HERITAGE IMPACT ASSESSMENT OF PROPOSED 2AFRICA/GERA (EAST) SUBMARINE FIBRE OPTIC CABLE SYSTEM, LANDING AT PORT ELIZABETH (GQEBERHA), EASTERN CAPE PROVINCE

Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an Environmental Impact Assessment

EIA Reference: 14/12/16/3/3/2/2057

Prepared for

Acer (Africa) Environmental Consultants

On behalf of

Alcatel Submarine Networks

Draft for comment: 18 May 2021

Revised Draft: 21 May 2021

Final Revised: 28 June 2021

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(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	Page 5 and Appendix 4
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(k) any mitigation measures for inclusion in the EMPr;	Section 11: Conclusion and Recommendations
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(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	Section 11: Conclusion and Recommendations
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Comments from the South African Heritage Resources Agency– see Sections 4
(p) any other information requested by the competent authority	N/A
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

DETAILS OF THE SPECIALIST

This study has been undertaken by John Gribble BA Hons, MA (ASAPA) and Gail Euston-Brown BA of ACO Associates CC, archaeologists and heritage consultants.

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CONSULTANT DECLARATION OF INDEPENDENCE

I, John Gribble, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company (if applicable): ACO Associates CC

Date: 28 June 2021

EXECUTIVE SUMMARY

ACO Associates cc has been commissioned by ACER (Africa) Environmental Consultants on behalf of Alcatel Submarine Networks to undertake a desktop heritage impact assessment of the marine and terrestrial route of the proposed 2AFRICA/GERA (East) submarine fibre optic cable system which makes landfall at Port Elizabeth (Gqeberha) in the Eastern Cape.

This maritime heritage assessment report, supported by recommendations for implementable mitigation measures will form part of an Environmental Impact Assessment for the proposed cable system.

Findings: Evidence from South Africa and elsewhere in the world indicates that there is the potential for the survival in submerged, seabed contexts of archaeological material and palaeoenvironmental evidence deposited on the continental shelf, to approximately the -120 m contour, during periods of lower sea level within the last 900,000 years. Although no comprehensive geophysical dataset for the Algoa Bay as a whole was available for this assessment, the rivers that presently debouch into the bay are likely to have done so at times of lower sea levels and will have palaeo-channels which extend offshore across the present seabed. Where archaeological material and palaeoenvironmental evidence have survived post-glacial marine transgressions, there is the potential for this material to be within or associated with now submerged palaeo-channels.

Where such material has survived post-glacial marine transgression, it will form part of the sedimentary make-up of the seabed and may be impacted by interventions on and in the seabed. The small footprint of the seabed intervention that will result from the installation of the cable system, however, makes the potential for direct impacts on submerged prehistoric archaeological material in the study area unlikely.

In terms of palaeontological potential within the study area, the onshore portion of the cable route is underlain by cross-bedded Nanaga Formation aeolianites. Offshore, the similar sediments are present nearer the coastline and become older away from the coast, in general, but the pattern is disrupted by the canyons in the Algoa Basin, and the Port Elizabeth and Uitenhage Troughs. Although the SAHRIS palaeo-sensitivity map indicates that the area is very highly sensitive for the Quaternary aeolian sands, because these sands are aeolian they would only be able to entrap very small fragments of fossils.

The burial of the cable, both within the seabed and on ashore may result in interactions with the Nanaga Formation, but the limited extent and depth of the burial trenches, and the low palaeontological potential of the aeolianites means that that direct palaeontological impacts are considered to be negligible.

Regarding historical shipwrecks, this assessment found that three shipwrecks may occur within the 1 km study area buffer around the proposed cable alignment. Two of these wrecks are older than 60 years and thus subject to protection under the National Heritage Resources Act. The Inshore and Shallow Waters geophysical surveys noted the presence along the route of a two occurrences of possibly anthropogenic debris and magnetic anomalies, although none of these contacts could be more accurately described or positively identified. It is therefore not known whether any of these anomalies represent historical shipwrecks or related material.

The small footprint of the seabed intervention and the potential for seabed debris to damage the cable plough, which means that the three wrecks in the vicinity of the cable alignment and the geophysical contacts are likely to be carefully avoided during cable installation, suggests that the potential for direct impacts on maritime archaeological sites or material in the study area is negligible.

Although archaeological assessments in the Summerstrand / Cape Recife area indicate the presence in places of particularly Later Stone Age sites and material, the urban development of the area that includes the beach manhole alternatives and the two possible terrestrial cable route alignments suggests that archaeological material is unlikely to be preserved in this area.

Furthermore, the small footprint of the terrestrial interventions to construct the beach manhole and install the cables, and the likely disturbed nature of the substrate under roads and pavement suggests that the potential for direct impacts on maritime archaeological sites or material in the study area is low.

Recommendations: No specific mitigation is proposed in respect of submerged prehistoric archaeological or palaeontological resources in the Inshore or Shallow Water areas of the cable route, although it is recommended that in the Inshore Waters and on the beach crossing an alert for the occurrence of fossil bones and teeth, as well as potential submerged prehistoric archaeological material, be included in the EMPr for the project, specifically for the divers working in the shoreface and the operators excavating the trench in the beach and dune. This alert should be underpinned by a Chance Fossil Finds Protocol that is also included in the EMPr for the project.

Should any possible archaeological or palaeontological material be accidentally disturbed during these activities it must be immediately reported to the ECO and/or the monitoring archaeologist for further advice. Any finds accidently disturbed must be recorded, and their contextual information (a report) must be lodged with a SAHRA-approved institution.

With regard to historical shipwrecks, the proposed 2AFRICA/GERA (East) cable system has a very low potential for impacts on such sites arising out of the installation of the seabed cable. However, in view of the potential, albeit very small, for the presence of currently unknown wrecks close to the cable route, the following recommendations are made in respect of mitigation measures to be applied during the installation of the cable system:

- If any <u>further</u> geophysical data, particularly in the Inshore and Shallow Waters portions of the cable route, are generated to support the installation of the cable system they are archaeologically reviewed for the presence of historical shipwrecks or related material. If possible, the project archaeologist should be consulted before data are collected to ensure that the survey specifications and data outputs are suitable for archaeological review;
- Should the data identify wreck material at or near the location of any portion of the cable, micro-siting of the cable and/or the possible implementation of an exclusion zone around the archaeological feature should be sufficient to mitigate the risks to the site;
- Should any archaeological material be accidentally encountered during the course of cable installation, work must cease in that area until the project archaeologist and SAHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it.

In respect of terrestrial archaeological sites or material, the following recommendations are made:

- Should any archaeological sites or material be encountered during the course of laying the cable, work must cease in that area until the project archaeologist and the ECPHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it; and

- If any burials or human remains are encountered at any stage during the installation of the cables, work in the vicinity must cease immediately, the remains must be left in situ but made secure and the project archaeologist and ECPHRA must be notified immediately so that a decision can be made on how best to deal with the remains.

Based on the information and assessment above, it is our reasoned opinion that the proposed installation of the 2AFRICA/GERA (East) cable system to Port Elizabeth raises no red flags, contains no fatal flaws and is unlikely to have any significant impact on heritage resources. It is, therefore, considered acceptable.

GLOSSARY

Archaeology: Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Early Stone Age: The archaeology of the Stone Age between 700 000 and 2 500 000 years ago**.**

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.

Holocene: The most recent geological time period which commenced 10 000 years ago.

Late Stone Age: The archaeology of the last 20 000 years associated with fully modern people.

Marine Isotope Stage: Alternating warm and cool periods in the Earth's palaeoclimate, deduced from oxygen isotope data derived from data from deep sea core samples.

Midden: A pile of debris, normally shellfish and bone that have accumulated as a result of human activity.

Middle Stone Age: The archaeology of the Stone Age between 20 000-300 000 years ago associated with early modern humans.

National Estate: The collective heritage assets of the Nation.

Palaeontology: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Pleistocene: A geological time period (of 3 million – 10 000 years ago).

Pliocene: A geological time period (of 5 million – 3 million years ago).

SAHRA: South African Heritage Resources Agency – the compliance authority which protects national heritage.

ACRONYMS

BMH	Beach Manhole
CLS	Cable Landing Station
DEFF	Department of Environment, Forestry and Fisheries
EA	Environmental Authorisation
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ESA	Early Stone Age
LSA	Late Stone Age
MBES	Multibeam Bathymetry
MSA	Middle Stone Age
Mya	Million years ago
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency
SSS	Sidescan Sonar
UNCLOS	United Nations Convention on the Law of the Sea

1. INTRODUCTION

ACO Associates cc (ACO) has been commissioned by ACER (Africa) Environmental Consultants (ACER) on behalf of Alcatel Submarine Networks (ASN) to undertake a desktop heritage impact assessment of the marine and terrestrial route of the proposed 2AFRICA/GERA (East) submarine fibre optic cable system which makes landfall at Port Elizabeth (Gqeberha) in the Eastern Cape.

ASN has been contracted to supply and install the proposed cable system which will be operated by VODACOM (PTY) LTD as the South African landing partner.

ACER is the appointed Environmental Assessment Practitioner (EAP) and is responsible for the Environmental Authorisation (EA) requirements, including identifying environmental aspects relevant to the proposed telecommunications infrastructure and construction of the cable system.

2. PROJECT DESCRIPTION

The following description of the project is summarised from information presented in the Final Scoping Report (ACER (Africa) Environmental Consultants 2021).

The proposed submarine cable system known as 2AFRICA/GERA (East) circumnavigates Africa, connecting Africa to Europe and parts of the Middle East (Figure 1).

The cable system will enter South Africa’s Exclusive Economic Zone (EEZ) from the EEZ of Mozambique on the east coast. Thereafter the cable system follows a course south and west around the South African coast, before tracking north-east from a point approximately 100 km west of Cape Point to cross the contiguous zone and territorial waters to make a final landfall at Duynefontein, north of Cape Town in the Western Cape.

There will be two branch lines off the main cable, to Amanzimtoti and Port Elizabeth (Gqeberha), respectively. The Port Elizabeth branch will run from the main cable, through the EEZ, contiguous zone and territorial waters to a landing site, the exact position of which will be identified based on a combination of engineering, environmental and economic factors and will require offshore and nearshore surveying of the seabed, but which will be at one of two alternatives at Pollock Beach in Summerstrand (Figures 2 and 3). Of these, Alternative 1 is preferred.

The proposed 2AFRICA/GERA (East) branch to Port Elizabeth will include the following activities (ACER (Africa) Environmental Consultants 2021):

- Pre-installation activities including cable route survey, route engineering, route clearance and pre-lay grapnel run;
- Laying and burial of the cable in the offshore environment within South Africa's EEZ from where it branches off the trunk line until it reaches the shore;

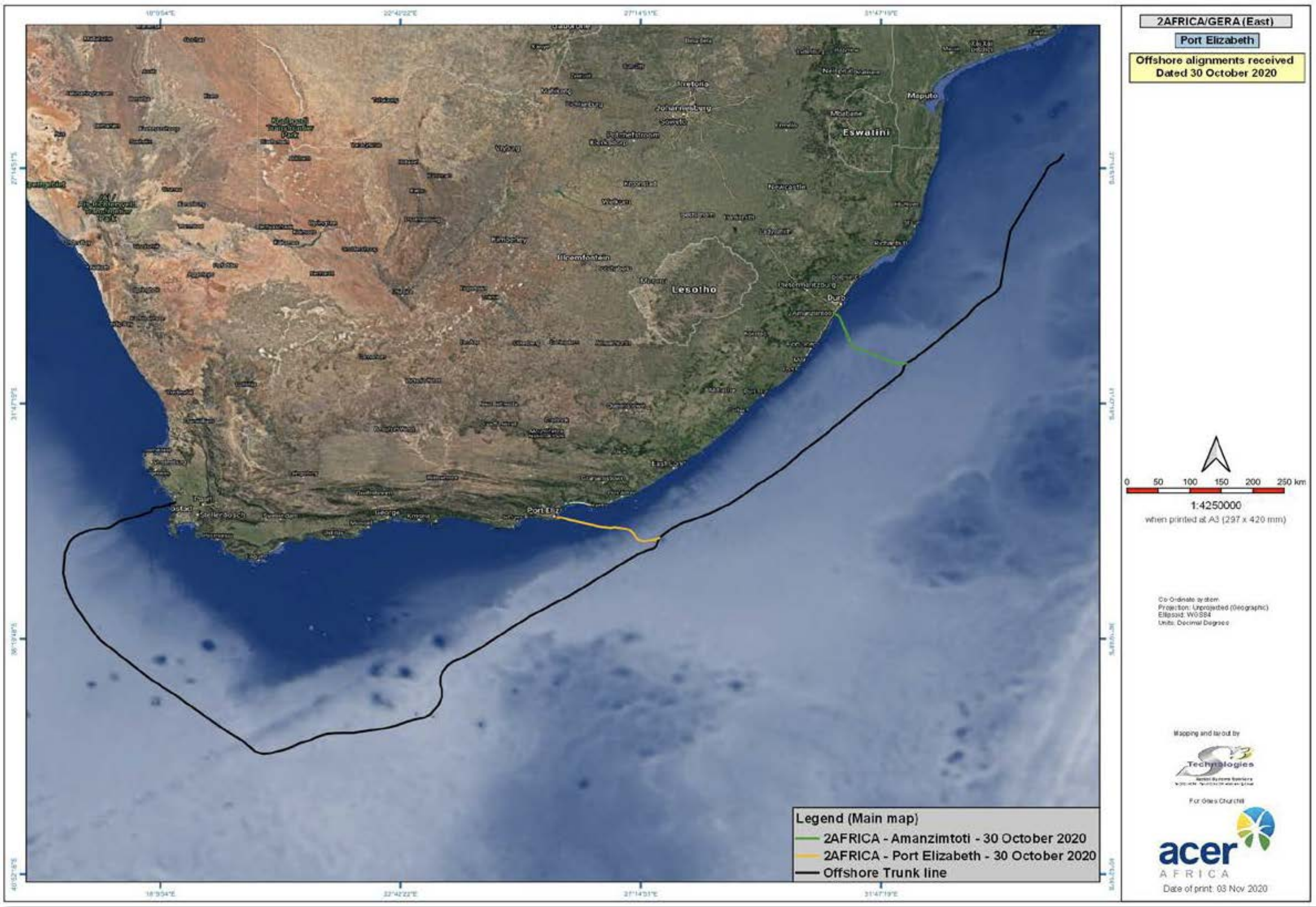

Figure 1: 2AFRICA/GERA (East) Cable System and Port Elizabeth Branch Cable (yellow line) (After ACER (Africa) Environmental Consultants 2021).

