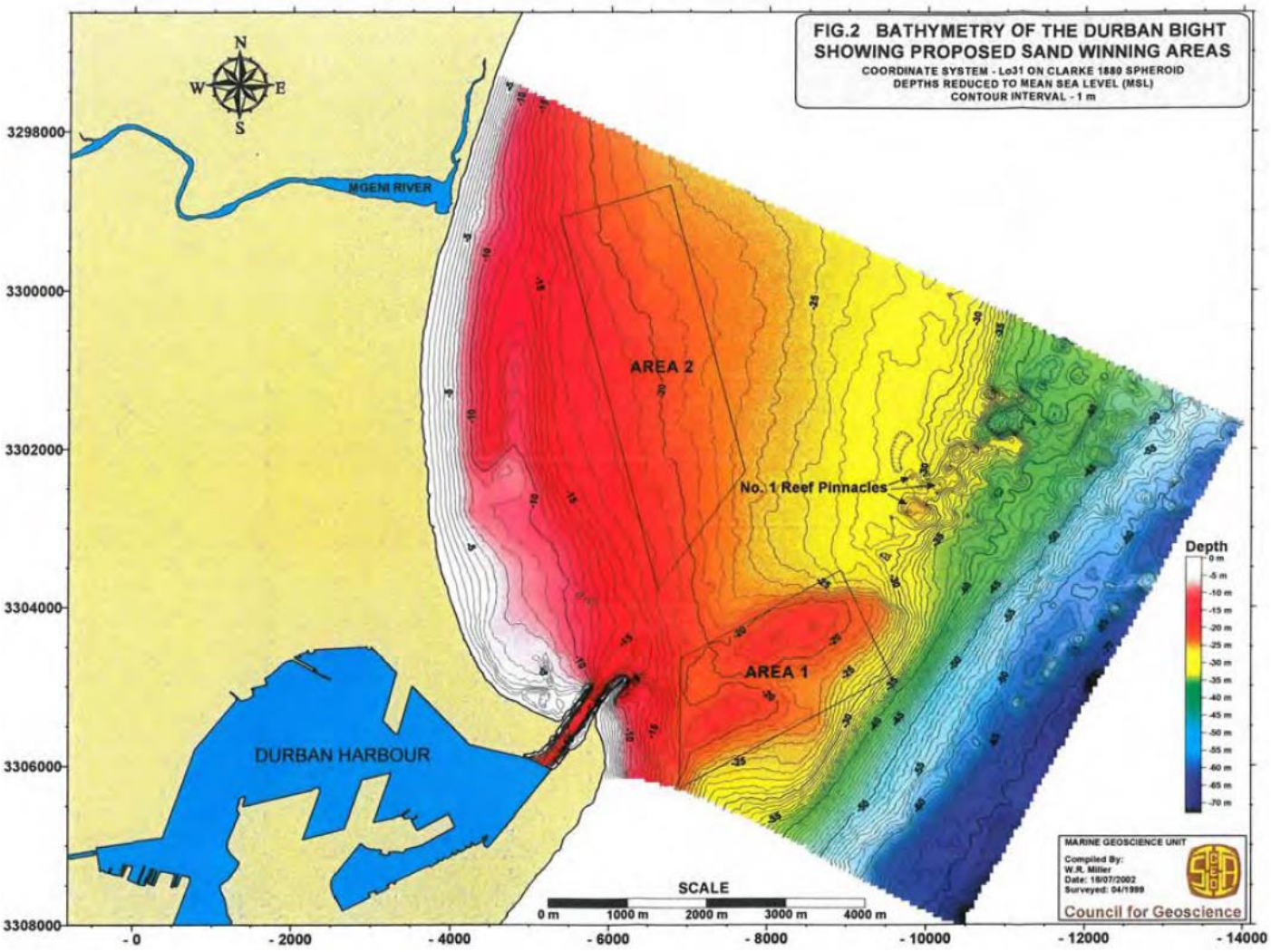


Figure 8: ***Location of Offshore Sandwinning Sites Previously Investigated (Council for Geoscience, 2001)***

11.2 Feasible Alternatives

Two feasible alternative sites for the proposed offshore sandwinning were considered, namely Site 1 and Site 2, which both occur within Area 1 of the sites previously investigated by the Council for Geoscience (see **Figure 8**).

11.2.1 Site 1 (of Area 1)

Site 1 occurs approximately 1,2 km east of the Port of Durban harbour mouth and is approximately 110 hectares in size (**Figure 9** and **Appendix E**).

The bathymetry of Alternative Site 1 varies from a minimum of -19m to a maximum depth of –20m (Council for Geoscience, 2001). The area is dominated by a northern mound which measures 2000m in length, 750m in width and 10m in height. In general, the bathymetry is gently undulating with bathy-metric gradients varying from 0.14° to 0.69°.

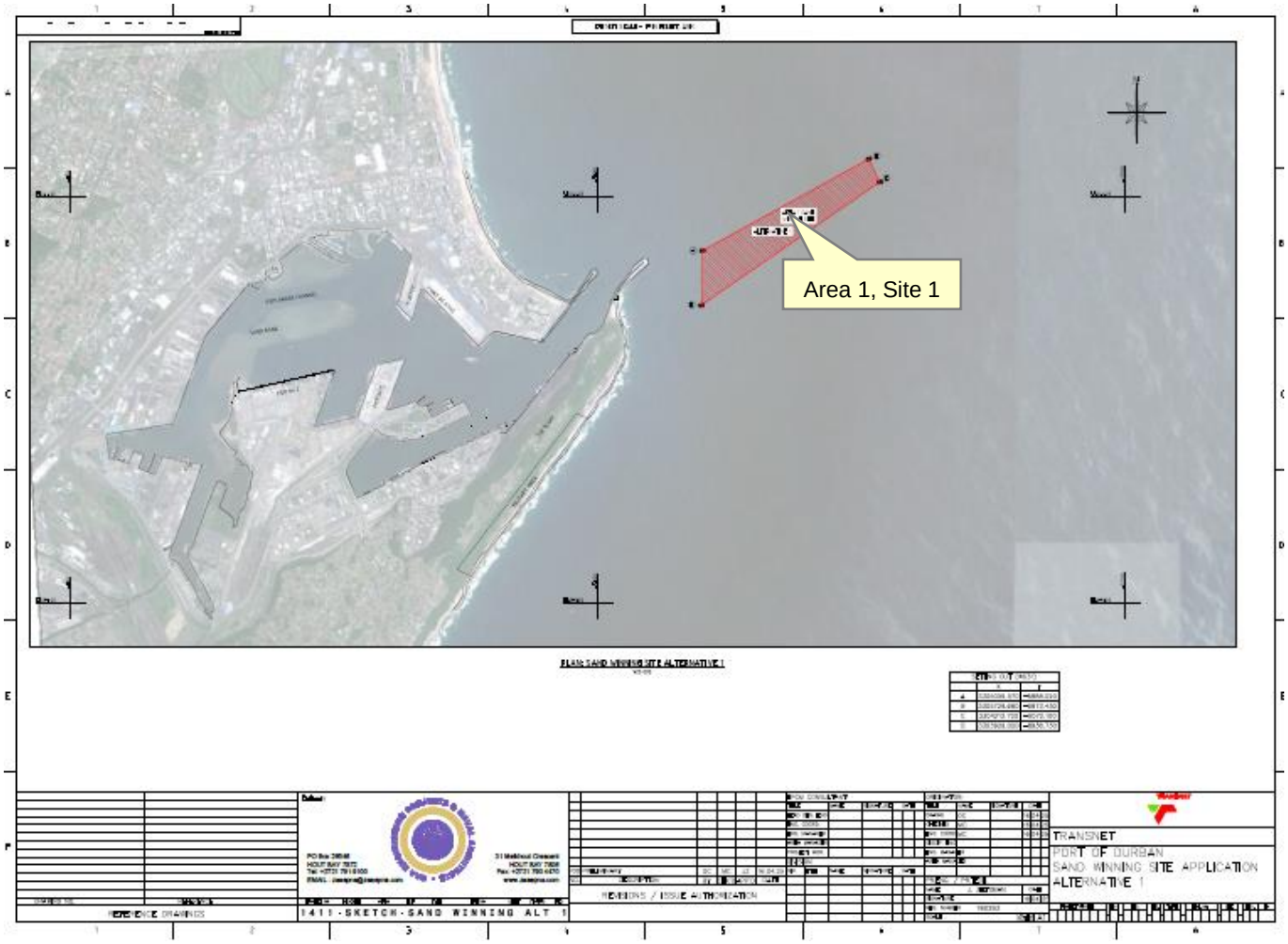


Figure 9: ***Alternative Site 1***

11.2.2 Site 2 (of Area 1)

Site 2 occurs slightly south of Alternative Site 1 and is approximately 250 hectares in size (**Figure 10** and **Appendix E**).

In terms of bathymetry, Alternative Site 2 varies from approximately –20m to a maximum of –32m (Council for Geoscience, 2001). The site also has a mound which is approximately 1500m in length, 700m in width and only 2-3m in height.

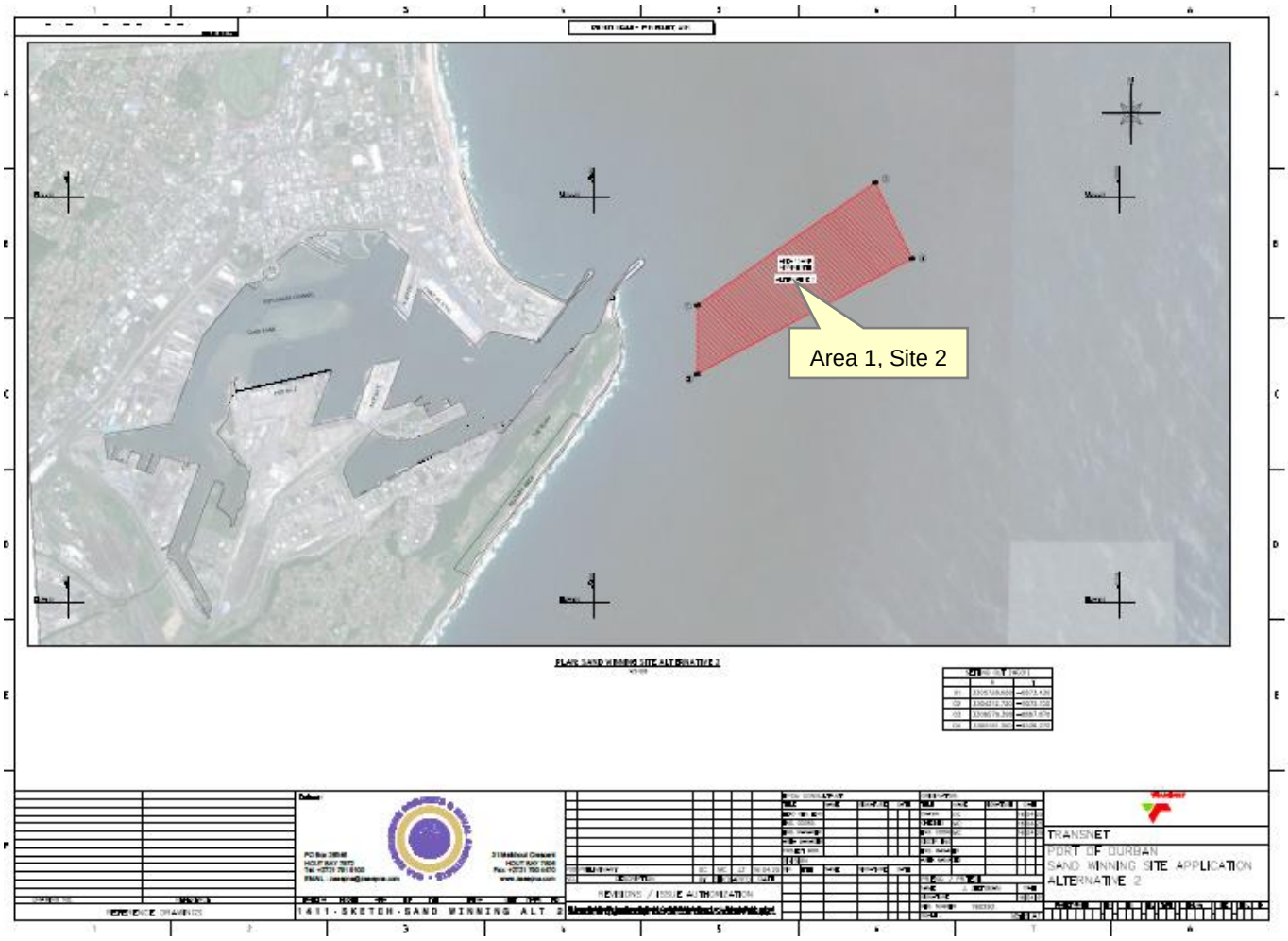


Figure 10: Alternative Site 2

11.3 No-go alternative

The no-go implications for the Port are twofold. Firstly, without offshore infill material, the various Port expansion projects will not be able to proceed. Secondly, TEMPI undertook an economic assessment of the Port of Durban in 2007 which found that if infrastructure within the Port was not upgraded to respond to international trends, the Port of Durban will not maintain a competitive level of services and large vessels will make use of competitor Ports. This will result in negative economic impacts on the local and national economy and a negative impact on related industries. The following is also stated in the 2016/17 eThekwini SDF with regards to the proposed expansion of the Port of Durban (eThekwini Municipality, 2016):

- The Port of Durban is the primary contributor to eThekwini's economy which is of provincial and national significance and has seen a steady increase in container traffic in recent times. One of the serious constraints to development is the inefficiencies and congestion in the Durban port operations;

- The municipality is poised for steady economic growth from several major catalytic projects over the next 20 years which includes the Port expansion plans (amongst others); and
- The economic growth of the eThekwini is mostly based on the port and related activities. The Port Expansion and Back of Port redevelopment are key investment priorities not only to the municipality but to the country as a whole. The expansion of the Port is one of the ways the eThekwini can maximise future investment and strengthen its comparative and competitive advantage over other port cities both locally and internationally.

11.4 Material from Land Based Sources

Extraction of land based sources of material can result in long term impacts to the environment, including landscape and visual impacts and habitat loss, if a new extraction site were to be created. The sandwinning site is "self-healing" due to the natural longshore sand transportation which will rapidly fill in any depressions. Hydrodynamic and morphological studies have also shown that there will be a negligible impact on the wave climate and the coastline due to dredging at the sandwinning site (refer to discussion in **Section 13.4**).

The use of land based sources of material would require the transportation of material from the site where it is sourced to the Port of Durban by road. The local and regional road network in and around the Port already experiences high volumes of road traffic and the transportation of the fill material would cause further congestion on the local road network.

Given the number of truck movements required to transport materials to the site on the local road network there is also anticipated to be increased air quality and noise related impacts when compared with the use of an offshore site.

The use of road haulage would also result in significantly greater CO_2 emissions per tonne mile when compared with transportation by sea.

In addition, the cost per tonne of material from land based sources would be higher than that of material sourced from an offshore site.

11.5 Material from Existing Offshore Sources

Currently, there are no existing approved offshore sites. However, infill material from offshore sources identified by the Council for Geoscience (2001) can be used subject to the material being suitable (i.e. correct geotechnical properties), available in sufficient quantities at the right time and within close enough distance to the destination site to allow economically viable transportation.

12 PROFILE OF THE RECEIVING ENVIRONMENT

12.1 Climate

12.1.1 General

Based on feedback from the South African Weather Services (SAWS) the closest meteorological station is located at Virginia. The information to follow was obtained for this station.

12.1.2 Temperature

The area around the Port of Durban is subjected to a warm maritime climate. Average daily maximum and minimum temperatures for the last ten years are provided in **Table 9** and **Table 10**, respectively.

Table 9: ***Average Daily Maximum Temperature (°C) (2006 – 2016) - Virginia***

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
27	28	27	25	24	23	22	22	23	23	24	26

Table 10: ***Average Daily Minimum Temperature (°C) (2006 – 2016) - Virginia***

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
22	22	21	18	16	14	13	14	16	17	18	20

12.1.3 Precipitation

Overall, Durban experiences warm and wet summers and mild moist to dry winters. The monthly daily rainfall for the last ten years is provided in **Table 11**.

Table 11: ***Monthly Daily Rain (mm) (2006 – 2016) - Virginia***

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
90	55	84	56	43	25	55	29	59	81	98	93

12.1.4 Wind

The wind rose shown in **Figure 11** for a 10-year period (2006 – 2016) is interpreted as follows:

- The wind blows mostly from the NE, WNW and SW;
- The highest percentage of winds blow with speeds of 0.5 – 2.5 m/s and 3.5 – 5.6 m/s; and
- 5.4% of all winds are calm.

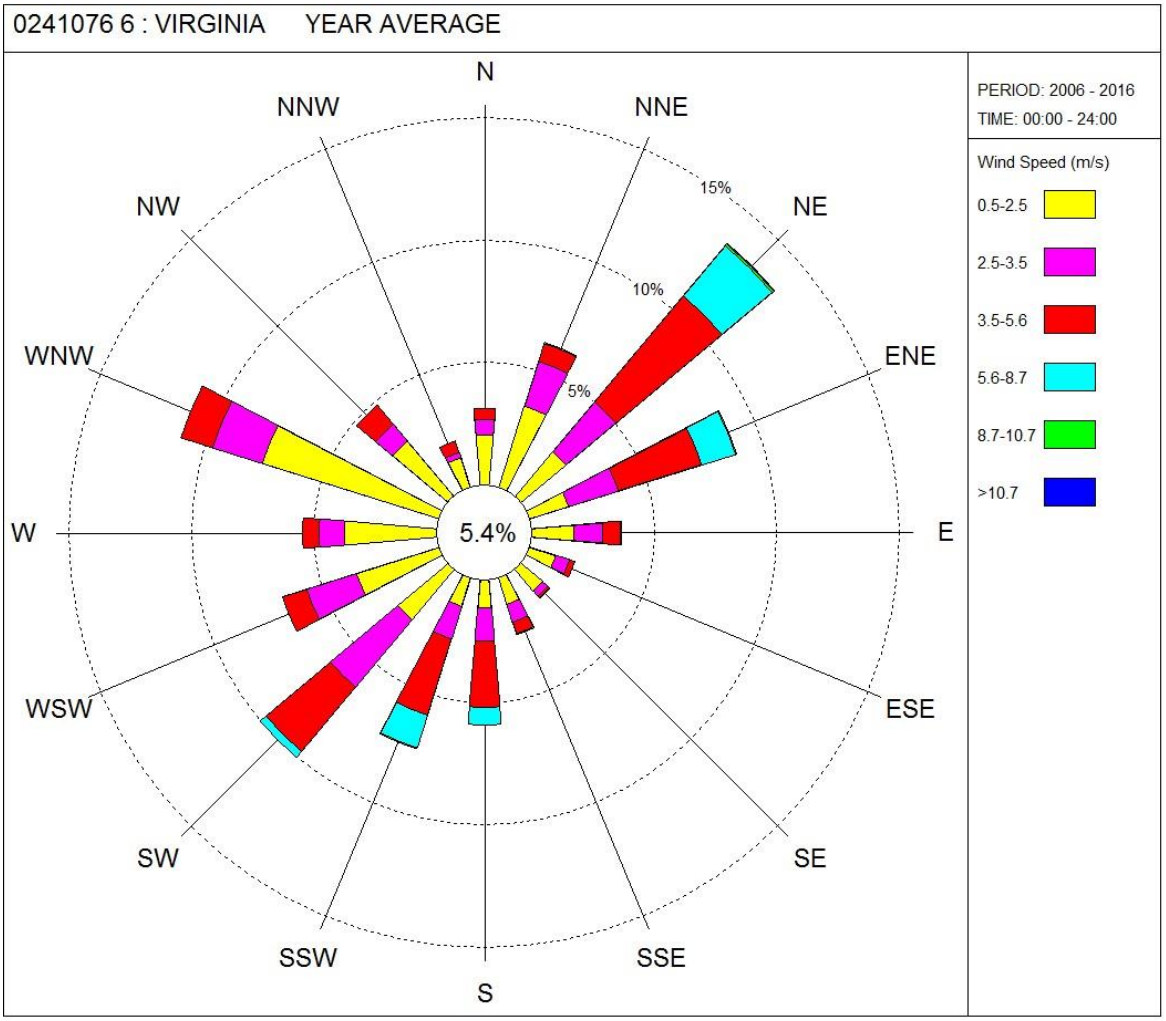


Figure 11: ***Wind rose for the Virginia weather station (2006 – 2016)***

12.2 Geology

A Geophysical and Sediment Sampling Survey of Area 1 and Area 2 (refer to **Figure 8**) was undertaken by the Council for Geoscience (2001). These investigations noted that these initial areas have weak to moderately reflective, even toned planar acoustic facies which is typical of fine to medium grained unconsolidated shelf sand (i.e. normal near shore marine sediments) (Miller and Leuci, 2001).

Grab samples in Area 1 (which encompasses both Site 1 and Site 2) were characterised by light olive to light reddish brown, moderately well sorted to very well sorted, subangular to well rounded, medium-grained, clean free flowing sands with high calcium carbonate contents, low gravel contents and low interstitial mud contents (Miller and Leuci, 2001).

The geology at Site 1 and Site 2 is shown in **Figure 12**.

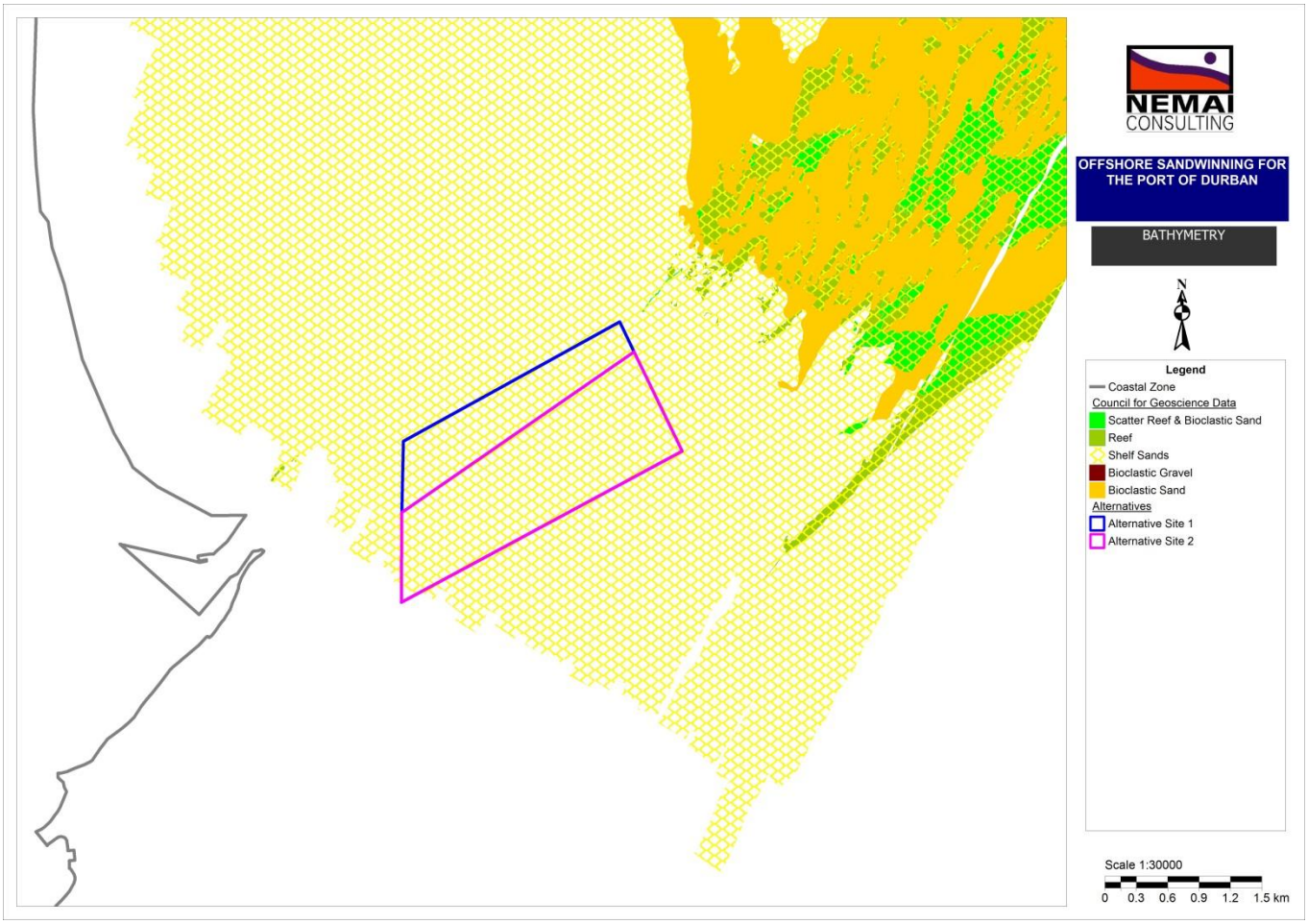


Figure 12: ***Geology***

12.3 Bathymetry

Based on the investigations undertaken by the Council for Geoscience (2001) (refer to **Figure 8**), the bathymetry of Area 1 (which encompasses both Site 1 and Site 2) varies from a minimum depth of -19 m to a maximum depth of - 32m (Miller and Leuci, 2001). The seafloor is dominated by a northern mound which measures ± 2000m in length, ± 750m in width and ± 10m in height, and a southern mound which measures ± 1500m in length, ± 700m in width and 2 -3 m in height (Miller and Leuci, 2001). The bathymetry is otherwise gently undulating with bathymetric gradients steepening towards the east. Bathymetric gradients vary from 0.14° in the central and western parts to 0.69° in the eastern part of Area 1 (Miller and Leuci, 2001).

The bathymetry of the alternative sites is shown in **Figure 13**.

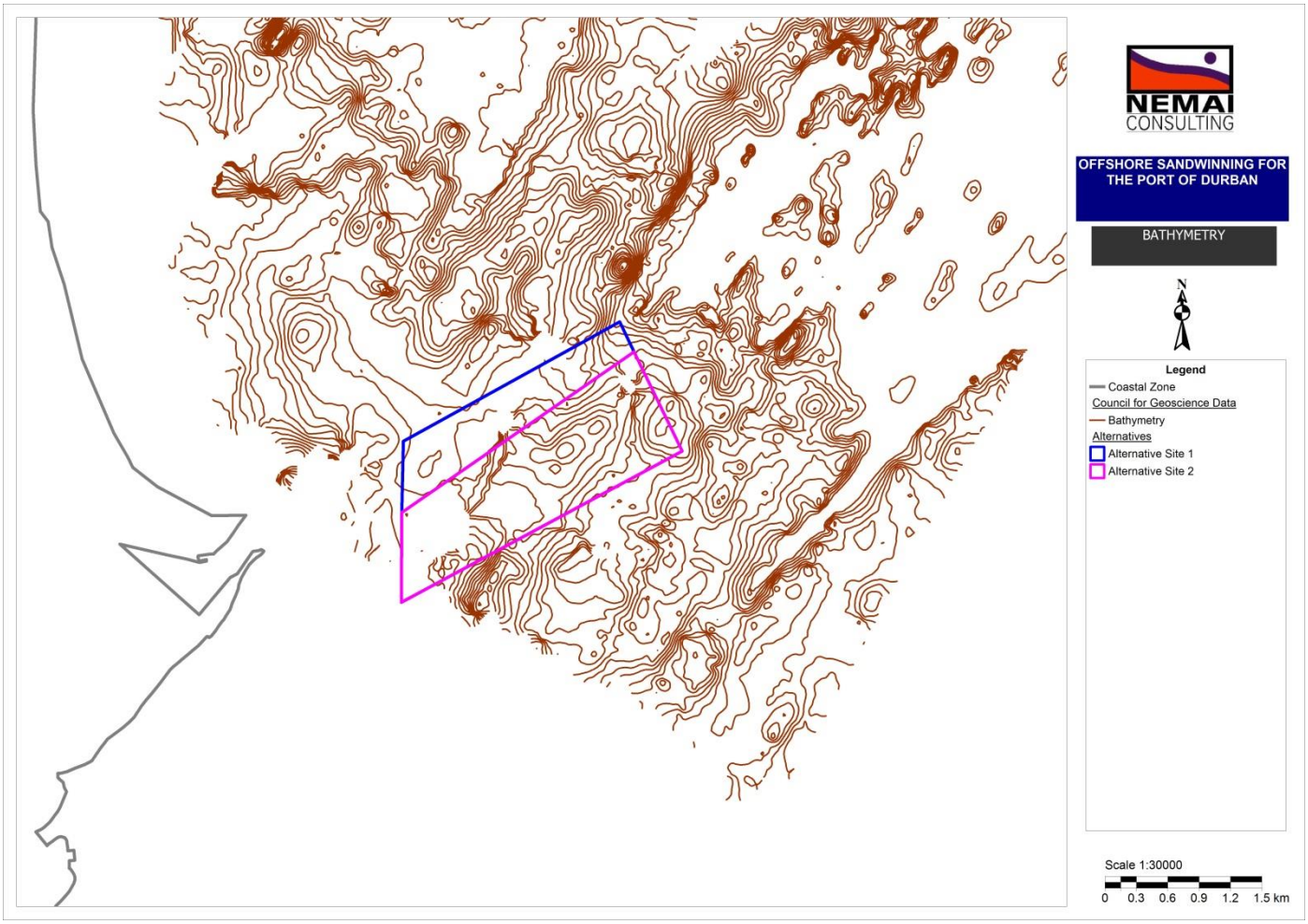


Figure 13: ***Bathymetry***

Hard substrates (including scattered reef exposure and areas where the reef is buried beneath a thin veneer of sediment), which occur in the north-eastern section of Area 1, as well as smaller sonar contacts identified as part of the abovementioned survey are regarded as potential hazards to dredging and should be avoided. Miller and Leuci (2001) identified an 800 m wide corridor adjacent to the western boundary of Area 1 as the most favourable for sandwinning.

12.4 Oceanography

The physical oceanography of an area, particularly water temperature, nutrients, oxygen levels, and wave exposure, are the principal driving forces that shape marine communities. The marine ecosystems off the south-east coast of Africa are influenced by the warm Agulhas Current, which originates off the northern Mozambique coast and sweeps poleward (**Figure 14**). The influence of the current varies along the coast chiefly due to changes in bottom topography (Schumann, 1998). The proposed sandwinning sites are located on the 'Durban Shelf', which is a transition region extending southwards as far as Park Rynie.