- The laying of the cable within the shallow water environment which is likely to involve a direct shore end operation where the shore end of the subsea cable is installed directly from the main subsea cable installation vessel and floated to the beach landing point using buoys and assisted by small boats and divers. It will then be buried in the seabed using the diver jet burial technique. The cable will be buried in sediment wherever possible, and the route will be adjusted to avoid obvious visible rock. The aim is to bury the cable to a depth of 1 m where possible. This burial is intended to provide protection to the cable from the hazards posed by ships' anchors, fishing trawls/lines and the like;

- Excavations within the intertidal zone and across the beach to bury the cable before it is anchored into a cable anchor block and beach manhole (BMH). The latter will need to be constructed and will be an underground structure with a volume of approximately 12 m^3;
- Excavations within the intertidal zone and beach to bury the system earth cable and installation of a system earth just offshore from Pollock Beach;
- The preferred construction method to land the cable at Pollock Beach is cable trenching, which may include rock trenching if sand profiles are too shallow. The cable will be buried to a depth of 2 m, substrate permitting, within the beach and into intertidal zone to a water depth of approximately 0.5 – 1 m. If rock substrate is encountered at depths shallower than 2 m, rock trenching will be undertaken to bury the cable. Rock trenching will involve trenching into the rock to a depth of approximately 30 cm which will allow the cable to to be installed below the natural rock profile. Once installed the channel excavated into the rock will be backfilled with the rock chips removed during trenching/cutting and mixed with a cement suitable for the marine environment.
- Rock trenching can only be undertaken where the substrate is conducive for trenching (i.e. rock shelves) and not where the substate is made up of boulders tightly packed together. If boulders are encountered below the beach and intertidal zone the alternative cable installation method under consideration will be Horizontal Directional Drilling (HDD). This involves the use of a directional drilling machine, and associated attachments, to accurately drill along the chosen bore path and back ream the required pipe.

Once the cable has been installed to the BMH, a cable trench will be required for the front haul alignment from the BMH to the Cable Landing Station (CLS) site, which will be accommodated within the existing Telkom Limited SOC (Telkom) Exchange Building located on the corner of Skegness and Bognor Streets in Summerstrand (Figure 3). Construction related disturbances in the terrestrial environment will occur between the BMH and CLS site.

The details of the these activities are given in Section 5.2.4 and 5.3 of the Final Scoping Report (ACER (Africa) Environmental Consultants 2021) and will be addressed, as relevant in the impact assessment below.

3. TERMS OF REFERENCE

ACO Associates was commissioned to produce a Heritage Impact Assessment (HIA) of the portion of the proposed 2AFRICA/GERA (East) cable system to be landed at Port Elizabeth, as part of the Environmental Impact Assessment (EIA) process for the project required by the National Environmental Management Act (No. 107 of 1998), as amended.

This HIA deals with both the marine and terrestrial portions of the cable system. The marine portion of the cable route is located between the outer edge of the contiguous zone (i.e. 24 nautical miles offshore) and the high water mark, which is the extent of the jurisdiction of the South African Heritage Resources Agency (SAHRA) (see Sections 4.1 and 4.2 and Figure 2 above). The terrestrial element of the cable route lies between the BMH and the CLS and

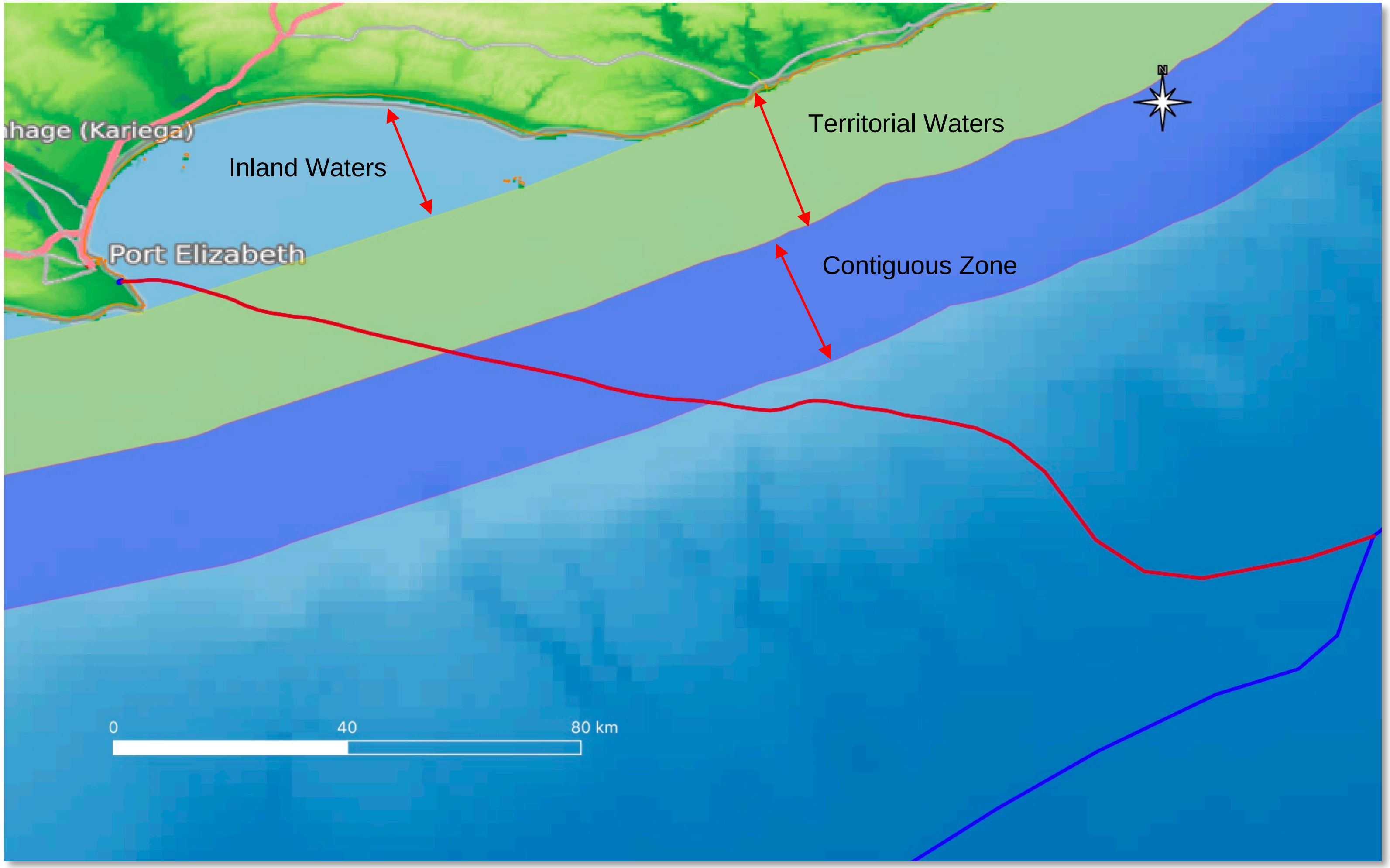

Figure 2: Proposed routes of the 2AFRICA/GERA (East) cable system (blue line) in South African EEZ, and the Port Elizabeth branch line route (red line). The contiguous zone is shaded blue, and the territorial waters are shown as green (Source: Google Earth).

Figure 3: Proposed terrestrial cable route options (blue lines) between the two possible landfall and BMH sites on Pollock Beach and the Cable Landing Station on the corner of Skegness and Bognor Streets, Summerstrand. The marine cable (red line) terminates at the BMH. Alternative 1 is the preferred BMH site (Source: Google Earth).

falls under the jurisdiction of the Eastern Cape Provincial Heritage Resources Authority (ECPHRA).

This report aims to identify heritage resources which may be impacted during the construction, operation and decommissioning phases of the project, assess their significance and provide recommendations for any mitigation than may be necessary.

This document therefore includes the following:

- A desk-top level literature review to assess the potential for maritime archaeological sites, and submerged pre-colonial sites along the marine route of the cable system;
- A desk-top level literature review to assess the potential for archaeological and other heritage sites along the terrestrial route of the cable system;
- A desk-top palaeontologist assessment of the potential for impacts to palaeontological features (both on land and in the seabed) arising from the cable system; and
- A review of the offshore geophysical survey reports for the cable system for seabed anomalies that may represent heritage resources.

The results of the studies listed above are integrated in this HIA report along with an assessment of the sensitivity and significance of any heritage resources, an evaluation of the potential impacts on them of the construction, operation and decommissioning of the project, and recommendations for measures to mitigate any negative impacts on them.

The HIA must be submitted for comment to the South African Heritage Resources Agency (SAHRA) and Eastern Cape Provincial Heritage Resources Authority (ECPHRA) as the relevant statutory commenting bodies under the National Environmental Management Act for the offshore and terrestrial elements of the project respectively.

4. RELEVANT LEGISLATION

4.1. National Heritage Resources Act (No. 25 of 1999)

The National Heritage Resources Act (NHRA) came into force in April 2000 with the establishment of SAHRA, replacing the National Monuments Act (No. 28 of 1969 as amended) and the National Monuments Council as the national agency responsible for the management of South Africa’s cultural heritage resources.

The NHRA reflects the tripartite (national/provincial/local) nature of public administration under the South African Constitution and makes provision for the devolution of cultural heritage management to the appropriate, competent level of government, in this case the ECPHRA.

Because national government is responsible for the management of the seabed below the high-water mark, however, the management of maritime and underwater cultural heritage resources under the NHRA does not devolve to provincial or local heritage resources authorities but remains the responsibility of the national heritage agency, SAHRA.

The NHRA gives legal definition to the range and extent of what are considered to be South Africa's heritage resources. According to Section 2(xvi) of the Act a heritage resource is "any place or object of cultural significance". This means that the object or place has aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Of the heritage resource types protected by the NHRA, the installation and operation of the 2AFRICA/GERA (East) cable system has the potential to impact the following, which are defined in Section 2 of the NHRA:

- Submerged pre-colonial archaeological sites and materials older than 100 years;
- Maritime and underwater cultural heritage sites and material older than 60 years, which are principally historical shipwrecks;
- Palaeontological features and material, which are defined by the NHRA as the fossilised remains or fossil trace of animals or plants which lived in the geological past;
- Terrestrial archaeological sites and materials older than 100 years;
- Structures older than 60 years;
- Graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Public monuments and memorials.

These cultural heritage resources are protected by the NHRA and a permit from SAHRA or the ECPHRA, as appropriate, is required to destroy, damage, excavate, alter, deface or otherwise disturb any such site or material.

It is also important to be aware that in terms of Section 35(2) of the NHRA, all archaeological objects and palaeontological material is the property of the State and must, where recovered from a site, be lodged with an appropriate museum or other public institution.

Section 38(8) of the NHRA states that if an impact assessment is required under any legislation other than the NHRA then it must include a heritage component that satisfies the requirements of Section 38(3). Furthermore, the comments of the relevant heritage authority must be sought and considered by the consenting authority prior to the issuing of a decision.

4.2. Maritime Zones Act (No. 15 of 1994)

South Africa’s Maritime Zones Act of 1994 is the national legislative embodiment of the international maritime zones set out in the United Nations Convention on the Law of the Sea (UNCLOS).

The Act defines the extent of the territorial waters, contiguous zone, exclusive economic zone and continental shelf, which together comprise some 4.34 million square kilometres of seabed around the South African coast and sets out South Africa’s rights and responsibilities in respect of these various maritime zones.

Under the terms of the maritime zones established by the Act, the application of the NHRA applies within South Africa’s territorial waters (12 nautical miles seaward of the baseline) and extends to the outer limit of the maritime cultural zone (24 nautical miles seaward of the baseline). Any offshore activities that have the potential to disturb or damage cultural heritage resources located in or on the seabed within the territorial waters and maritime cultural zone require the involvement of SAHRA, as a commenting body in respect of the National Environmental Management Act EIA process and as permitting authority where impacts to sites or material cannot be avoided and damage or destruction will occur.

The maritime portion of the proposed 2AFRICA/GERA (East) cable system crosses the continental shelf, the EEZ, the contiguous zone and the territorial waters, and comes ashore at Port Elizabeth landward of the territorial water baseline (Figure 2 above), within what Section 3 of the Maritime Zones Act defines as South Africa’s internal waters. In terms of Section 3(2) of the Act, “any law in force in the Republic, including the common law, shall also apply in its internal waters”.

With respect to the portion of the cable system to be installed on the continental shelf and within the EEZ, Section 9 of the Maritime Zones Act states that activities undertaken from installations operating within these areas may be subject to the requirements of any law in force in the Republic. The definition of “installation” (which includes vessels) provided in the Act, however, appears to limit this to activities related to seabed mining and mineral exploitation.

The extent of the application of the NHRA and Maritime Zones Act in respect of the 2AFRICA/GERA (East) cable system is therefore, limited to the area between the high-water mark and the outer edge of the contiguous zone.

4.3. National Environmental Management Act (No. 107 of 1998)

The 1998 National Environmental Management Act (NEMA) provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals that are likely to have a negative effect on the environment.

Regulations governing the environmental authorisation (EA) process have been promulgated in terms of NEMA and include the EIA Regulations (GNR R326/2017) and Listing Notices (LN) 1-3 (R327, R325 and R324) that list activities requiring EA.

The proposed 2AFRICA/GERA (East) cable system triggers a number of activities in the Listing Notices and the project is thus be subject to a full Scoping and Environmental Impact Assessment process and must obtain a positive Environmental Authorisation from the national Department of Environment, Forestry and Fisheries (DEFF) prior to commencement of the proposed activities

As NEMA commenting bodies, SAHRA and the ECPHRA were both asked to comment on the Background Information Document (BID), Draft Scoping Report (DSR) and Final Scoping Report (FSR). SAHRA responded to each invitation to comment (on 7 December 2020, 24 March 2021 and 29 April 2021, respectively) noting in its responses that the need for a HIA is addressed in each of the documents. SAHRA also supports the proposal that the maritime archaeologist would review the geophysical survey data collected for the alignment of the subsea cable as an important aid to inform the specialist report. No response has been received from the ECPHRA.

5. METHODOLOGY

This desktop report provides an assessment of both the maritime and underwater cultural heritage and terrestrial heritage potential of the 2AFRICA/GERA (East) cable system to be landed at Port Elizabeth. The project area for this assessment is defined in Section 5.2 below.

The report includes a short description of what comprises South Africa's maritime and underwater cultural heritage, with particular emphasis on the maritime history of the Algoa Bay coast in the vicinity of the cable landfall. This is followed by a discussion of potential maritime heritage resources along that portion of cable system within the contiguous zone, territorial waters and inland waters, framed within that wider context.

The potential for heritage resources to be associated with the terrestrial portion of the cable route between the BMH and CLS is also addressed, through a review of the pre-colonial and more recent history of the project area.

A palaeontological impact assessment by Dr Marion Bamford of the University of the Witwatersrand considers the potential for palaeontological features and resources to be present along the cable route, both onshore and in the seabed.

The report draws information from readily available documentary sources and databases, including SAHRA's Maritime and Underwater Cultural Heritage database, a database of underwater heritage resources maintained by ACO Associates, and from relevant primary and secondary sources, and current geophysical data collected along route (see Section 8.2 below) to identify as accurately as possible any known and potential heritage resources along the proposed cable route alignment.