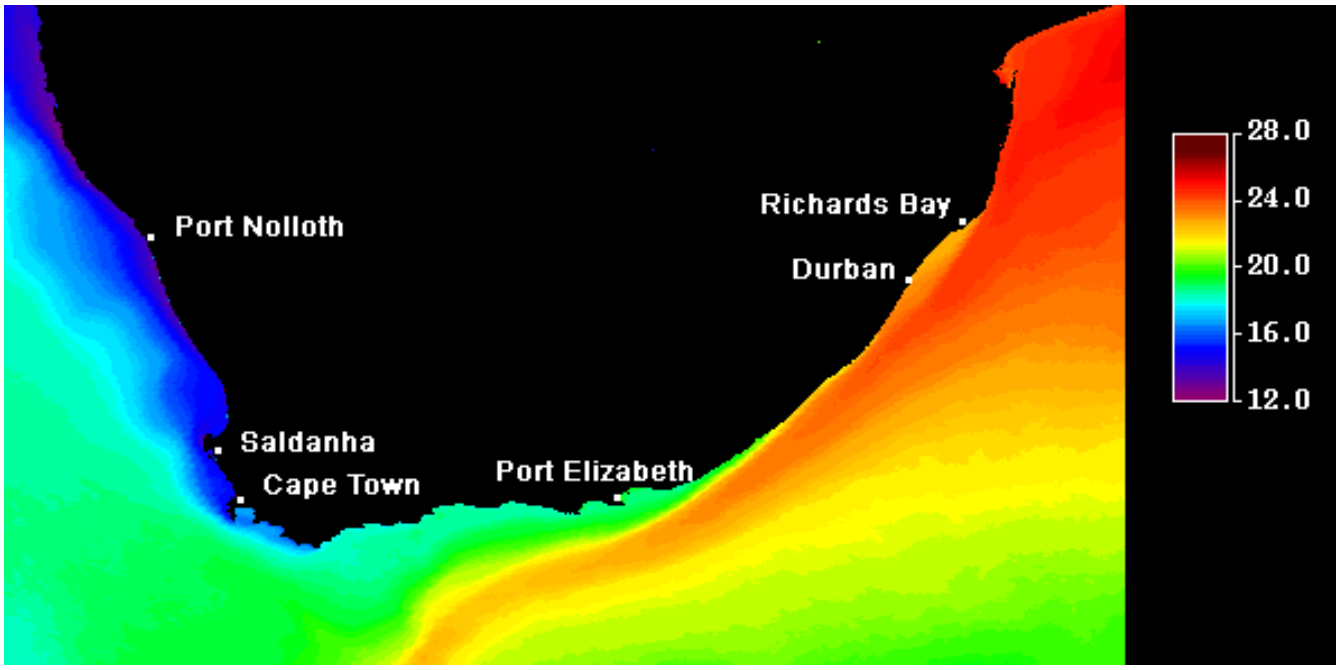


Figure 14: *Nine-year time composite image of average sea surface temperatures in °C showing the warm-water Agulhas Current (red) moving south-west along the east coast and the cool Benguela Current System (blue) moving north-west along the west coast (Source: AquaMODIS 4 km resolution)*

Inshore currents are predominantly north-east and swing gradually to south-west about 50 km offshore, although current reversals are common in the inshore region. A semi-permanent cyclonic eddy exists approximately 55% of the time off Durban and is associated with a well-defined northward coastal current between Park Rynie and Balito Bay (Roberts *et al*., 2010, Guastella and Roberts 2016). Current-reversals depend mainly on the presence of the Durban Eddy and, less frequently, the Natal Pulse, which extends further offshore. Local winds can also contribute to current reversals in near-surface waters (**Figure 15**).

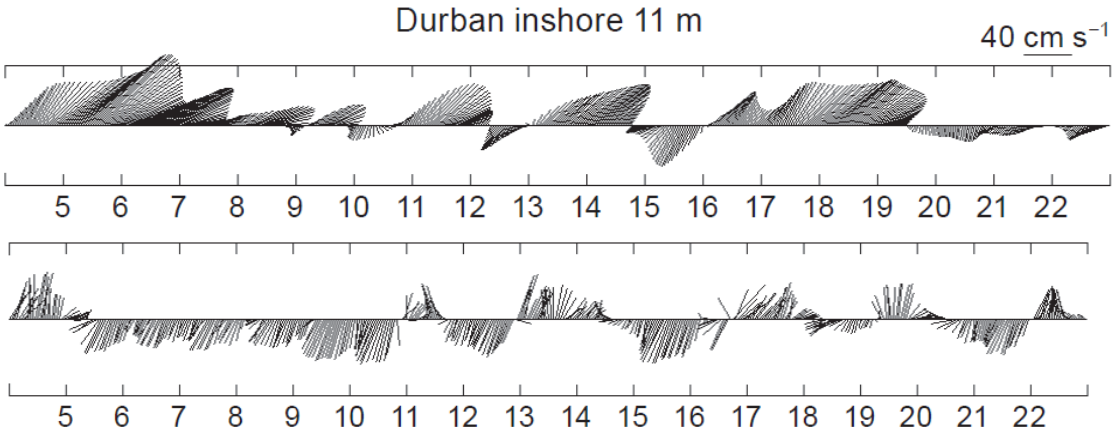


Figure 15: *Inshore currents at 11 m depth (top) and wind vectors at Durban from 4–22 February 2010. Wind direction is rotated 180° to enable comparison with current vectors (i.e. wind direction is 'towards') and north is upwards (Adapted from: Guastella and Roberts 2016)*

12.5 Biogeography

Earlier delineations of marine biogeographic patterns around the coast of South Africa were updated by Sink *et al*. (2012). According to these divisions, Durban falls within the Natal Ecoregion, one of five inshore ecoregions located around the coast. This ecoregion extends from the Mbashe River in the Eastern Cape northwards to St Lucia (Bustamante, 1994, Sink *et al*., 2005) (**Figure 16**).

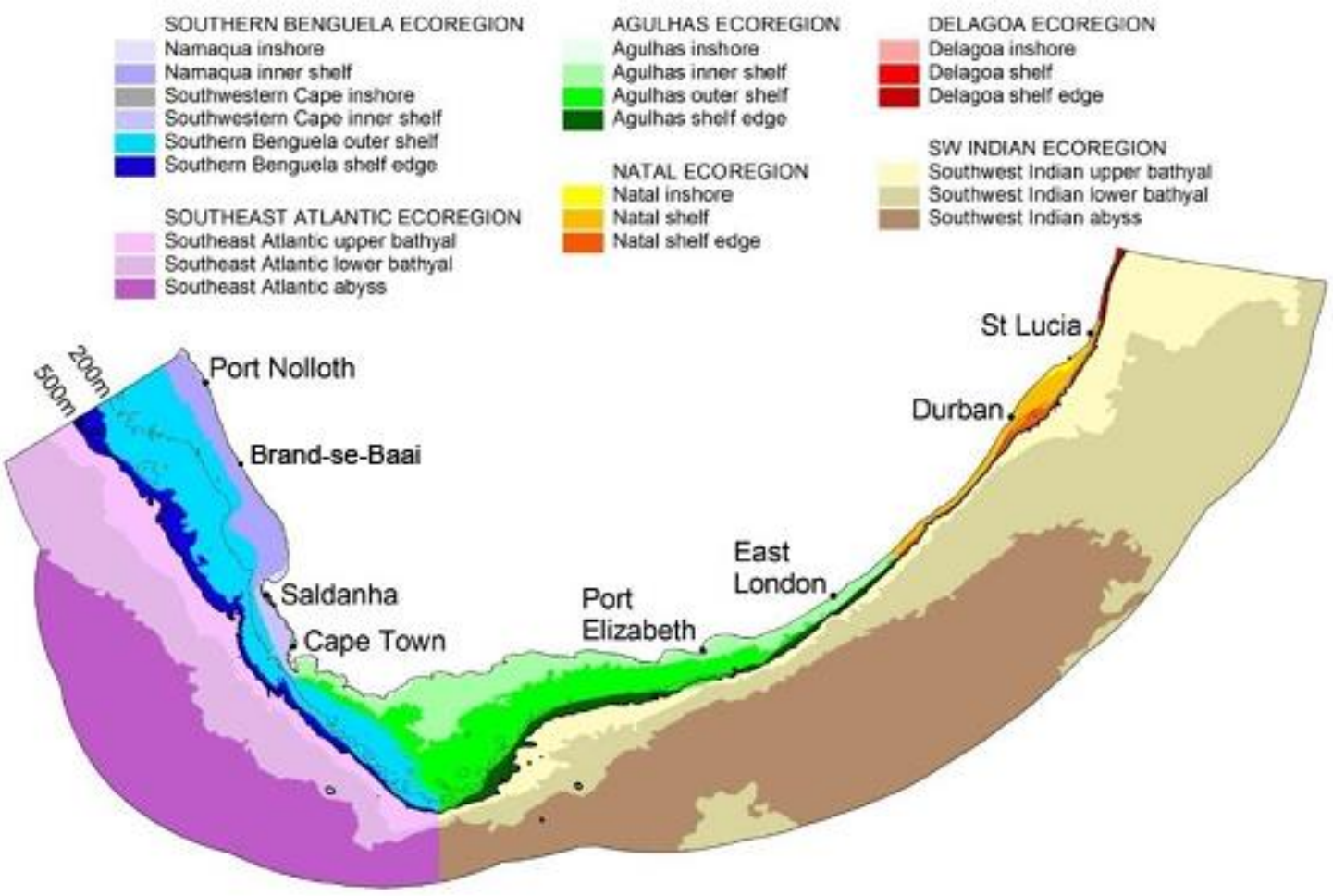


Figure 16: ***Six marine ecoregions with 22 ecozones incorporating biogeographic and depth divisions in the South African marine environment as defined in the 2011 National Biodiversity Assessment (NBA) (Source: Sink et al., 2012)***

12.6 Marine Sensitivity

According to the KZN Marine Systematic Conservation Plan (2012), the proposed sites do not fall within any Critical Biodiversity Area (CBA) (**Figure 17**).

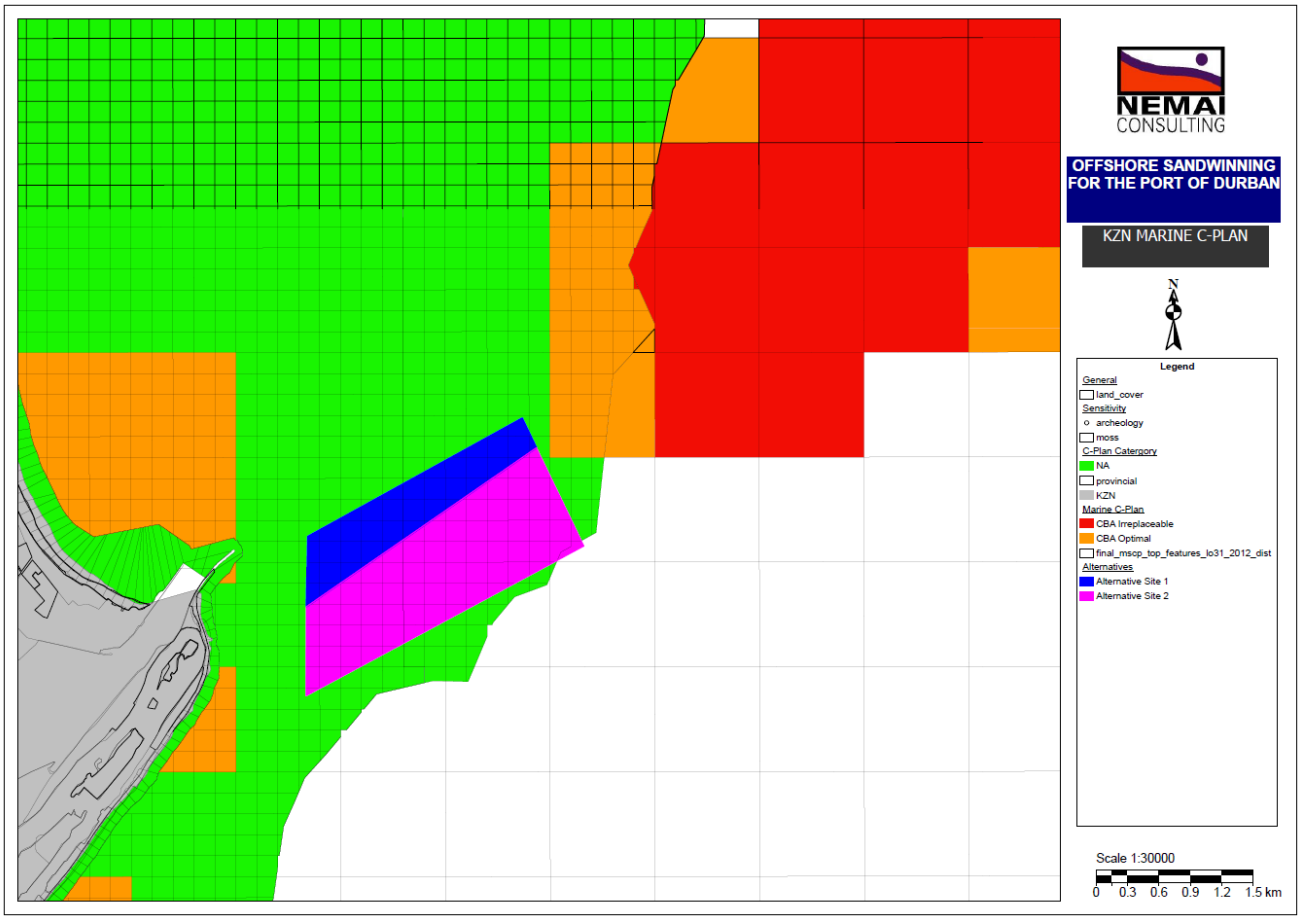


Figure 17: ***KZN Marine Systematic Conservation Plan***

The National Spatial Biodiversity Assessment (NSBA) (2004) was also assessed. This report presents a spatial assessment of the conservation status of selected marine biodiversity patterns in South Africa, at a national scale. It addresses a subset of marine species, and broad scale intertidal and subtidal habitats within South African waters, to the EEZ. The report is aimed at improving biodiversity management in the marine environment.

According to the NBSA, the project area falls into a zone which is moderately protected (**Figure 18**). Furthermore, it falls within the unconsolidated inshore habitat and does not extend into any inshore reef habitat (**Figure 19**).

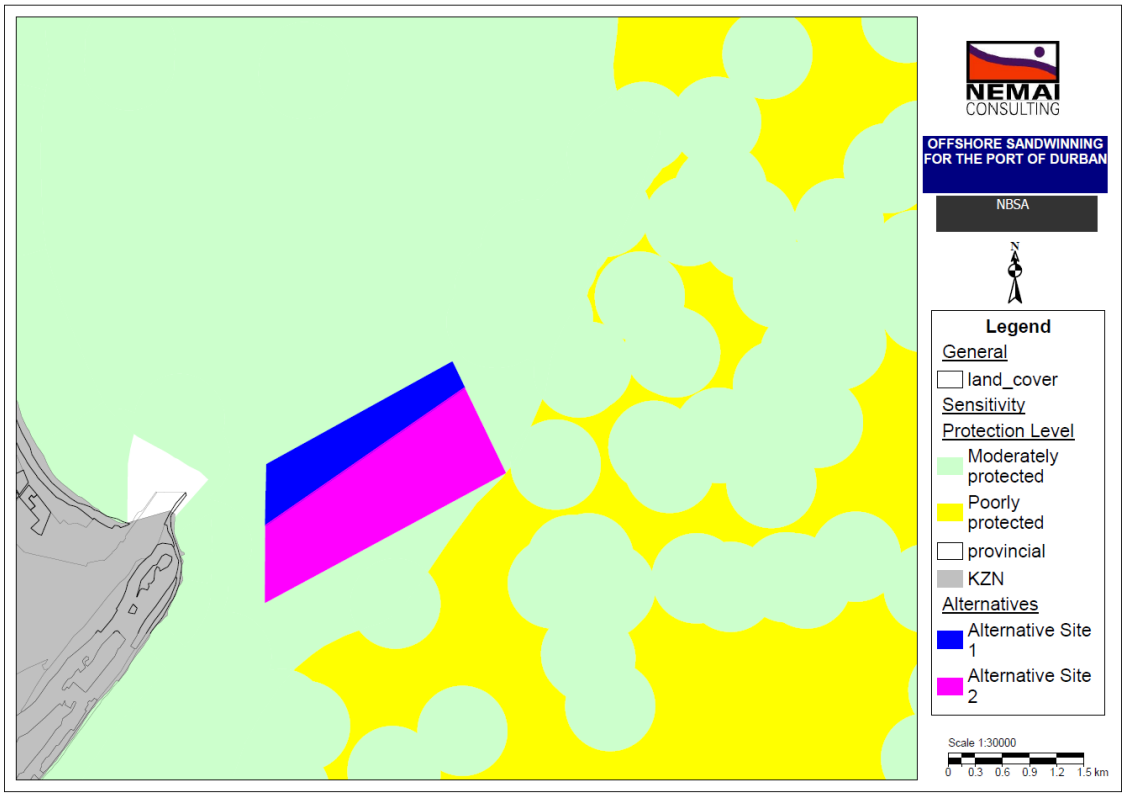


Figure 18: ***NBSA Protection Level***

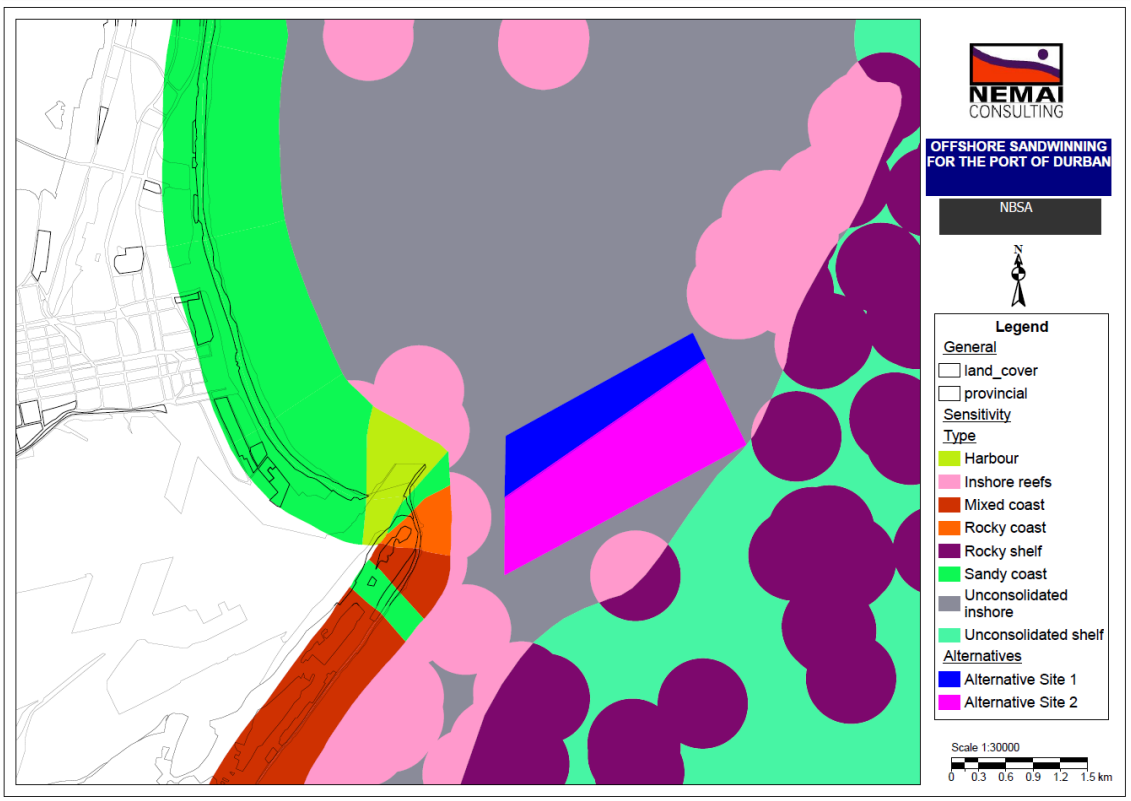


Figure 19: ***NBSA Type***

The report also noted a number of MPAs however the closest of these is the Aliwal Shoal Controlled Zone, Aliwal Shoal Crown Area Restricted Zone and the Aliwal Shoal Produce Restricted Zone, which are approximately 44 km's south west of the proposed sandwinning sites (**Figure 20**).

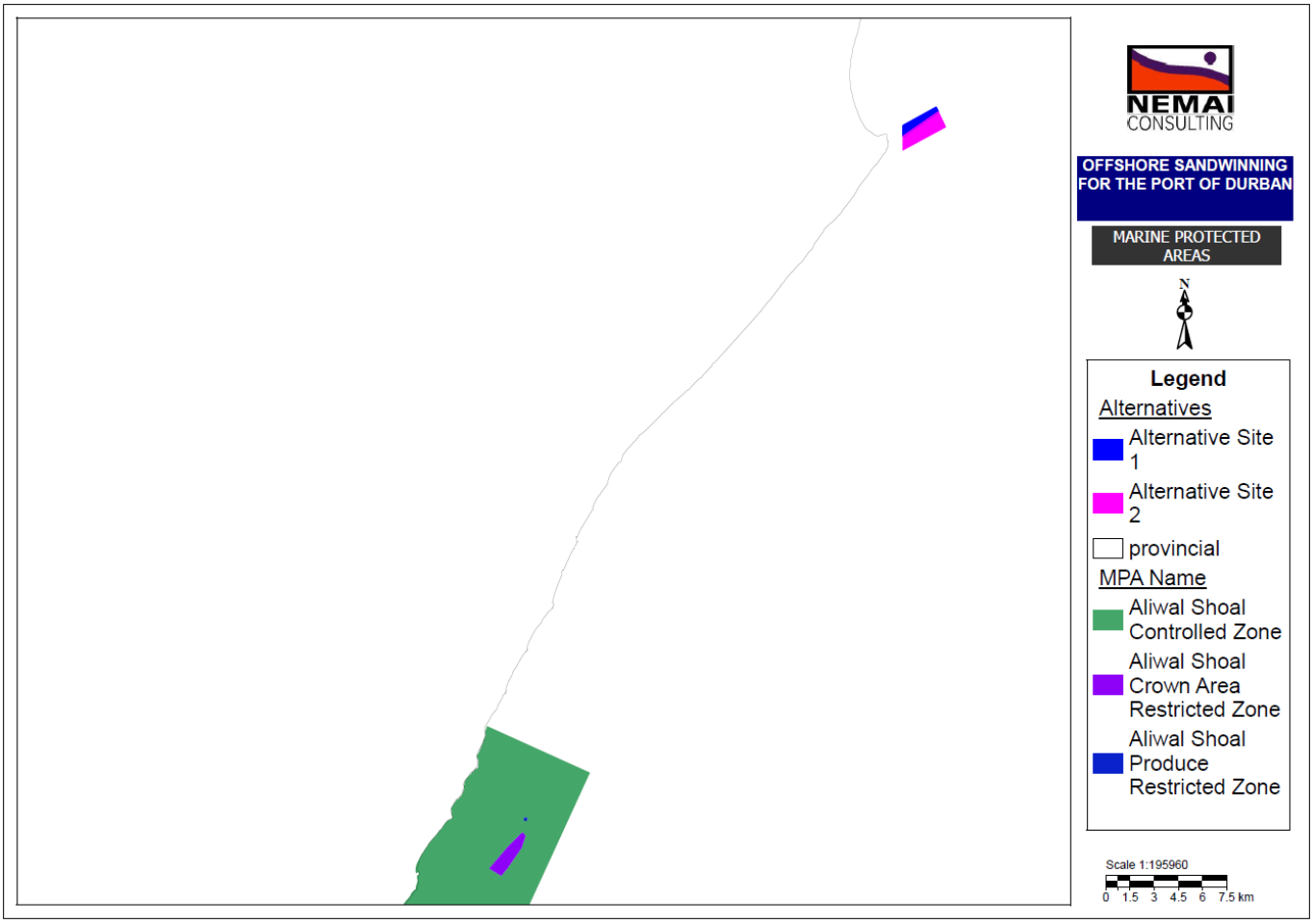


Figure 20: ***Focus areas for offshore protection***

In terms of MPAs, most offshore habitat types are unprotected. The offshore expansion of South Africa's MPA network is a national priority. A collaborative five-year Offshore Marine Protected Area project was undertaken to support the identification of a network of potential offshore spatial management measures including MPAs. The network aims to represent offshore biodiversity, protect vulnerable marine ecosystems, contribute to fisheries sustainability, support the management of bycatch, and provide for research and monitoring. The study found that the closest focus area to the study site was the Tugela Banks area which is approximately 45 km north east of the proposed offshore sandwinning sites (see **Figure 21**).

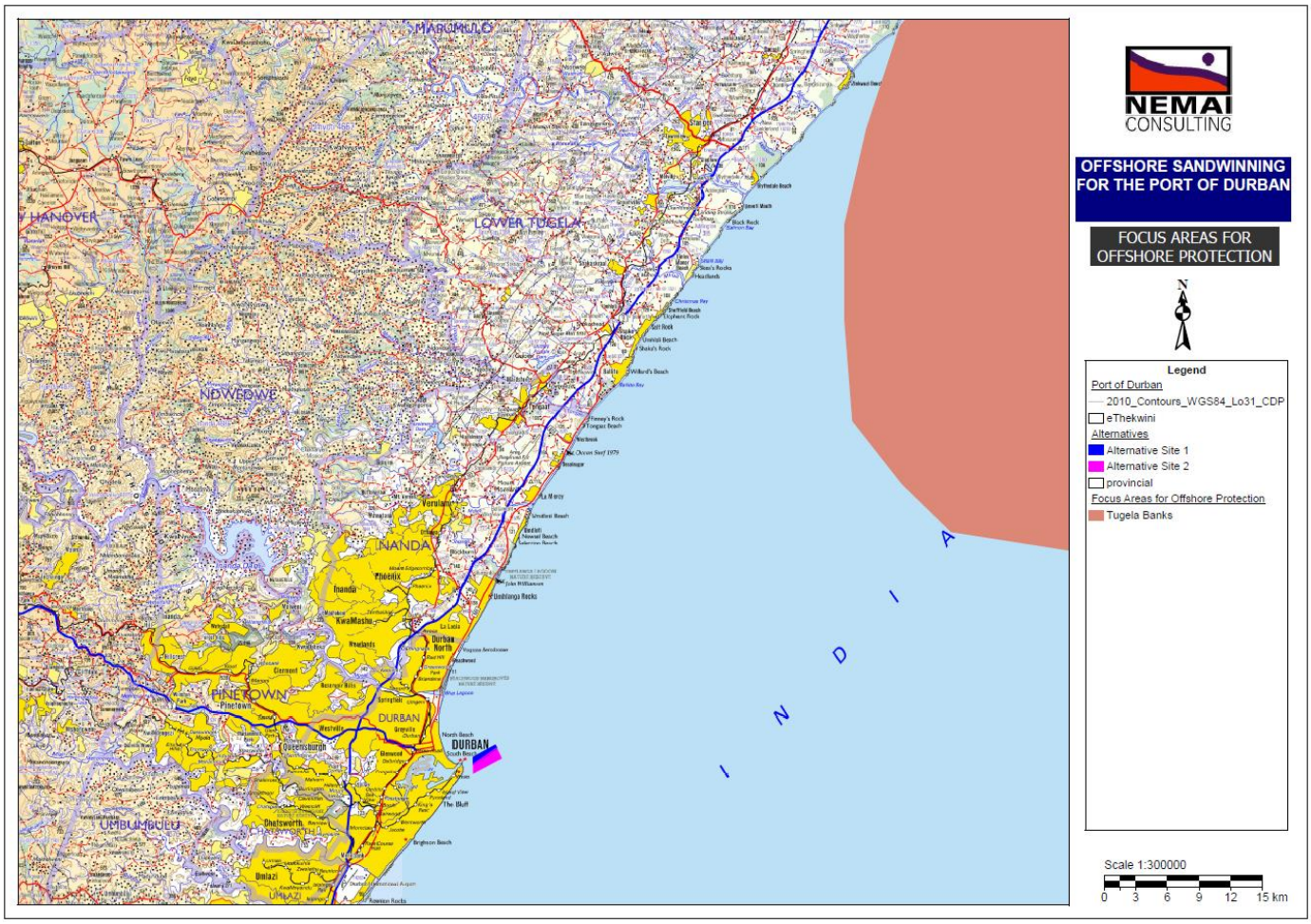


Figure 21: ***Focus areas for offshore protection***

12.7 Avifauna

Due to high levels of disturbance caused by beachgoers and the course-grained sand which is unsuitable habitat for most infauna, Durban beachfront has a poor representation of bird species. Most of the avifaunal community is comprised of gulls, particularly the Grey-headed Gull and Kelp Gull (SABAP 2, 2012). The Cape wagtail, white-fronted plover and pied kingfisher are also regularly seen. During the summer months the occasional Palaearctic migrant may be seen, including the common greenshank, although most of these and other waders prefer the intertidal flats in Durban Harbour. Swift, common and Caspian terns are also found in the area but rarely land on the beaches.

12.8 Water Quality

Water quality characteristics in the inshore waters off Durban Bay are strongly influenced by the prevailing currents, with higher temperature associated with flow from the northeast (up to 22°C), while current switches to the southwest are generally accompanied by a drop in

temperature of around 5°C. Nutrient concentrations in the shelf water off Durban water are reported to be low (Nitrates: = 3.33 µM/l, silicates = 3.71 µM/l and phosphates = 0.62 µM/l, Carter & d'Aubrey, 1998).

Turbidity is a measure of light in the water column, while the amount of Total Suspended Solids (TSS) represents the mass of the inorganic and organic suspended solids (i.e. fine sediment, algae and plankton) per unit volume of water (Anchor Environmental, 2016).

Little data is available on background turbidity in the vicinity of the study area. Previous studies have quantified this using remote sensing satellite imagery for the surrounding ocean within 3 km of the dredge disposal site. A total of eleven 1-km resolution pixel values of the diffuse attenuation coefficient at 490 nm were extracted from a 3-year time composite AquaMODIS image and the average of these calculated (Porter, 2009). The average diffuse attenuation value (m-1) was then converted to turbidity in nephelometric units (NTU) using the following equation (SKM, 2011):

- Turbidity (NTU) = Turbidity (m-1)/0.0123 (R2 = 0.8065)

Turbidity in NTU was then converted to turbidity (suspended solids) in mg.l-1, so that the same units were used as those in the turbidity plume modelling. The following equation was used (SKM, 2011):

- Turbidity (mg.l-1) = Turbidity (NTU) x 0.8405 (R2 = 0.9448)

Average background TSS concentrations at the sandwinning sites were calculated at 8.7 mg/L with an average turbidity of 10.4 NTU (Porter 2009).

12.9 Sediment - Offshore Environment

The geology of the Natal continental shelf was described by Flemming (1981) who classified areas into three sedimentary zones that run parallel to the coast: an inshore "wave dominated nearshore sediment wedge", an intermediate "current controlled central-shelf sand stream" and an offshore "sand depleted outer-shelf gravel pavement". The proposed sandwinning sites are located within the nearshore sediment wedge.

A Geophysical and Sediment Sampling Survey of Area 1 and Area 2 (refer to **Figure 8**) was undertaken by the Council for Geoscience (2001), with the following purpose:

- Produce a bathymetric chart of the areas;
- Produce a side-scan sonar mosaic of the areas to show the nature of the seafloor;
- Assess unconsolidated sediment thickness in the areas;
- Collect grab samples to assess sediment distribution patterns in the areas;
- Collect sediment cores at selected sites within the areas to assess sediment variation with depth;

- Make recommendations regarding the suitability of each of the areas for sandwinning; and
- Delineate the most suitable areas for sandwinning.

As mentioned in **Section 11.1**, Area 1 (which encompasses both Site 1 and Site 2) was identified as the most favourable area for sandwinning. Contributing factors included the lack of reef exposure, close proximity to the harbour entrance, the sparse nature of debris accumulations and availability of adequate sediment thickness (3 - 4 m) (Miller and Leuci, 2001).

Area 1 has a large area of sediment cover on gently sloping seafloor in shallow water. The average thickness of unconsolidated sediment is estimated at 3.6 m but ranges from 0 m on the reef outcrops to a maximum of 9.5 m. Grab and core samples indicate that sediments in Area 1 are generally coarse grained with a low mud and calcium carbonate content (Miller and Leuci, 2001). Sedimentary characteristics for Area 1 are shown in **Table 12**.

Table 12: ***Representative sediment characteristics of Area 1 sediment samples (Miller and Leuci, 2001)***

	Median mm	Mean mm	Sorting	Gravel %	Mud %	Dry Density	$CaCO_3$ %
Grabs (*n = 16*)	0.304	0.322	0.45	0.49	1.34	1.622 T/m^3	12.77
Cores (*n = 30*)	0.256	0.276	0.51	3.73	1.64	1.602 T/m^3	17.64
All (*n = 46*)	**0.273**	**0.292**	**0.49**	**2.6**	**1.54**	**1.609 T/m^3**	**15.95**

12.10 Marine Biota

12.10.1 Phytoplankton and Zooplankton

Carter & Schleyer (1998) provide a summary of available information on phytoplankton communities of the KwaZulu-Natal shelf region. Chlorophyll-a concentrations in this region are reportedly low (at least an order or magnitude lower than those in the southern Benguela off the west coast of South Africa), and show little variability. Carter & Schleyer (1998) indicate that measured concentrations of chlorophyll-a in this region range from around 0.03 to 3.88 µg/l. Concentrations are highest at around 10 m depth but do not show strong variation with depth. Chlorophyll-a concentrations are higher in inshore water relative to offshore waters, being on the upper end of the range reported above rather than the lower end. Seasonal variations in phytoplankton production have been reported, with production peaking in spring (Schleyer 1981).

Zooplankton biomass in the inshore waters of Natal is reported to be highly variable but can attain moderate to high concentrations, especially close inshore (Carter & Schleyer 1998). Average zooplankton biomass for the region is reported as 0.285 ml/m3 (= 45.6 mg/DW/m^3, Raymont, 1983).

12.10.2 Intertidal (sandy beach) benthic invertebrates

Invertebrate macrofauna from four beaches in KZN have been studied and described by (Dye *et al*., 1981). None of these sites were located close to Durban Bay, the closest sites being Kelso beach approximately 25 km south of Durban and Blythedale beach at least 50 km to the north. At the time of sampling these beaches were relatively undisturbed and probably support a much higher abundance and diversity of fauna than those in Durban Bay which are affected by a range of impacts including coastal development, port development, beach nourishment, impaired water quality and high levels of human traffic. That said, Dye *et al*. (1981) list a total of 5 and 9 species of macroinvertebrates (organisms larger than 1 mm) on the two beaches on the northern KZN coast (Sodwana Bay and St Lucia respectively), and only one species (the ghost crab *Ocypode ryderi*) from the beaches close to Durban (Kelso and Blythedale). They attribute the low diversity of macrofauna on the latter two beaches to the very coarse nature of the sediments on these two beaches (median particle: 864 and 992 µm respectively). Dye *et al*. (1981) also surveyed meiofauna (organisms smaller than 1mm) on these beaches and reported large meiofaunal assemblages at the two sites close to Durban, reaching densities up to 2.0-3.74 x 106 ind./m2, at Blythedale and Kelso, respectively. Abundance values at these site were greater than those reported for St Lucia (max = 0.95 x 106 ind./m2) or Sodwana Bay (1.08 x 106 ind./m2).

12.10.3 Soft bottom benthic macrofauna

Surveys of benthic invertebrates living in sediments off the KZN coast date back to the 1900s when the Government of the Cape appointed Dr J.D. Gilchrist to take charge of fisheries and marine biological surveys of the region. These early survey provide some useful insights into the characteristics of the fauna of the region but far more comprehensive surveys have been undertaken more recently in an effort to assess the impacts of wastewater discharges on the marine environment off Durban. These more recent surveys have yielded over 372 identifiable taxa (species) for the region. The nearshore sandy benthos is diverse with a total of 198 invertebrate macrofauna species known to the area (CSIR in 1995). Moderate diversity at the site from which the data was collected (and the proposed sandwinning sites) is to be expected as abundance and diversity seem to peak some distance offshore of the proposed dredge sites (in around 60 m water depth) and declines offshore and inshore of this point (McClurg 1998). Furthermore, it is well documented that benthic invertebrate diversity is greatest along the east coast of South Africa as opposed to the south or west coast (Sink *et al*., 2011).

In terms of community composition, 45% of the 198 species listed consist of Polychaeta, 19% Amphipoda, 7% bivalvia and 5% Brachyura with following taxa constituting the remainder: Actinaria; Anomura; Caridea; Cumacea; Echinoidea; Gastropoda; Holothuroidea; Isopoda; Mysida; Nemertea; Ophiuroidea; Ostracoda; Penaeidea; Sipunculida and

Tanaidacea. Meiofauna are reportedly dominated by Nematode worms, followed by annelids (turbellarians) and arthropods (harpacticoid copepods).

12.10.4 Fish

Indo-Pacific fish fauna constitute about 74% of the ~1 192 species found in KwaZulu Natal waters (van der Elst, 1988). These species inhabit tropical reefs, shallow intertidal areas, soft sediment habitat, pelagic waters and/or deeper shelf waters.

Data on ichthyofauna from sandy habitats in the vicinity of Area 1 are scarce. Beckley and Fennessey (1996) report on catches made by the beach seine fishery off Durban. These data, although representative of sandy bottom fish fauna closer inshore (up to 300 m from the beach and 6 m water depth) provide a description of the fish likely to occur on the proposed sandwinning sites. A total of 119 fish species, as well as cuttlefish, squid and crabs were recorded in catches. Numerically dominant in catches were small shoaling clupeids (e.g. sardines), engraulids (e.g. anchovy) and species of leiognathidae that typically feed in the water column. Approximately a third of the species recorded in catches are in some way associated with the benthos and may be impacted by sandwinning operations (**Table 13**). These include several commercially important species of sciaenids (croakers and drums), haemulids (grunters) and a number of elasmobranch species. The soft sediment provides primary habitat and feeding grounds for these and many other species that travel from nearby rocky reefs to feed on invertebrates.

Table 13: ***Demersal fish species recorded during beach seine-net surveys in Durban Bay (Beckley and Fennessey 1996)***

Species	Common name	Species	Common name
Teleosts		*Pomadasys maculatum*	Saddle grunter
Argyrosomus japonicus	Dusky kob	*Pomadasys olivaceum*	Olive grunter
Argyrosomus thorpeii	Squaretail kob	*Pseudorhombus elevatus*	Ringed flounder
Cociella sp.	Spotfin flathead	*Saurida undosquamis*	Largescale lizzardfish
Cynoglossus lida	Roughscale tongue sole	*Sillago sihama*	Silver sillago
Johnius dussumieri	Mini-kob	*Umbrina robinsoni*	Slender baardman
Lithognathus mormyrus	Sand steenbras	Elasmobranchs	
Otolithes ruber	Snapper kob	*Aetobatus narinari*	Spotted eagleray
Paralichthodes algoensis	Measels flounder	*Dasyatis chrysonota*	Blue stingray
Paraplagusia bilineata	Fringelip tonguefish	*Dasyatis kuhlii*	Blue spotted sting ray
Parupeneus macronema	Band-dot goatfish	*Gymnura natalensis*	Butterfly ray
Parupeneus rubescens	Blacksaddle goat fish	*Himantura gerrardi*	Sharpnose stingray
Platycephalus indicus	Bartail flathead	*Rhinobatos annulatus*	Lesser guitarfish
Plotosus lineatus	Striped eel catfish	*Rhinobatos leucospilus*	Greyspot guitarfish
Pomadasys commersonnii	Spotted grunter	*Rhyncobatos djiddensis*	Giant guitarfish
Pomadasys kaakan	Javelin grunter	*Torpedo sinuspersici*	Marbled electric ray

12.11 Socio-Economic Environment

As the proposed development is related to an offshore environment it is difficult to provide an overview of the socio-economic environment. However, as the proposed activity is required for development within the Port of Durban, an overview of the Port is provided below.

The Port of Durban can be seen as the premier gateway Port in South Africa and as the South African economy grows, so does the need for a greater capacity to cater for growing freight volumes at the Port. Major growth areas for the Port are seen to be in containers. In 2002 the Port handled 1.31m TEUs and in 2016 the Port handled 2.62m TEUs, which is double the volume handled 15 years ago. The trend on increased container volumes will continue, however at a lower rate. Over the next 10 years, container demand is expected to grow from 2.6m TEUs to 3.7m TEUs.

12.12 Maritime Archaeology

Since the British ship Good Hope was wrecked in Durban in 1685 (Turner, 1988), over 141 ships have been wrecked in or near Durban Harbour. Of these, 38 were salvaged or removed, either at the time of the event or years later, as in the case of the Karin. Of the 101 remaining wrecks, 14 were scuttled in the deep water either off the Bluff or about 5km away from Durban; 28 were wrecked in or near the entrance to the harbour and the remaining 61 were wrecked on the Durban Beach areas or the Outer Anchorage.

The shipwreck database highlights the large quantities of wrecks that are in the area. There are wreck trap areas; these are areas where there is a higher concentration of wrecks due to prevailing weather conditions and the limitations of historical shipping. For Durban the two most prominent traps were Back Beach and the Bar. Today, these areas are just offshore, north of the harbour; and the Harbour mouth – part of Site 1 and Site 2 (in Area 1), which are more likely to have a high concentration of Maritime Underwater Cultural Heritage (MUCH) sites.

The possible occurrence of shipwrecks at Site 1 and Site 2 (in Area 1), based on the Shipwreck Database, is contained in the Underwater Heritage Impact Assessment (African Centre for Heritage Activities, 2016) (refer to **Section 13.2**).

12.13 Tourism

The main tourist areas around the site include the Marinas, swimming beaches north of the Harbour entrance and uShaka Marine World (located approximately 2.3 km to the west of Site 1). Diving is a popular sport in the area and daily launches from the beach at Vetch's Pier provide income for a number of beachfront businesses. Recreational and commercial fishers also launch and fish in the area.

According to the eThekwini Municipality (2016), tourism remains one of the most significant components of the metropolitan economy. Recreation opportunity is considered to be the main tourist resource and is based largely on the natural qualities of the coast. The coastline and beaches are significant tourist anchors for accommodation, commercial and entertainment development.

Overall, tourism is highly dependent on beaches and thus the beaches of Durban are considered a valuable ecotourism resource. Construction of the harbour began in 1857 and later included a large sand trap area just south of the harbour mouth to collect sand moving northward and to prevent the entrance from being blocked up. This interrupted the supply of sand to the northern beaches and as a result, they became severely eroded. In order to counter the erosion, a sand pumping scheme was implemented in 1935, whereby the sand trap was emptied with a dredger and the sediment pumped to the northern beaches. This proved unsuccessful and erosion continued despite further pumping schemes and the construction of the Paterson Groynes in the mid 1950's. Further studies resulted in the implementation of the current scheme which was commissioned in 1982 to replenish the eroded beaches. This included continuation of the sand pumping scheme together with the replacement of the Paterson Groynes with two low-level groynes built in 1983 and 1985 and a third groyne built in 1987/88 to create acceptable beach profiles. The sand trap does not trap at 100% efficiency, however it is assumed that the pumped volume closely represents the sediment volume entering the sand trap i.e. natural littoral drift. Mather *et al.* (2003) conclude that the scheme achieved its objectives and report a constant supply of sand to Durban's beaches at an average volume of 280 000 m^3 per annum.

13 SUMMARY OF SPECIALIST STUDIES

13.1 Introduction

The requisite specialist studies identified during the Scoping phase, which were conducted as part of the EIA, included a Marine Impact Assessment and Underwater Heritage Impact Assessment. In addition, technical studies undertaken included a Wave Modelling Study, Sediment Analysis and a previous Geophysical and Sediment Sampling Survey (Council for Geoscience, 2001).

For the inclusion of the findings of the Specialist Studies into the EIA report, the following guideline was used: *Guideline for the review of specialist input in EIA processes (Keatimilwe & Ashton, 2005)*. Key considerations included:

- Ensuring that the specialists have adequately addressed IAPs' issues;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and

- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective Specialist Studies was incorporated into the EIA report in the following manner:

6. A summary of each specialist study is contained in the sub-sections to follow, focusing on the approach to the study, key findings and conclusions drawn;
7. The Specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 14**;
8. The evaluations performed by the specialists on the alternatives of the project components were included in the comparative analysis (**Section 15**) to identify the most favourable option;
9. Specialist input was obtained to address comments made by IAPs that related to specific environmental features pertaining to each specialist discipline; and
10. Salient recommendations made by the specialists were taken forward to the EIA Conclusions and Recommendations (**Section 17**).

13.2 Marine Impact Assessment

13.2.1 Scope of Specialist Study

A summary of key issues and triggers identified during Scoping include the following:

- Alteration of sediment habitat;
- Impacts of dredging on water quality (increased turbidity) and related impacts on benthic organisms, fish, crustaceans and water birds;
- Potential mobilisation of contaminants;
- Impacts to inshore hydrodynamics;
- Potential for shoreline erosion due to change in sea floor bathymetry at offshore sandwinning site.

The scope of the Marine Impact Assessment included the following:

1. A description of the affected environment.
2. An assessment of potential impacts to marine ecology around the sandwinning site.
3. Identification of appropriate and feasible mitigation measures to reduce negative impacts of project related activities on marine habitats and species in the vicinity of the sandwinning site.

13.2.2 Details of Specialist

Details of the nominated specialist who undertook the study are as follows:

Organisation:	Anchor Environmental Consultants
Name:	Barry Clark

Qualifications:	PhD - Marine Biology
No. of years' experience:	15
Affiliation (if applicable):	• Professional Natural Scientist: South African Council for Natural Scientific Professions • Professional Member of South African Institute of Ecologists and Environmental Scientists • South African representative to the SURVAS Network (Synthesis and Upscaling of Sea-level Rise Vulnerability Assessment Studies) • Member of International Association of Impact Assessors • Member of Subsistence Fisheries Advisory Group • Member of the South African Network for Coastal and Oceanic Research (SANCOR) Economics Task Team

13.2.3 Summary of Study

This section provides a summary of the Marine Impact Assessment Study (Anchor Environmental, 2016), as contained in **Appendix F1**.

13.2.3.1 Impact assessment

A total of eight potential environmental impacts were assessed, ranging from habitat alteration to shoreline erosion (**Table 14**). Impact assessments for Site 1 and Site 2 were grouped together as no differences in marine life or sediment quality are expected. Identified impacts ranged from 'moderate' to 'insignificant' severity. Results from previous sediment plume analysis and shoreline stability specialist studies predicted no significant impacts associated with increased turbidity levels and beach erosion (ZAA 2012 & 2016). Impacts on benthic macrofauna and fish are likely to be temporary and full recovery of the impacted area is expected within a one to two year period following the final sandwinning event. Details of the potential impacts are discussed in **Section 14.2**.

Table 14: Impact ratings before and after the implementation of mitigation (Anchor Environmental, 2016)

Impact identified	Significance before mitigation	Significance after mitigation
Impact 1: Alteration of subtidal soft sediment habitat	**MODERATE**	n/a
Impact 2: Disturbance of mobile organisms	**MODERATE**	n/a
Impact 3: Turbidity plumes created by dredging	**LOW**	n/a
Impact 4: Smothering of benthic marine organisms	**LOW**	n/a
Impact 5: Mobilisation of contaminants and nutrients	**VERY LOW**	n/a
Impact 6: Disposal of solid waste & spillage of hazardous substances	**MODERATE**	**LOW**
Impact 7: Shoreline erosion	**INSIGNIFICANT**	n/a
Impact 8: Inshore hydrodynamics	**LOW**	n/a

13.2.3.2 Mitigation measures

Interventions to alleviate the severity of the impacts identified for sandwinning were divided into two categories: required and recommended depending on the severity of the impact.

Mitigation measures required for sandwinning operations include:

- Suitable handling and disposal protocols for solid waste;
- Implementation of the 'reduce, reuse, recycle' ethos;
- Adequate spill protection for fuel and oil;
- Strict monitoring of vessels for fuel leaks; and
- Implementation of a rigorous environmental management and control plan for the spillage of hazardous substances.

13.2.3.3 Conclusions

Based on data from hydrological and sediment modelling, geotechnical investigations (i.e. Geophysical and Sediment Sampling Survey undertaken by the Council for Geoscience, 2001) and the marine environmental study, impacts from sandwinning at the alternative sandwinning sites are unlikely to differ when viewed from a marine environmental perspective.

As sediment within Area 1 is relatively coarse, only a small plume area is likely to result from sandwinning operations. As a result, monitoring of turbidity levels (i.e. TSS) during sandwinning is not considered necessary.

Apart from the historical offshore disposal site that overlaps the south-eastern corner of Site 2, no sources of sediment contamination have been identified in Area 1. Due to the fact that the offshore disposal site was decommissioned in the 1900's and that strong alongshore currents disperse fine particles (which may have higher contaminant loading), it is unlikely that any fine sediment originating from the Port of Durban still exists within Area 1. Refer to **Section 13.6** for the findings of the assessment of the sediment quality.

13.3 Underwater Heritage Impact Assessment

13.3.1 Scope of Specialist Study

The key issues and triggers identified during Scoping for this study include the following:

- Potential occurrence of heritage resources such as shipwrecks at the offshore sandwinning sites.

The objectives were to identify potential MUCH sites within the designated areas, evaluate the potential impact of dredging in the designated areas, and to recommend measures to mitigate any negative impacts on MUCH sites in the designated areas.

13.3.2 Details of Specialist

Details of the nominated specialist who undertook the study are as follows:

Organisation:	African Centre for Heritage Activities
Name:	Vanessa Maitland
Qualifications:	B.A. (Hons) – Archaeology
No. of years' experience:	8 years
Affiliation (if applicable):	Association for South African Professional Archaeologists

13.3.3 Summary of Study

This section provides a summary of the Underwater Heritage Impact Assessment (African Centre for Heritage Activities, 2016), as contained in **Appendix F2**.

The approach to the Underwater Heritage Impact Assessment included the following:

- Conduct desktop study and compile a shipwreck database from the available written and oral sources;
- Magnetometer (mag) survey of the designated areas;
- Diver searches on the magnetic anomalies (hits) to ascertain the nature of the sites.

13.3.3.1 Shipwreck Database

The database of potential shipwrecks at the sandwinning sites is contained in **Table 15**, based on the Shipwreck Database Zones shown in **Figure 22**. According to the database there are at least 35 vessels that may be found in this area. These vessels are either known to have sunk in the vicinity or there is insufficient data to ascertain their whereabouts.

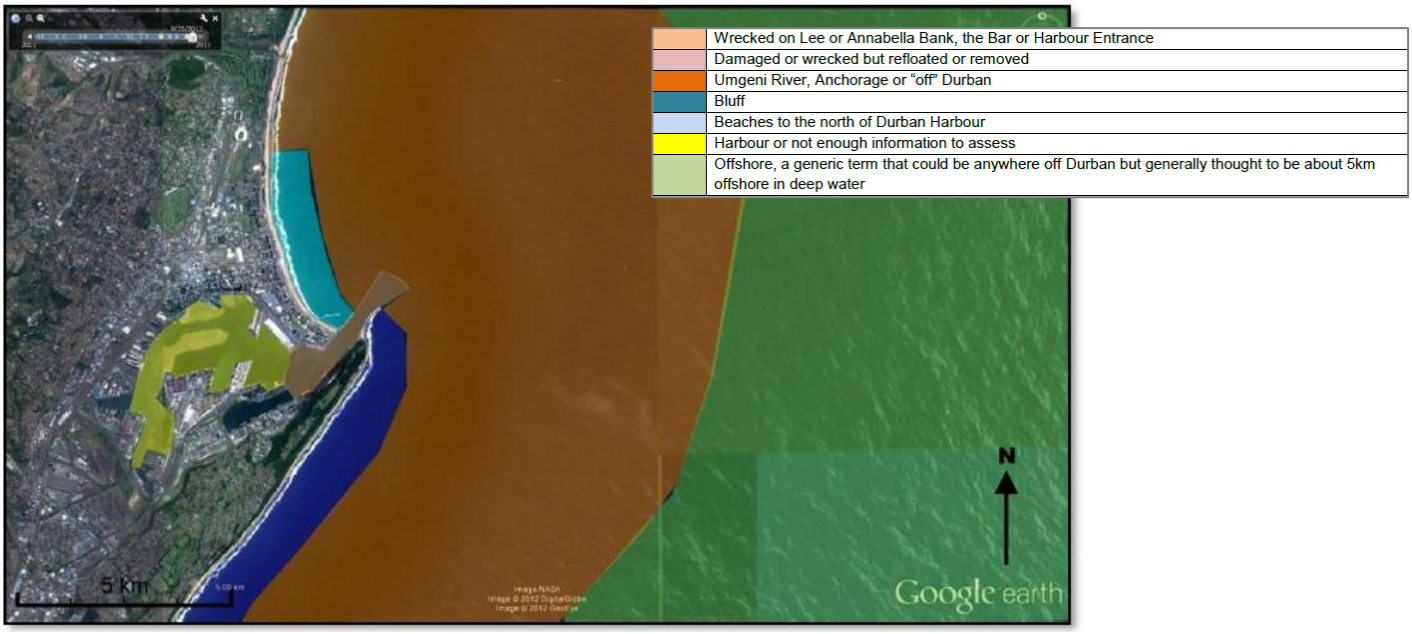


Figure 22: Durban Harbour area showing Shipwreck Database Zones (African Centre for Heritage Activities, 2016) (note: colour code based on Table 15)

Table 15: Shipwreck Database (African Centre for Heritage Activities, 2016)

Name	Events	Home Port	Date	History
Altcar	Marooned – Refloated	Britain - Australia	31 August 1880	Off the Bluff. On 19-04-1880 it put into Durban with the lower deck beams broken while on passage from London to New South Wales with machinery and railway plant. On 31-08-1880, it was stranded off the Bluff at Durban, report described vessel as a 'floating coffin'. It was refloated because it continued to be listed in Lloyd's Register of Shipping until 1909.
Ann	Wrecked		1826	Entrance to Durban Harbour. One of the crew, Charles Rawdon MacLean changed his name to John Ross.
Blink	Scuttled		22 January 1940	Scuttled 6km from Durban. The *Blink* once worked with the *Skarpjeden*, the *Hogni* and the *Norman II*. *The Norman II* sank off Zululand in 1925. The *Hogni* was scuttled in 1936 and the *Skarpjeden* had been scrapped. The *Blink*, stripped of her machinery, gear and funnel was taken 6 km from Durban and scuttled. This may be the Cooper Light Wreck.
Cetus	Aground – Refloated	South Africa	2 April 1912	Southern Breakwater. The vessel was returning to Durban Harbour when she was driven onto the Southern Breakwater by heavy seas.
City of Lima	Sank – Wrecked	Britain	21 July 1883	Sank 1km from shore on the Durban Bar Ridge during an east-north-east wind. The crew and working party of 22 were saved by life boat and the barque capsized 45 minutes later. No lives were lost. The Court of Inquiry censured the Mate for a "general lax state of affairs" and the Master "for being on shore every night".
Colombo	Foundered – Wrecked	Dutch	24 September 1822	Off Port Natal.
Dora P. (ex *Pro-Patria*, ex *Steamer*, ex *Calshot*)	Scuttled		18 April 1950	Offshore? The vessel burned 160 km off Durban when an engine room fire ignited her cargo. The 7 200-ton British steamer *Avismere*, the British tanker *Prestige* and the Durban Harbour tug *T. Erikson* responded to her SOS. The crew were taken aboard the *Avismere* and the gutted vessel was taken to port by the *H.M.S.A.S. Bloemfontein*. Afterwards she was sunk by gunfire from the *Jan Van Riebeeck*.
Elizabeth	Sank		11 January 1878	Anchorage. The *Ocean Ranger*, under Capt. Priddles was lying in Port. The cargo boat *Elizabeth* was sent to unload machinery. The barometer began falling and the crew of the *Elizabeth* protested that the cargo boat was being overloaded. When she was finally released, she was deeply laden. She took on water and sank. Capt. Priddles claimed the cargo boat was unseaworthy but her owner Mr. Hooper sued the captain for damages and won.
Elizabeth Anne	Wrecked		October 1863	Unknown
F. Todenskjold	Sank	South Africa	30 May 1915	Entrance to Harbour.
Fleur de Maurice	Aground	Britain	April 1894	Unknown
Fusileer / Fusilier (ex	Aground – Wrecked	Britain	25 May 1865	The rocks of the side of the foot of Bluff. During the voyage to Port Natal, 189 people died of

Name	Events	Home Port	Date	History
Crimea)				fever and many more were ill. The vessel parted from her anchors at the Outer Roadstead, during a north-east wind; it struck the rocks of the side of the foot of the Bluff. All but 20 immigrants were rescued and placed in quarantine at the Point. Soldiers of the 99th Regiment, stationed in Durban at the Old Fort, guarded the survivors, "in order that no one should come near enough out of curiosity to spread the disease, whatever it was, to the town." The Natal Mercury reported that the hulk was "lying about north and south (bow pointed northward) broadside to the sea".
Hogni	Scuttled		8 September 1936	Offshore?
Istar (ex *Nahma*)	Scuttled		28 March 1931	7 km off Durban Harbour. This vessel began her career as a millionaire's yacht. In World War I, she served as a submarine chaser. In the 1920's, during prohibition, she was one of the most notorious rum-runners along the eastern seaboard of the United States. She then came to South Africa, where she served as the floating factory shop of a shark fishing venture. In 1929, she was serving fourteen boats, each with ten nets, and was capable of processing 500 sharks per day. In March 1931, she was bought for scrap and her bronze propeller was removed. Thousands of spectators lined the beachfront to bid farewell as the *Istar* as she was towed by the tugs *Sir John Robinson* and *Sir William Hoy*. The vessel was taken 7 km from the entrance to Durban Harbour and scuttled.
Kayle				Unknown
Lady May	Scuttled		Pre-1939	Offshore?
Licensed Lighter No. 18	Sank		18 July 1889	Outer Anchorage. This lighter was removing cargo from the steamship *Dunbar Castle* in the Outer Anchorage, when a loose telegraph pole fell into her hold. The lighter sprang a leak and foundered shortly after dusk.
Lighter No. 20	Sank – Refloated		6 September 1901	Outer Anchorage. When this lighter sank, four lives were lost. It was refloated and towed into port.
Lily	Sank		15 May 1879	Harbour Channel. This vessel was apparently old and heavily laden; she heeled over and sank in the channel. The crew were rescued by the men of the cargo boat *Phoebe*.
M. Smith Peterson	Abandoned – Towed – Converted to hulk	Norway	23 March 1903	Durban as a hulk. After the vessel was disabled in a gale, the crew were rescued by the fishing steamer, *Hansa* and brought to Durban. The barque was abandoned near Port Shepstone and towed to Durban by the tug *Ingane*. She was converted into a hulk.
Medway (ex *Umtata*)	Grounded – Towed out – Foundered at Outer Anchorage	Britain	15 October 1883	Outer Anchorage. The *Medway* was under tow by the *Fox* when she struck the Bar. She was taken back to the Outer Anchorage but foundered soon afterwards. Several unsuccessful attempts were made to raise the hull.
Minerva	Aground –	Britain	4 July 1850	Reef running out from the Bluff, the point of the

Name	Events	Home Port	Date	History
	Wrecked			Bluff. This was the largest vessel chartered by J.C. Byrne in his immigration scheme by which he despatched thousands of settlers from Britain to Natal between 1849 and 1851. The *Minerva* was anchored at the outer roads of Durban on the morning of 3 July 1850. Towards dusk, the wind freshened. It was thought that a shackle bolt fell out and caused a cable to part. At 23:00, the tide and current swept the ship onto a reef running out from the Bluff. The vessel broke apart the following night. No lives were lost but the 276 passengers lost most of their possessions. A valuable racehorse managed to swim ashore. George Potter's Saddlery shop on Smith Street, Durban, was made out of fittings from the wreck.
Northwester / North-Wester	Wrecked?		31 May 1939/1839	Unknown. No lives lost.
Onaway	Aground – Wrecked		2 / 3 February 1892	Under the lighthouse against the South breakwater – 29°52.40 S, 31°03.70 E. It was thought that the *Onaway's* captain, who had not called at Durban since the South Pier was built, mistook it for the North pier. Thinking he was entering the channel, he came in to the south of it at 22:00. No lives were lost. A south-west gale blew for a week and the vessel became a total wreck. Cargo was washed ashore. The master's certificate was suspended for 6 months by the Court of Inquiry.
HMS Otis	Scuttled	Britain	September 1946	Off Durban. Served in the East Indies, in 1940 going on to the Mediterranean, in 1942 to Home Waters, in 1943 to the South Atlantic for anti-submarine training purposes. The last submarine of this type to be taken out of service in April 1946. Scuttled in September 1946 off the coast of Durban.
Pensamento / Peusamento	Aground – Wrecked	Portugal	20/19 October 1879	The Bar? This vessel lay at the Donald Currie Moorings (Bluff Channel?) waiting to proceed to Mocambique. However, a sand spit formed during the night. The vessel took the ground on the ebb tide and was subsequently condemned and broken up. Malcolm Turner says she developed a leak, and broke her back after grounding on the Bar. No lives were lost and the cargo was saved.
Richard Pearce / Richard Pearse	Unknown	Britain	March 1880 / 18 May 1880	Unknown. This vessel was being towed by the *Forerunner*, when she stuck on the Annabella Bank. Refloated and towed into the harbour. On 18 May 1880, it was again reported that she had stranded at Durban. We do not know if this refers to the earlier incident or a second more serious incident. However, she is never mentioned on the 1881 Shipping Registers.
Sarah Smith	Grounded – Refloated – Condemned – Sold	Britain	7 February 1874	Lee/Annabella Bank. This vessel was leaving Durban when she neared the Annabella Bank, the light south-west breeze died and she stranded on the Bank. Her cargo was unloaded and sold. Some days later she was refloated but was condemned and sold as a wreck by auction.
Sir Gordon	Scuttled		1945	Offshore? This vessel arrived in East London in

Name	Events	Home Port	Date	History
				1890. She was in service as a rock breaker, then a grab-dredger. Later she was sold to a treasure syndicate. After 55 years of service, she was scuttled off Durban.
Southport	Ashore – Wrecked	Britain	23 August 1878	Back Beach, 150m from the H.D. Stover – 29° 51.80 S 31° 03.00 E. After this vessel was damaged off Cape Agulhas, she put into East London. The captain was still ashore when she drifted from her anchorage and was carried northwards by an east-north-east wind and current. The unexpected voyage ended in Durban during a severe gale. She stranded on the beach. All the crew survived when they were rescued by Capt. Airth and the lifesavers.
Transvaal	Wrecked – Split in half	Britain	8 December 1874	Near the Bluff / 2.5 km south of the Umgeni River Mouth, close to the *Star of Wales* (1874). The reports of the location varied in the different databases. Apparently she was anchored near the Umgeni River Mouth when her anchors parted during a southerly gale. She went aground stern first and then swung broadside to the coast. A great sea struck her and she split in half from bow to stern. The starboard side was washed inshore and the port side out to sea. As her masts fell, her crew, who had climbed into the rigging, perished before the eyes of the onlookers on the shore. No one was allowed on the beach opposite the wreck until the bodies were washed ashore. The Captain was ashore at the time. The twelve crew members were buried in a mass grave in the West Street Cemetery.
Unknown	Scuttled		Pre-1939	Offshore.
Unknown	Scuttled		Pre-1939	Offshore.
Unknown	Scuttled		Pre-1939	Offshore.
Walter Reichel (ex *Wilhelm*, ex *Grimgerde*, ex *Armourer*, ex *Engineer*)	Scuttled	Germany	29 December 1933	Offshore.

Note that the actual identity of Stuart's Wreck (discussed in **Section 13.3.3.3**) has not been established to date and thus it does not feature in the above table.

13.3.3.2 Magnetometer Survey

The analysed field data from the magnetometer survey results show a total of 44 hits over both Site 1 and Site 2. **Figure 23** and **Figure 24** map the locations of all the mag hits in relation to Site 1 and Site 2, respectively.