5.1. Geophysical Survey

The geophysical survey report prepared by Fugro Germany Marine (Fink 2020) for Segment E2 of the 2AFRICA/GERA (East) cable system, between the Port Elizabeth BMH and the offshore Port Elizabeth Branching Unit (BU) (see Figure 4), was reviewed for this HIA to ascertain whether any shipwrecks or other potential heritage resources had been identified within the sidescan sonar (SSS), multibeam bathymetry (MBES) and magnetometer data collected during the survey of the cable route.

The geophysical survey, for cable route design and engineering, was conducted between August and October 2020 along the Inshore, Shallow and Deep Water sections of the

2AFRICA/GERA (East) cable system (Fink 2020). The route survey comprised an investigation of the bathymetry, seabed features and shallow geology of the proposed route. A geotechnical sampling programme was also undertaken to establish sediment types for correlation with geophysical data (Fink 2020).

This archaeological review of the geophysical data relied on the survey report and the seabed feature characterisation it contained, processed seabed bathymetric maps attached to the report and other geophysical data within the contiguous zone and territorial waters.

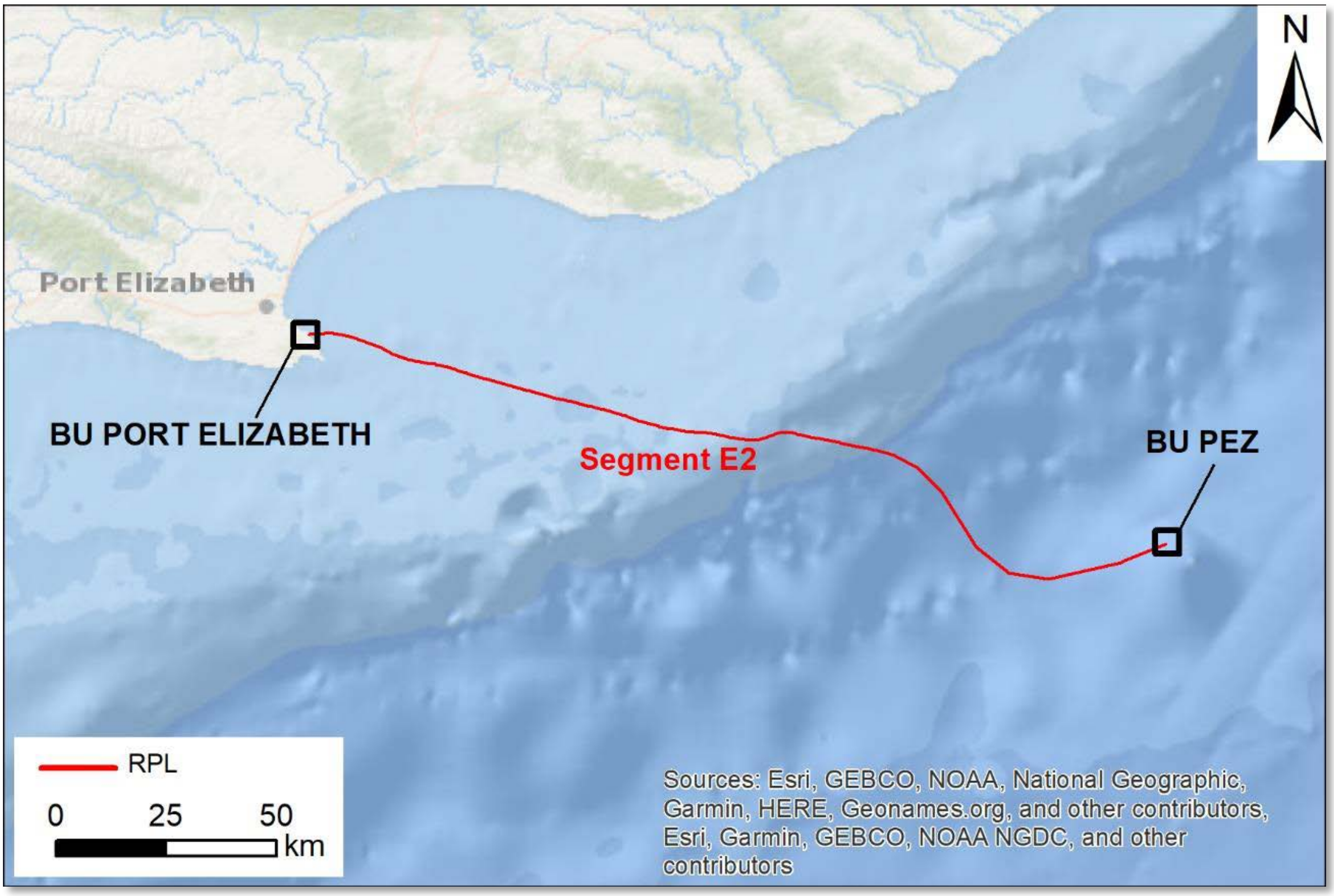

Figure 4: 2AFRICA/GERA (East) Segment E2 – Port Elizabeth BMH to Port Elizabeth BU (After: Fink 2020).

5.2. **Study Areas**

The study area for the marine elements of this heritage impact assessment has been defined as a buffer of 1 km on either side of the proposed marine route alignment between the Mean High Water Mark at Pollock Beach and the outer edge of the contiguous zone, 24 nautical miles from the baseline (Figure 5).

On shore, the study area is confined to the road reserves within which cable installation is proposed.

5.3. Limitations

South Africa's record of both maritime and terrestrial archaeological resources is based on a mix of information derived from historical documents and other secondary sources. Where available this is supplemented by primary sources such as geophysical data and other field-based observations and site recordings.

While every effort has been made to ensure the accuracy of the information presented below, therefore, the reliance on secondary data sources does mean that there are considerable gaps and inaccuracies in this record. For example, in the marine environment the positions given for most of the wrecks referred to in the following sections are estimated rather than known locations and are based on descriptions of their loss or positions taken at the time of loss (often by third parties). The potential also exists for currently unknown and/or unrecorded maritime heritage sites to be encountered on the seabed in the course of activities associated with this project.

6. UNDERWATER CULTURAL HERITAGE

South Africa has a rich and diverse underwater cultural heritage. South Africa's rugged and dangerous coastline is strategically located on the historical trade route between Europe and the East and has witnessed more than its fair share of shipwrecks and maritime dramas since the early 16^{th} century.

At least 2400 vessels are known to have sunk, grounded, or been wrecked, abandoned or scuttled in South African waters since the early 1500s. This doesn't include the as yet unproven potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions along the South African east coast.

In addition to historical shipwrecks, the record of South Africa's long association with the sea is much broader and extends far back into prehistory. This element of our maritime and underwater cultural heritage is represented around the South African coast by thousands of pre-colonial shell middens and large numbers of tidal fish traps, which reflect prehistoric human exploitation of marine resources since at least the Middle Stone Age (MSA), more than 150,000 years ago.

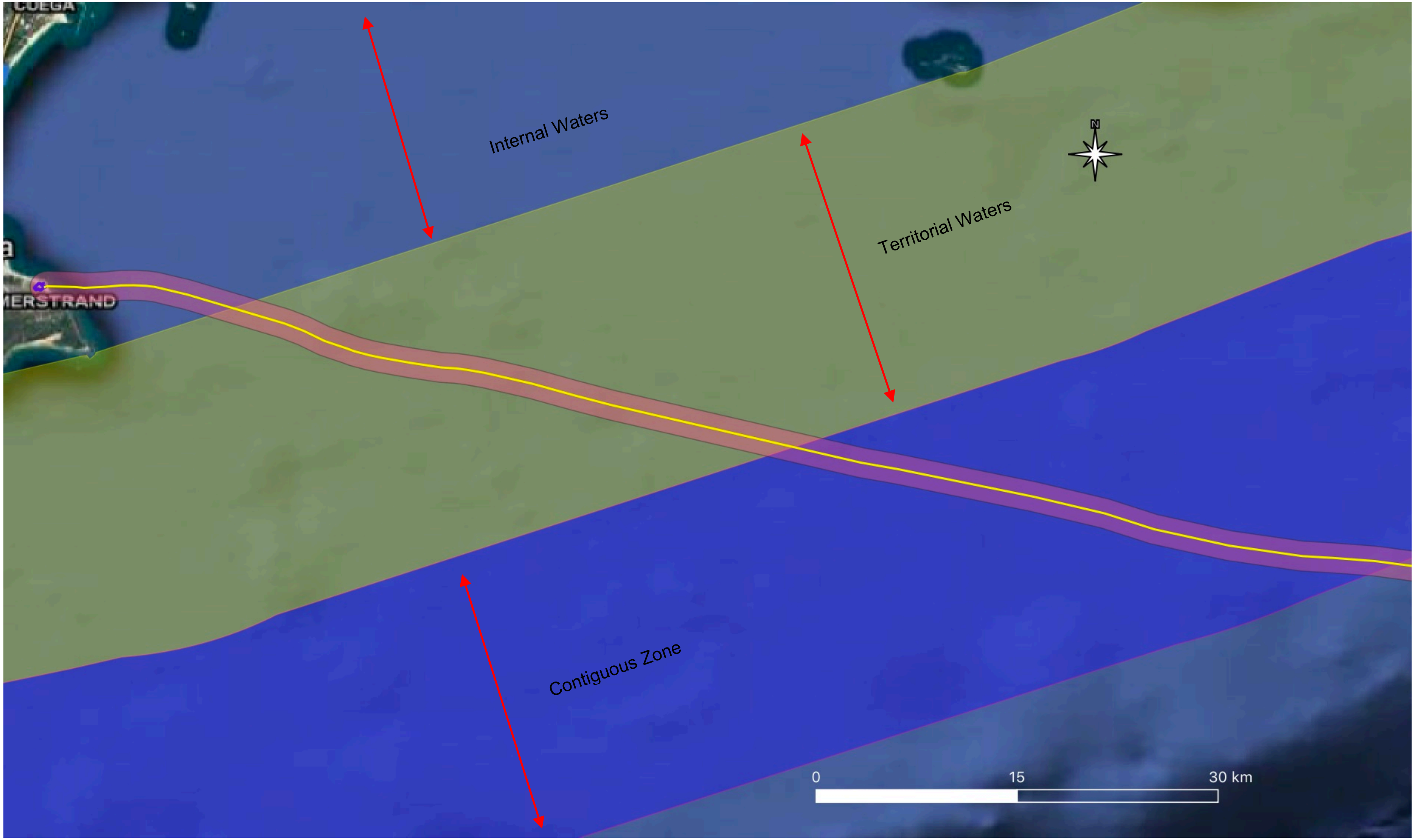

Figure 5: Maritime archaeological assessment study area for this report between the outer limit of the contiguous zone (24 NM from the baseline) to the mean high-water mark at the landfall at Pollock Beach. The study area comprises a 1 km buffer (pink polygon) on either side of the proposed route alignment (red line) (Source: Google Earth).

Another, until recently, largely unacknowledged and unexplored aspect of our maritime and underwater cultural heritage are pre-colonial terrestrial archaeological sites and palaeolandscapes which are now inundated by the sea.

The marine portion of this assessment considers maritime and underwater cultural heritage resources along the 2AFRICA/GERA (East) cable system landward of the EEZ/contiguous zone boundary, namely submerged prehistoric resources and historical shipwrecks and also comments on the palaeontological potential of the seabed to be affected.

6.1. Submerged Prehistory

Since the start of the Quaternary approximately 2.6 million years ago, the world has been subject to a series of cooling and warming climatic cycles during which sea level has generally been lower than it is today. Within the last 900,000 years, these cycles have caused global sea levels to fluctuate substantially on at least three occasions, with other lesser fluctuations in between. This has been the result of increased and decreased polar glaciation and falls in sea level were caused by the locking up in the polar ice caps of huge quantities of seawater as global temperatures cooled.

The most extreme recent sea level drop occurred between circa 20,000 and 17,000 years ago when at the height of the last glaciation (Marine Isotope Stage 2 (MIS)) global sea levels were more than 120 m lower than they are today (Waelbroeck *et al*, 2002; Rohling *et al*, 2009).

As with the MIS 2 low sea level stand, those which corresponded with MIS 4 (~70,000 years ago), MIS 6 (~190,000 years ago), MIS 8 (~301,000 years ago) and MIS 12 (~478,000 years ago) would have “added a large coastal plain to the South African land mass” (Van Andel 1989:133) where parts of the continental shelf were exposed as dry land (see Cawthra *et al*, 2016). The exposure of the South African continental shelf would have been most pronounced on the wide Agulhas Bank off the southern Cape coast, and it is estimated that a new area of land, as much as 80,000 km^2 in extent, was exposed during the successive glacial maxima (Fisher *et al*, 2010) (Figures 6 and 7).

The exposed continental shelf was quickly populated by terrestrial flora and fauna, and also by our human ancestors who were dependant on these resources (Compton, 2011). As a result, for periods numbering in the tens of thousands of years on at least three occasions during the last 500,000 years our ancestors inhabited areas of what is now seabed around the South African coast.

This means that a large part of the archaeological record of the later Earlier, Middle and early Late Stone Age is located on the continental shelf and is now “inundated and for all practical purposes absent from [that] record” (Van Andel, 1989:133-134).

Until relatively recently there was little or no access to the submerged prehistoric landscapes and sites on the continental shelf, although evidence from various parts of the world of drowned, formerly terrestrial landscapes hinted at the tantalising prospect of prehistoric archaeological sites on and within the current seabed.

Figure 6: The south coast continental shelf showing the water depths of 45, 75, 120 and 400 m. The 2AFRICA/GERA (East) branch cable to Port Elizabeth will be installed in the area highlighted in red on the right of the image (Source: Compton, 2011 from Cawthra, 2014).

Perhaps the best-known example of such evidence is archaeological material and late Pleistocene faunal remains recovered in the nets of fishing trawlers in the North Sea between the United Kingdom and the Netherlands throughout the 20th century (Peeters *et al*, 2009; Peeters, 2011) and the University of Birmingham’s archaeological interpretation of

3D seismic data, collected in the same area by the oil and gas industry, which has revealed well-preserved prehistoric landscape features across the southern North Sea (Fitch *et al*, 2005, Gaffney *et al*, 2010).

Closer to home, there is archaeological evidence for a prehistoric human presence in what is now Table Bay. In 1995 and 1996 during the excavation of two Dutch East India Company shipwrecks, the *Oosterland* and *Waddinxveen*, divers recovered three Early Stone Age, Acheulian handaxes from the seabed under the wrecks (Plate 1). The stone tools, which are between 300,000 and 1.4 million years old, were found at a depth of 7-8 m below mean sea level and were associated with Pleistocene sediments from an ancient submerged and infilled river channel. Their unrolled and unworn condition indicate that they had not been carried to their current position by the ancient river and suggests that they were found more or less where they were dropped by Early Stone Age hominins more than 300,000 years ago, when the sea level was at least 10 m lower than it is today (Werz and Flemming, 2001; Werz *et al*, 2014).