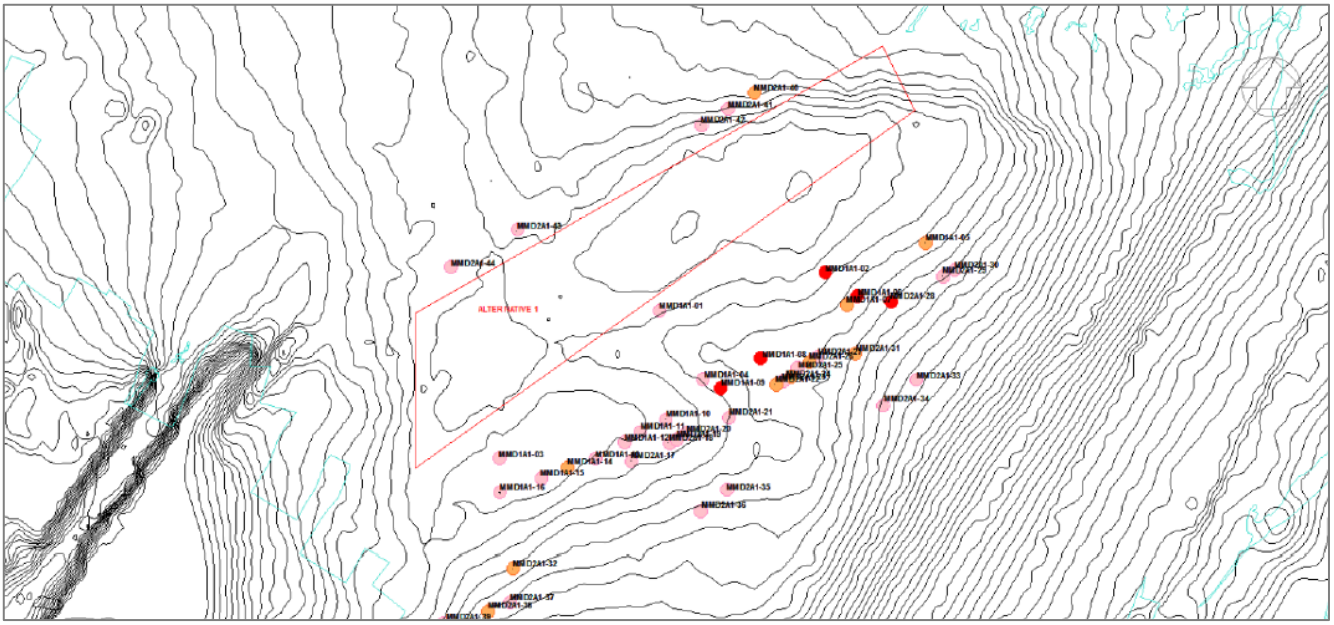


Figure 23: ***Site 1 – Analysed Field Data Magnetic Anomalies showing probability ratings (African Centre for Heritage Activities, 2016)***

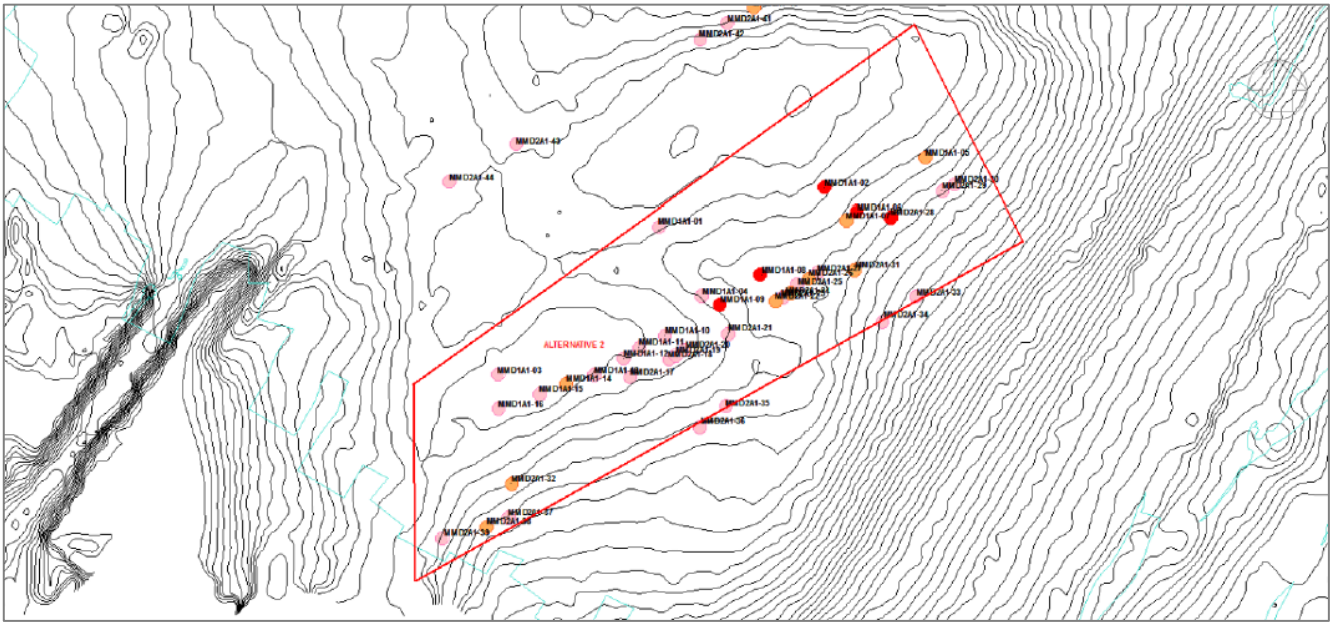


Figure 24: ***Site 2 – Analysed Field Data Magnetic Anomalies showing probability ratings (African Centre for Heritage Activities, 2016)***

Legend		
	Known shipwrecks	
	Magnetometer Strength	**Probability of MUCH Site**
	Low Strength	Low Probability
	Medium Strength	Medium Probability
	High Strength	High Probability

The magnetic anomalies were plotted over the side scan sonar image from the Council for Geoscience. Miller and Leuci (2001) stated one of the seven acoustic facies that they could

identify from the side scan mosaic was, "… small localised examples of highly reflective objects with little or no acoustic shadow on the seafloor. Interpretation: Metal debris or man-made artefacts which have been thrown overboard by passing ships." These could also be evidence of MUCH sites.

Miller and Leuci (2001) state in their analysis of the debris: "The objects have a random arrangement but some occur in fairly dense clusters. The debris in [Site 1 1 and Site 2] has a very scattered distribution and the objects are usually less than 10m in diameter."

These debris objects were compared to the magnetic anomalies and the result is mapped in **Figure 25**. As can be seen, the entire area has small debris fields. However, the magnetometer registered very few hits over the northern area. This debris is either not metal or too small to register. Some of the debris scatters on the south side correlate well to the magnetic data.

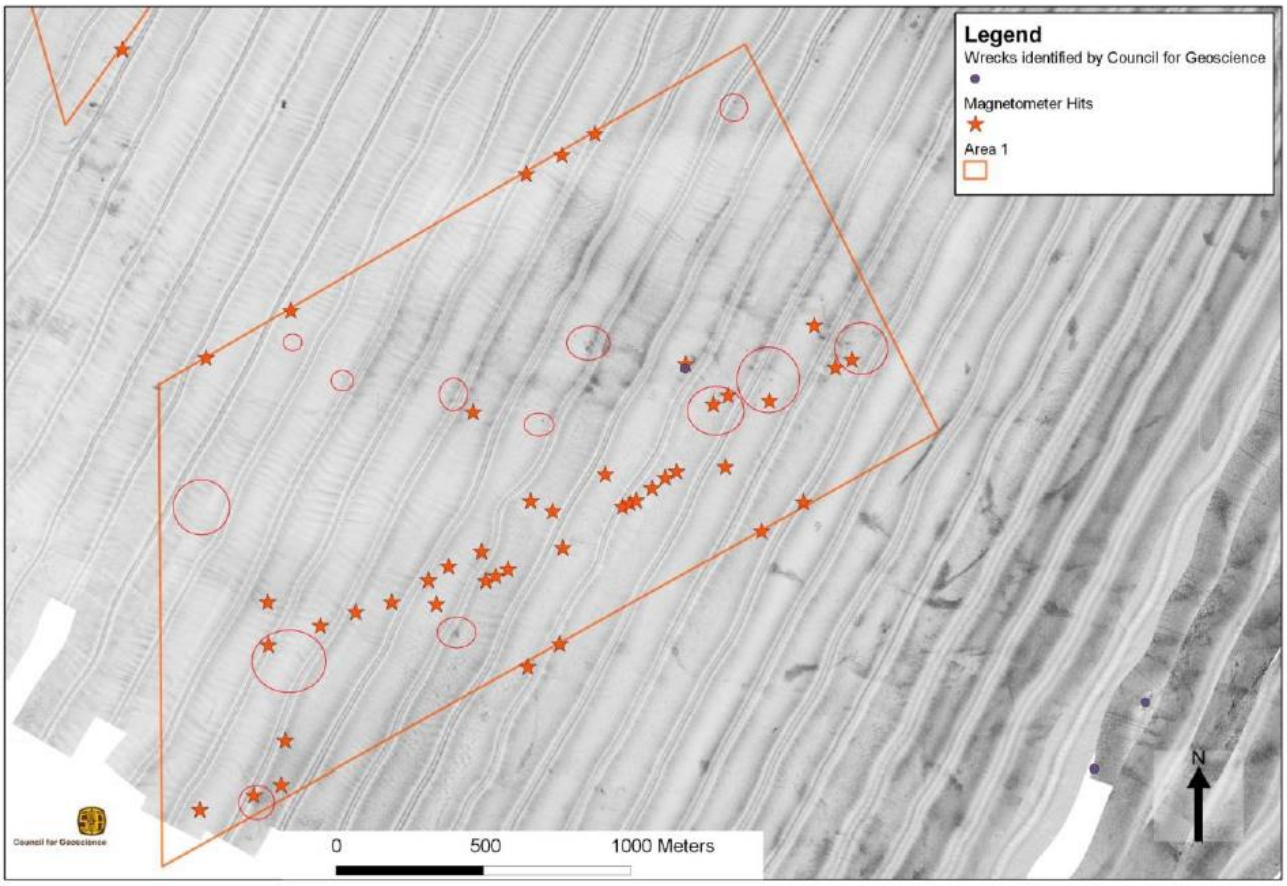
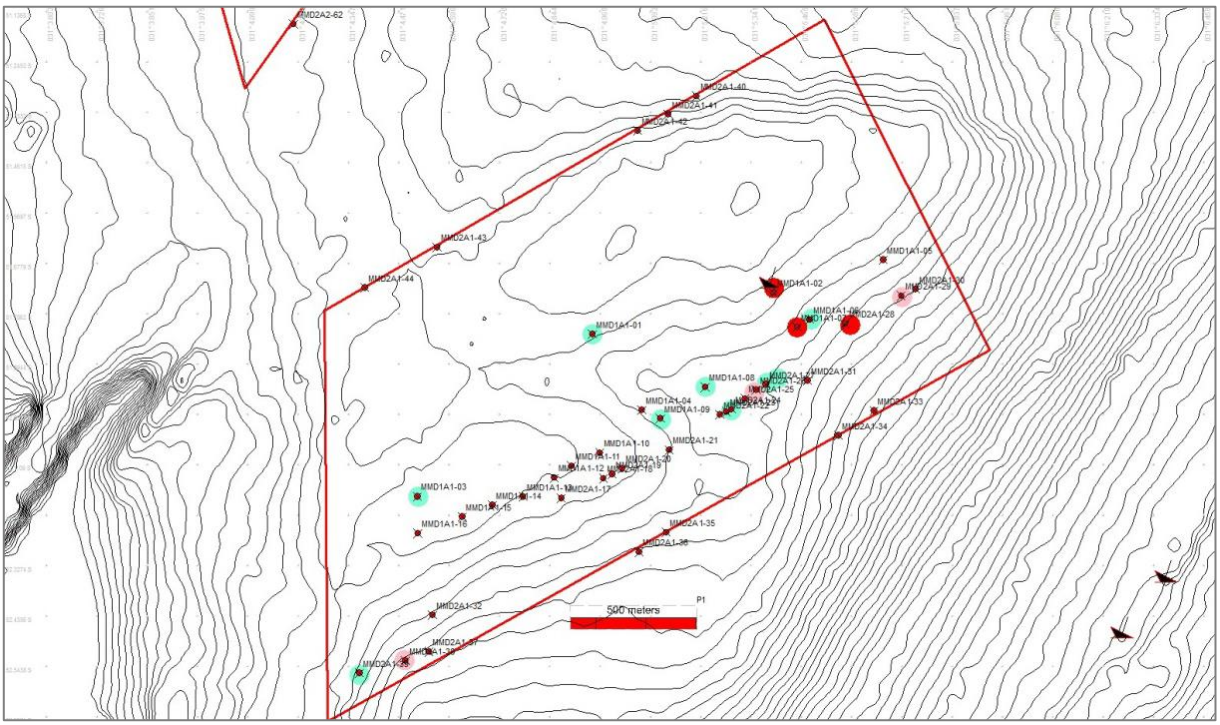


Figure 25: ***Sites 1 and 2 – Field Data Magnetic Anomalies correlated to identified debris (African Centre for Heritage Activities, 2016)***

13.3.3.3 Diver Searches

The results from the diver searches are shown in **Figure 26**.



Legend		
	Known shipwrecks	
	Magnetometer Hit	
	Diver Search Results	**Probability of MUCH Site**
	Low Strength	Low Probability
	Medium Strength	Medium Probability
	High Strength	High Probability

Figure 26: ***Sites 1 and 2 – Field Data Magnetic Anomalies showing diver search results (African Centre for Heritage Activities, 2016)***

All the relevant magnetic anomalies occurred within Alternative Area 2. Diver searches were conducted on 34% of these hits, of these only two had visible metal objects which may be MUCH sites. All of these were in the general area of "Stuart's Wreck" (site number MMD1A1-02), that is the south-eastern corner of Site 2 (29 051.769' S; 31 05.385' E).

Figure 27: ***Photographs of Stuart's Wreck (African Centre for Heritage Activities, 2016)***

13.3.3.4 Conclusions

Site 1 is free of magnetic anomalies and would therefore represent, from a heritage point of view the best possible area for sandwinning. The magnetic anomalies seem to be clustered on the northern edge of Site 1 and within Site 2. While there are two historic dredge dumps in the area, these essentially cover the area of Site 2 and any artefacts within these areas (barring the discovery of an entire shipwreck) will have a low heritage significance.

Therefore, the specialist recommended dredging at Site 1. However, the dredgers should be aware of their work environment and follow the recommended management measures should they uncover any potential MUCH sites during the work.

13.4 Wave Modelling Study

During Scoping the impact of dredging at the offshore sandwinning site on wave action and related sedimentation/erosion of nearby beaches was identified as a potential issue.

Details of the nominated specialist which was appointed to undertake the study are as follows:

Organisation:	ZAA Engineering Projects and Naval Architecture (Pty) Ltd
Name:	Dr John Zietsman
Qualifications:	BSc (CivEng), UCT, MSc (Ocean Eng) University College London, PhD University of London
No. of years' experience:	39
Affiliation (if applicable):	PrEng, FSAICE, MICE, MRINA (overseas), MSNAME, FSAAE, CEng

This section provides a summary of the Wave Modelling Study (ZAA Engineering Projects and Naval Architecture, 2016), as contained in **Appendix F3**.

13.4.1.1 Introduction

A numerical wave refraction model was prepared to study the effects of modifying the ocean floor in a local area directly east of the entrance to the Port of Durban. Modification of the seabed will result from dredging an amount of sand to be used for future marine works proposed inside the Port. This removal of offshore material will result in temporary increased water depths at the sandwinning sites.

The wave refraction study assessed the short term impact on the local wave climate of the surrounding coastline. Local deepening has been characterised as short term based on anticipated replenishment caused by natural longshore sediment transport.

13.4.1.2 Software Utilised

The Delft3D suite has been employed for this study. Delft3D-Wave has been used for the wave refraction calculations while the RGFGRID and QUICKIN modules were used for generating the model grids and bathymetry files.

The wave module of Delft3D computes wave propagation, wave generation by wind, non-linear wave-wave interactions and dissipation for a given bottom topography, wind field, water level and current field in waters of deep, intermediate and finite depth. Delft3D-Wave uses the 3rd-generation SWAN wave model by default.

SWAN is an acronym for **S**imulating **WA**ves **N**earshore. The main characteristics of SWAN with respect to the physics and numerics are:

- The physics in SWAN are explicitly represented with state-of-the-art formulations;
- The SWAN model is fully spectral in frequencies and directions (0_–360_);
- The wave computations in SWAN are unconditionally stable due to the fully implicit schemes that have been implemented; and
- The computational grid in SWAN can handle all wave directions.

13.4.1.3 Model grids

The model has been defined with two grids, one being nested in the other. A large regional grid with a resolution of 100m covers an area of 18km X 18km. Offshore wave conditions have been applied at the boundaries of this grid and refracted inshore. A detailed grid with a resolution of 20m has been nested within the regional grid and obtains wave input at its boundaries directly from the larger grid.

13.4.1.4 Bathymetry

Model bathymetry has been obtained from various coastal charts issued by the South African Navy Hydrographers office. For each wave direction and scenario, three tidal states have been allowed for according to SANHO tide tables, being LAT at 0.0m (Lowest Astronomical Tide), mid-tide at 1.11m and HAT at 2.3m (Highest Astronomical Tide). Bathymetry has been imported into QUICKIN in a random point format consisting of seabed levels. QUICKIN maps the levels to the regular grids as defined in RGFGRID, and converts them to water depths. Note that all seabed contour plots shown hereafter indicate water depth and not seabed level.

Modified bathymetry for the two proposed sandwinning sites have been created based on the assumption that the depth over the entire area will be increased by a uniform amount.

The current state of the bathymetry for both grids is shown in the **Figure 28**. The bathymetry after dredging for Site 1 and Site 2 is provided in **Figure 29** and **Figure 30**, respectively.

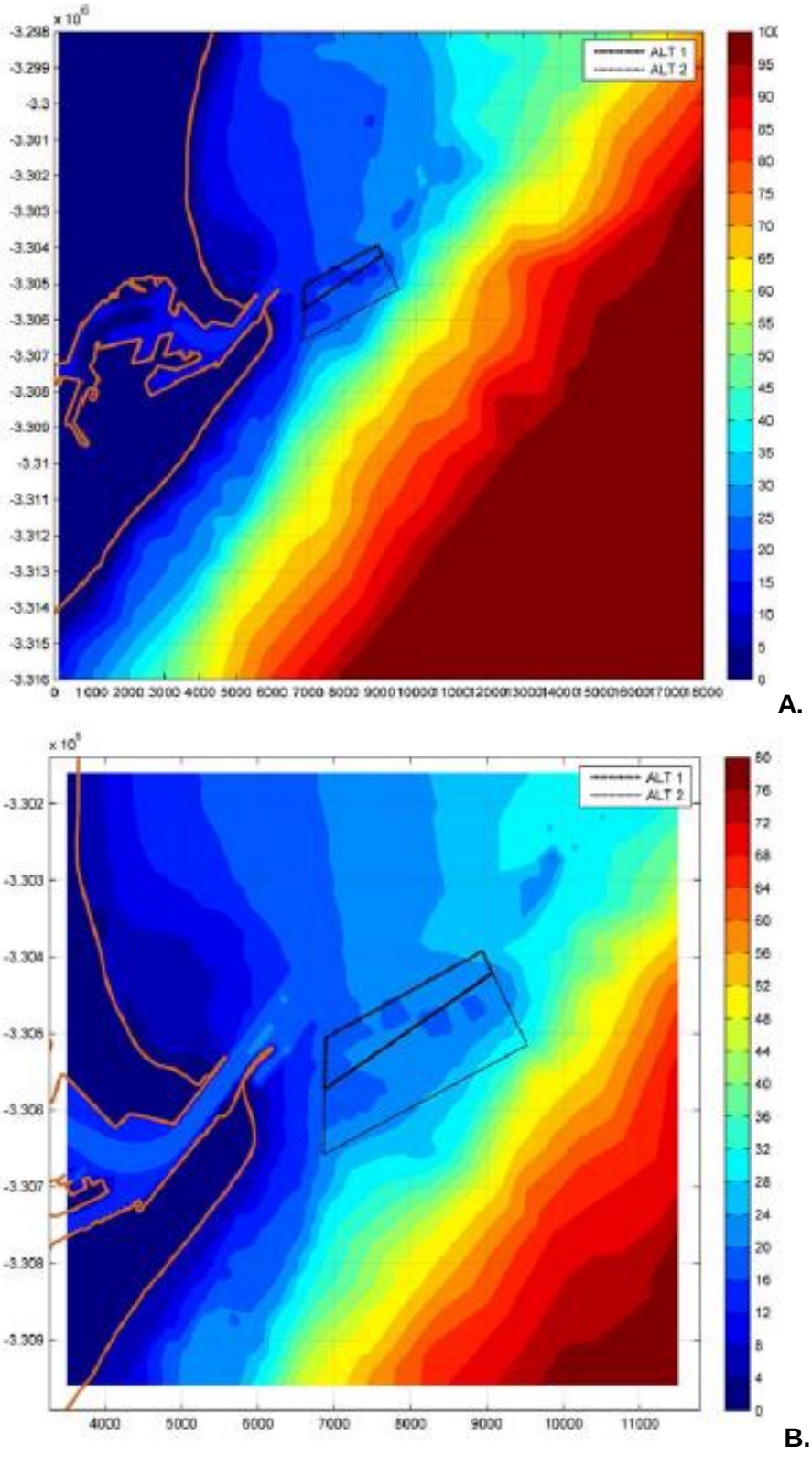


Figure 28: Current Bathymetry – A.) Regional Grid Extents and Water Depth in Meters and B.) Inshore Grid Extents and Water Depth in Meters (ZAA Engineering Projects and Naval Architecture, 2016)

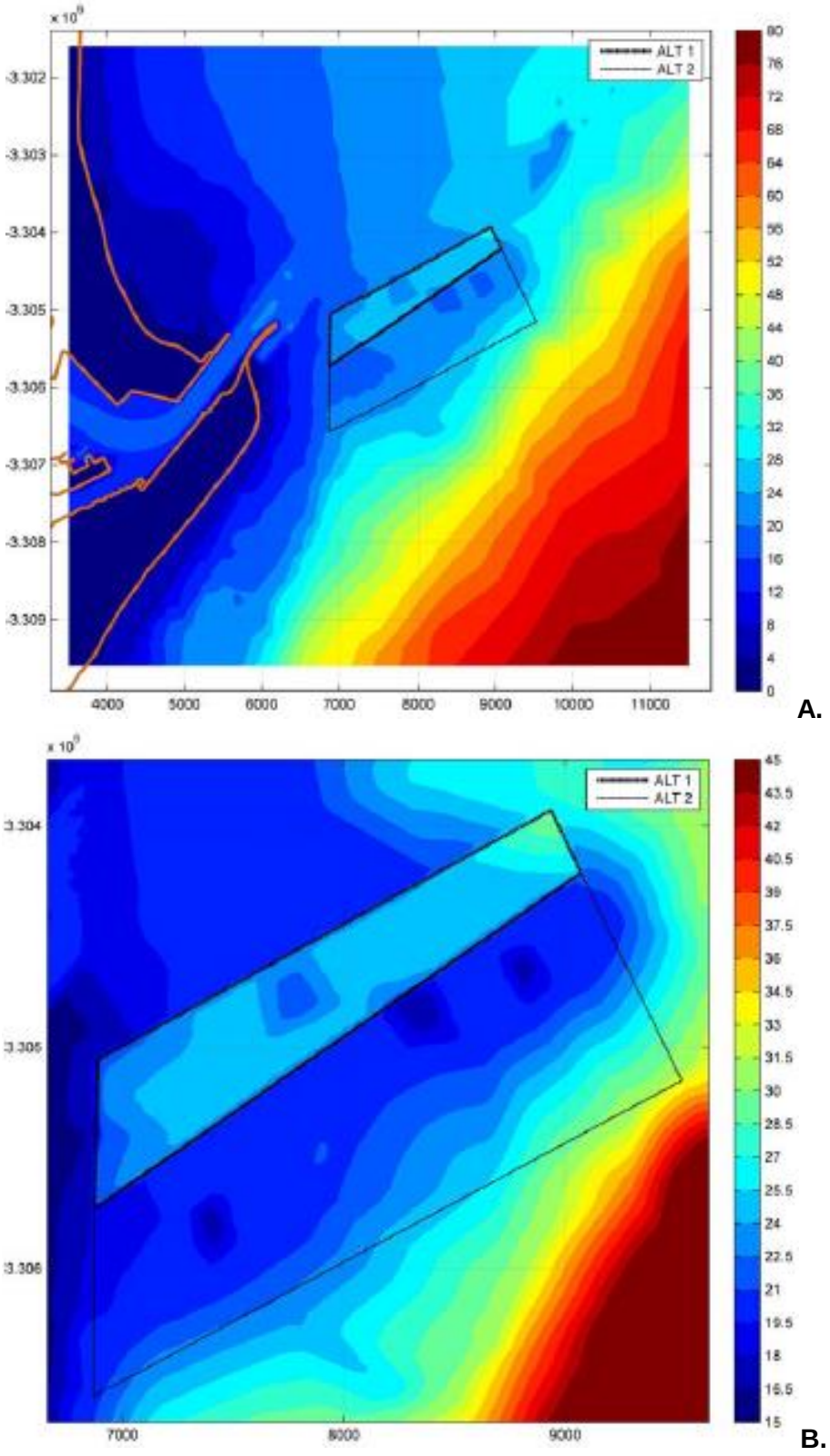


Figure 29: *A.) Site 1 after Dredging and B.) Site 1 Dredged Detail (ZAA Engineering Projects and Naval Architecture, 2016)*

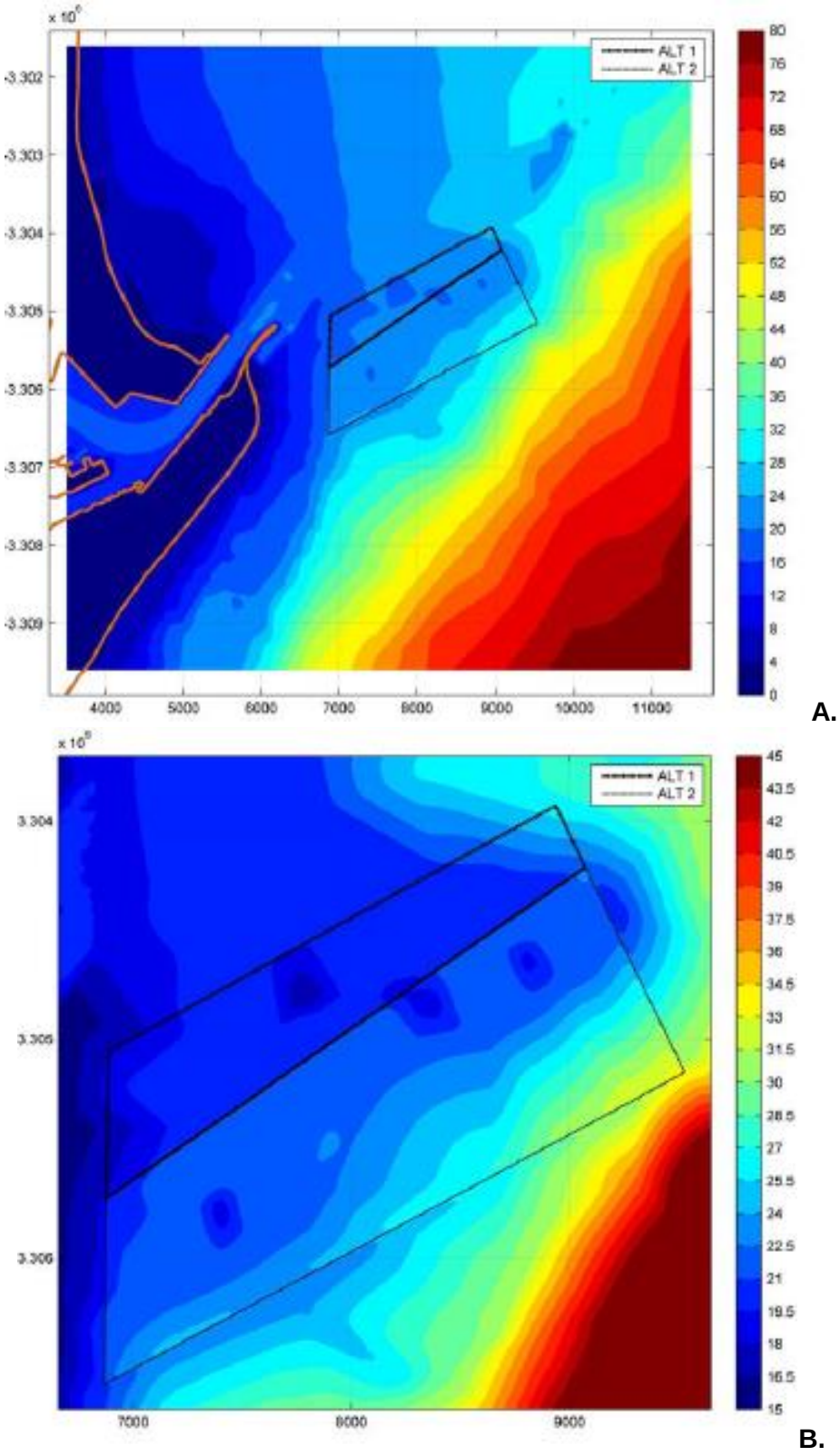


Figure 30: *A.) Site 2 after Dredging and B.) Site 2 Dredged Detail (ZAA Engineering Projects and Naval Architecture, 2016)*

13.4.1.5 Boundary Conditions

Wave conditions at the regional grid boundaries were based on statistics obtained from an analysis of National Centers for Environmental Prediction (NCEP) data. An initial study was undertaken to establish the sensitivity of the sites to wave direction. To this end, after careful consideration of the occurrence data presented below and for each direction selected, a significant wave height of 2.0 m with a period of 9s was employed. Nine wave directions between Northeast and Southwest were selected for the study.

Following this initial analysis, two 1:10 year storm events were analysed for the most onerous directions.