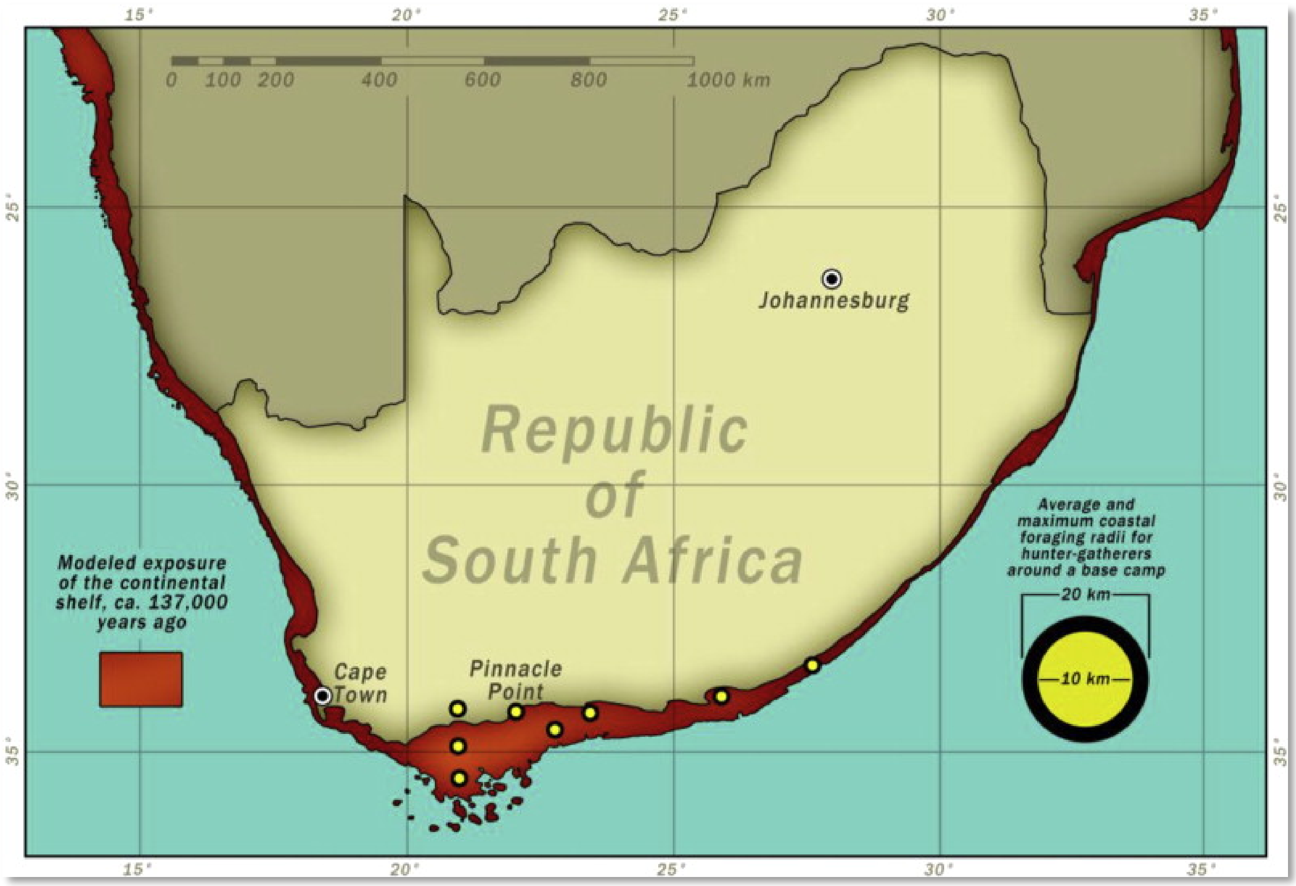

Figure 7: Possible extent of the South African continental shelf c.137,000 years ago (Source: Franklin et al, 2015)

6.1.1. Potential for Submerged Prehistory of the Algoa Bay Area

There have, to date, been no specific studies of the submerged prehistory of Algoa Bay. However, the archaeological evidence for a hominin presence in the Algoa Bay region in the Earlier, Middle and Later Stone Age is plentiful.

Earlier and Middle Stone Age lithic material has been found in the in the Sundays River Valley, while at the important site of Amanzi Springs, 40 km north of the Port Elizabeth near Addo, Earlier Stone Age artefacts are found *in situ* with well-preserved plant and faunal remains within spring sediments (Deacon, 1970).

There is Later Stone Age archaeological material preserved in caves and rock shelters, such as Melkhoutboom Cave, in the Cape Fold Belt Mountain surrounding Port Elizabeth (see Deacon and Deacon, 1963; Deacon, 1976; Binneman, 1997) and large numbers of coastal shell middens have been reported at Humewood, St. George's Strand and the Coega River Mouth (Rudner, 1968).

Plate 1: Three Acheulian handaxes recovered form seabed sediments in Table Bay (Source: http://www.aimure.org/index.php/aimure-projects)

Binneman and Webley (1997) reported thirteen shell middens and stone tool scatters about 500 m east of the Coega River mouth in the archaeological assessment carried out for the development of maritime infrastructure for the Port of Ngqura. Importantly, some of this archaeological material was recorded in secondary context in the gravels from older river terraces along the banks of the Coega River – a context reminiscent of the Table Bay finds referred to earlier.

Also important to note is the presence in Algoa Bay of a late Quaternary of consolidated, calcareous aeolianite, known as the Nahoon Formation, which was deposited during sea level regressions associated with the last two glacial periods. The Nahoon Formation outcrops between Plettenberg Bay and East London and is known to preserve vertebrate trackways, estimated to be approximately 124 000 years old, which include the footprints of a young human child in the sandstone at Nahoon Point north of East London in 1964 (Roberts 2008). Where Nahoon Formation outcrops survive below the current sea level, there is the potential for them to preserve further trackways and also archaeological material.

The rivers that currently feed into Algoa Bay would, during times of lower sea level in the past, have flowed across the exposed floor of the bay and are likely to have been an activity and resource focus for hominins. As in Table Bay and elsewhere in the world, there is thus the potential for the preservation within current seabed sediments of Algoa Bay of pre-colonial archaeological sites and material.

Where alluvial sediment within palaeochannels or other such features has survived post-glacial marine transgressions there is also the potential to recover palaeoenvironmental data (pollens, foraminifera and diatoms, for example) which can contribute contextual information to our understanding of the ancient human occupation of South Africa.

There is thus the potential for the preservation, within the thin Quaternary surficial sediments in the study area, in water depths of less than approximately 120 m, of pre-colonial archaeological sites and material.

7. PALAEONTOLOGY: MARINE AND TERRESTRIAL

7.1. **Project Location and Geological Context**

The cable route is planned to pass through the southern part of the Algoa Basin and make landfall on Pollock Beach, Summerstrand.

The rocks underlying the cable route, both onshore and to at least 100 km offshore, are those of the Cape Supergroup (Thamm and Johnson 2006; Linol et al. 2016) (Figure 9 / Table 1). The Peninsula Formation is in the lower Table Mountain Group (Cape Supergroup) and is composed of quartzitic sandstone that was deposited in a fluvial braid-plain and shallow marine setting (Thamm and Johnson 2006). Overlying these are the Late Jurassic to Early Cretaceous Uitenhage Group rocks that are exposed onshore to the north of the proposed terrestrial cable route (Shone 2006) and extend offshore in the Port Elizabeth Trough and the Uitenhage Trough (Broad et al. 2006).

Onshore, the older rock is overlain by much younger aeolianites (cemented windblown sands) and aeolian sands of the Algoa Group, Nanaga Formation (Figure 9) that are Pliocene to Pleistocene in age (Roberts et al. 2006). The formation comprises coastal palaeo-dune fields, with medium-grained cross-bedded, calcareous sandstone and calcretes up to 250m thick (ibid). The southern part of the Cape Recife peninsula is overlain by modern dune and shore sands that have been stabilised by natural vegetation, and more recently, by introduced and invasive vegetation, (De Beer 1986).

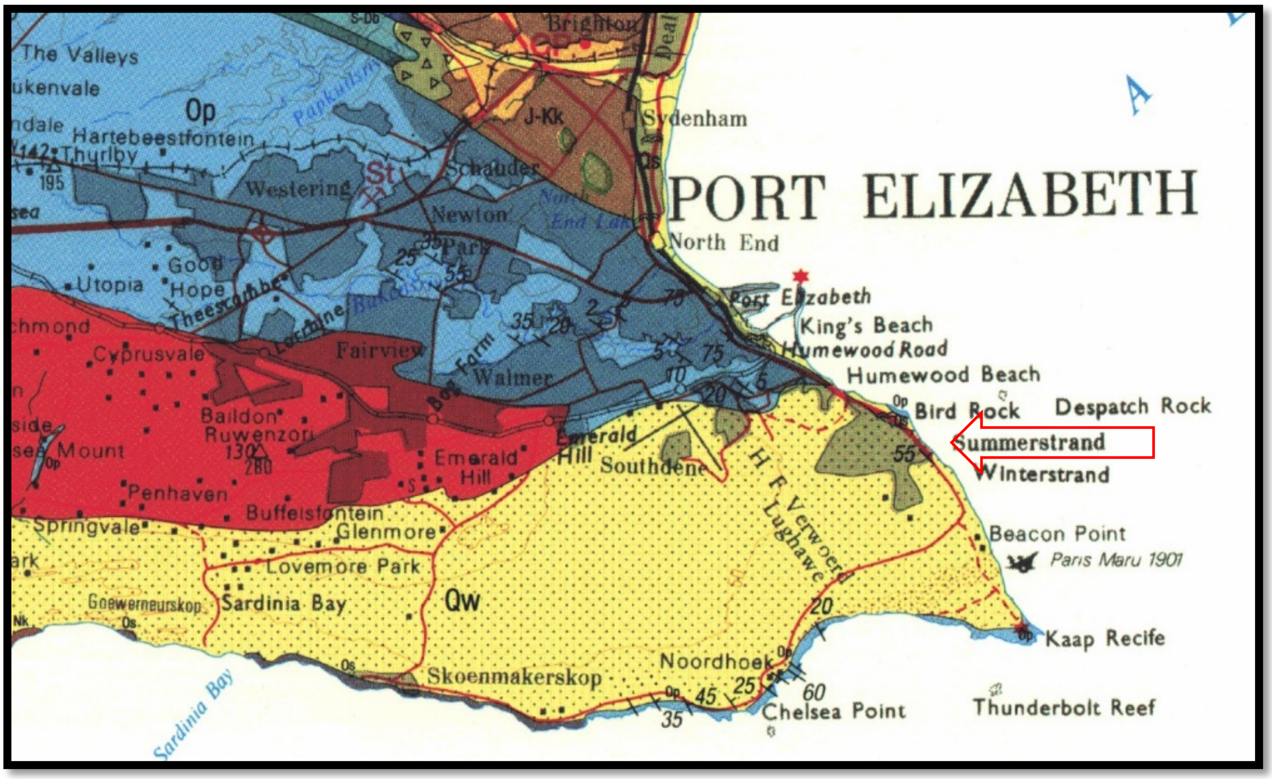

Figure 8: Geological map of the area around Algoa Bay, Port Elizabeth and the Summerstrand peninsula. The location of the proposed landfall site is indicated by the blue arrow. Abbreviations of the rock types are explained in Table 2 (Source: Geological Survey 1: 250 000 map 3324 Port Elizabeth).

Table 1: Explanation of symbols for the geological map and approximate ages (Roberts et al, 2006; Thamm and Johnson, 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project).

Symbol	Group/Formation	Lithology	Approximate Age
Qw	Quaternary sands	Aeolian sands	Quaternary, last 2.5 Ma
T-Qn	Nanaga Fm, Algoa Group	Aeolianite	Miocene-Pliocene
Op	Peninsula Fm, Table Mountain Group, Cape SG	Quartzitic sandstone	Ordovician

Offshore, according to Bamford (2021), the stratigraphy is complex, with successive waves of deposition and some periods of erosion when the sea level was low. A number of seabed sediment reconstructions based on core material, and more recently on the integration of magnetic, gravity and seismic data are cited in Appendix 1 below.

7.2. **Palaeontological Context**

The palaeontological sensitivity of the terrestrial portion of the cable route is presented in Figure 9. The onshore or landfall site for the fibre cable is in the Nanaga Formation aeolianites. Dunefields with crossbedding would not preserve any fossils because the sands are windblown, in alternating directions. Cemented sands in wet pockets or seeps might preserve shells, worm burrows or root traces but these tend to be very fragmentary and very recent.

Offshore, the younger sediments are nearer the coastline and become older away from the coast, in general, but the pattern is disrupted by the canyons in the Algoa Basin, and the Port Elizabeth and Uitenhage Troughs (Figure 8 in Appendix 1).

Palynological (pollen) analyses of offshore sediments have been done by Scott (1976) for the Kirkwood Formation strata. In a borehole core he found spores of ferns and lower plants and pollens of cycads, bennettitaleans and conifers. McMillan analysed the marine micro-organisms from cores and used the taxa the determine the ages of the Cretaceous and Tertiary sediments in this basin and other offshore basins (McMillan et al. 1997; McMillan 2003).

From the SAHRIS map below (Figure 9) the landfall site and terrestrial cable route is indicated as an area of very highly sensitive (red) for the Quaternary aeolian sands, however, because these sands are aeolian they would only be able to entrap very small fragments of fossils. In seeps or wet areas, root casts or almost modern shells might accumulate.

8. MARITIME HISTORY OF SOUTH AFRICA'S COAST AND SURROUNDS

In 1498 the Portuguese explorer Vasco da Gama finally pioneered the sea route around Africa from Europe to the East. Since then, the southern tip of the African continent has played a vital role in global economic and maritime affairs, and until the opening of the Suez Canal in 1869, represented the most viable route between Europe and the markets of the East (Axelson, 1973; Burman, 1976; Turner, 1988; Gribble, 2002; Gribble and Sharfman, 2013).

The South African coast is rugged and the long fetch and deep offshore waters mean that the force and size of seas around the coast are considerable; a situation exacerbated by prevailing seasonal winds. The geographical position of the South African coast on the historical route to the East and the physical conditions mariners could expect to encounter in these waters have, in the last five centuries, been responsible for the large number of maritime casualties which today form the bulk of South Africa's maritime and underwater cultural heritage (Gribble, 2002).

At least 2,400 vessels are known to have sunk, grounded, or been wrecked, abandoned or scuttled in South African waters since the early 1500s. More than 1,900 of these wrecks are older than 60 years of age and are thus protected by the NHRA as archaeological resources. The existing list of wrecks is by no means complete and does not include the as yet unproven potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions along the South African east coast. It is anticipated that further research in local and foreign archives, together with physical surveys to locate the remains of historical shipwrecks will produce a final tally of more than 3,000.

The earliest known South African wrecks are Portuguese, dating to the sixteenth century when that country held sway over the route to the East. Due to the later, more prolonged ascendancy of the Dutch and British in European trade with the East and control at the Cape, the majority of wrecks along the South African coast belong to these two nations. However, at least 36 other nationalities are represented amongst the wrecks that litter the South African coast.

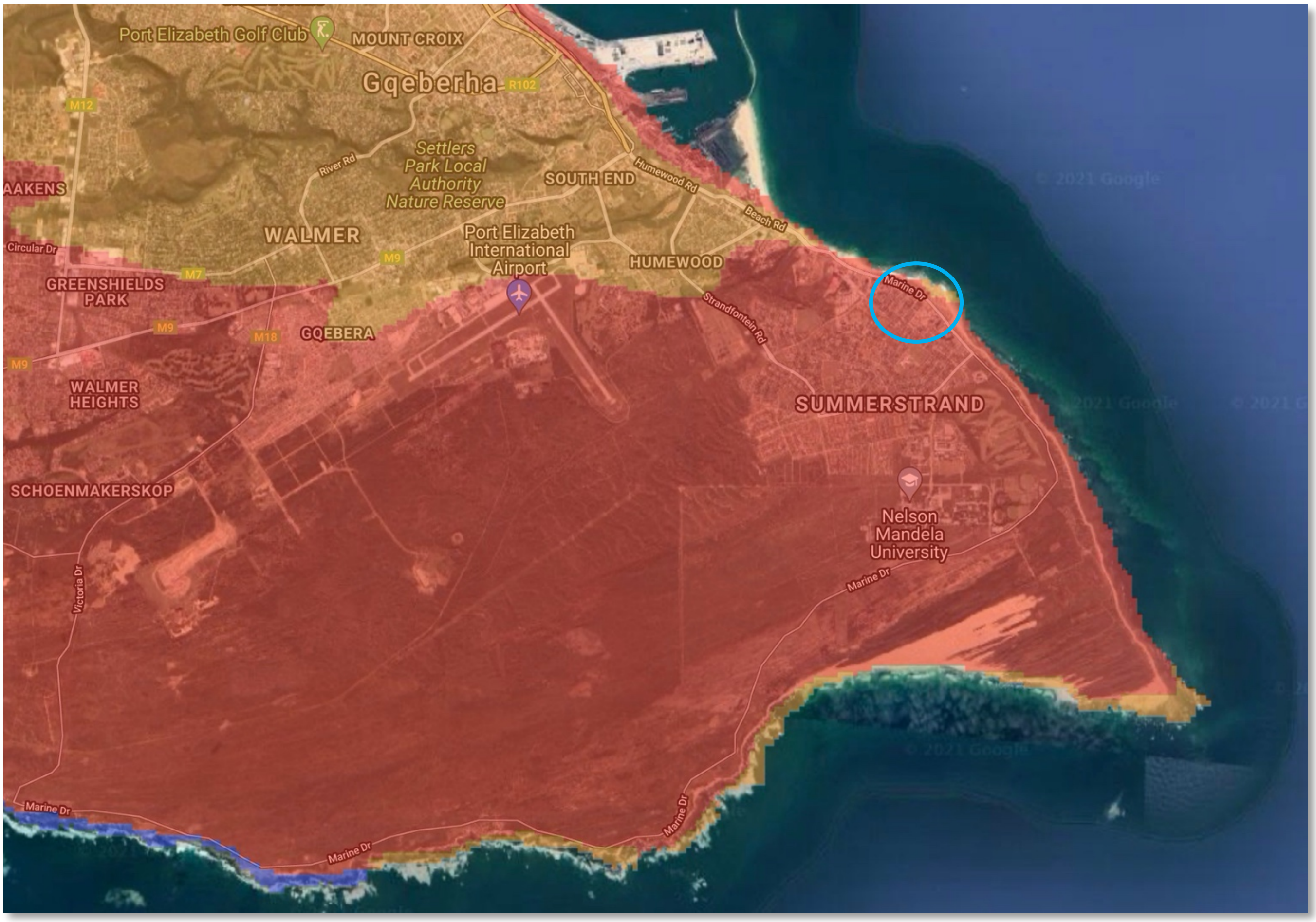

Figure 9: Palaeontological sensitivity (red = very high) of the area surrounding and including the terrestrial cable route (blue circle) (Source: SAHRIS, https://sahris.sahra.org.za/map/palaeo).

Da Gama's maritime incursion into the Indian Ocean laid the foundation for more than 500 years of subsequent European maritime activity in the waters around the South African coast (Figure 10). The Portuguese and other European nations who followed their lead around the Cape and into the Indian Ocean, however, joined a maritime trade network that was thousands of years old and in which east and south east Africa was an important partner.

This trade spanned the Indian Ocean and linked the Far East, South East Asia, India, the Indian Ocean islands and Africa. Archaeological evidence from Africa points to an ancient trade in African products – gold, skins, ivory and slaves – in exchange for beads, cloth, porcelain, iron and copper. The physical evidence for this trade includes Persian and Chinese ceramics excavated sites on African Iron Age like Khami, Mapungubwe and Great Zimbabwe (see Garlake 1968, Huffman 1972, Chirikure 2014), glass trade beads found in huge numbers on archaeological sites across eastern and southern Africa (Wood 2012).

There is shipwreck evidence on the East African coast for this pre-European Indian Ocean trade (see for example Pollard et al 2016) and clear archaeological and documentary evidence that this trade network extended at least as far south as Maputo in Mozambique. This suggests that there is the potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions to exist along the South African east coast and offshore waters.

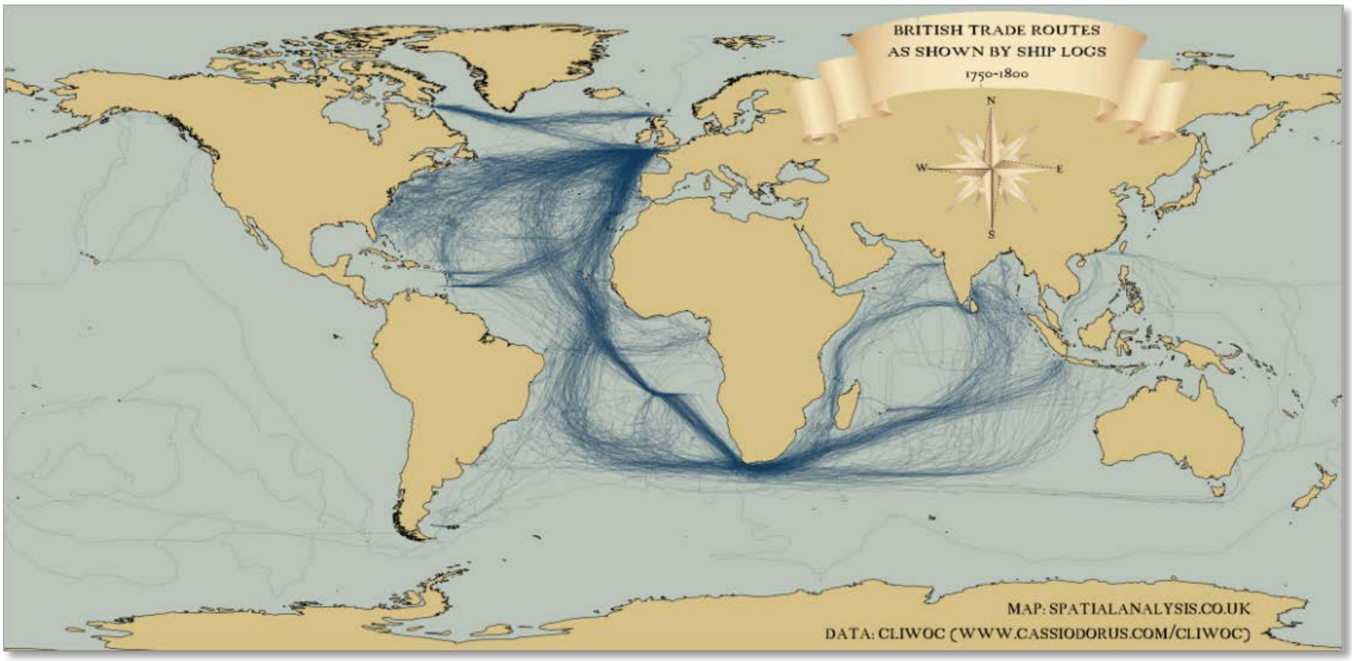

Figure 10: Example of the strategic position of the South African coast in global trade. British trade routes as shown by ship logs – 1750 to 1800 (Source: http://www.theguardian.com/news/datablog/2012/apr/13/shipping-routes-history-map).

The historical shipwrecks that form part of South Africa's underwater cultural heritage are thus a unique and highly cosmopolitan repository of information about global maritime trade during the last five centuries and potentially much further back into the past. These sites contain a wealth of cultural material associated with that trade and clues to the political, economic, social and cultural changes that accompanied this trade and which contributed to the creation of the modern world.

8.1.1. Maritime History of the Algoa Bay Area

In its crossing of the contiguous zone and territorial waters, the 2AFRICA/GERA (East) cable system, will be routed across the approaches to Algoa Bay which, next to Table Bay, was historically one of the busiest shipping hubs on the South African coast.

Algoa Bay is a wide, relatively shallow (<70 m), eastward-facing bay whose crenulate shape is the result of the dominant swell from the south-west. The bay is not a natural harbour, but is nevertheless a safe anchorage for much of the year because the dominant winds are from the southwest, with an increase in the frequency of winds with an easterly component during the summer months. The strongest winds occur during October and November, and it was these south-easterly gales which historically decimated shipping in the bay (Inggs 1986; Schumann *et al* 2005).

The first European observation of the bay was by Bartholemeu Dias in 1488 shortly before his crew forced him to turn back for home. He described the bay named it Baia da Roca. By the time Manuel de Mesquita Perestrelo, the Portuguese navigator and cartographer was commissioned to chart the southern African coastline in 1575, the bay was being called Bahia da Lagoa, and subsequently Baia da Alagoa, after a small lagoon at the mouth of the Swartkops River, from which it’s modern name is derived (Inggs 1986; Knox-Johnston 1989; https://en.wikipedia.org/wiki/Manuel_de_Mesquita_Perestrelo) (Figure 10).

At the time of the First British Occupation of the Cape (1785-1803) little was known by the colonial government about Algoa Bay and in 1797 the Governor sent John Barrow to the eastern districts of the Cape to report on Algoa Bay's potential as a harbour and the best way to defend it. At the same time the navy sent Lieutenant William Rice to survey the coast of the bay.

Until then no attempt had been made to use Algoa Bay as a port and, according to Inggs (1986:17), “as late as 1785 local inhabitants reported that they had never seen ships in the bay”.

Barrow found the most suitable landing place to be on the beach north of the Baakens River mouth and in 1799, following unrest in the eastern districts, the government decided there was a need to protect the landing and watering place at Algoa Bay. A wooden blockhouse overlooking the Baakens River was built, and shortly thereafter replaced by a stone redoubt on the steep hill overlooking the river - Fort Frederick (Inggs 1986).

Port Elizabeth owes its foundation, and Algoa Bay its position as South Africa’s second port, to the arrival in 1820 of 5,000 British immigrants, brought to the eastern Cape as part of a colonial government scheme to strengthen the eastern boundary of the colony (Ingpen 1979; Inggs 1986). With people came trade and commerce and Algoa Bay soon became a busy port providing a link for the eastern Cape with Cape Town and England, with wool becoming the major export (Ingpen 1979; Turner 1988; Knox-Johnston 1989).

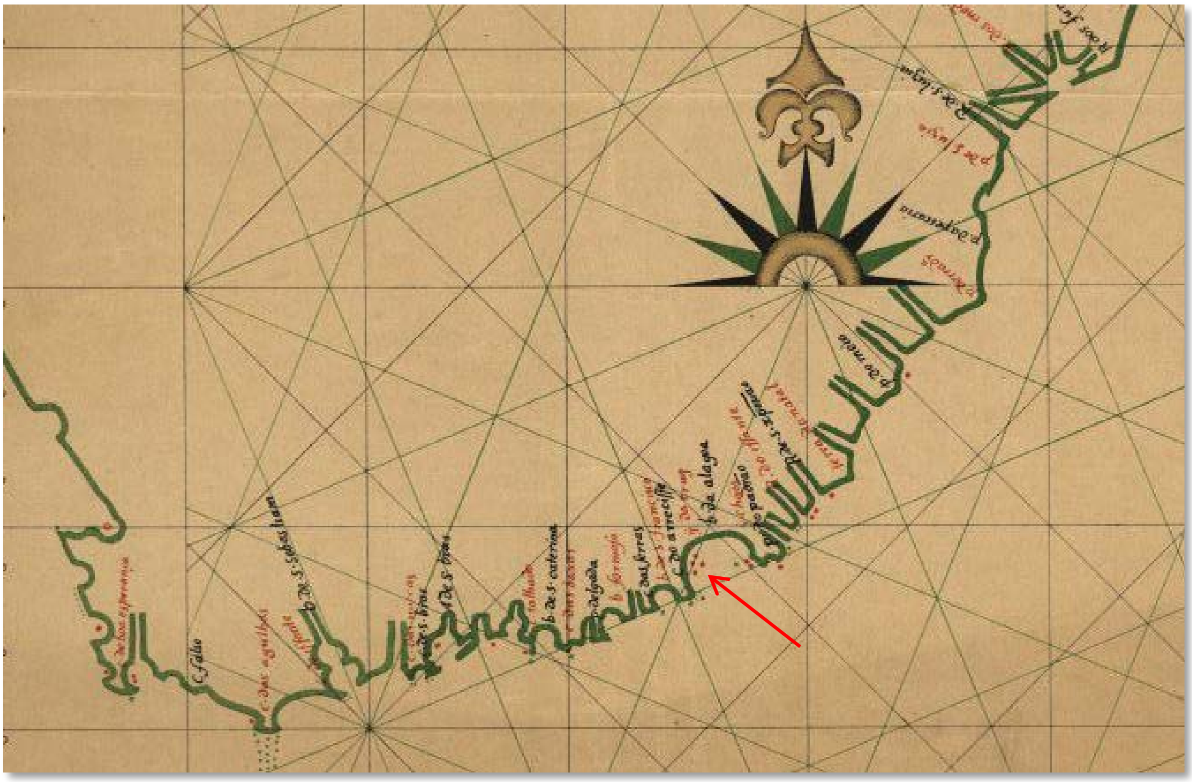

Figure 11: Manuel de Mesquita Perestrelo's 1575 map of the southern African coast. The Baia da Alagoa is marked with the red arrow (Source: https://en.wikipedia.org/wiki/Manuel_de_Mesquita_Perestrelo).

Increasing number of vessels visited the bay. Ingpen (1979) refers to 40 vessels were anchored in the bay in June 1859, for example, and with this increased shipping came greater numbers of casualties. Inggs (1986:3) comments that in comparison with Table Bay, which was a very dangerous anchorage in the winter and where the development of a harbour was thus vital, such facilities at Port Elizabeth "would merely add to the convenience of shipping". As a result, no formal infrastructure was started until 1840 when a jetty was built, only to be destroyed in a storm in 1843 (Plate 2).