13.4.1.6 Physical Parameters and Processes

The following physical parameters and processes have been specified for wave simulations during this study:

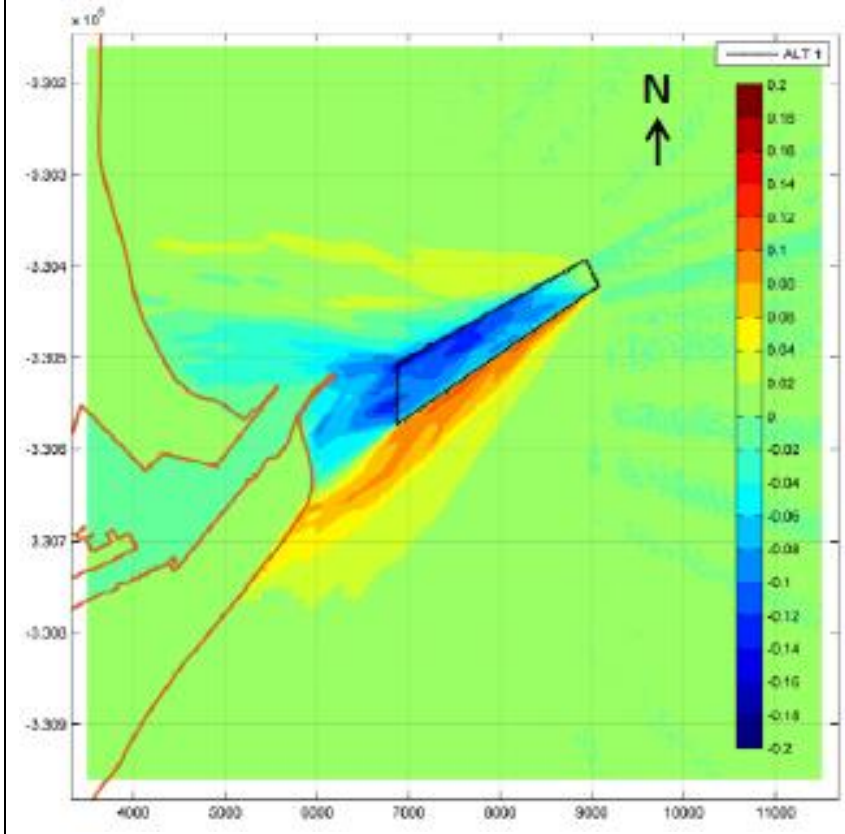
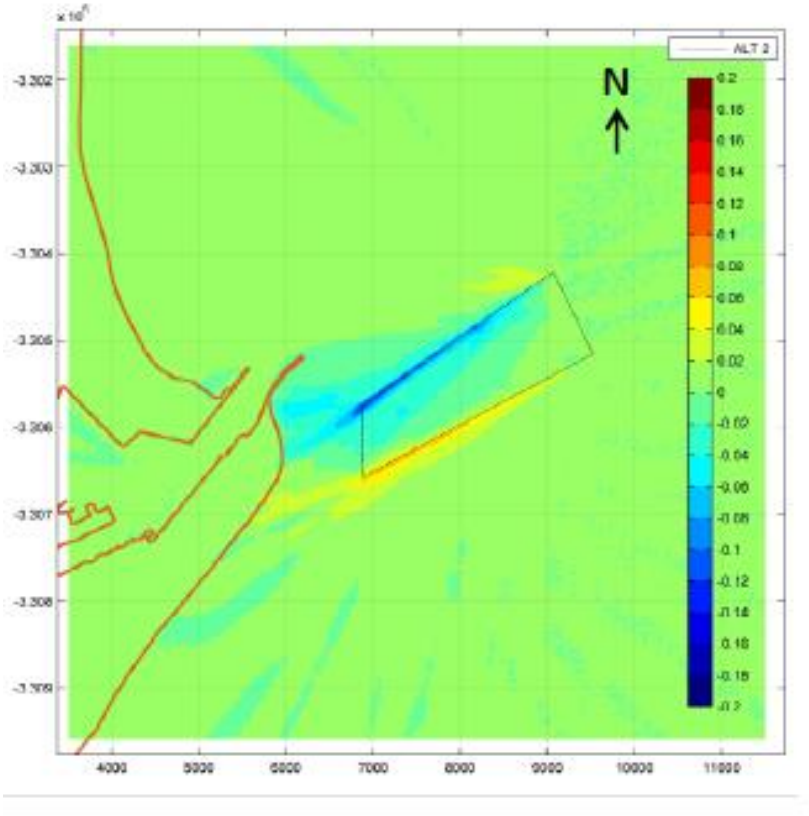
- Constants:
  - Gravity 9.81 m/s²
  - Water density 1,025 kg/m³
  - Minimum Depth 0.05 m
- Processes:
  - Wind not activated
  - Depth induced Breaking Alpha=1.0, Gamma=0.73
  - Bottom Friction JONSWAP coefficient = 0.067
  - Whitecapping Komen *et al*.
  - Refraction active
  - Frequency shift active

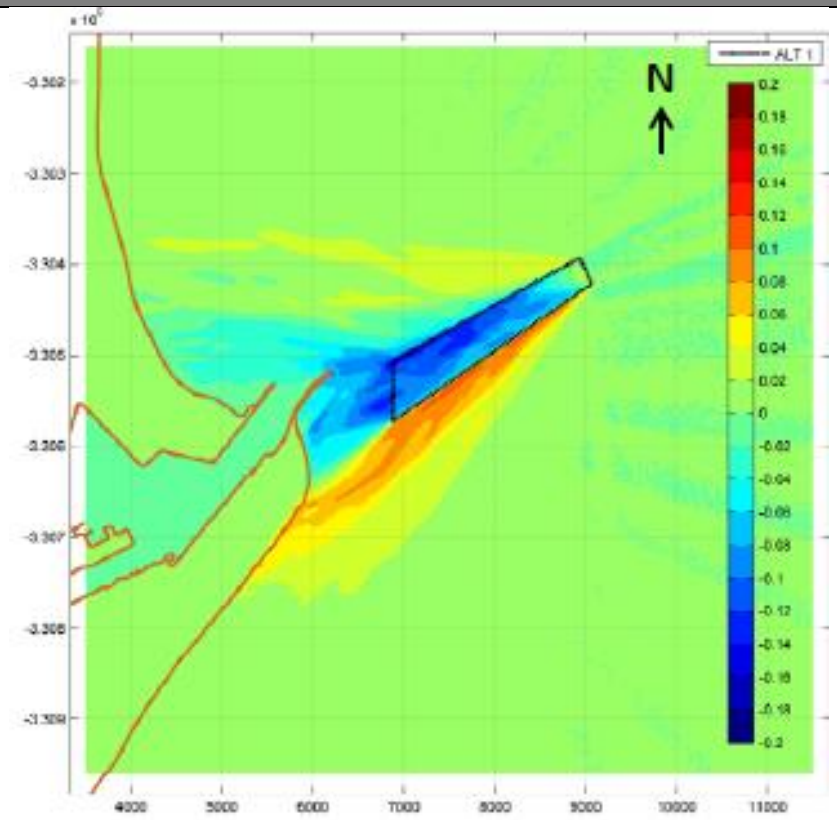
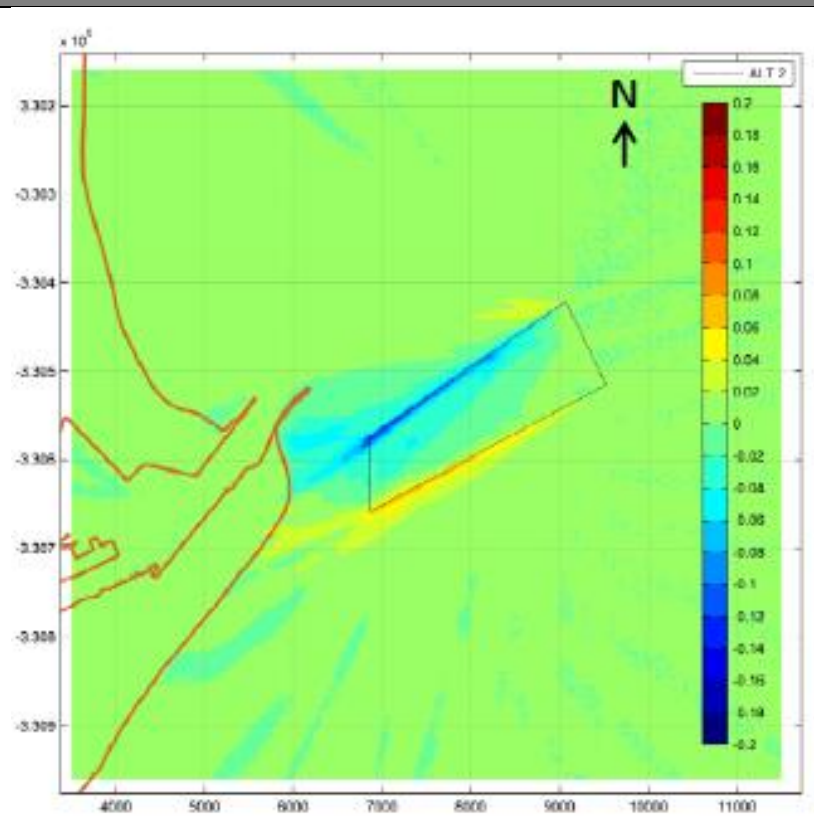
13.4.1.7 Results

The results of wave simulations and format for comparative purposes are described below. During post processing of the results, it became apparent that differences in wave vectors are almost indiscernible. Furthermore, differences due to variation in tidal level are similarly insignificant. As a result of this, only the mid-tide water level results were included in the report.

In order to effectively convey the core findings, the output for each wave direction and alternative site was prepared as shaded contour plots indicating the difference in significant wave height before and after dredging at the particular site. Further processing of these results by subtracting initial wave heights from post-dredged wave heights, has enabled the production of plots indicating the difference in significant wave height. The scale bar indicates difference in wave height in meters, with a positive value representing an increase in wave height and a negative value a reduction in wave height. **Table 16** show the difference in significant wave height for all wave directions included in the study.

Table 16: ***Difference in significant wave height for all wave directions included in the study (ZAA Engineering Projects and Naval Architecture, 2016)***

Direction	Site 1	Site 2
NE		

Direction	Site 1	Site 2
ENE		

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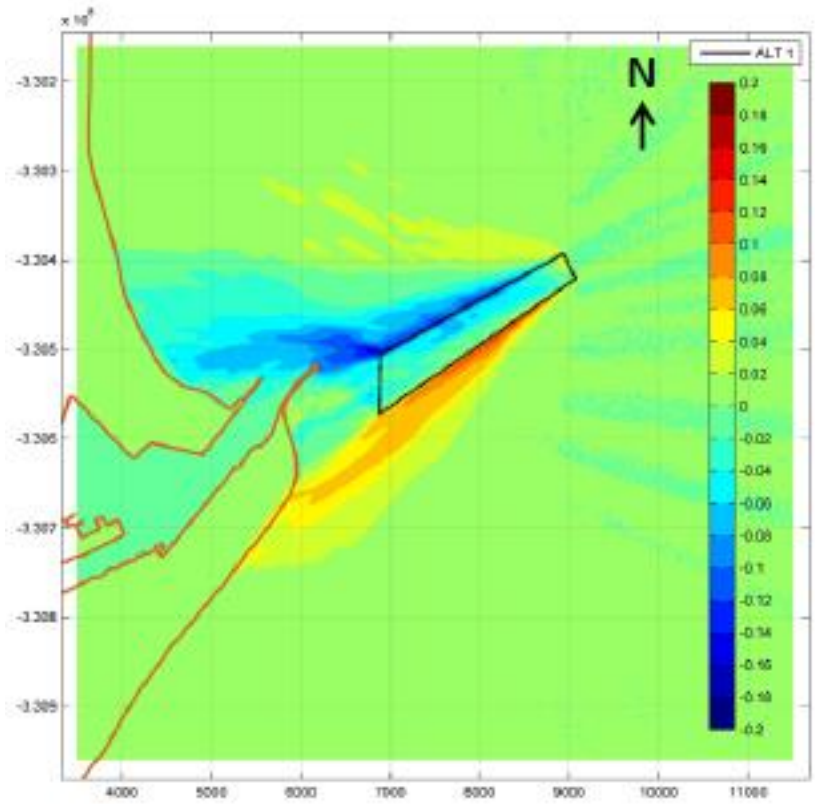
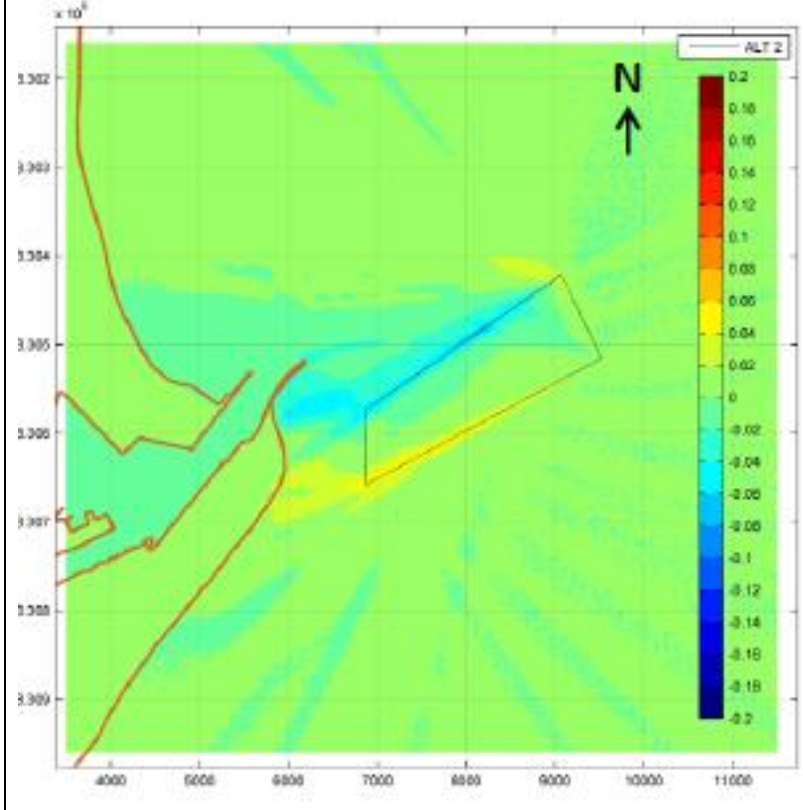
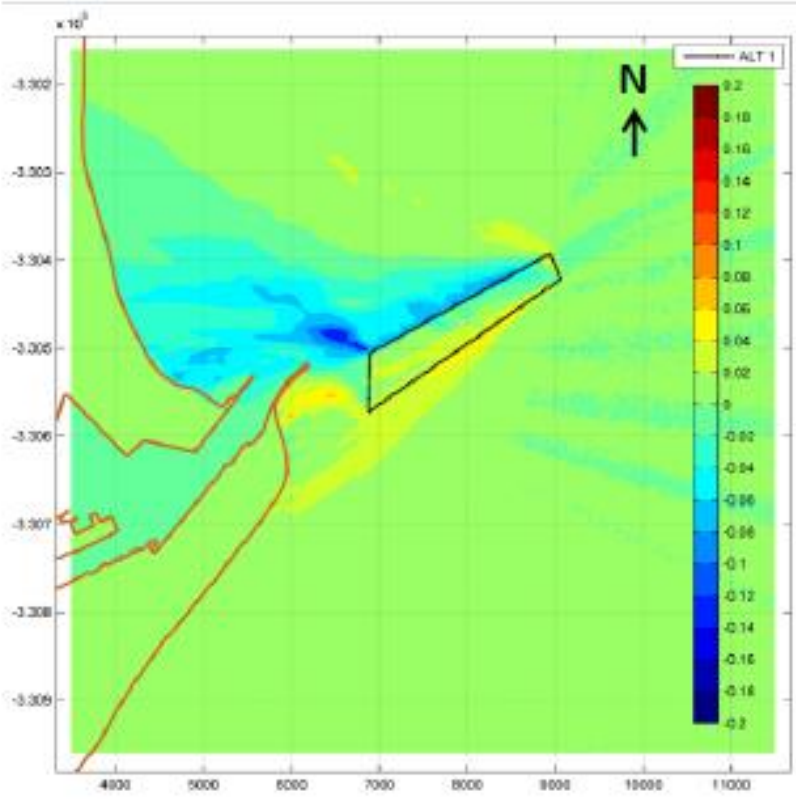
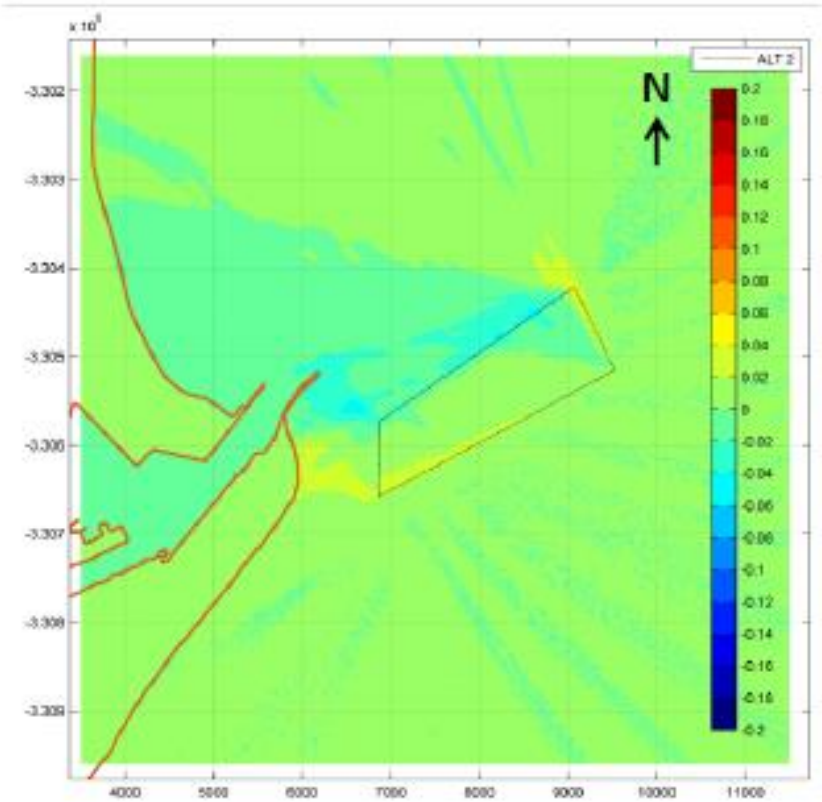
E		

Direction	Site 1	Site 2
ESE		

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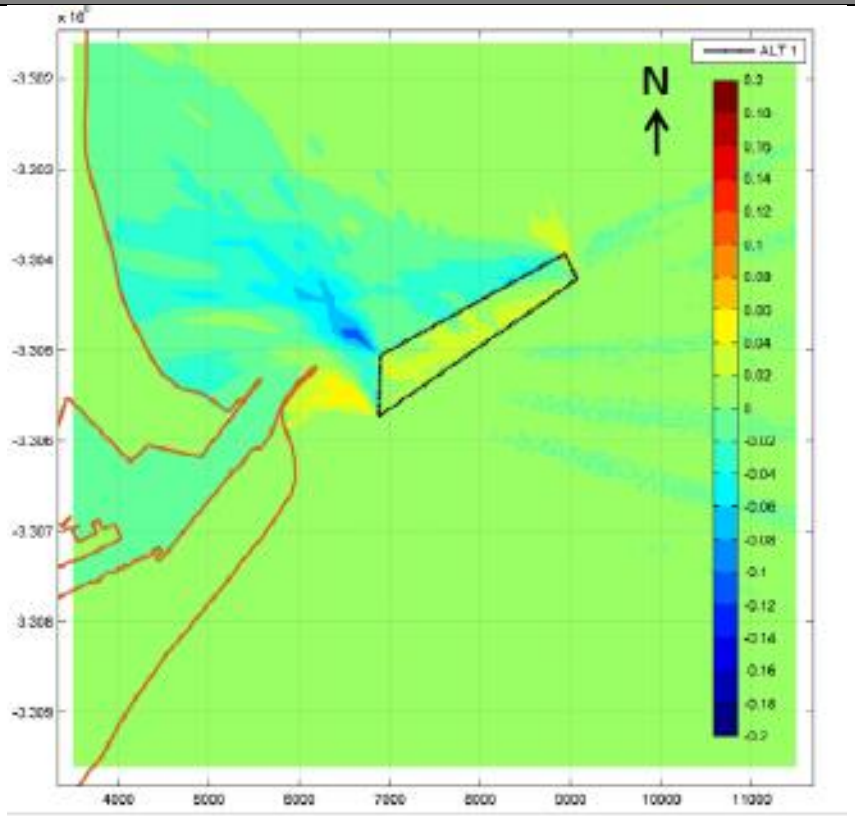
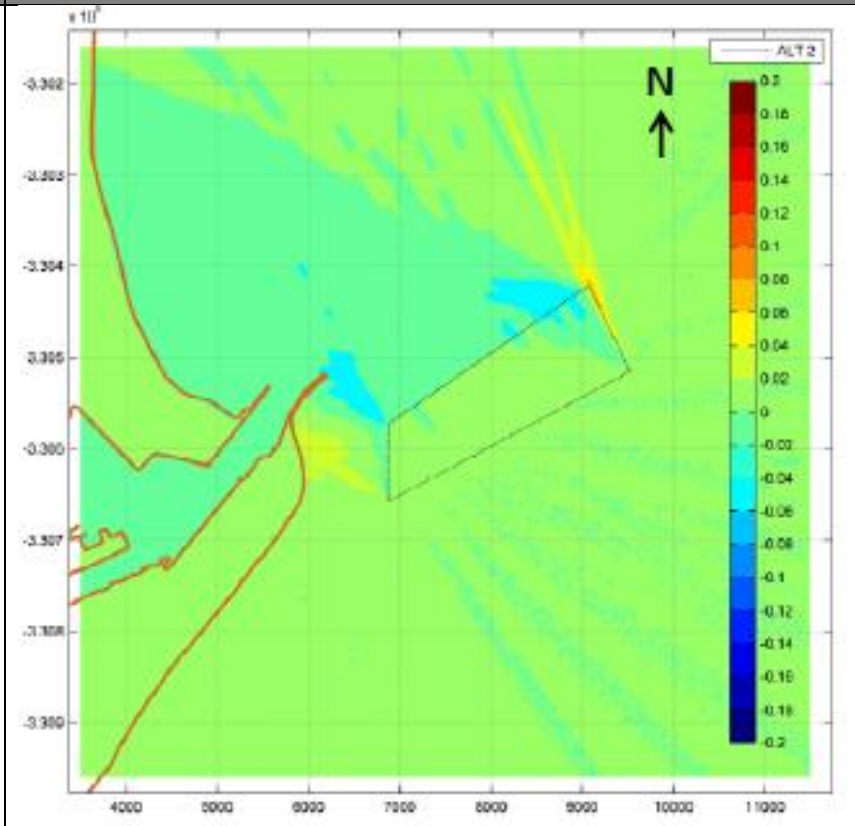
SE		

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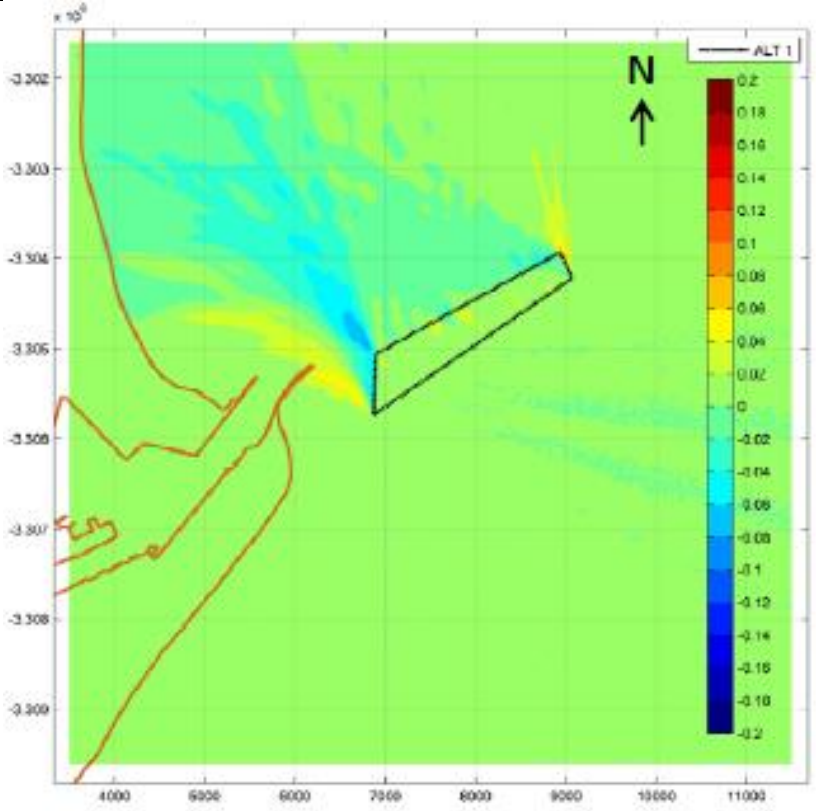
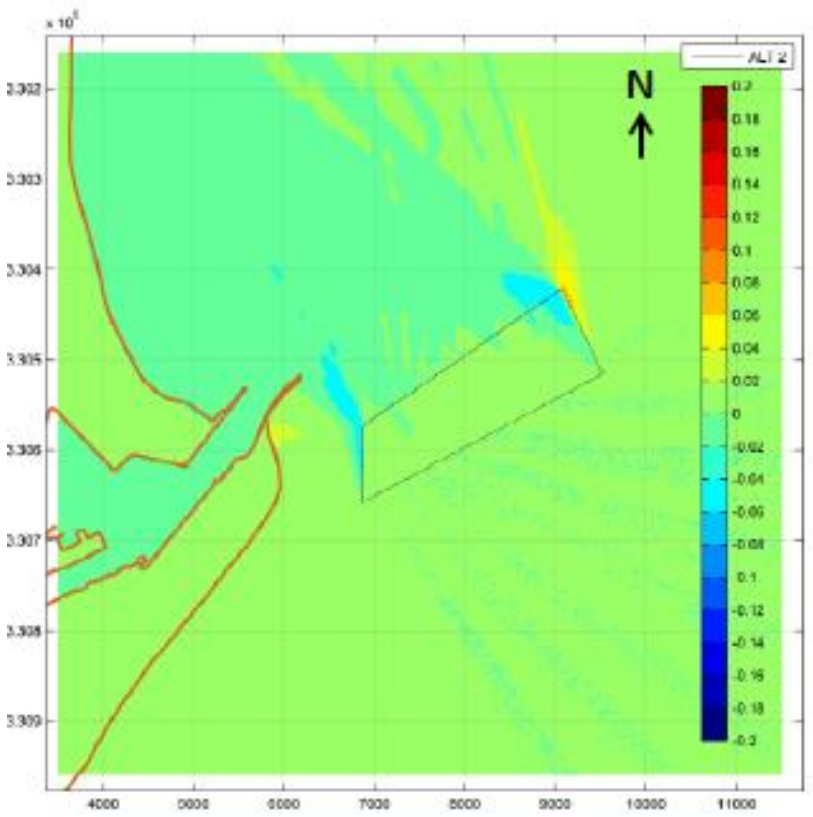
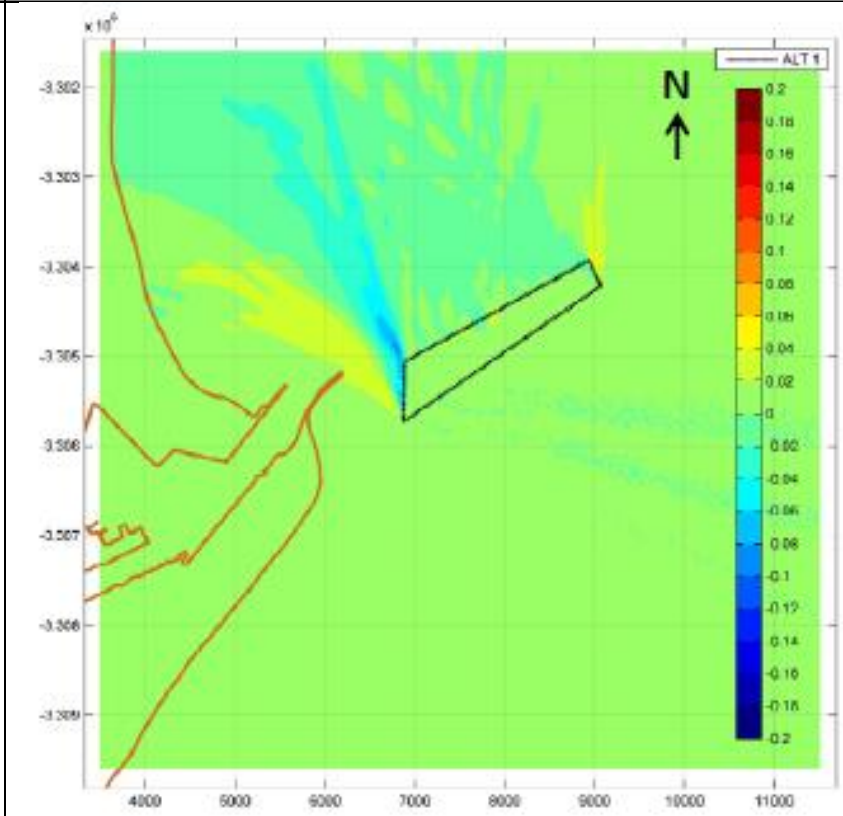
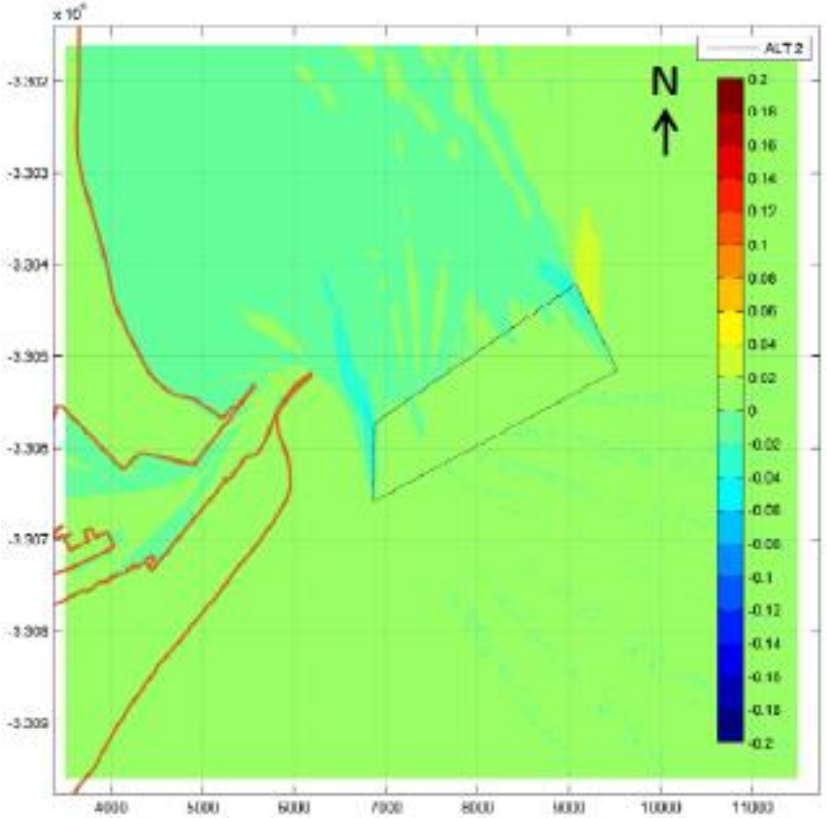
SSE		

Direction	Site 1	Site 2
S		

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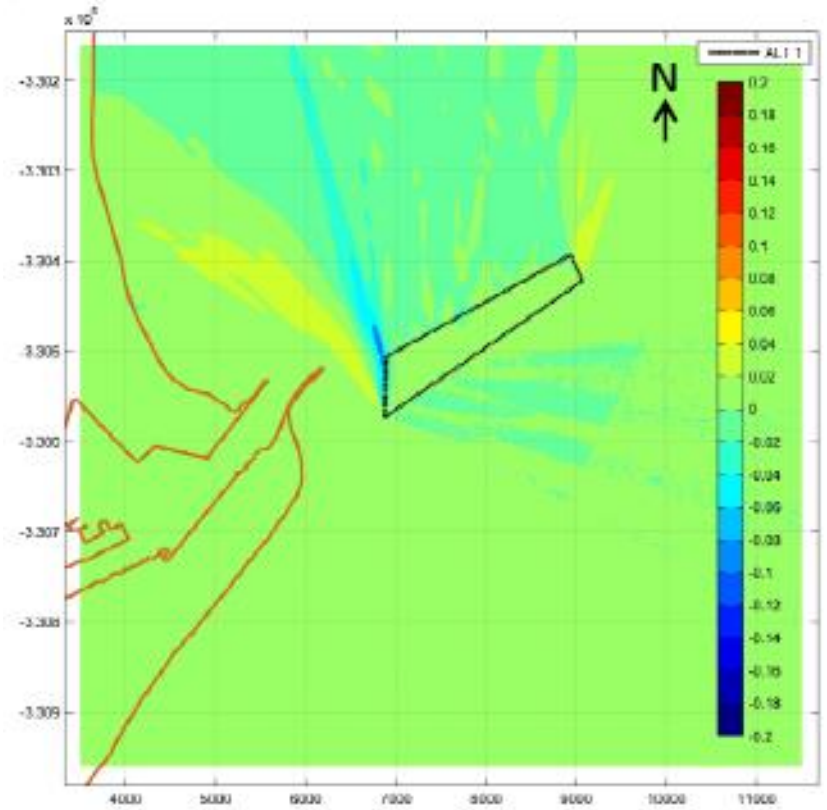
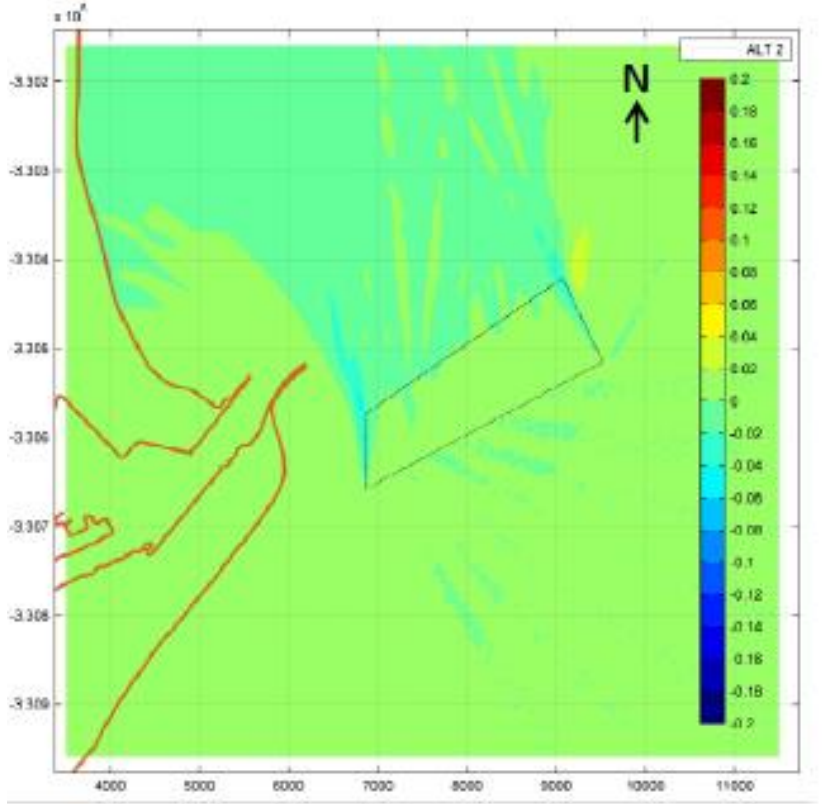
SSW		