Two decades later in 1855, after Her Majesty's Transport *Charlotte* was wrecked on the rocks at the bottom of Jetty Street in 1854 with the loss of 62 soldiers, 16 women and 26 children, a breakwater was built to shield the landing place but the area in the lee of the breakwater quickly silted up, however, and became too shallow to use (Morris 2005; Goschen and Schumann 2011).

The landing and shipping of goods and passengers therefore continued in surfboats from the open beach, through Algoa Bay's notorious surf to ships lying in the anchorage (Plate 3). At various times from the 1820s formal moorings – presumably consisting of anchors and chains - were laid opposite the landing beach (see Plate 4 below) to improve the holding and safety of ships at anchor (Inggs 1986; Knox-Johnston 1989).

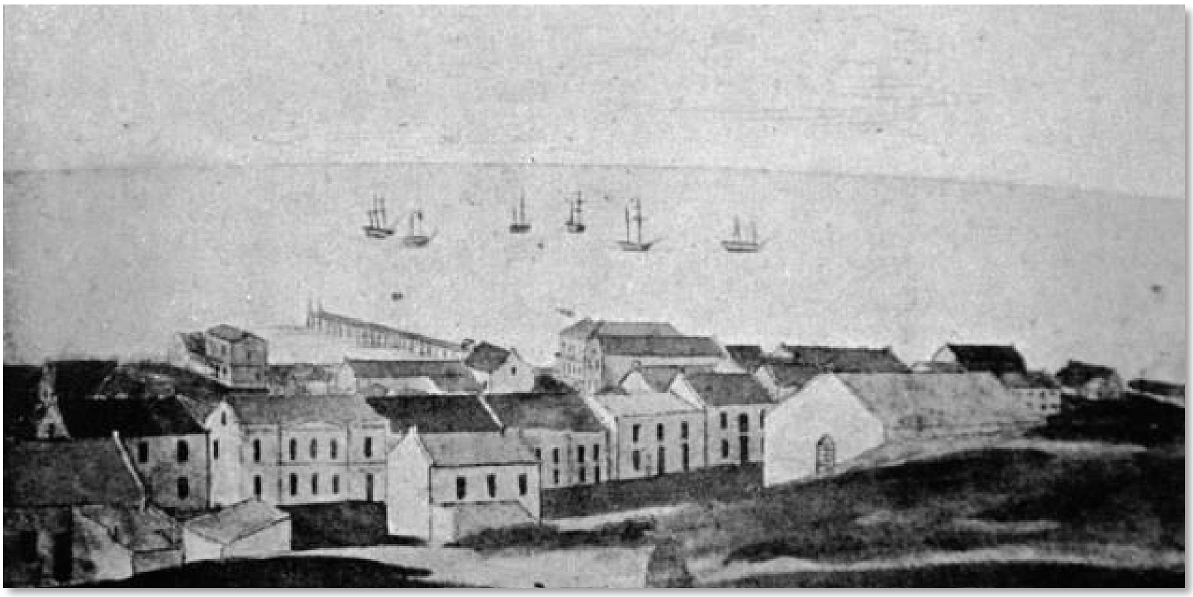

Plate 2: Port Elizabeth in 1840 showing the first jetty. From a painting by Mr Piers (Source: http://thecasualobserver.co.za/port-elizabeth-yore-town-officials-residents-1840s/)

These moorings did little to protect shipping from Algoa Bay's south-easterly gales and large numbers of ships were wrecked, particularly on the beaches north of the Baakens River. In 1859, 10 vessels were wrecked on North End beach and ten years later in 1869, 11 of the 13 vessels at anchor in the bay were beached. The construction of the North (1870) and South Jetties (1884) were of limited help as they did not provide an anchorage, and casualties continued to mount. Four ships were wrecked in a south-easter in 1872, nine were beached in similar circumstances in 1888, two were wrecked in 1892 and a total of 27 vessels were beached or destroyed in two major gales in 1902 (21 casualties) and 1903 (6 casualties) (Turner 1988; Goschen and Schumann 2011).

Proper harbour works were finally sanctioned in 1914. The Dom Pedro Jetty was completed in 1920 and the Burton Breakwater which curved around the new harbour was finished in 1931 (Inggs 1986; Goschen and Schumann 2011).

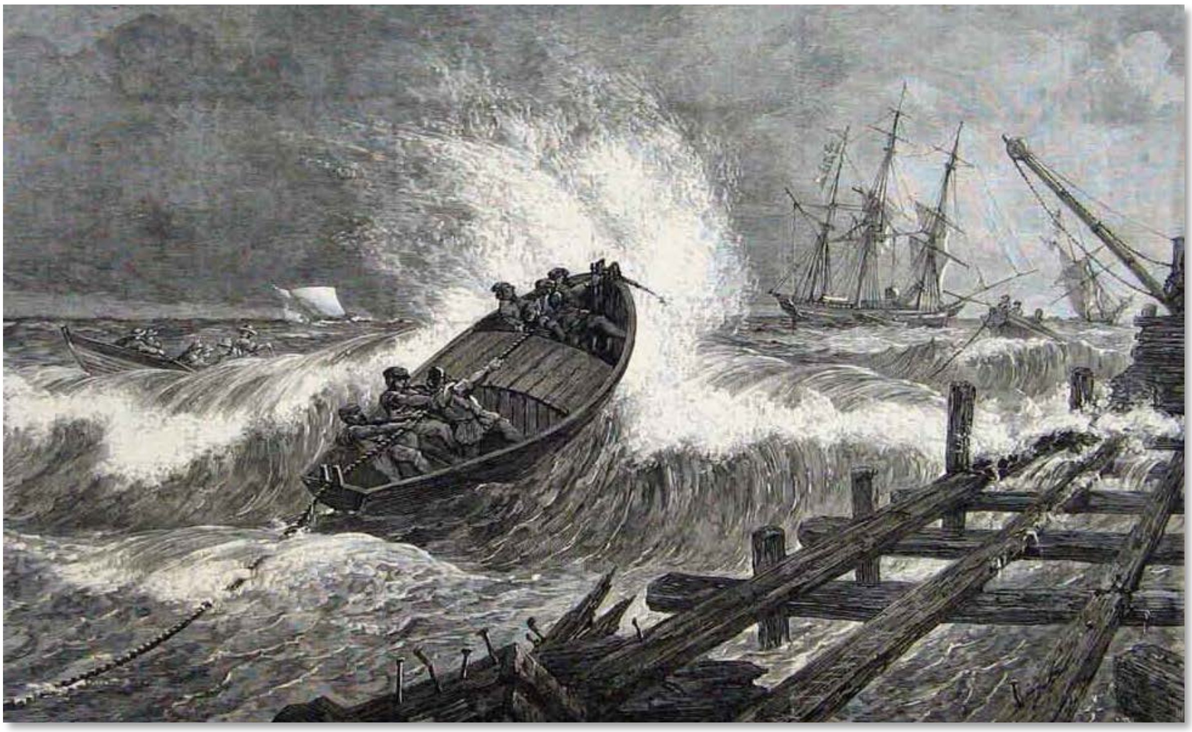

Plate 3: Surf boat working at Port Elizabeth (Source: Illustrated London News).

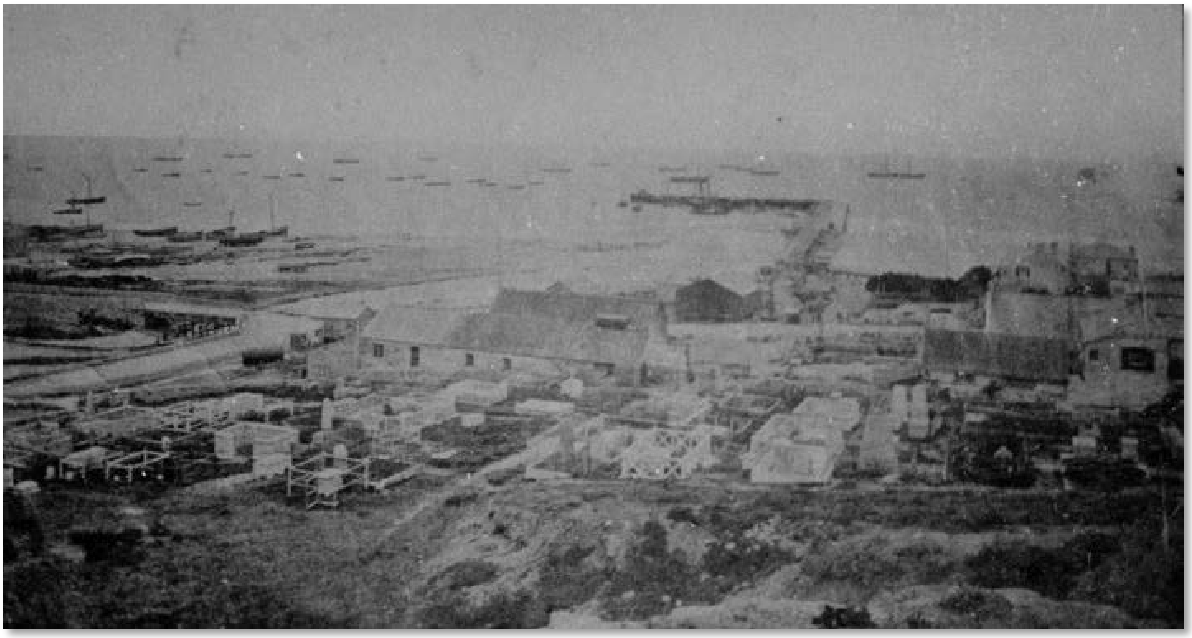

Plate 4: Port Elizabeth between 1862 and 1869 showing vessels at anchor in the historical anchorage beyond the mouth of the Baakens River (Source: http://thecasualobserver.co.za/port-elizabeth-yore-baakens-pristine-lagoon-commercial-area/)

8.1.2. **Shipwrecks in the Study Area and Vicinity**

The local records consulted for this study - SAHRIS (http://www.sahra.org.za/sahris) a shipwreck database compiled by Fedde Van den Bosch (2014) and the shipwreck database maintained by ACO Associates – and reference books such as Morris (2005), contain records of more than 300 potential wrecks in the western half of Algoa Bay between Cape Recife and Bird Island.

The bulk of these sites are concentrated in the area of and to the north of the historical anchorage, off the Baakens River mouth, with relatively few wrecks (11) recorded between the harbour and Cape Recife and in the vicinity of the proposed cable landfall (Figure 12). The wrecks are:

Table 2: List of possible wrecks in the vicinity of the proposed cable route alignment.

Ship Name	Place	Date Wrecked	Latitude / Longitude	Confidence	Event Type
Argalie	Algoa Bay	1869/09/18	-33.9646 / 25.6602	Estimated - low	Unknown
Fidelia	1.7 km north of Cape Recife lighthouse (400m offshore)	1873/04/07	-34.0089 / 25.6967	Approximate	Wrecked
Haerlem (SAS)	Humewood Beach / Near Roman Rock	1987/11/01	-33.9810 / 25.6966	Estimated	Scuttled
Knysna	Cape Recife	1952/03/31	-33.9913 / 25.6873	Approximate	Scuttled
Balaclava / Balaklava	Roman Rock (near bell buoy)	1867/06/15	-33.9816 / 25.6975	Approximate	Wrecked
Colonial Empire	Thunderbolt Reef (south west of). Near lighthouse	1917/09/17	-34.0251 / 25.7071	Approximate	Wrecked
Dane (RMS)	Cape Recife / Great Fish Point - between	1865/12/	-34.0190 / 25.7020	Approximate	Wrecked
Itzehoe / Itzahoe	North of Cape Recife Lighthouse	1911/05/24	-34.0227 / 25.7025	Accurate	Wrecked

Zephyr	1 mile east of North Jetty	1889/10/16	-33.9647 / 25.6518	Estimated - low	Wrecked
Unknown stranded wreck	Summerstrand	Unknown	-34.006 / 25.6923	Approximate	
Dangerous wreck	East of Humewood	Unknown	-34.0072 / 25.7105	Accurate	Unknown
Obstruction	Summerstrand	Unknown	-33.9681 / 25.705	Approximate	

* See Appendix 2 for more detail about these wrecks

Most of the vessels listed above are recorded as having been wrecked or scuttled and their remains can thus be expected to be present in or on the seabed in some form. The records in Table 2 above for which no name is given (Unknown stranded wreck / Dangerous wreck / Obstruction) reflect possible wrecks, seabed obstructions or geophysical contacts recorded by historical seabed surveys, and it is possible that wreck material exists at or near these positions on the seabed.

The wrecks of the *Haerlem*, *Knysna* and *Balaclava* (shaded blue in Table 2 above) appear to be closest to the proposed alignment of the 2AFRICA/GERA cable and are within the 1 km buffer on either side of the cable route used by this assessment as its core study area.

Of these sites, the South African naval frigate *Haerlem*, scuttled as an artificial reef in 1987, is currently less than 60 years of age and is thus not protected by the NHRA as a heritage resource. Unlike all of the other wrecks, however, the position of the *Haerlem*, is known with accuracy and, located roughly 600 m north of the cable route, this wreck is very unlikely to be affected by, or affect the installation of the cable system in its proposed alignment.

Figure 12: Proposed alignment of the 2AFRICA/GERA (East) cable system within Algoa Bay. The maritime assessment study area (a 1 km buffer on either side of the route) is shown, as are the recorded wrecks in the vicinity, both to the north around the old anchorage, and to the south around Cape Recife (Source: Google Earth).

Lastly, and something that must be considered in relation to the installation of the proposed cable, is that many records for shipping casualties in the area only list the location of loss as “Algoa Bay” or “Port Elizabeth” and such wrecks could be anywhere in the bay. As mentioned already, given the history of the anchorage at Port Elizabeth and weather and current patterns associated with the bay, and the likelihood is that the bulk of them will be in the vicinity of the modern harbour and North End. However, the potential presence of wrecks within the development area that are not on the list of casualties in Table 2 must be considered a possibility as they can pose a risk to the project in terms of damage to machinery during seabed works.

8.2. Review of Geophysical Survey Results

The proposed cable route was surveyed by Fugro Germany Marine using sidescan sonar (SSS), multibeam bathymetry (MBES) and magnetometer to provide primary evidence of seabed hazards, seabed geomorphology and other oceanographic and anthropogenic data (Fink 2021). As well as being essential for planning of the installation of the cable, these data are also of interest from a maritime archaeological perspective as they can provide concrete evidence of wrecks and other heritage resources on or in the seabed.

The archaeological review of the geophysical survey report and accompanying digital mapping for Segment E2 of the 2AFRICA/GERA (East) cable system concentrated on the results of the inshore and shallow water sections of the survey between the low water mark and the outer edge of the contiguous zone and found the following:

8.2.1. Inshore Survey Area

The Inshore Survey covered an area from KP 0.340 in a water depth of 2.6 m to KP 2.484 where water depth is 22 m. The area is dominated and characterised by outcropping and subcropping rock, similar to aeolianite, and possibly an exposure of the Nanaga Formation aeolianites mentioned by Bamford (2021). Seaward of the rock outcrops the seabed is composed of fine sand (Figure 13).

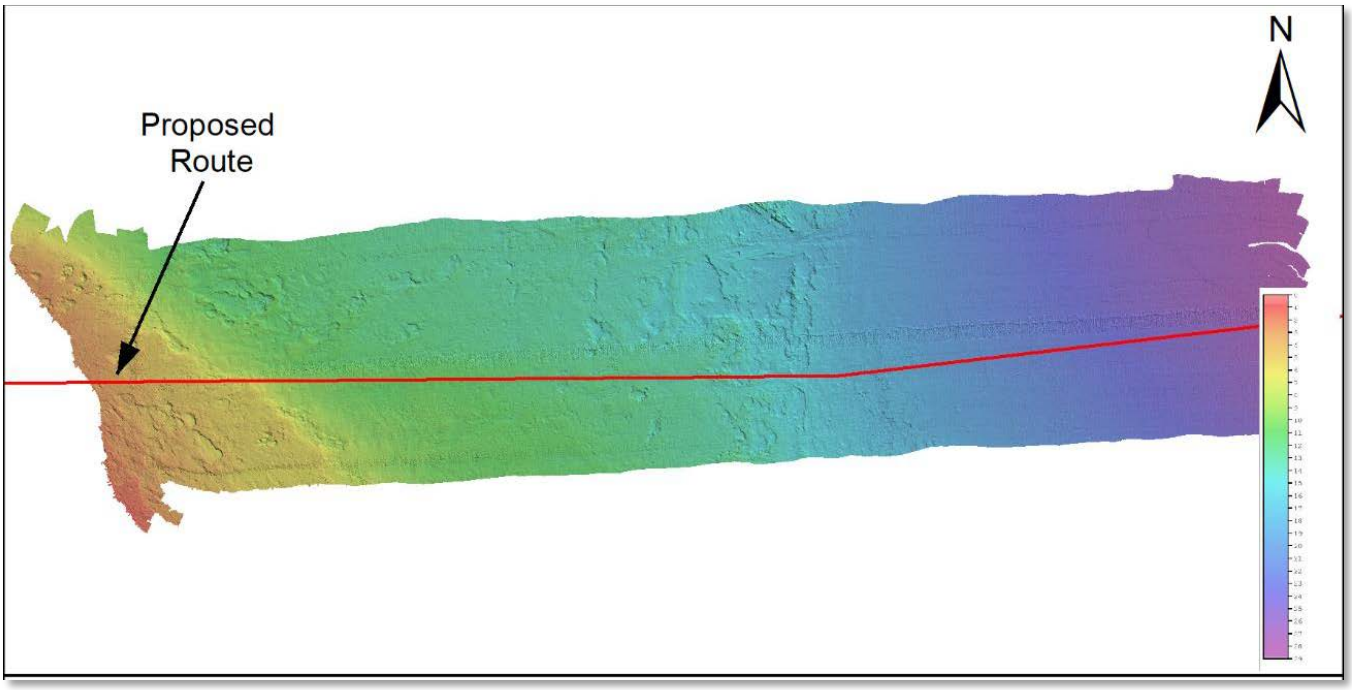

Figure 13: Multibeam image of the Inshore Survey Area between KP 0.340 and KP 3.000. Note the rock visible on the seabed on the left of the image (After Fink 2021).

Sonar Contacts - One hundred and six (106) sonar contacts were detected in the sidescan sonar (SSS) data. Ninety-six (96) of these contacts were boulders and ten (10) were identified as depressions. No anthropogenic seabed debris was identified in the data.

Magnetometer Contacts - Five (5) magnetometer contacts were defined in the Inshore Survey area of which one cluster of three (3) anomalies is related to geology. The remaining two (2) (E2-A-M001 and E2-A-M005) small contacts (26 and 8 nT respectively) could not be identified, but neither is in any proximity to the wrecks recorded in the area.

8.2.2. **Shallow Water Survey**

The Shallow Water Survey starts at KP 2.484 continues in an easterly direction to KP 5.000, where the water depth is 41.6 m. Beyond KP 3.089 the route enters an area composed of loose to medium dense sand, alternating with outcropping and subcropping rock which the SSS mosaic shows to have a similar reflectivity to the inshore aeolianite (see for example Figure 14).

Between KP 33.177 and KP 47.358 (a little beyond the outer edge of the contiguous zone and the limit of this review) the route crosses an area composed of very soft to soft silty clay and loose medium dense sand alternating with subcropping rock.

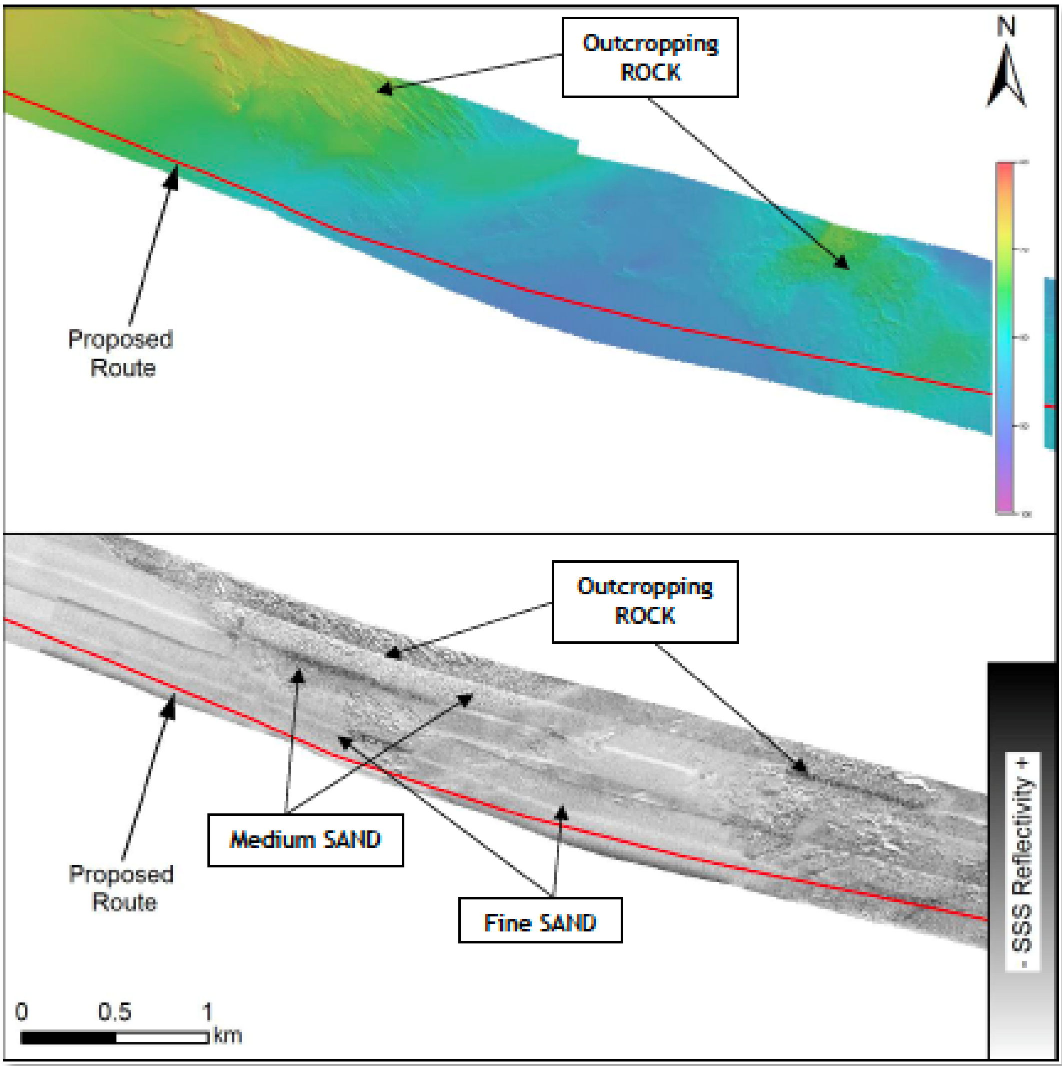

Figure 14: Combination of MBES and SSS images showing the rock outcroppings and sandy areas between KP 19.000 and KP 23.000 (After Fink 2021).

Sonar Contacts - Five hundred and thirteen (513) sonar contacts were identified in the shallow water portion of the survey. The majority (511) were classified as boulders but two (2) (E2-G-S344 and E2-G-S527) were described as debris, although of an unknown nature. E2-G-S344 is relatively small measuring 2.7 x 1.7 x 1.8 m, but E2-G-S527 is much larger with measurable dimensions of 15.9 x 3.4 x 1.9 m. E2-G-S527 is located within the contiguous zone, approximately 37.5 km from the baseline, while E2-G-S344 lies in the territorial waters, approximately 13.5 km from the baseline. Contact E2-G-S527 is less than 70 m south of the proposed route alignment and should be avoided during cable installation.

Magnetometer Contacts – Three (3) unidentified magnetic contacts were recorded in the shallow water segment. One of these magnetic anomalies (E2-G-M001) is less than 30 m from SSS contact E2-G-S344. This confluence of a magnetic anomaly and what's characterised as seabed debris suggests this may be an anthropogenic object. The object is sufficiently distant from the cable route alignment, however, not to be impacted by the project.

In summary, while a handful of the sidescan and magnetometer anomalies identified in or on the sea bed appear to be anthropogenic debris, the nature of these anomalies was not possible to discern from the available data. No wrecks were observed in any of the geophysical datasets but the size of SSS contact E2-G-S527 suggests it may be wreck-related, while the proximity of magnetic and sonar contacts E2-G-M001 and E2-G-S344 suggest there may be an anthropogenic object on the seabed in that vicinity. It is recommended that these three seabed anomalies are avoided during cable installation.

9. ARCHAEOLOGY OF THE TERRESTRIAL CABLE ROUTE

The short sketch of some of the known pre-colonial archaeological sites in wider Port Elizabeth / Algoa Bay region in Section 6.1.1 above indicates that our human ancestors have been living in the area since the Early Stone Age. In the more immediate vicinity of the terrestrial portion of the proposed cable route, Binneman and Booth (2010) state that the archaeology of the Driftsands/Cape Recife area is largely unknown, mainly because little systematic research has been conducted there.

Most archaeological sites found in the Port Elizabeth area are Late Stone Age, date from the past 10,000 years and are associated with the San hunter-gatherers and Khoikhoi pastoralists. The most common archaeological sites along the nearby coast are shell middens found usually concentrated opposite rocky coasts, but also along sandy beaches (Rudner 1968).

This is borne out by several heritage impact assessments have been produced for the Driftsands/Cape Recife area (see Webley 2005a; Webley 2005b; Binneman and Reichert 2015) which indicate that there is a coastal LSA archaeological signature in the form of shell middens and possible intertidal fishtraps, on the relatively undeveloped Cape Recife peninsula. Along the developed portions of the south coast of Algoa Bay, which includes the cable route landfall, however, urban development has probably largely destroyed any archaeological sites that may have formerly been present.

South of the proposed terrestrial cable route alignment, Binneman (2016) reports finding 19th century historical dump material in a dune deflation hollow during an archaeological impact assessment for the upgrading and expansion of the Cape Recife wastewater treatment works.

This material is probably an exposure of a large historical dump dating from 1893-1909 in the Driftsands area, which stretches from west of Schoenmakerskop to the borders of Walmer and Summerstrand (see Figure 15).

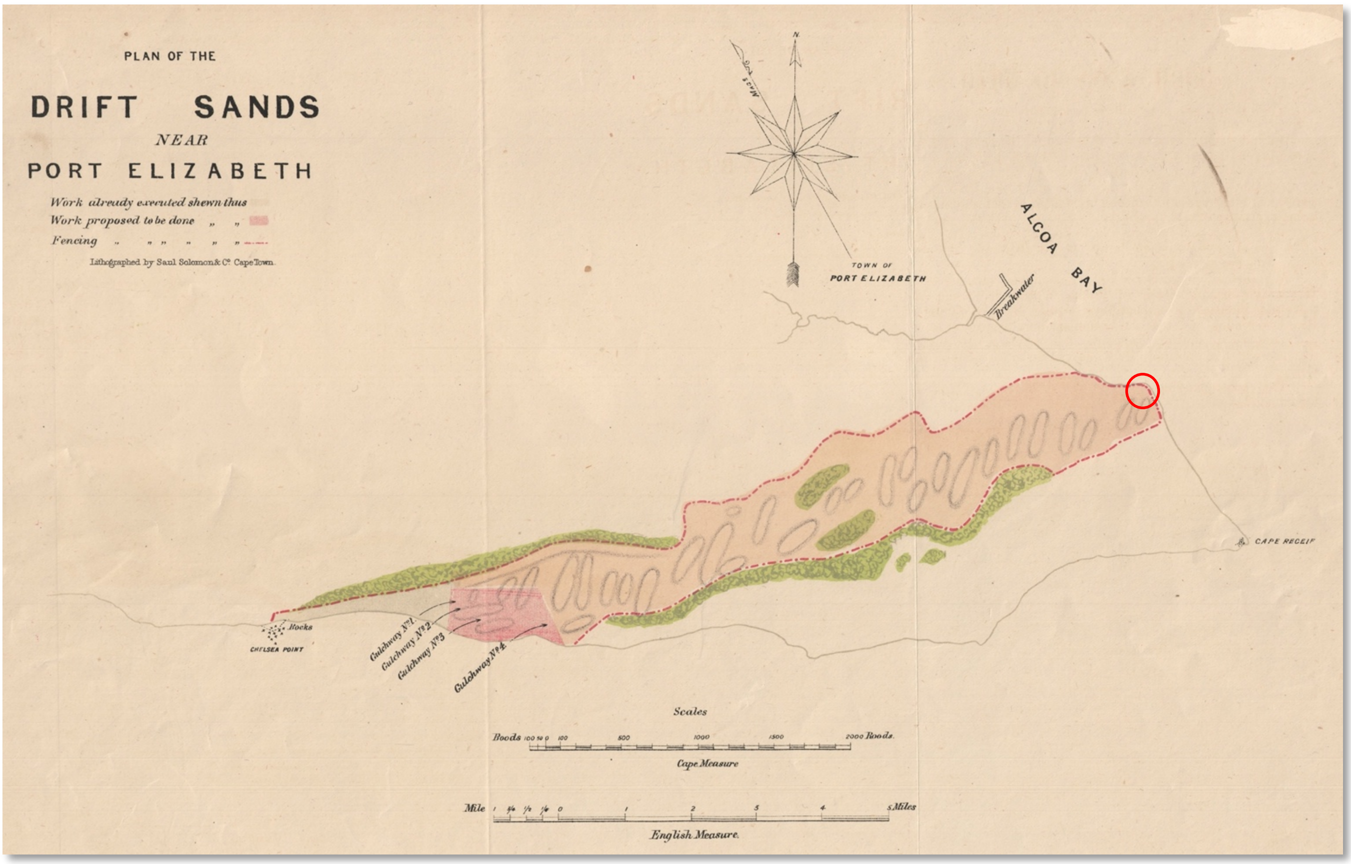

Figure 15: Plan of the Drift Sands near Port Elizabeth dated 1880. The approximated location of the terrestrial cable route is shown in red (Source: UCT Online Collection, https://digitalcollections.lib.uct.ac.za/collection/islandora-25175)

According to the historian Jennie Bennie (pers. comm.) the mobile sands of the large dunefield between Summerstrand and Cape Recife posed a threat to the harbour. In 1893 Joseph Storr Lister of the Cape Forestry Department was appointed to solve the drifting sand problem and proposed stabilising the dunes by dumping household rubbish on the dunes. A nine mile railway line into the dunes was constructed and a train (called the 'Driftsands Special') dumped some 80 tons of town rubbish a day on the dunes (Plate 5).