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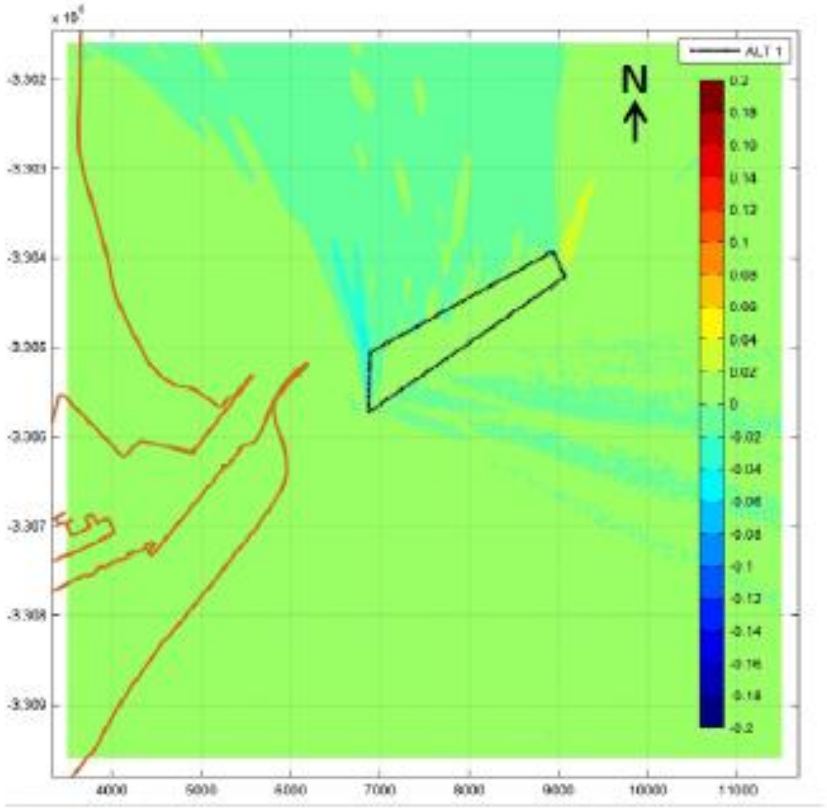
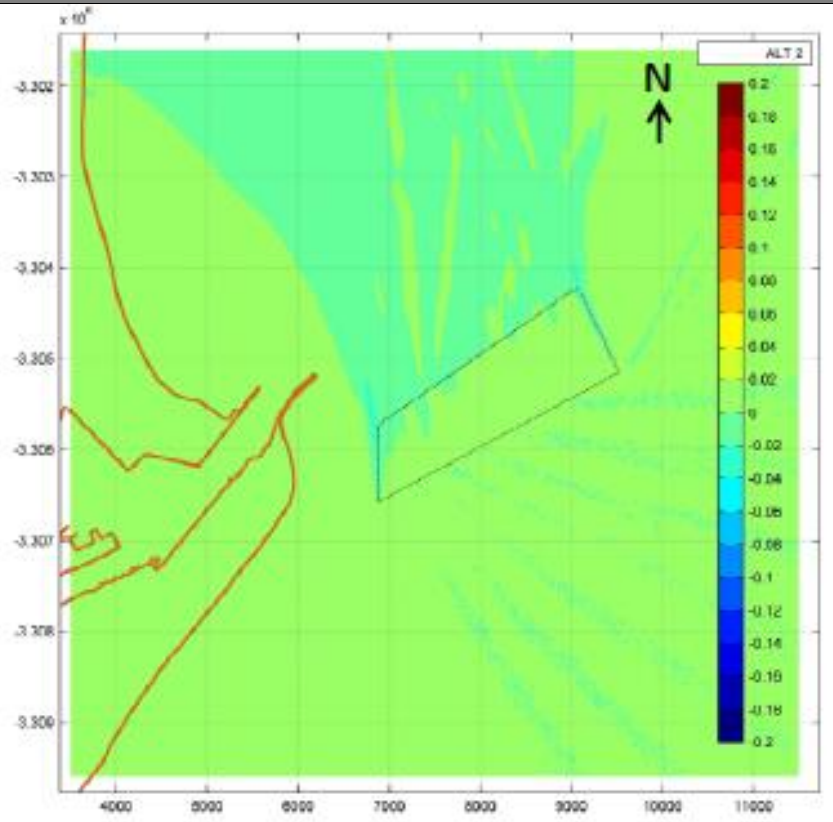
SW		

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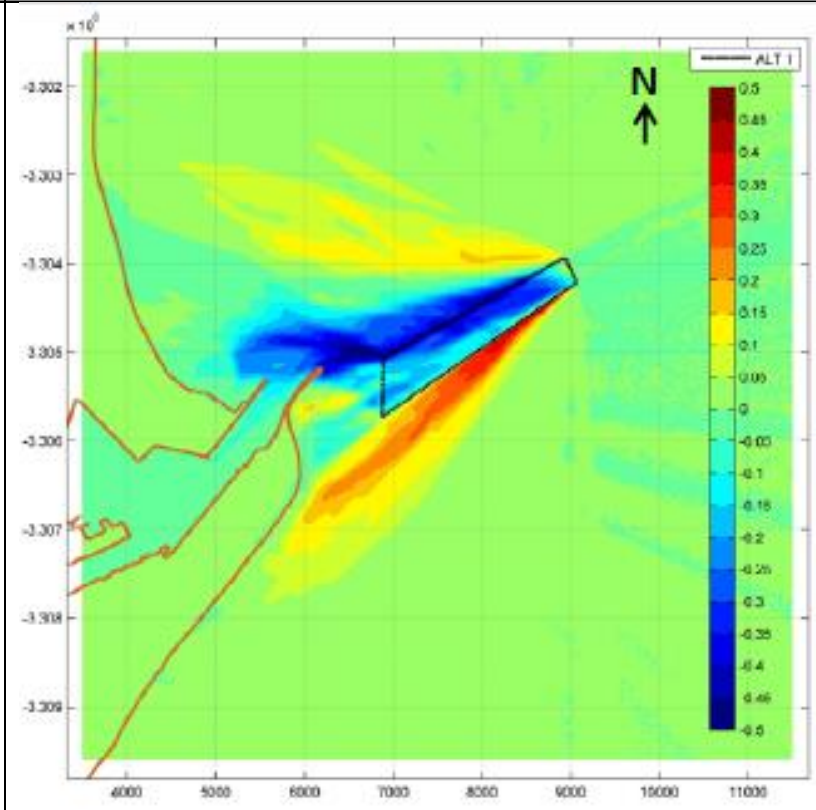
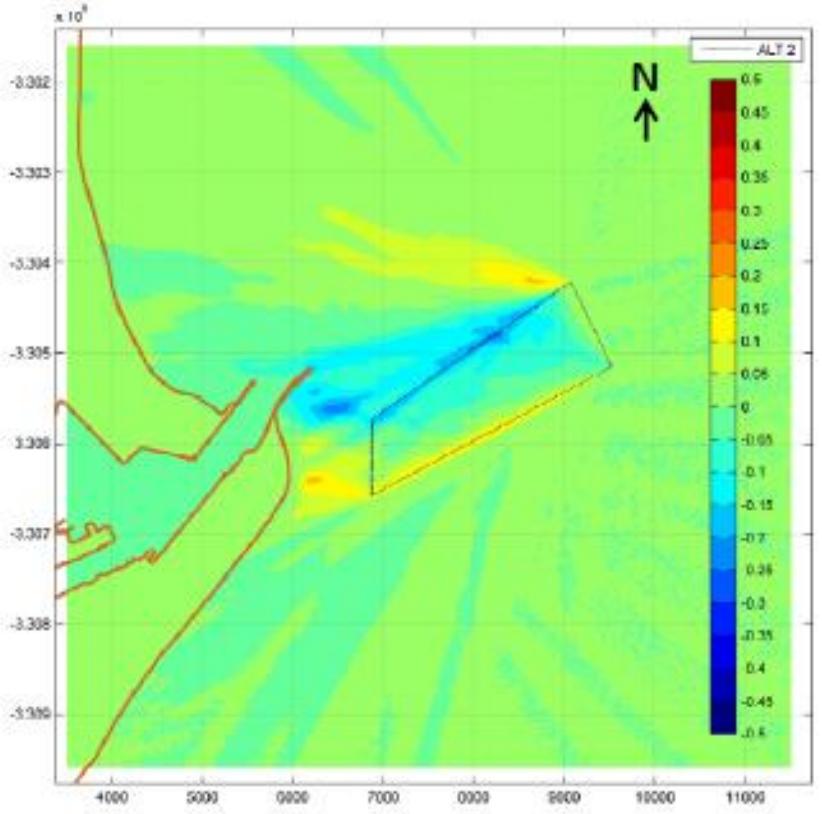
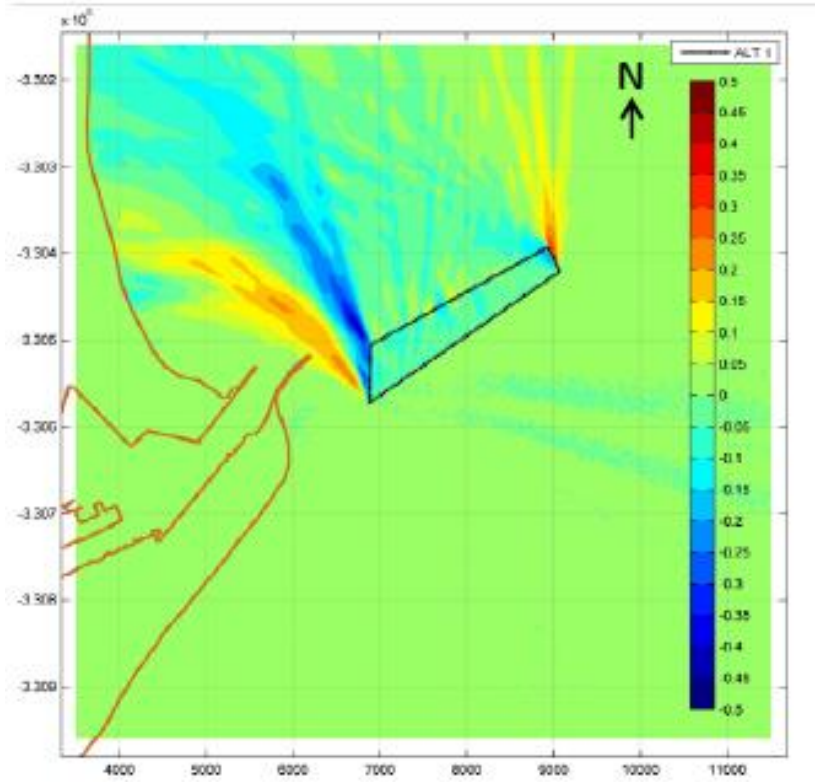
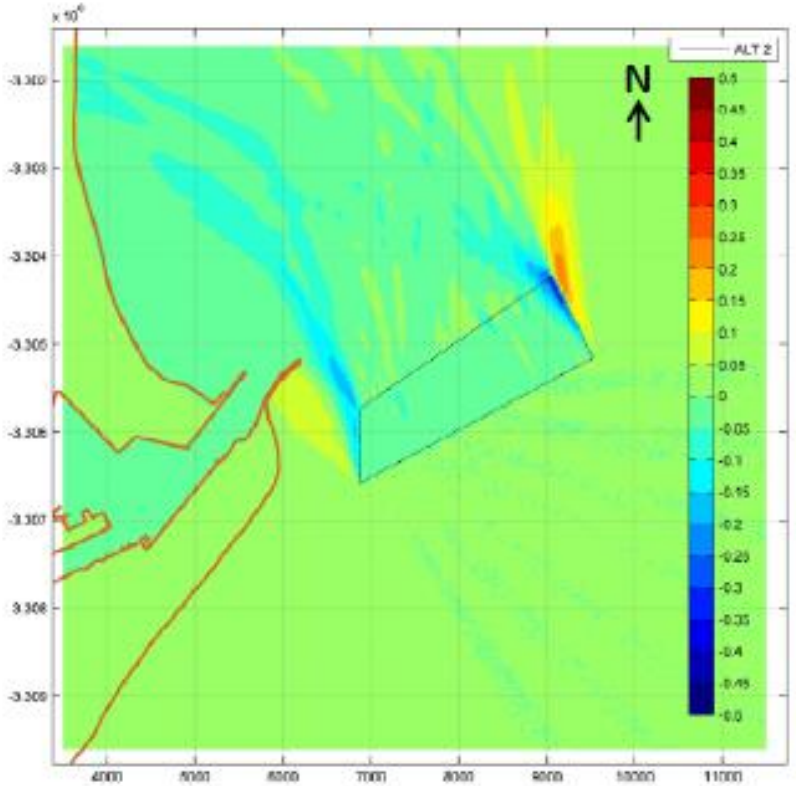
ENE-E		

Direction	Site 1	Site 2
SSW-S		

13.4.1.8 Discussion

Due to indiscernible changes in wave vectors between pre- and post-dredging scenarios, results have been presented as plots showing difference in significant wave height.

Maximum increase in local significant wave height has been calculated to be less than 0.1 m for normal wave conditions, with maximum decrease of the same order. This difference in terms of the offshore significant wave height is generally less than 5%. These increases in wave height are not adjacent to the beaches but are offshore of the harbour breakwaters in deeper water where they will have negligible effect. The wave heights adjacent to the beaches will in general reduce in height if sandwinning is undertaken.

Areas mostly affected by a bigger change in significant wave height are immediately to the south and north of the port entrance as expected, with values observed for Site 1.

For 1:10 year storm conditions, the increase in Hs has been calculated to be 3.3% and 2.3% for the E/ENE and S/SSW directions respectively.

Table 17 below summarises the peak values obtained from the analyses.

Table 17: ***Maximum Difference in Significant Wave Height per Swell Direction (ZAA Engineering Projects and Naval Architecture, 2016)***

WAVE DIRECTION		MAXIMUM INCREASE IN Hs, Area affected	MAXIMUM REDUCTION IN Hs, Area affected
NE	45°	0.03m, South of Bluff area	-0.09m, Bluff area
ENE	67.5°	0.09m, Bluff area	-0.07m, South Pier
E	90°	0.07m, Bluff area	-0.07m, South Pier
ESE	112.5°	0.03m, Sand trap to Bluff area	-0.05m, Port Entrance to South Beach area
SE	135°	0.03m, Bluff Area	-0.11m, Bluff area
SSE	157.5°	0.05m, South Pier	-0.01m, South Beach
S	180°	0.03m, South Pier	-0.03m, South Beach
SSW	202.5°	0.01m, South Beach (locally)	-0.01m, South Beach
SW	225°	--	-0.01m, South Beach
E/ENE 10Y	**78.75°**	**0.15m, Bluff Area**	**-0.35m, South Pier**
S/SSW 10Y	**191.25°**	**0.15m South Pier**	**-0.15m, South Beach**

13.4.1.9 Conclusions

The simulations have indicated that the maximum possible change in seabed elevation due to sandwinning will result in changes to local coastal significant wave heights of less than 5% of the corresponding offshore significant wave height for the full range of wave directions.

For the most frequently occurring wave directions, the changes to local coastal significant wave heights were found to be less than 1.5% of the corresponding offshore wave heights. It should be noted that the biggest storms are from S to SSW which is also the most frequently occurring wave direction. For the 1:10 year storm calculations the change in local coastal

significant wave heights was found to be not more than 3.3% and 2.3% of the corresponding offshore heights E/EWE and W/SSW respectively.

It is not anticipated that such minor differences in wave height under normal conditions will result in any negative impact on shoreline stability and sediment transport anywhere along the coastline in the immediate vicinity.

It is expected that any local increases in water depth due to dredging in the proposed areas will be reversed in a short period of time due to longshore sediment transport of approximately 1,250,000 m^3 per annum.

13.5 Geophysical and Sediment Sampling Survey

The Marine Geoscience Unit at the Council for Geoscience conducted a marine geophysical investigation of Area 1 and Area 2 (shown in **Figure 8**), as potential sandwinning sites. A copy of the report is contained in **Appendix F4**.

A standard suite of geophysical instruments including a digital echo-sounder, 3.5 kHz sub-bottom profiler and a side-scan sonar were used for data collection during the survey. A grab sampling and sediment coring programme was also conducted to investigate the nature of the sediments and to assess their suitability as backfill.

Findings from this investigation are included in the following sections of the EIA Report:

- Section 12.2 - description of the geology at the sandwinning sites;
- Section 12.3 - description of the bathymetry at the sandwinning sites;
- Section 12.9 - description of sediment characteristics at the sandwinning sites; and
- Section 11.1 - explanation of the screened alternative sandwinning sites (Area 1 and Area 2).

The geophysical investigation found that the most promising sandwinning site for Area 1 (which encompasses both Site 1 and Site 2) is a ± 800m wide corridor adjacent to the western boundary of this area (shown in **Figure 31**). Contributing factors include the lack of reef exposure, close proximity to the harbour entrance, the sparse nature of debris accumulations and availability of adequate sediment thickness (3 - 4 m) (Miller and Leuci, 2001).

Although this is the case, Area 1 was divided into Site 1 and Site 2 (alternatives assessed as part of the EIA) based on the findings of the Underwater Heritage Impact Assessment undertaken for the Berth 203 to 205 Expansion EIA.

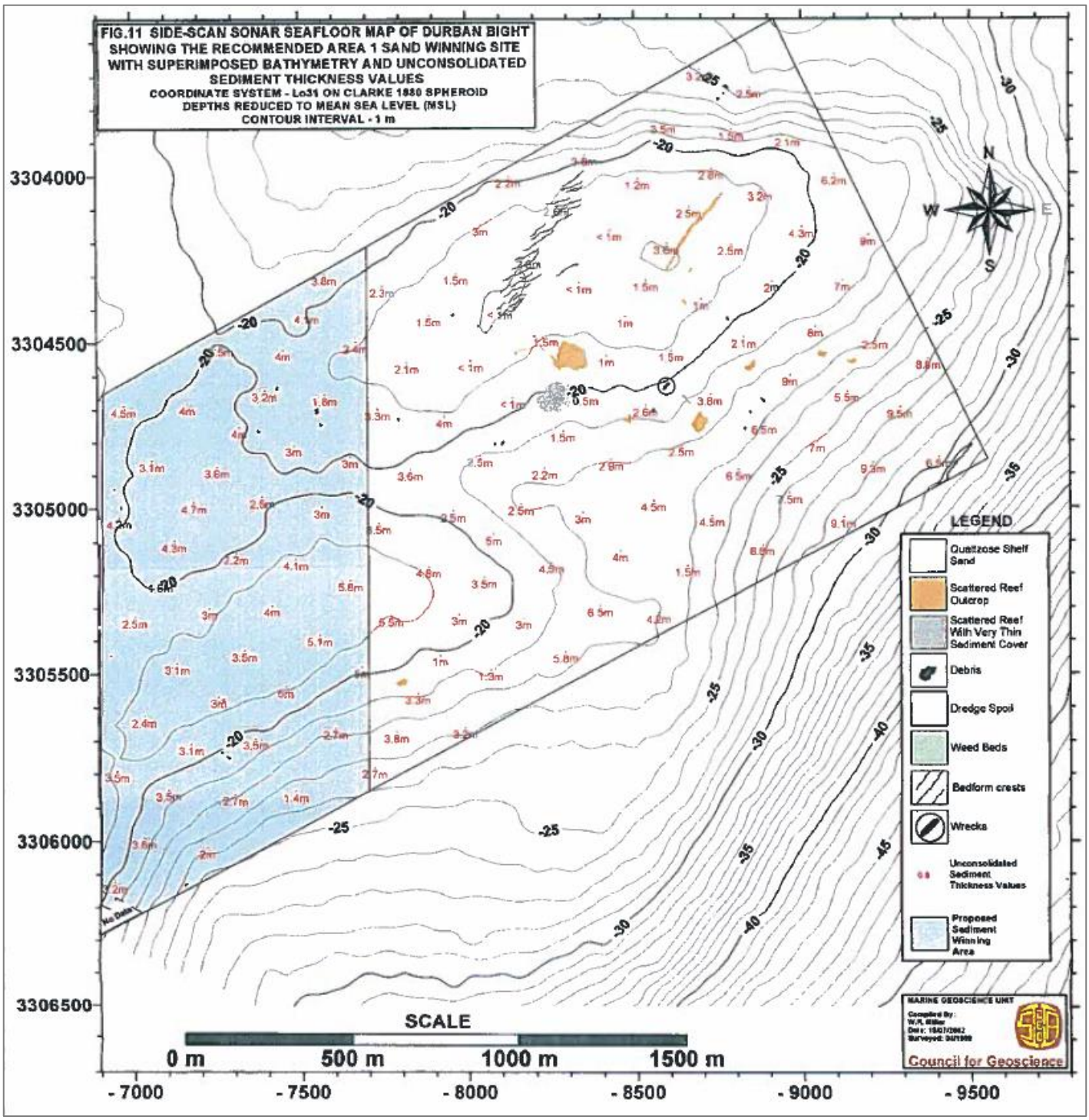


Figure 31: ***Recommended Area 1 Sandwinning Site, based on geophysical investigation (Miller and Leuci, 2001)***

13.6 Assessment of Sediment Quality

13.6.1 Scope of Specialist Study

An assessment of the sediment quality was conducted by the Coastal Systems Research Group of the CSIR to determine whether the sediment at the alternative sandwinning sites is contaminated.

13.6.2 Details of Specialist

Details of the nominated specialist which was appointed to undertake the study are as follows:

Organisation:	Coastal Systems Research Group Ecosystem Services Competence Area Natural Resources and the Environment CSIR
Name:	Brent Newman
Qualifications:	PhD Zoology
No. of years' experience:	23 years
Affiliation (if applicable):	N/A

13.6.3 Summary of Study

The findings of this investigation follow and a copy of the report is contained in **Appendix F5**.

13.6.3.1 Fieldwork and Laboratory Analyses

Sediment was collected in April 2017 at six positions (stations) at the two alternative sandwinning sites near the entrance to the Port of Durban (listed in **Table 18** and shown in **Figure 32**). The sediment was collected using a Day grab.

Table 18: ***GPS coordinates of stations sampled at alternative sandwinning sites (CSIR, 2017)***

Station	Latitude	Longitude
SW1	29°52.363'S	31°4.445'E
SW2	29°52.074'S	31°4.985'E
SW3	29°51.759'S	31°5.592'E
SW4	29°51.953'S	31°4.438'E
SW5	29°51.699'S	31°4.914'E
SW6	29°51.418'S	31°5.454'E

The sediment was analysed for grain size composition, total organic content and concentrations of a suite of metals.

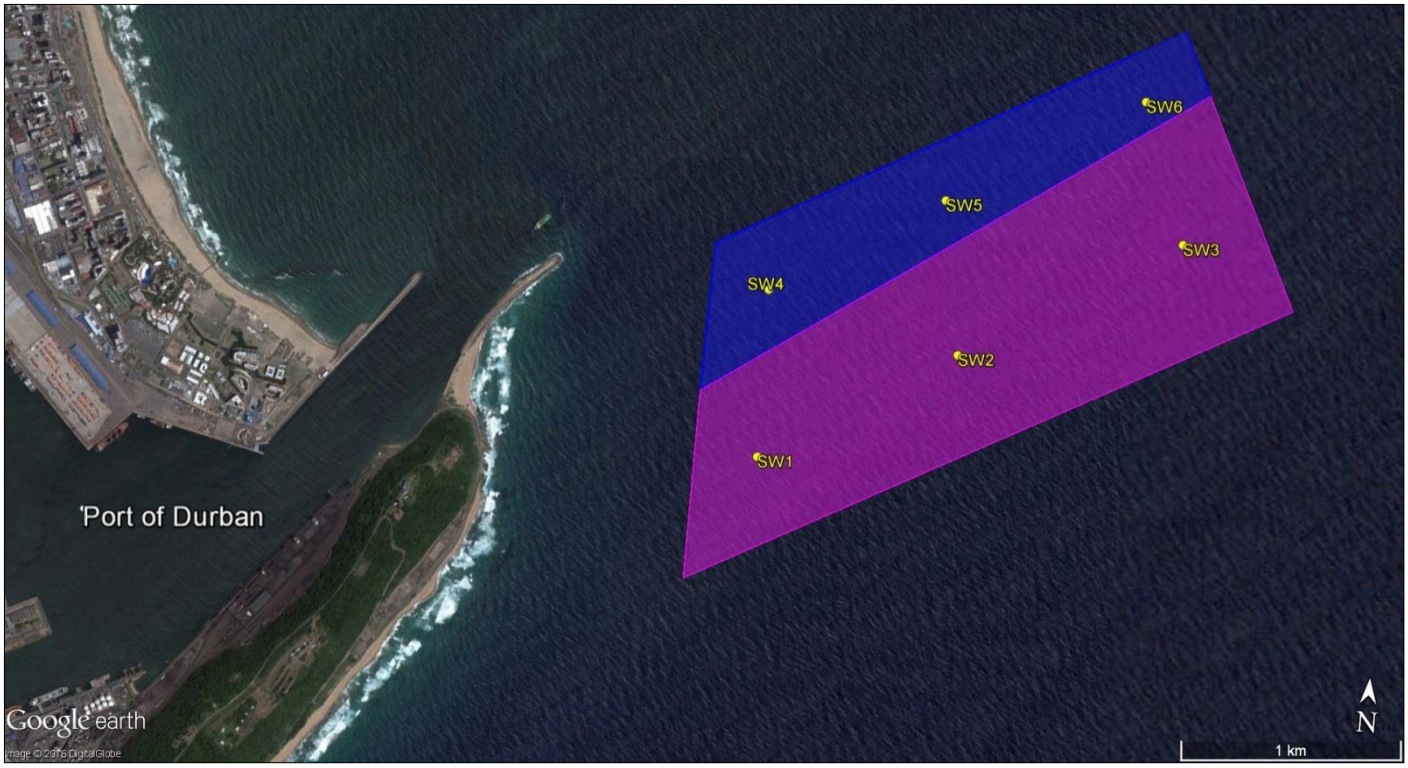


Figure 32: ***Aerial view of the alternative sandwinning sites showing the positions (stations) where sediment was collected for physical and chemical analysis in April 2017 (CSIR, 2017)***

13.6.3.2 Results and Discussion

From a textural perspective the sediment collected at all stations at the alternative sandwinning sites is classified as sand. The dominant grain size class at all stations was medium-grained sand. No mud was detected in the sediment at any station. The high sand fraction and absence of mud reflects strong currents that characterise the water column at the alternative sandwinning sites and effectively limit the settling of fine-grained material on the seabed.

The total organic content of sediment collected was extremely low, never exceeding 0.05%. This is consistent with the absence of mud in the sediment and also reflects the strong currents that characterise the water column at the alternative sandwinning sites and effectively limit the settling of fine-grained material on the seabed. There is thus little risk that the exposure of particulate organic matter in sediment at the sandwinning sites will result in a significant oxygen demand when this material is degraded by bacteria.

The concentrations of all metals in sediment collected at all stations fall within baseline model prediction limits or below baseline concentrations. In other words there was no evidence for metal contamination of sediment at the sandwinning sites. This is not surprising considering the sediment was comprised almost exclusively of sand, which is comprised largely of metal deficient quartz, and that mud, which is not only the dominant natural metal bearing phase of sediment but also sequesters contaminant metals, was not detected in the

sediment. Although this study focussed on surface sediment there is very little likelihood the situation for deeper layers of sediment will be any different as this sediment is also likely to be comprised predominantly of sand.

The toxicological risk posed by metals in sediment can be estimated by their comparison to sediment quality guidelines. DEA: Oceans and Coasts has defined sediment quality guidelines that are used to decide if sediment identified for dredging in South African ports is of a suitable quality for openwater disposal. The Department defined two guidelines, known as the Level I and Level II. Sediment that has metals at a concentration below the Level I is considered suitable for openwater disposal. Sediment with metals at a concentration between the Level I and Level II is considered cause for possible ecological concern, with the degree of concern increasing as the concentration approaches the Level II. Sediment with metals at a concentration exceeding the Level II is considered unsuitable for openwater disposal.

Metal concentrations in sediment from all stations at the sandwinning sites are far lower than the Level I. In other words there is very little likelihood the metals were toxic to sediment-dwelling organisms. It is important to note these sediment quality guidelines are only intended for application in ports, where metal concentrations in sediment are naturally higher than in sediment in nearshore marine waters. This is because the sediment in most ports is characterised by a high mud fraction.

13.6.3.3 Conclusions

Sediment collected at the two alternative sandwinning sites near the Port of Durban was comprised almost exclusively of sand. Metal concentrations in the sediment were very low, reflecting the fact that the sediment is comprised almost exclusively of sand, which is naturally metal deficient, and no mud was detected in the sediment. Metal concentrations in the sediment are far lower than sediment quality guidelines derived to be protective of sediment-dwelling organisms.

There is thus essentially no risk that metals in sediment at the sandwinning sites were toxic to sediment-dwelling organisms and also essentially no risk metals will be released into the water column during dredging.

14 IMPACT ASSESSMENT

14.1 Overview

14.1.1 General

This section focuses on the pertinent environmental impacts that could potentially be caused by the proposed activity. An 'impact' refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity. Impacts were identified as follows:

- Impacts associated with listed activities contained in GN No. R. 984 (4 December 2016) for which authorisation has been applied for;
- An appraisal of the project activities and components;
- Issues highlighted by environmental authorities;
- Comments received during public participation;
- An assessment of the receiving biophysical, social, economic and technical environment; and
- Findings from Specialist Studies.

14.1.2 Issues raised by Environmental Authorities and IAPs

The issues raised by authorities (both regulatory and commenting) and IAPs to date during the execution of the EIA are captured in the Comments and Responses Report (refer to **Appendix J**). These issues are succinctly grouped in **Table 19**.

14.1.3 Environmental Activities

In order to understand the impacts related to the project it is necessary to unpack the activities associated with the proposed sandwinning operations, which include the following:

- Planning Phase -
  - Technical, economic and environmental screening of alternate footprints;
  - Seek relevant statutory approvals.
- Pre-Mining Phase -
  - Procurement process for Contractors.
- Mining Phase -
  - Dredging operations (see description in **Section 6.2**) ; and
  - Transporting dredged material to where it is required.

14.1.4 Potential Significant Environmental Impacts

The potential significant environmental aspects and impacts associated with the project, as listed in **Table 19**, were identified through an appraisal of the following:

- Activities associated with the offshore sandwinning operations;
- Proposed alternatives (**Section 11**);
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (**Section 12**), which included a desktop evaluation (via literature review, specialist input, GIS, topographical maps and aerial photography), and site investigations;
- Findings from Specialist Studies (**Section 13**);
- Understanding of direct and indirect effects of the project as a whole (**Section 14**);
- Input received during public participation from authorities and IAPs;
- Legal and policy context (**Section 7**); and
- Local and international research of similar projects.

Note that Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact.

Table 19: ***Potential Environmental Aspects/Impacts/Implications***

Category	Potential Issues/Aspects/Impacts/Implications
Bathymetry	• Changes to the underwater topography
Wave hydrodynamics	• Changes in the local wave and current patterns • Changes to local erosional and depositional patterns
Marine sediments	• Changes in sand movement • Loss of sand through dredging • Rate of replenishment at sandwinning site • Sufficient volume of sand available
Water quality	• Creation of turbidity plumes as a result of dredging and disposal of material • Disturbing contaminants historically deposited at the sandwinning site • Fuel spills from dredger • Spillages of dredged material
Marine ecology	• Changes in the density, diversity, biomass, and community structure of the benthos or fish populations (biological effects) caused by: – Alteration of the substrate (habitat loss) – Physical removal – Water pollution – Smothering – Noise • Disturbance at sensitive times such as the sardine run and

Category	Potential Issues/Aspects/Impacts/Implications
	whale migrations • Impacts on marine mammals such as humpback dolphins
Beaches	• Erosion of beaches due to a reduction of sediment supply to the coast • Shoreline accretion
Climate change	• Increased storm surge heights and intensities, which may impact on sandwinning activities
Socio-economic	• Impacts on recreational activities • Impacts of increased sedimentation, as well as shoreline erosion or accretion, on beach users and uShaka Marine World • Impacts on subsistence fisher folk • Positive impacts related to development within the Port of Durban
Heritage	• Impacts to underwater heritage resources

The cumulative impacts are discussed in **Section 14.4.**

The findings of the Specialists are of particular importance in terms of understanding the impacts of the project and managing these during the sandwinning operations, as these studies focused on the significant environmental issues identified during the execution of the EIA.

14.1.5 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts (refer to methodology provided in **Table 20**).

The assessment considers impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

Table 20: Impact Assessment Methodology

Nature			
Negative	Neutral	Positive	
-1	0	+1	
Extent			
Local	Regional	National	International
1	2	3	4
Magnitude			
Low	Medium	High	
1	2	3	
Duration			
Short Term (0-5yrs)	Medium Term (5-11yrs)	Long Term	Permanent
1	2	3	4
Probability			
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5
Significance			
No Impact/None	No Impact After Mitigation/Low	Residual Impact After Mitigation/Medium	Impact Cannot be Mitigated/High
0	1	2	3

The following definitions apply:

Nature (/Status)
The project could have a positive, negative or neutral impact on the environment.
Extent
• Local – extend to the site and its immediate surroundings. • Regional – impact on the region but within the province. • National – impact on an interprovincial scale. • International – impact outside of South Africa.
Magnitude
Degree to which impact may cause irreplaceable loss of resources. • Low – natural and social functions and processes are not affected or minimally affected. • Medium – affected environment is notably altered; natural and social functions and processes continue albeit in a modified way. • High – natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
Duration
• Short term – 0-5 years. • Medium term – 5-11 years. • Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.

• Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability
• Almost certain – the event is expected to occur in most circumstances. • Likely – the event will probably occur in most circumstances. • Moderate – the event should occur at some time. • Unlikely – the event could occur at some time. • Rare/Remote – the event may occur only in exceptional circumstances.
Significance
Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows- 0 – Impact will not affect the environment. No mitigation necessary. 1 – No impact after mitigation. 2 – Residual impact after mitigation. 3 – Impact cannot be mitigated.

The following scoring system applies:

Overall Score = (NxMxS)x(E+D+P)

For example, the worst possible impact score of -117 would be achieved based on the following ratings:

N = Nature = -1

M = Magnitude = 3

S = Significance = 3

E = Extent = 4

D = Duration = 4

P= Probability = 5

Worst impact score = (-1 x 3 x 3) x (4+4+5) = -117

On the other hand, if the nature of an impact is 0 (neutral or no change) or the significance is 0 (no impact), then the impact will be 0.

Impact Scores will be ranked as per the ratings shown in **Table 21**.

Table 21: ***Ranking of Overall Impact Score for Impact Assessment***

Impact Rating	Low/Acceptable	Medium	High	Very High
Score	0 to -30	-31 to -60	-61 to -90	-91 to -117

In the case of the Specialist Studies, some of the impact assessment methodologies deviated from the approach above. However, the quantitative basis for these specialist

evaluations of the impacts to specific environmental features still satisfied the intention of the EIA.

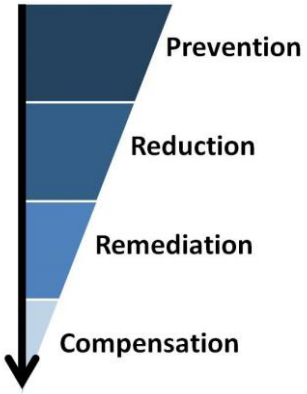
14.1.6 Impact Mitigation

14.1.6.1 Mitigation Hierarchy

Impacts are to be managed by assigning suitable mitigation measures. According to DEAT (2006), the objectives of mitigation are to:

- Find more environmentally sound ways of executing an activity;
- Enhance the environmental benefits of a proposed activity;
- Avoid, minimise or remedy negative impacts; and
- Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy – (1) prevent; (2) reduce; (3) rehabilitate (or remediate); and/or (4) compensate for the environmental impacts.



The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices.

Note that the mitigation measures in the subsequent sections are not intended to be exhaustive, but rather focus on the potentially significant impacts identified.

The EMPr (contained in **Appendix G**) provide a comprehensive list of mitigation measures for specific elements of the project, which extends beyond the impacts evaluated in the body of the EIA Report.

14.1.6.2 EMPr

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

The EMPr aims to satisfy the requirements stipulated in Appendix 4 of GN No. R. 982 (4 December 2014).

The scope of the offshore sandwinning EMPr is as follows:

- Establish management objectives during the sandwinning operations in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;

- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr;
- Provide legislative framework; and
- Description of requirements for record keeping, reporting, review, auditing and updating of the EMPr.

All liability for the implementation of the EMPr (as well as the EIA findings and environmental authorisation) lies with the project proponent (i.e. TNPA).

The following considerations and assumptions accompany the compilation of the EMPr:

- The EMPr is guided by the following principles, based on Lochner (2005) –
  - Continuous improvement - The project proponent (or implementing organisation) should be committed to review and to continually improve environmental management, with the objective of improving overall environmental performance;
  - Broad level of commitment - A broad level of commitment is required from all levels of management as well as the workforce in order for the implementation of the EMPr to be successful and effective;
  - Flexible and responsive - The implementation of the EMPr needs to be responsive to new and changing circumstances. The EMPr is a dynamic "living" document that will need to be updated regularly throughout the duration of the project life-cycle.
- Compliance with the EMPr must be audited in terms of Regulation 34 of GN No. R 982 (4 December 2014).
- Any amendments to the EMPr must be undertaken in accordance with Regulations 35 – 37 of GN No. R.982 (4 December 2014).
- The EMPr provides the framework for the overarching environmental management requirements for the project life-cycle. Following detailed design and planning, the EMPr may need to be revised to render the management actions more explicit and accurate to the final project specifications.
- The EMPr will be linked to the project's overall Environmental Management System (EMS) (if applicable), where the EMS constitutes an iterative process that aims to achieve continuous improvement and enhanced environmental performance.
- Although every effort has been made to ensure that the scope and level of detail of the EMPr are tailored to the level of environmental risk (i.e. type and scale of activity and the sensitivity of the affected environment) and the project- and site-specific conditions, certain of the environmental management requirements within the EMPr may be regarded as generic to make provision for activities that may take place as part of the overall project.

14.1.7 Closure Plan

Due to the nature of the proposed sandwinning activities a Closure Plan, as contemplated in Regulation 19 of GN No. R. 982 (4 December 2014), is not required. Following consultation with DMR an Exemption Application, in accordance with Regulation 3 of the National Exemption Regulations (8 December 2014), was compiled in this regard which is contained in **Appendix H**.

14.2 Impacts on Receiving Environment

14.2.1 Climate

The proposed offshore sandwinning does not have any direct impacts on climate. In order to ensure minimal increases in greenhouse gasses associated with fuel combustion in dredge equipment, it is recommended that one dredger be used at a time and that the dredger should be well maintained and efficiently operated at all times.

A benefit of using marine sources of aggregate is that ships can deliver the material directly to the harbour, at the project sites, which minimises road and rail transport that are associated with higher emissions of greenhouse gasses.

The key climate change and climate change-related factors which can affect offshore sandwinning include:

- Increasing storm surge heights;
- Possible increases in storm intensity;
- Changes in seasonable precipitation amounts;
- Increasingly intense precipitation events; and
- Changes in the morphology of the coastal area due to climate change may induce changes in erosion and sedimentation patterns, with potential consequences for offshore dredging requirements.

The dredger will be seaworthy, fit for its intended use and able to withstand any normal perils of the sea. Under severe conditions (e.g. intense storms) it may be deemed necessary to halt dredging operations until conditions improve.

14.2.2 Bathymetry

One of the principal effects of sediment extraction is associated with changes in bathymetry. Dredging using a TSHD creates furrows in the seabed typically 2 - 3 m wide and initially around 0.5m deep. These furrows may extend for the whole length of the dredger operation. Over time, the overall level of the seabed is gradually lowered further through repeat activities. The direct ‘footprint’ of the changes in bathymetry is local, confined to dredging lanes or pits within the dredging area.

The effect may also be non-permanent in duration, due to subsequent infilling of the dredged areas with sediment. The rate of infilling is governed by the mobility of seabed sediments within the region and the intensity of the dredging activities (frequency and spatial extent of dredging within the seabed area). However, until the seabed level recovers there may be associated indirect effects on the wave, tide and sediment regimes, which may cause impacts that extend beyond the dredged area, potentially extending to the coastline or other sensitive receptors in the offshore area (RHDHV, 2015).

In order to obtain the required volume of material sandwinning will proceed to approximately 4.1m in Site 1 and approximately 1.8m in Site 2. Thus there will be a change in bathymetry at the sandwinning site. However, the change in bathymetry is not expected to be permanent as longshore sediment transport of approximately 1,250,000 m^3 per annum will decrease the effect of sandwinning (ZAA Engineering Projects and Naval Architecture, 2016).

The following is noted with regards to the proposed dredging operations:

- Slopes will normally be about 1-vertical to 10-horizontal (5.7 degrees) with a maximum of about 1-vertical to 4-horizontal (14 degrees);
- As the TSHD starts or nears the end of a run it lowers or raises (respectively) the trailing dredge head while the vessel is still moving, before turning, and this flattens the slopes at the edges;
- TSHD's essentially dredge the seabed horizontally and limited quantities of sand are loosened on each pass and there is very low spillage; and
- The expected depth dredged in a single sweep depends on the size of the dredge head and the vessel speed.

Impact Assessment	
Potential Impact:	Potential changes to bathymetry at sandwinning site as a result of dredging operations.
Proposed Mitigation:	The depth of material removed each time the dredger visits the site is small and the natural longshore sand movement along the coast will rapidly fill in the small depression so created. Hence, no mitigation is required.

	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-1	Local 1	Medium 2	Medium-term 2	Almost Certain 5	1	-16

14.2.3 Inshore hydrodynamics

In general, changes in bathymetry have the potential to alter the wave transformation processes across an affected seabed, with a residual effect potentially extending to adjacent areas of seabed, sand banks or even the shore. In addition, the processes of wave refraction across a seabed may be altered following dredging activities, thereby potentially altering the distribution of wave energy in the lee of the dredged area. Both the direction and magnitude of waves may be influenced. These factors may, in turn, alter the processes of sediment

transport, potentially including altering littoral drift rates and patterns of erosion and accretion at the coast.

Simulations as part of the Wave Modelling Study (ZAA Engineering Projects and Naval Architecture, 2016) indicated that the maximum possible change in seabed elevation due to sandwinning will result in changes to local coastal significant wave heights of less than 5% of the corresponding offshore significant wave height for the full range of wave directions. For the most frequently occurring wave directions, the changes to local coastal significant wave heights were found to be less than 1.5% of the corresponding offshore wave heights. It should be noted that the biggest storms are from S to SSW which is also the most frequently occurring wave direction.

For the 1:10 year storm calculations the change in local coastal significant wave heights was found to be not more than 3.3% and 2.3% of the corresponding offshore heights E/EWE and W/SSW respectively.

It is not anticipated that such minor differences in wave height under normal conditions will result in any negative impact on shoreline stability and sediment transport anywhere along the coastline in the immediate vicinity.

It is expected that any local increases in water depth due to dredging in the proposed areas will be reversed in a short period of time due to longshore sediment transport.

The impact assessment for the effect of sand-winning on inshore hydrodynamics, as contained in the Marine Impact Assessment Study (Anchor Environmental, 2016), follows.

Impact Assessment							
Potential Impact:	Potential effect of sandwinning on inshore hydrodynamics.						
Proposed Mitigation:	No mitigation required, based on findings of specialist studies.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-1	Regional 2	Low 1	Long-term 3	Unlikely 2	1	-7

14.2.4 Turbidity Plume

Figure 33 shows the types of processes which can generate a sediment plume during the operation of a TSHD.

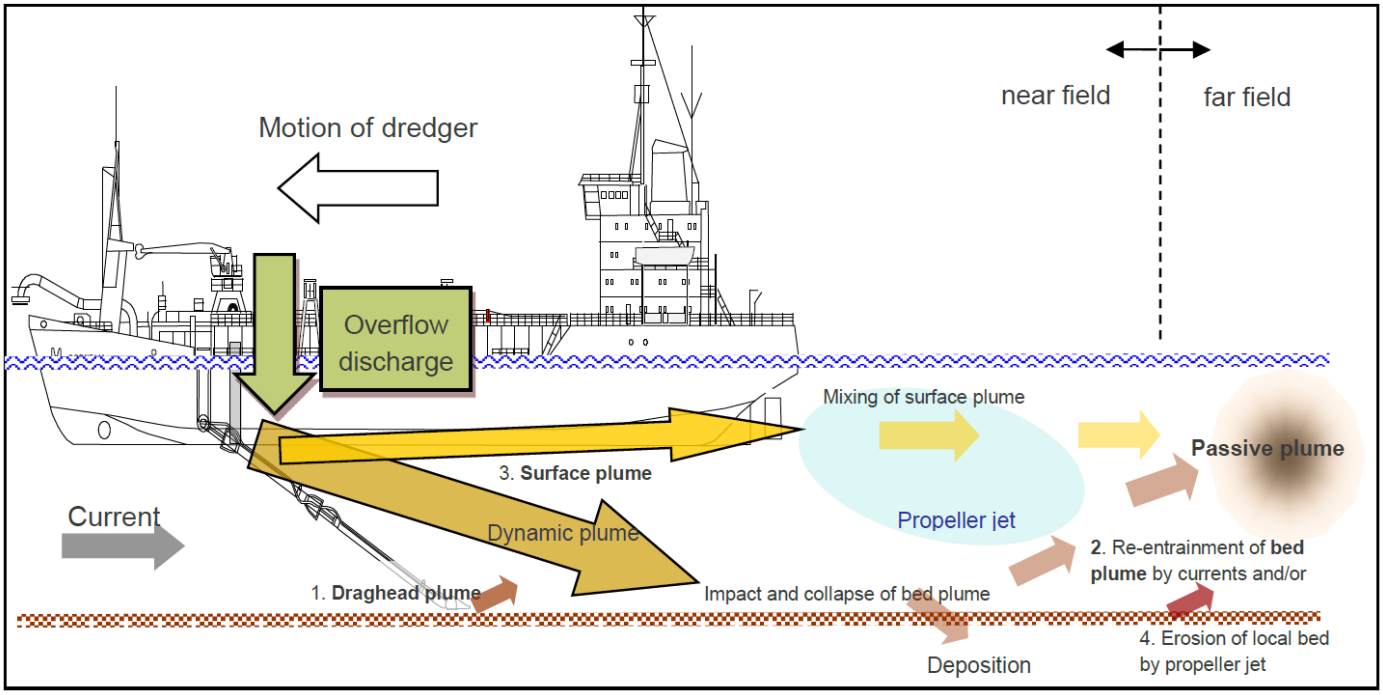


Figure 33: General mechanisms for release of sediment arising from TSHD dredging (Spearman et al., 2011)

The plumes arising from TSHDs are caused by the discharge (or "overflow") of sediment-laden water from the hopper (usually through the hull of the dredger but sometimes over the ship-sides) which can form surface or near bed plumes. The introduction of this sediment, which can have significant initial momentum, into the water column results in a body of water denser than the surrounding water that descends towards the seabed. For dredgers which release overflow from the hull, (under normal loading) the plume ejected from the hull of the dredger creates both a dynamic plume (which descends rapidly towards the bed) and an often visible surface plume from the material which does not descend directly to the seabed with the dynamic plume.

Available evidence from measurements (HR Wallingford, 2016) indicates that the bulk of the overflow sediment forms a dynamic plume whilst the surface plume represents a small proportion of the sediment released in the overflow. Typically, this proportion is around 15% or less (HR Wallingford, 2016).

The dynamic plume eventually impacts with, and collapses onto, the bed to form a bed plume which may not initially mix with the overlying waters, depending on the density difference between this layer and the ambient concentrations and the magnitude of the ambient currents (and wave action). As sediment settles out of this layer, and the thickness of the layer is reduced by further collapse, mixing will at some point occur and this layer may be re-entrained into the waters above to contribute to the passive plume. The sediment released onto the bed from the dynamic plume may mix with the overlying waters in time (depending on the currents and waves) but is not normally measurable as part of the

dispersing plume due to its low rate of entrainment and positon extremely close to the seabed.

Disturbance by the TSHD drag-head also plays a small role, although typically the release of fine sediment from the drag-head is less than 1% of that from the overflow (HR Wallingford, 2016).

The duration of the turbidity plume in the water column depends upon the water temperature, salinity, current speed, and the size range of the suspended particles (ICES, 1992). The released sediment will become dispersed vertically and laterally, resulting in increased suspended sediment concentration and sediment deposition nearby to the dredging operations and, potentially, in areas that are remote from the sediment release point. Sediment release and dispersion has the potential to reduce light levels in the water column, smother seabed biota and alter the nature of the seabed substrate (RHDHV, 2015).

The likely magnitude of the turbidity plume associated with the proposed sandwinning activities was not modelled as part of the turbidity modelling studies. This was not deemed necessary by engineers due to the fact that the volume of suspended sediment is far greater for the dumping of dredged material in comparison to that of sandwinning. Hence, modelling was only undertaken for sediment plumes resulting from offshore disposal of dredged material (ZAA Engineering Projects and Naval Architecture, 2012). These models were run for the prevailing wind directions (south-west and north-east) at a velocity of 39 knots and are presented in **Figure 34**. Due to these prevailing winds, material disturbed on the bottom or released into the water column at the proposed sandwinning sites is likely to be carried in a north-easterly direction for the majority of the time but on occasion may also be carried towards the south-west. Given the small magnitude of the plume predicted from these studies, even under worse-case scenario conditions, it was concluded that additional modelling work for the sandwinning operations was not required. As sediment within the sites is relatively coarse, only a small plume area is likely to result from sandwinning operations.

Under north easterly wind conditions dispersion of the sediment plume during dumping was predicted to be more rapid due to the increased current velocity toward the south west, although the predicted TSS concentration of 5 mg/L four hours after discharge are highly unlikely to reach the shoreline. This added to the background turbidity of 8.7 mg/L, falls below the low risk TSS level of 20 mg/L (Steffani *et al*., 2003). Despite the unavoidably high but localised turbidity at the dredge head, the perceived impact is considered to be of 'low' risk.

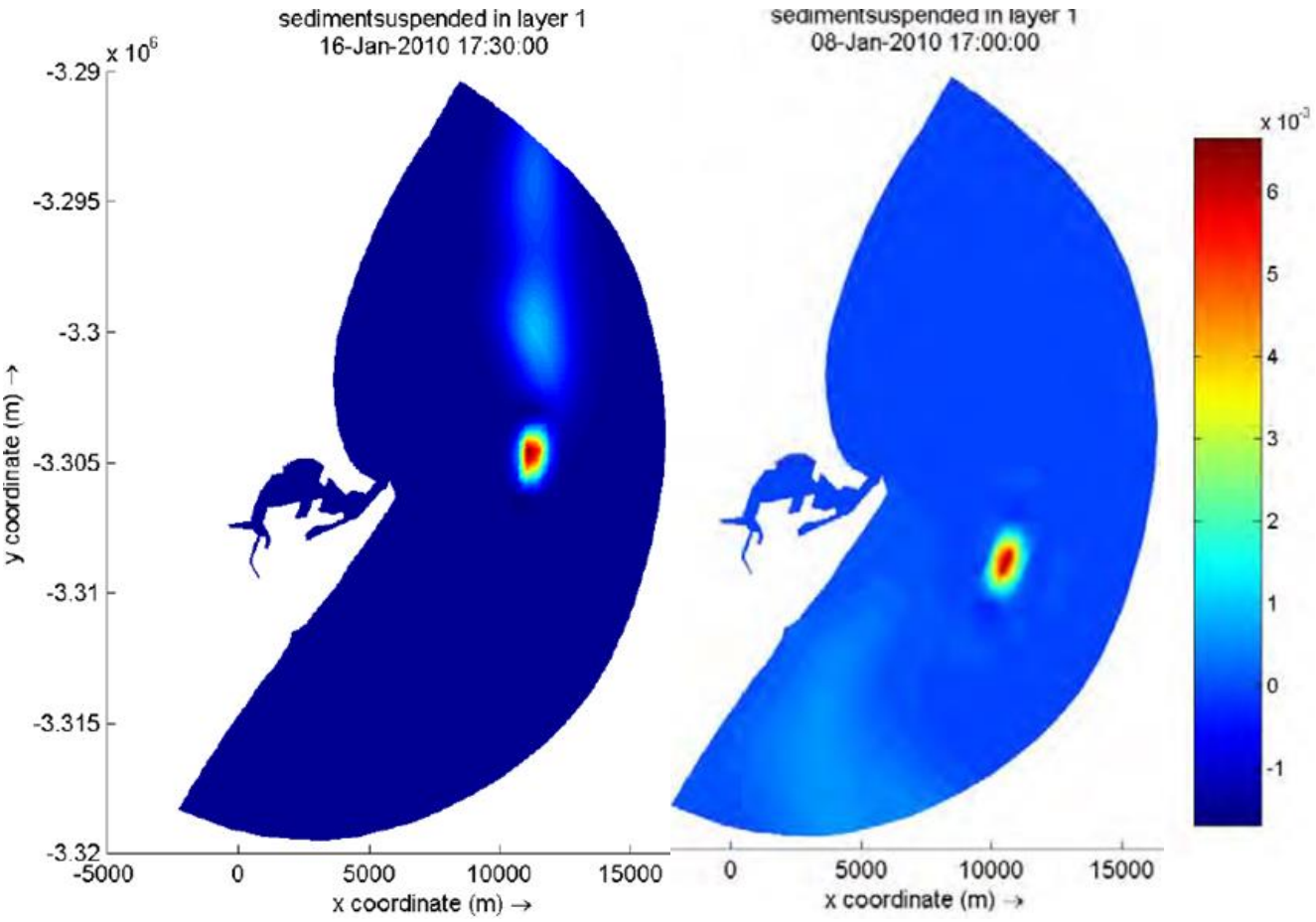


Figure 34: ***Predicted suspended sediment dispersion within the surface layer due to offshore dumping at spring tide with a 20 knot SSW wind (left) and neap tide with a 39 knot NNE wind (right) (adapted from ZAA Engineering Projects and Naval Architecture, 2012)***

The impact assessment for the ecological effects of increased turbidity on marine biota, as contained in the Marine Impact Assessment Study (Anchor Environmental, 2016), follows.

Impact Assessment	
Potential Impact:	Adverse ecological effects of increased turbidity on marine biota.
Proposed Mitigation:	No mitigation required, based on findings of specialist studies.

	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-1	Local 1	Low 1	Long-term 3	Likely 4	1	-8

14.2.5 Smothering of benthic marine organisms

The physical removal of benthic sediment during sand-winning is associated with the suspension and the resultant deposition of particles that can smother marine organisms in the impacted area. Benthic invertebrates, particularly those that filter-feed, are susceptible to these effects as many lack the mobility inherent to fishes. They generally ingest high levels of inorganic material filtered from the water, resulting in lower growth rates, starvation and, in

the worst cases, mortality. Particle size analysis revealed that surficial marine sediments within the sandwinning areas largely comprised sand. Given that sand settles out of the water column faster than fine sediments and that the affected area is relatively small when compared to the total deep subtidal habitat offshore, the result of smothering is considered to be 'low'.

The impact assessment for the ecological effects caused by smothering of subtidal bottom-dwelling organisms, as contained in the Marine Impact Assessment Study (Anchor Environmental, 2016), follows.

Impact Assessment							
Potential Impact:	Adverse ecological effects caused by smothering of subtidal bottom-dwelling organisms.						
Proposed Mitigation:	No mitigation required, based on findings of specialist studies.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-1	Local 1	Low 1	Long-term 3	Almost certain 5	1	-9

14.2.6 Mobilisation of contaminants and nutrients

Sandwinning is likely to stir up subtidal marine sediments that may contain contaminants (e.g. trace metals, hydrocarbons) and excess nutrients, which can negatively impact marine biota in the surrounding area. Harmful substances can cause mortality of invertebrates, while excess nutrients can cause algal blooms, decreased dissolve oxygen concentrations and local eutrophication.

The assessment of the sediment quality undertaken by CSIR (refer to **Section 13.6**) concluded the following:

- The sediment collected at the two alternative sandwinning sites near the Port of Durban was comprised almost exclusively of sand. Metal concentrations in the sediment were very low, reflecting the fact that the sediment is comprised almost exclusively of sand, which is naturally metal deficient, and no mud was detected in the sediment;
- Metal concentrations in the sediment are far lower than sediment quality guidelines derived to be protective of sediment-dwelling organisms; and
- There is thus essentially no risk that metals in sediment at the sandwinning sites were toxic to sediment-dwelling organisms and also essentially no risk metals will be released into the water column during dredging.

A quantitative impact assessment was thus not deemed to be necessary, based on the abovementioned findings.

14.2.7 Disposal of solid waste and spillage of hazardous substances

The problem of litter entering the marine environment has escalated dramatically in recent decades, with an ever-increasing proportion of litter consisting of non-biodegradable materials. Objects which are particularly detrimental to marine fauna include plastic bags and bottles, pieces of rope and small plastic particles (Wehle and Coleman 1983). Large numbers of marine organisms are killed or injured daily by becoming entangled in debris (Wallace, 1985) or as a result of the ingestion of small plastic particles (Shomura and Yoshida, 1985). As a result, all domestic and general waste from the dredger must be disposed of responsibly.

Spillage of hazardous substances such as fuel for the powering of vessels also poses a risk to the environment. As hydrocarbons are toxic to aquatic organisms, all fuel and oil must be stored with adequate spill protection and vessels must be checked for leaks. A rigorous environmental management and control plan must be available to limit ecological risks from accidents. Disposal of any substance into the marine environment is strictly prohibited and accidental spillages must be immediately contained and reported. After implementation of mitigation, these impacts are of 'low' significance.

Spillages of dredged material can be picked up by checking the disposal site records and logs of dredged material disposal trips.

The impact assessment for the disposal of solid waste and spillage of hazardous substances, as contained in the Marine Impact Assessment Study (Anchor Environmental, 2016), follows.

Impact Assessment	
Potential Impact:	• Adverse ecological effects caused by the disposal of solid waste. • Adverse ecological effects caused by spillage of hazardous substances.
Proposed Mitigation:	• Suitable handling and disposal protocols must be clearly explained and sign boarded. • Implement the 'reduce, reuse, recycle' ethos. • All fuel and oil must be stored with adequate spill protection and vessels must be checked for leaks. • A rigorous environmental management and control plan must be available. • Disposal of any substance into the marine environment is strictly prohibited. • Accidental spillages must be immediately contained and reported.

	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-1	Regional 2	Low 1	Long-term 3	Likely 4	2	-18
With Mitigation	-1	Regional 2	Low 1	Long-term 3	Unlikely 2	1	-7

14.2.8 Shoreline erosion

Bed shear stress is defined as the speed at which a fluid moves over a substratum. For a fluid to begin transporting sediment, the speed of movement must exceed the critical shear stress of the bed. An increase in bed shear stress may result in an increase in the amount of

sediment brought into suspension (i.e. erosion), and conversely, a decrease in bed shear stress can result in a decrease in the amount of sediment in suspension (i.e. accretion). Hydrodynamic model simulations prepared by ZAA Engineering Projects and Naval Architecture (2012) showed no significant changes in bed sheer stress over time at any of the observation points along beaches both north and south of Durban (see **Figure 35**).

Furthermore, it is not anticipated that such minor differences in wave height will negatively impact shoreline stability and sediment transport under normal conditions. ZAA stated that: "any local increases in water depth due to sandwinning in the proposed areas will be reversed in a short period of time due to the longshore sediment transport of approximately 1,250,000 m^3 per annum". As such, ZAA concluded that there is unlikely to be any change in erosion or accretion rates on the beaches due to sandwinning activities and this impact is rated as 'low'.

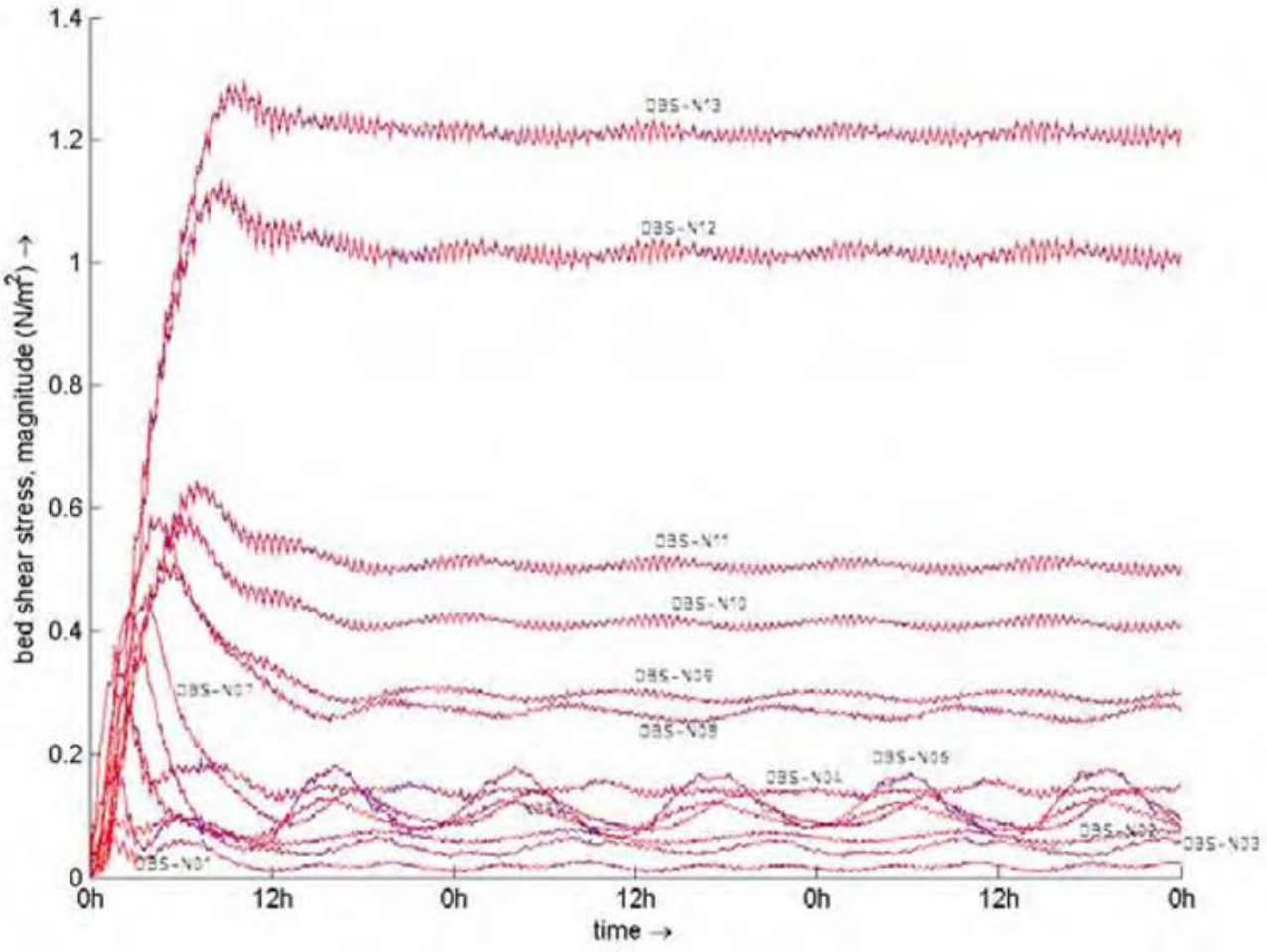


Figure 35: ***Bed shear stress along North Beach with no difference evident in pre- (blue) and post- (red) scenarios (adapted from ZAA Engineering Projects and Naval Architecture, 2012)***

The impact assessment for the effects of sandwinning on shoreline erosion, as contained in the Marine Impact Assessment Study (Anchor Environmental, 2016), follows.

Impact Assessment							
Potential Impact:	Effects of sandwinning on shoreline erosion.						
Proposed Mitigation:	No mitigation required, based on findings of specialist studies.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-1	Regional 2	Low 1	Long-term 3	Unlikely 2	1	-7

14.2.9 Alteration of deep subtidal soft sediment habitat

The Marine Impact Assessment Study (Anchor Environmental, 2016) evaluated the impacts of sandwinning for approximately 4.5 million m^3 of infill for multiple construction projects over an extended period of time. As existing deep subtidal habitat will be affected during each sandwinning event, disturbance will be ongoing, making it difficult for infauna from surrounding, undisturbed areas to recruit into the disturbed area.

It is reported that recovery times for benthic communities consist of an initial recovery phase of 12 months, followed by a period of several years before the population structure returns to pre-disturbance conditions (Newell *et al*., 1998). Recovery time varies according to sediment particle size and the prevailing current strength, with a longer recovery period expected for coarse sediments and a stronger prevailing current. Recolonisation usually takes place through the migration of adults from neighbouring populations by currents and tides (Newell *et al,*. 1998). Following the termination of sandwinning, the impacted area usually recolonises rapidly as opportunistic taxa associated with disturbed environments (e.g. surface deposit feeders) settle. As the community reaches equilibrium, short-lived species are succeeded by long-lived taxa (e.g. plough shells and peanut worms).

The most severe impact on the benthic invertebrate macrofauna from sandwinning at the proposed offshore sites is physical disturbance of the substratum, resulting in habitat loss and mortality of resident infanua. The proposed sandwinning sites represent a ubiquitous sandy-bottom habitat which is fairly tolerant to disturbance when compared to reef and bioclastic sediments. Furthermore, the size of the area impacted is negligible in comparison to the size of the entire area of the same habitat type. Although infauna are expected to slowly recolonise the area after decommissioning of the sandwinning site, the duration of this impact is long-term and the significance 'moderate'. Confidence in this assessment is moderate as no sampling of benthic macrofauna has been conducted at the sites.

The impact assessment for the ecological effects due to alteration of soft sediment habitat, as contained in the Marine Impact Assessment Study (Anchor Environmental, 2016), follows.

Impact Assessment	
Potential Impact:	Ecological effects due to alteration of soft sediment habitat.
Proposed Mitigation:	No mitigation possible.

	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-1	Local 1	Medium 2	Long-term 3	Almost certain 5	2	-36

14.2.10 Disturbance of mobile organisms

The footprint of Site 1 is 1.1 km^2, while that of Site 2 is 2.5 km^2. During sandwinning, the fast swimming mobile fish and elasmobranchs (sharks, rays and skates) will be able to move to adjacent areas, while most slow swimming fish, crabs and benthic infauna are unlikely to be able to move out of the way of the dredger and mortality of these animals is expected to be high. Given the low diversity and abundance of birds and high intensity of human activity on the Durban beachfront and offshore shipping traffic, we anticipate a negligible impact on avifauna of the region.

Most fish fauna associated with the sandy habitats off Durban are expected to be displaced from the sandwinning area whilst active sandwinning is taking place. Larger fish, elasmobranchs and cetaceans will probably swim away from the area of active sandwinning area and will not be susceptible to entrainment in the dredging equipment. Consequently, the anticipated impact of active sandwinning for larger mobile fauna is disturbance rather than mortality. Smaller cryptic species that shelter on or in the sediment and have more limited mobility (e.g. small sole, tonguefish, lizzardfish and flounder) may get sucked up by the dredger and perish.

The altered benthic habitat post-sandwinning is unlikely to be suitable for much of the fish fauna (particularly the smaller cryptic species that shelter within or on the sediment and have relatively small home ranges), until such a time as the sediment stabilizes and invertebrate fauna begins to recolonise the affected area. For these species, the area will probably remain unsuitable until the invertebrate fauna recovers to baseline conditions. Larger species, such as kob, grunter, bellman and many of the sharks and rays, that use the soft sediment areas as feeding grounds, should begin to utilize the affected area as pioneer benthic invertebrate communities develop (these pioneer communities may provide a valuable and accessible food resource). Due to the continuous supply of sediment northwards, it is expected that the trench created by dredging will return to pre-mined depth after termination of sandwinning. Given the dynamic nature of soft substratum habitats in depths shallower than thirty meters on exposed coasts, full recovery of the mobile fauna should take place within the timeframe of benthic invertebrate community recovery. Until this time, sandwinning will be ongoing, resulting in the impact being ‘moderate’.

The impact assessment for the disturbance of mobile organisms during sandwinning, as contained in the Marine Impact Assessment Study (Anchor Environmental, 2016), follows.

Impact Assessment							
Potential Impact:	Disturbance of mobile organisms during sandwinning.						
Proposed Mitigation:	No mitigation required, based on findings of specialist studies.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-1	Local 1	Medium 2	Long-term 3	Almost certain 5	2	-36

14.2.11 Noise

The potential sources of noise associated with a TSHD are shown in **Figure 36**.

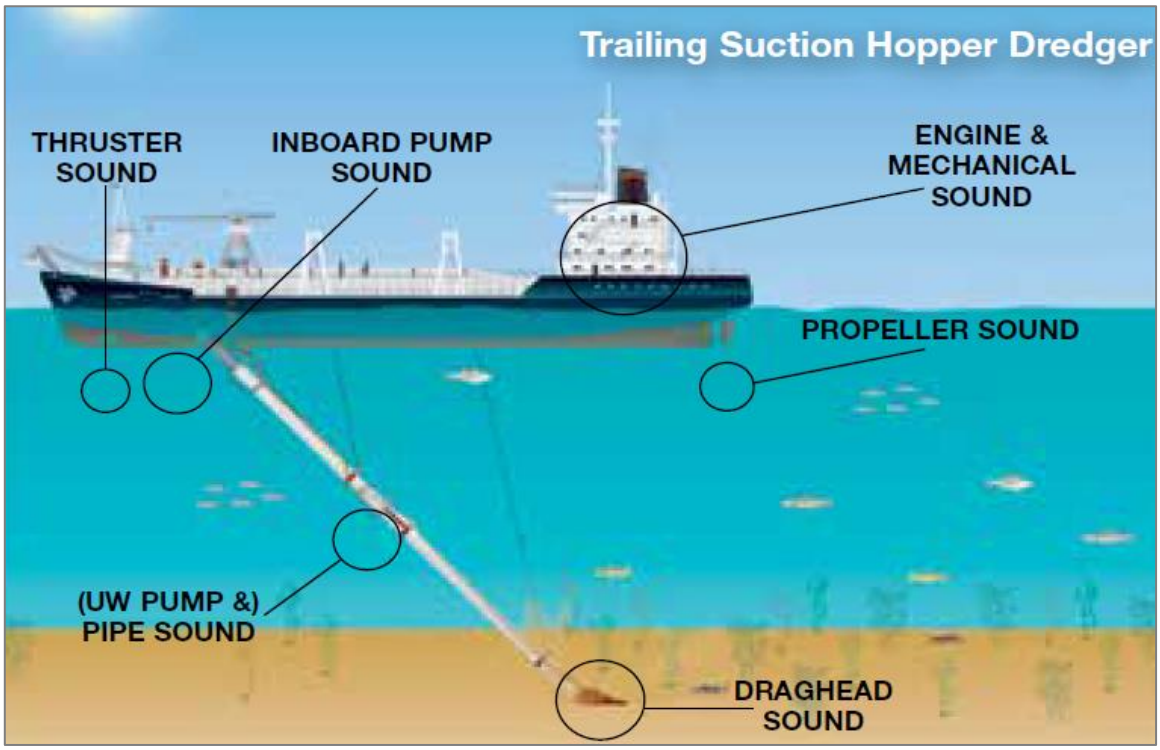


Figure 36: ***Sound sources for TSHD (adapted from WODA, 2013)***

According to WODA (2013), to date auditory and non-auditory injuries have not been observed or documented to occur in association with dredging projects of any kind (with the exception of cases involving underwater blasting prior to substrate removal by conventional dredgers). Lower levels of impact may take the form of recoverable damage to auditory tissues and hearing loss attributable to temporary threshold shifts if animals are exposed for a long period of time and stay in the vicinity of the dredger. Behavioural response is the most likely effect (WODA, 2013).

Impacts of noise and vibration from dredging on marine biota are likely to be negligible as mobile organisms such as marine mammals, sharks, and fish will quickly move out of the area where the dredger is operating.

Dredging activities will be offshore at a distance of 1 - 2km east of the Port of Durban. Sensitive noise receptors near the Port include amongst others recreational users of the shoreline and other amenities (including uShaka Marine World). However, this area is already associated with shipping activity due to the harbour.

Impact Assessment							
Potential Impact:	• Noise impacts on land and along the shoreline related to sandwinning operations. • Noise impacts to marine biota related to sandwinning operations.						
Proposed Mitigation:	No mitigation required, based on findings of specialist studies.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-1	Local 1	Low 1	Medium-term 2	Unlikely 2	1	-5

14.2.12 Visual/seascape impacts

Given the normal nature of shipping activity in this area around the Port as well as the distance of the sandwinning site from the Port (1 - 2km), visual impacts associated with the sandwinning operations are not deemed to be significant.

Impact Assessment							
Potential Impact:	Visual impacts on land and along the shoreline related to sandwinning operations.						
Proposed Mitigation:	No mitigation required, based on findings of specialist studies.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-1	Local 1	Low 1	Medium-term 2	Unlikely 2	1	-5

14.2.13 Impairment of recreational activities

Negative impacts to recreational activities as a result of the sandwinning operations are linked to the adverse effects to fish resources (e.g. turbidity plumes, loss of habitat), physical alteration of the beaches (e.g. erosion or accretion) and changes to inshore hydrodynamics. The aforementioned impacts were assessed as part of the Marine Impact Assessment Study and the Wave Modelling Study and are discussed in various sub-sections under **Section 14.2**.

14.2.14 Safety of crew and vessel

In all dredging projects, the safety of the crew must be assured. This includes the handling of all equipment and dredged material. In addition, the TSHD is required by international

maritime laws to meet certain standards of strength and stability. The strength of the vessel has to meet criteria based on its loading according to the allowed draught in flat water as well as in water with waves. The stability of a seagoing vessel such as a TSHD is also stipulated as the ability of the ship to return to equilibrium when affected by outside forces like winds and waves.

Impact Assessment							
Potential Impact:	Dangers to crew and TSHD.						
Proposed Mitigation:	Adherence to legal obligations and standards to ensure safety of crew and vessels.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-1	Local 1	Medium 2	Medium-term 2	Unlikely 2	1	-10
With Mitigation	0						

14.2.15 Socio-Economic Environment

The Port of Durban can be seen as the premier gateway Port in South Africa and as the South African economy grows, so does the need for a greater capacity to cater for growing freight volumes at the Port. Major growth areas for the Port are seen to be in containers. In 2002 the Port handled 1.31m TEUs and in 2016 the Port handled 2.62m TEUs, which is double the volume handled 15 years ago. The trend on increased container volumes will continue, however at a lower rate. Over the next 10 years, container demand is expected to grow from 2.6m TEUs to 3.7m TEUs. In addition, the Port provides numerous local jobs and contributes to the economic well-being of eThekwini Metropolitan.

Offshore sandwinning will generate material that will be used for the various projects that are associated with the proposed container capacity expansion programme at the Port of Durban (refer to **Section 4.1**). This will also create temporary and permanent jobs that associated with these developments.

Impact Assessment							
Potential Impact:	Socio-economic benefits associated with continued development within the Port.						
Proposed Mitigation:	Mitigation to form part of the individual projects that will form part of the developments within the Port of Durban where the material will be used.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	+1	Regional 2	Medium 2	Long-term 2	Likely 4	2	32

14.2.16 Underwater Heritage

An extract from the Underwater Heritage Impact Assessment (African Centre for Heritage Activities, 2016) follows.

In terms of Section 7 of the NHRA, the underwater heritage sites currently known or which are expected to occur in the alternative sites are evaluated to have the following significance: Grade I. All heritage resources found below the high water mark fall under the national heritage organization (SAHRA) and shipwrecks are automatically Grade 1. There is at least one confirmed shipwreck at Site 2, namely Stuart's Wreck.

Heritage sites are fixed features in the environment, occurring within specific spatial confines. Any impact upon them is permanent and non-reversible. Those resources that cannot be avoided and that are directly impacted by the proposed development can be excavated / recorded and a management plan can be developed for future action. Those sites that are not impacted on can be written into the management plan, whence they can be avoided or cared for in the future.

The impact assessment contained in the Underwater Heritage Impact Assessment (African Centre for Heritage Activities, 2016) focused on the Stuart's Wreck. As this site is located at Site 2, which is not the preferred site, the impact assessment does not apply as this wreck will be avoided. A general impact assessment for underwater heritage, which includes mitigation measures proposed in the Underwater Heritage Impact Assessment (African Centre for Heritage Activities, 2016); follows.

Impact Assessment

Potential Impact:	Damage to underwater heritage as a result of chance finds.
Proposed Mitigation:	• Protection of MUCH sites against vandalism, destruction and theft. • The preservation and appropriate management of new discoveries in accordance with the NHRA, should these be discovered during dredging activities. • The dredgers should be notified and held to the no-dredge zone to avoid destroying MUCH sites. • The contractors and workers should be notified that archaeological sites might be exposed during the dredging activities. • Should any heritage artefacts be exposed during dredging, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Officer shall be notified as soon as possible. • All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Officer will advise the necessary actions to be taken. • Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site. • Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1). • Transnet must take responsibility to contact the heritage practitioner to assess any sites uncovered during the project. • If the proposed dredge area is accepted, the co-ordinates of the new dredge area should be programmed into the dredger position fixing equipment.

	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-1	Local 1	Medium 2	Medium-term 2	Unlikely 2	1	-10
With Mitigation	0						

14.3 No-Go Impacts

The no-go implications for the Port are twofold. Firstly, without offshore infill material, the various Port expansion projects will not be able to proceed. Secondly, TEMPI undertook an economic assessment of the Port of Durban in 2007 which found that if infrastructure within the Port was not upgraded to respond to international trends, the Port of Durban will not maintain a competitive level of services and large vessels will make use of competitor Ports. This will result in negative economic impacts on the local and national economy and a negative impact on related industries.

14.4 Cumulative Impacts

According to GN No. R. 982 (4 December 2014), a “cumulative impact”, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Cumulative impacts can be identified by combining the potential environmental implications of the proposed activity with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area. The following factors influence the potential for cumulative impacts to arise (amongst others):

- Overlapping of works or activities in space or time;
- The combined significance of impacts of various activities; and
- The sensitivity of receptors and their exposure to the cumulative impacts.

According to Anchor Environmental (2016), cumulative marine environmental impacts emanating from the proposed project are primarily related to soft-bottom benthic habitat alteration, turbidity, smothering and beach erosion. The results of the Marine Impact Assessment Study indicate that the sections of soft-bottom benthic habitat that will be disturbed during sandwinning are represented elsewhere in Durban Bay and are not unique in terms of species composition, biomass or abundance. Furthermore, the sandy beaches are already highly disturbed by constant sand replenishment through the eThekwini Municipality sand transport scheme. In light of this, the study anticipates little to no impact on the intertidal beach macrofauna as a result of sandwinning activities. However, this is premised on the assumption that there will be no change in rates of erosion or accretion resulting from the project (refer to findings from the Wave Modelling Study in **Section 14.2.8**).

Results from a study by Corbella and Stretch (2012) show that beaches within The Durban Bight have been gradually receding over the past 4 decades. This is directly attributed to a decrease in sediment being deposited on the beaches as a result of reduced littoral

transport. It is suggested that terrestrial anthropogenic activities such as dam construction and mining of river sand have reduced sediment supply and constitute an important factor in the observed erosion trends. Added to this are the effects of an annual rise in sea level estimated at 2.7mm ± 0.05mm per year at a 95% confidence level (Mather, 2007). A Wave Modelling Study was therefore undertaken to understand the implications of the proposed sandwinning on wave action and resultant sedimentation/erosion of the beaches. The study calculated a maximum increase in local significant wave height of less than 0.1 m for normal wave conditions, with maximum decrease of the same order. This difference in terms of the offshore significant wave height is generally less than 5%. These increases in wave height are not adjacent to the beaches but are offshore of the harbour breakwaters in deeper water where they will have negligible effect. The wave heights adjacent to the beaches will in general reduce in height if sandwinning is undertaken.

The Study noted that these minor differences in wave height under normal conditions will not result in any negative impact on shoreline stability and sediment transport anywhere along the coastline in the immediate vicinity. They also note that it is expected that any local increases in water depth due to dredging in the proposed areas will be reversed in a short period of time due to longshore sediment transport of approximately 1,250,000 m^3 per annum.

At present, Transnet (and the TNPA) does not have a port wide approach or methodology to assessing and incorporating climate change risks such as sea level rise and coastal storm surge (Nemai Consulting, 2014). Assessment of these issues will be undertaken at an individual project level, via Transnet's project lifecycle planning process.

The activities associated with future projects at the Port of Durban need to be sufficiently understood to allow for the potential cumulative impacts to be assessed. These impacts will thus need to be evaluated as part of the various developments where the infill material will be utilised and each individual EIA.

15 ANALYSIS OF ALTERNATIVES

15.1 Introduction

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. By conducting the comparative analysis, the BPEOs can be selected with technical and environmental justification.

Münster (2005) defines BPEO as the alternative that "provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term".

15.2 No-Go Option

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the project is included in the evaluation of the alternatives.

The no go option is not supported for the following reasons:

- Without infill material, Port Development projects will not be able to take place. This will have a negative socio-economic impact on the Port as it will not be able to compete with international Ports; and
- The above will have a knock-on effect on the economy of eThekwini, KZN and South Africa as a whole.

15.3 Specialist Studies

Table 22 summarises the findings of the specialists in terms of their respective preferences for the project alternatives, where relevant.

Table 22: Summary of Specialists' Preferred Options

Specialist Study	Site 1	Site 2
Underwater Heritage Impact Assessment	• Site 1 has lower MUCH site potential. • From a heritage point of view, work can continue in the Site 1 sandwinning area, as long as the mitigation measures are implemented.	• There is one definite MUCH site – an unidentified shipwreck in Site 2. • There are clusters of magnetic anomalies within Site 2.
	✓	
Marine Impact Assessment	According to the Marine Impact Assessment Study (Anchor Environmental, 2016), impacts from sandwinning at Site 1 and Site 2 are unlikely to differ when viewed from a marine environmental perspective. This is based on data from hydrological and sediment modelling, geotechnical investigations (i.e. Geophysical and Sediment Sampling Survey undertaken by the Council for Geoscience, 2001) and the marine environmental study. However, the Marine Impact Assessment Study did note that the historical offshore disposal site overlaps the south-eastern corner of Site 2, which needs to be taken into consideration.	
	No preferred option was identified as part of this study.	

15.4 Best Practicable Environmental Option (BPEO)

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts associated with the two offshore sandwinning options, Site 1 (of Area 1) was selected as the BPEO (**Figure 37**).

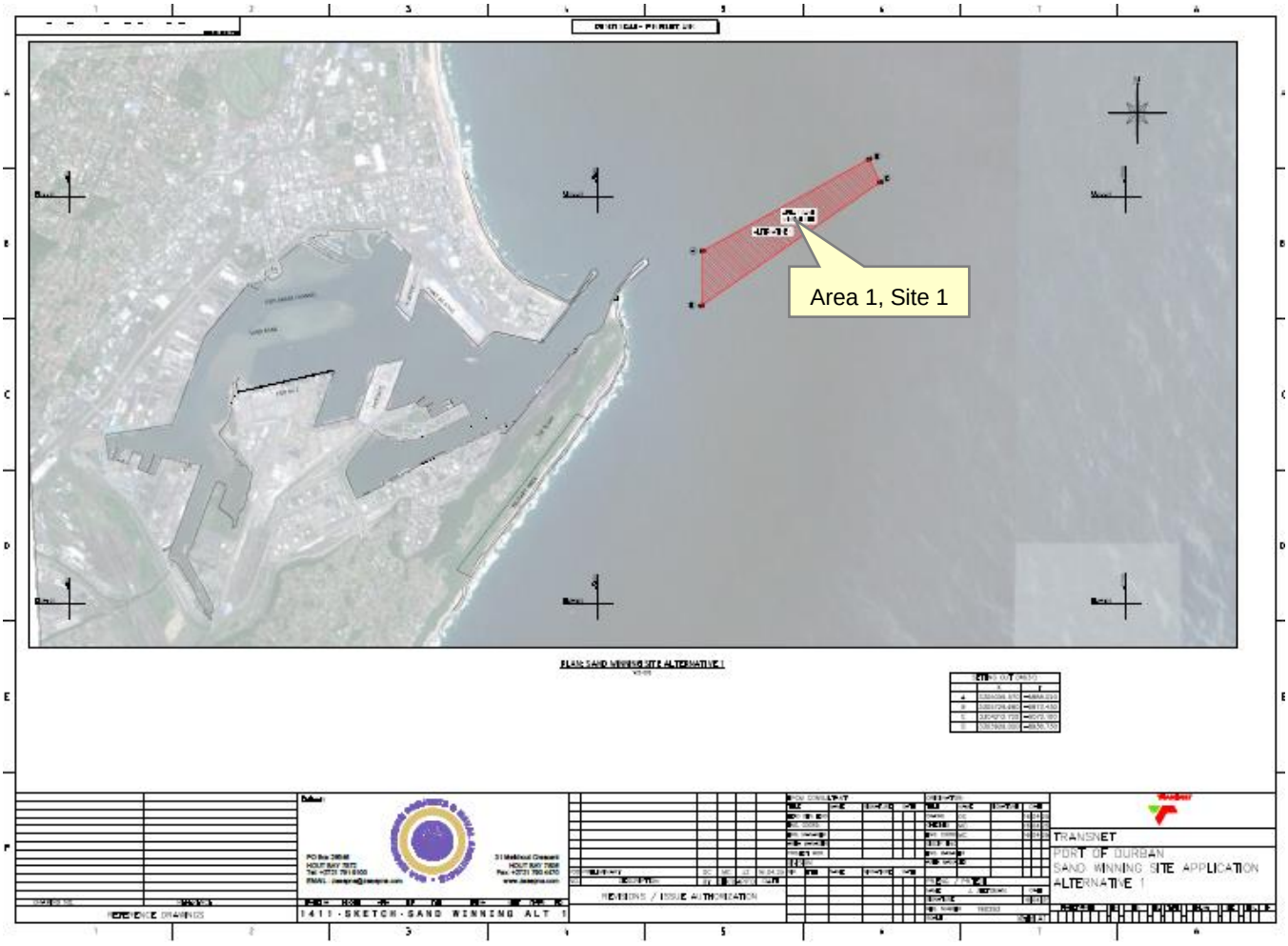


Figure 37: ***Alternative Site 1 - BPEO***

The reasons for this selection are as follows:

- Higher risks to MUCH sites at Site 2, based on findings of the Underwater Heritage Impact Assessment.
- According to Anchor Environmental (2016), the historical offshore disposal site overlaps the south-eastern corner of Site 2.
- Site 2 (250 hectares) has a much larger footprint compared to Site 1 (110 hectares). Even though this means that the depth of sandwinning at Site 1 (4.1 m) is greater than at Site 2 (1.8 m), the Wave Modelling Study found the impacts to the bathymetry and inshore hydrodynamics to be negligible.
- Availability of adequate sediments;

- It is located within the most cost-effective range; and
- The natural littoral drift brings sediments back into the area.

16 PUBLIC PARTICIPATION

16.1 Introduction

The purpose of public participation includes:

- Providing IAPs with an opportunity to obtain information about the project;
- Allowing IAPs to express their views, issues and concerns with regard to the project;
- Granting IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
- Enabling the project team to incorporate the needs, concerns and recommendations of IAPs into the project, where feasible.

The public participation process that was followed for the proposed project is governed by NEMA and GN No. R. 982. **Figure 7** outlines the key milestones achieved in terms of the public participation process for the EIA.

The subsections to follow provide an account of the public participation process conducted to date, with an emphasis on the EIA phase.

16.2 Public Participation during the Scoping Phase

The primary tasks undertaken as part of public participation during the Scoping phase included the following (details provided in Scoping Report):

- Compiling a database of IAPs;
- Notifying the relevant authorities with jurisdiction;
- Announcing the project, which included distributing BIDs and Reply Forms, placing onsite notices, and placing a newspaper notice;
- Convening a public meeting to announce the project and to present the Draft Scoping Report;
- Granting IAPs and authorities an opportunity to review the Draft Scoping Report; and
- Compiling and maintaining a Comments and Responses Report.

16.3 Public Participation during the EIA Phase

16.3.1 Maintenance of the IAP Database

A database of IAPs (refer to **Appendix I**), which includes *inter alia* different spheres of government (national, provincial and local), stakeholders, interest groups and members of the general public, was maintained during the EIA phase.

16.3.2 Notification of Review of Draft EIA Report

In accordance with Regulation 43(1) of GN No. R. 982 (4 December 2014), registered IAPs were granted an opportunity to review and comment on the Draft EIA Report.

Notification of the review of the Draft EIA Report was provided to registered IAPs via email and bulk SMS.

16.3.3 Accessing the Draft EIA Report

A hard copy of the document was placed at the Central Reference Library (10th Floor, Liberty Towers, 214 Dr Pixley KaSeme Street, Durban, 031 322 4414).

The 30-day public review period of the Draft EIA Report took place from 8 May to 8 June 2017.

16.3.4 Authority Review Period of Draft EIA Report

Hard copies of the Draft EIA Report was provided to the following key regulatory and commenting authorities for the same review period stipulated in **Section 16.3.3**:

- DMR KZN Office;
- DEA: Oceans and Coasts;
- KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA);
- EKZNW;
- Department of Water and Sanitation (DWS) KZN Regional Office;
- Amafa aKwaZulu-Natali;
- Department of Agriculture, Forestry and Fisheries (DAFF); and
- eThekwini Metropolitan Municipality.

The Draft EIA Report was also uploaded to the South African Heritage Resources Information System to allow for review by the South African Heritage Resources Agency (SAHRA).

16.3.5 Public Meeting

The following public meeting was held to present the Draft EIA Report and to provide IAPs with a platform for project related discussions:

- **Date:** 18 May 2017;
- **Time:** 16h30 to 18h30; and
- **Venue:** Royal Natal Yacht Club, Yacht Mole, Durban Harbour.

The minutes of the meeting are contained in **Appendix K**. All registered IAPs were notified of the public meeting via email or bulk SMS.

16.3.6 Comments and Responses Report

The EIA Comments and Responses Report (contained in **Appendix J**) provides a summary of comments, issues and queries received from authorities, stakeholders and IAPs to date. This report also attempts to address the comments through input received from the project team. All comments received following the review of the Draft EIA Report were included in the updated EIA Comments and Response Report. Copies of the comments are included in **Appendix L**.

16.3.7 Notification of Decision

All authorities and registered IAPs will be notified via email or bulk SMS after having received written notice from DMR on the final decision on the application. A newspaper notice will also be placed as notification of the Department's decision. These notifications will include the appeal procedure to the decision and key reasons for the decision.

17 EAP Conclusions and Recommendations

17.1 Sensitive Environmental Features

Within the context of the project area, cognisance must be taken of the following sensitive environmental features:

- Underwater heritage –
  - There is one definite Maritime Underwater Cultural Heritage (MUCH) site (shipwreck) in Site 2;
  - There are clusters of magnetic anomalies within Site 2;
  - Site 1 has lower MUCH site potential;
- Durban Estuary;
- Marine ecology –
  - Reef to the north-east of sandwinning site;
  - Phytoplankton and zooplankton;
  - Soft bottom benthic macrofauna;

  - Fish;
  - Shore birds;
- Shoreline environment and recreational users;
- Recreational and commercial fishers; and
- Existing offshore shipping traffic.

Where relevant, mitigation measures have been included in the EIA Report and EMPr to safeguard the above features. In addition, with the selection of Site 1 as the preferred alternative impacts to current known MUCH sites can be avoided.

17.2 Environmental Impact Statement

The strategic importance of developments within the Port of Durban, as well as the need for offshore sandwinning to obtain infill material to enable these developments, is acknowledged.

Various options for sourcing infill material were taken into consideration, including material from land based sources, material from existing offshore sources, and new alternative offshore sandwinning sites. Site 1 was identified as the BPEO for the offshore sandwinning site, based on input received from specialist studies and an appraisal of the receiving environment.

None of the potential environmental impacts that were assessed as part of the EIA, including specialist environmental and technical studies, were deemed to have a high significance after mitigation.

With the selection of the BPEO, the adoption of the mitigation measures include in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

18 OATH OF EAP

I (name and surname) Donavan Henning

Of (address) 147 Brian Fisher Drive, Ferndale, 2194

ID No. 761205 5057 080 *Contact No.* 011 781 1730

I hereby make an oath and state that:

In accordance with Appendix 3 of Government Notice No. R. 982 (4 December 2014), this serves as an affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

Section 3(s) -

1. *The correctness of the information provided in this report;*
2. *The inclusion of comments and inputs from stakeholders and interested and affected parties;*
3. *The inclusion of inputs and recommendations from the specialist reports where relevant; and*
4. *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.*

1. I know and understand the contents of this declaration.

2. I do not have any objection in taking prescribed oath.

3. I consider the prescribed oath to be binding on my conscience.

Signature _____ *Date:* 12 June 2017

I certify that the deponent has acknowledged that he/she knows and understands the contents of the statement and the deponent signature was placed there on in my presence.

CERTIFIED A TRUE COPY OF THE ORIGINAL DOCUMENT
GESERTIFISEER 'N WARE AFSKRIF VAN
OORSPRONKLIKE DOKUMENT
BRENDA PERUMAL
MALANI PADAYACHEE AND ASSOCIATES (PTY) LTD
COMMISSIONER OF OATH
JOHANNESBURG NORTH MAGISTERIAL DISTRICT
RANDBURG
REF No: 12/04/2016
EX OFFICIO COMMISSIONER OF OATHS
SIGNATURE
DATE

Brenda Perumal — FULL NAME

Financial Manager — DESIGNATION

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