The rubbish was spread in a relatively thin layer on the dunes, and the seeds of Australian *acacias* (Rooikranz, Port Jackson and Long-leaf wattles) planted into the garbage. In total some 91 000 metric tons of refuse was dumped on the dunes between 1893 and 1909 (Scott 1966).

According to Lastovica (1982) amateur bottle collectors illegally mined the old dump extensively between 1960 and 1970. Bayworld Museum in Port Elizabeth houses a large collection of material the material, which includes glass bottles, sherds of china from various Port Elizabeth hotels, china dolls, mother of pearl buttons, horseshoes and numerous other artefacts made by Dr Mike Raath in the Summerstrand area and beyond the Nelson Mandela Metropolitan University.

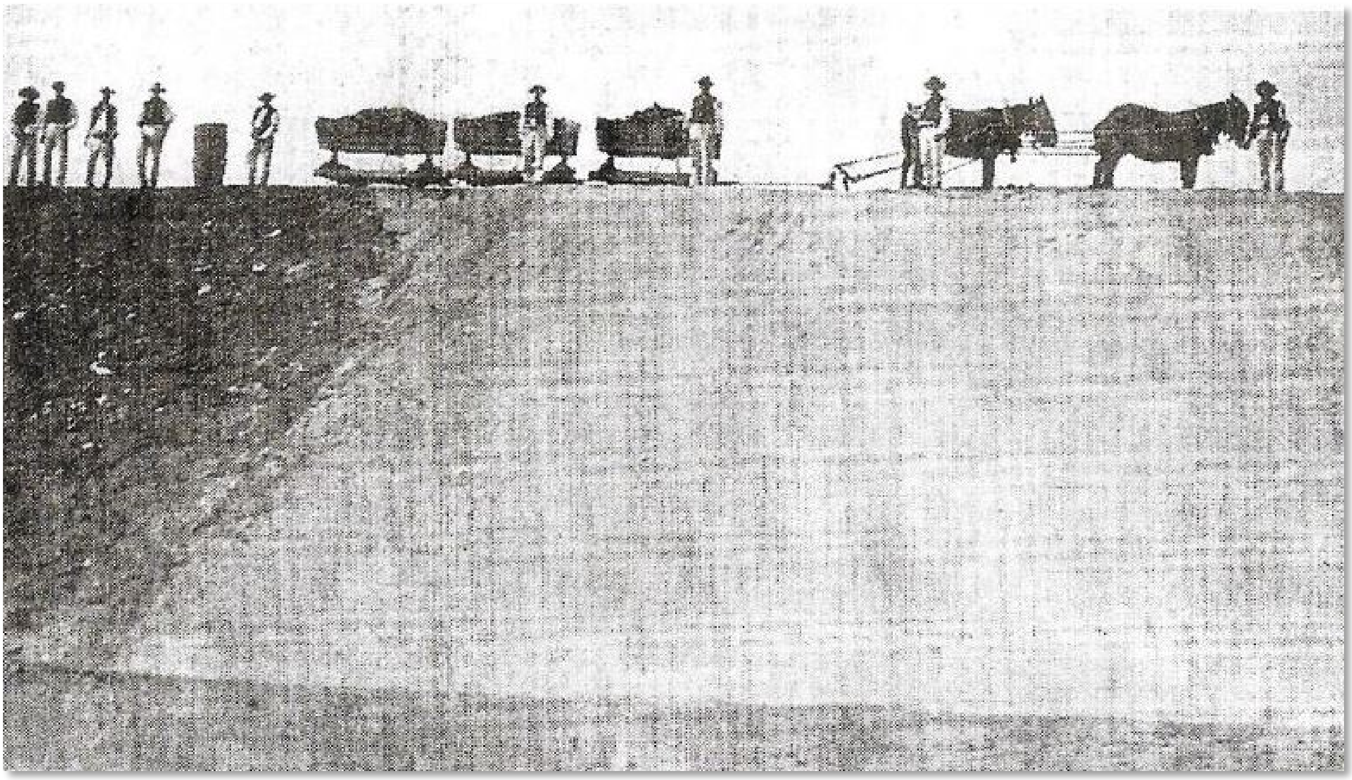

Plate 5: Spreading refuse on the drift sands c.1890 (Courtesy: http://thecasualobserver.co.za/port-elizabeth-yore-saga-drift-sands/)

The urban environment of Summerstrand, the landscaped dunes above the beach in the vicinity of the BMH and the fact that the cable will be laid within roadways and under pavements which have already disturbed the subsurface sediments, suggest that the presence or survival of in situ pre-colonial or historical archaeological sites or material is highly unlikely along the alignment of the terrestrial portion cable route.

10. IMPACT ASSESSMENT

Among the potential impacts associated with the proposed 2AFRICA/GERA (East) cable system to Port Elizabeth are impacts on submerged prehistoric and maritime archaeological heritage resources, on palaeontological features and fossil material and on pre-colonial and historical terrestrial archaeological sites and materials.

In all cases impacts can arise where interventions on and in the seabed or terrestrial sediments intersect with heritage resources: either directly where sites or material are damaged or disturbed, or indirectly where particularly the downstream effects of seabed activities can affect sites or material.

Direct impacts to buried heritage resources are caused by the cable burial process itself, where trenching or jetting cut into the seabed, or trenching disturbs terrestrial sediments. Where cables are laid on the seabed rather than buried, their placement can also have a direct impact on heritage sites and materials in their footprint. Interactions between cables, seabed ploughs and other equipment and historical wrecks can also have a direct impact in the form of damage to the former and it is thus desirable to ensure that direct interactions between project infrastructure and heritage resources are avoided.

Indirect impacts on heritage resources in seabed development contexts usually arise from the downstream effects of interventions on or in the seabed on nearby heritage resources. For example, the placement of cables on the seabed may affect local current patterns, causing seabed scour, which can in turn affect nearby heritage sites, both on or within the sea bed.

That said, the small footprint and low profile of the proposed 2AFRICA/GERA (East) cable is unlikely to cause downstream effects on the surrounding seabed.

On the basis of the heritage resources review in the preceding sections, the heritage receptors defined for this impact assessment are:

- Submerged prehistoric archaeological resources;
- Palaeontological features and fossil material;
- Maritime archaeological resources, mostly historical shipwrecks; and
- Terrestrial pre-colonial and historical archaeological sites and materials.

The assessment of impacts on these receptor classes is based on the methodology set out in Appendix 3 below.

10.1. **Submerged Prehistory**

Available evidence from South Africa and elsewhere in the world indicates that there is the potential for the survival in submerged, seabed contexts of archaeological material and palaeoenvironmental evidence deposited on the continental shelf, to approximately the -120 m contour, during periods of lower sea level within the last 900,000 years.

Although no comprehensive geophysical dataset for the Algoa Bay as a whole was available for this assessment, the rivers that presently debouch into the bay are likely to have done so at times of lower sea levels and will have palaeo-channels which extend offshore across the present seabed. Where archaeological material and palaeoenvironmental evidence have survived post-glacial marine transgressions, there is the potential for this material to be within or associated with now submerged palaeo-channels and it may be impacted by interventions on and in the seabed.

The small footprint of the seabed intervention that will result from the installation of the cable system, however, makes the potential for **direct** impacts on submerged prehistoric archaeological material in the study area unlikely.

The nature of the proposed seabed intervention, namely the burial of the cable in the seabed or its placement on the seabed surface in areas where burial is no possible suggests that **indirect** impacts, which manifest themselves after and/or downstream of the activity are also unlikely.

Based on the likely limited direct and indirect impacts of the installation of this and other past or future seabed cables off the Algoa Bay coast, the **cumulative impacts** of this cable system on submerged prehistorical archaeological material are likely to be low.

The **nature** of impacts, were they to occur, will be negative because the finite and non-renewable nature of heritage resources means that they cannot recover if disturbed, damaged or destroyed.

The potential impacts of the installation of the 2AFRICA/GERA (East) cable system on submerged prehistoric archaeological resources can be summarised as follows:

	Spatial Extent	Duration	Intensity	Frequency	Probability	Irreplaceability & Reversibility	Significance	Confidence
Without mitigation	Site specific	Short-term	Low	Once off	Improbable	- High irreplaceability - Non-reversible	Medium	Low
	Essential mitigation measures: No mitigation proposed • It is recommended that an alert for the occurrence of submerged prehistoric archaeological material be included in the EMPr for the project, specifically for the divers working in the shoreface and the operators excavating the trench in the beach and dune during cable installation.							
With mitigation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

10.2. Palaeontology

The PIA indicates that the onshore and offshore sediments that may be affected by the proposed cable are the relatively young Nanaga Formation aeolianites, which have a low potential to preserve significant fossils. Offshore, these relatively recent sediments are nearer the coast and become older away from the coast, but the pattern is disrupted by the canyons in the Algoa Basin, and the Port Elizabeth and Uitenhage Troughs.

Where the maritime section of the cable will be placed on the surface of the seabed that is covered with a thin layer of modern sediment and sea debris, **direct** impacts on the potentially fossiliferous sediments below the seabed are expected to be negligible.

Where burial is required, the proposed seabed plough method of cable burial means that it is not possible to perform palaeontological mitigation as seabed materials are not brought up to the vessel for inspection and sampling. However, the limited subsurface seabed disturbance entailed in burying the cable by seabed plough, means that **direct** palaeontological impacts are also considered to be negligible.

Where the cable crosses the shoreface and beach sands, the cable trenching, particularly if rock trenching is required or HDD if that is used may encounter the Nanaga Formation aeolianites. However, given the nature of these sediments, **direct** impacts on palaeontological material is unlikely and this impact is therefore considered to be low to negligible.

The nature of the proposed seabed intervention also suggests that **indirect** impacts, which manifest themselves after and/or downstream of the activity are likely to be negligible.

Based on the likely limited direct and indirect impacts of the installation of this and other past or future seabed cables off the Algoa Bay coast, the **cumulative impacts** of this cable system on palaeontological material are likely to be low.

The **nature** of impacts, were they to occur, will be negative because the finite and non-renewable nature of palaeontological material means that they cannot recover if disturbed, damaged or destroyed.

The potential impacts of the installation of the 2AFRICA/GERA (East) cable system on palaeontological resources can be summarised as follows:

	Spatial Extent	**Duration**	**Intensity**	**Frequency**	**Probability**	**Irreplaceability & Reversibility**	**Significance**	**Confidence**
Without mitigation	Site specific	Short-term	Low	Once off	Improbable	- High irreplaceability - Non-reversible	Medium	Low
	Essential mitigation measures: • No mitigation proposed • There is a very small chance that fossils may occur in the aeolianites so a Fossil Chance Find Protocol should be added to the EMPr: if fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. • Inshore Waters and on the beach crossing, it is recommended that an alert for the occurrence of palaeontological material be included in the EMPr for the project, specifically for the divers working in the shoreface and the operators excavating the trench in the beach and dune.							
With mitigation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

10.3. **Maritime Archaeology**

Based on the discussion of maritime heritage resources and the results of the seabed surveys above, three wrecks may occur within the 1 km study area buffer around the proposed cable alignment.

The inshore and shallow waters seabed surveys noted the presence along the route of a handful of possibly humanly-derived debris and magnetic anomalies, although none of these contacts could be more accurately described or positively identified. It is therefore not known whether any of these anomalies represent historical shipwrecks or related material.

The small footprint of the seabed intervention and the potential for seabed debris to damage the cable plough, which means that the three wrecks in the vicinity of the cable alignment and the geophysical contacts are likely to be carefully avoided during cable installation, suggests that the potential for **direct** impacts on maritime archaeological sites or material in the study area is negligible.

The nature of the proposed seabed intervention suggests that **indirect** impacts, which manifest themselves after and/or downstream of the activity and can take the form of, for example, seabed scour, are unlikely to affect any of the known wrecks in vicinity of the cable system.

Based on the likely limited direct and indirect impacts of the installation of this and other past or future seabed cables off the Algoa Bay coast, the **cumulative impacts** of this cable system on maritime heritage resources are likely to be low.

The **nature** of impacts, should they to occur, will be negative because the finite and non-renewable nature of heritage resources means that they cannot recover if disturbed, damaged or destroyed.

The potential impacts of the installation of the 2AFRICA/GERA (East) cable system on maritime heritage resources can be summarised as follows:

	Spatial Extent	Duration	Intensity	Frequency	Probability	Irreplaceability & Reversibility	Significance	Confidence

Without mitigation	Site specific	Short-term	Low	Once off	Improbable	- High irreplaceability - Non-reversible	Medium	Low
	Essential mitigation measures: • The three seabed anomalies (SSS contact E2-G-S527, and magnetic and sonar contacts E2-G-M001 and E2-G-S344) are avoided during cable installation. • Any further geophysical data generated to support to installation of the cable system must be archaeologically reviewed for the presence of historical shipwrecks or related material; • Any shipwreck-related material recovered from the seabed during the pre-lay grapnel runs must be retained, kept wet, and the maritime archaeological must be notified of the find. • Should the data identify wreck material at or near the location of any portion of the cable, micro-siting of the cable and/or the possible implementation of an exclusion zone around the archaeological feature should be sufficient to mitigate the risks to the site; • Should any maritime archaeological sites or material be accidentally encountered during the course of laying the cable, work must cease in that area until the project archaeologist and SAHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it.							
With mitigation	Site specific	Short-term	Low	Once off	Improbable	- High irreplaceability - Non-reversible	Low	Low

10.4. Terrestrial Archaeology

Although archaeological assessments in the Summerstrand / Cape Recife area indicate the presence in places of particularly Later Stone Age sites and material, the urban development of the area that includes the BMH alternatives and the two possible terrestrial cable route alignments suggests that archaeological material is unlikely to be preserved in this area.

Furthermore, the small footprint of the terrestrial interventions to construct the BMH and install the cables, and the likely disturbed nature of the substrate under roads and pavement suggests that the potential for **direct** impacts on maritime archaeological sites or material in the study area is low.

The nature of the proposed installation of the cables suggests that **indirect** impacts, which manifest themselves after the activity are unlikely to occur in vicinity of the cable system.

Based on the likely limited direct and indirect impacts of the installation of this and other past or future seabed cables off the Algoa Bay coast, the **cumulative impacts** of this cable system on archaeological sites and material are likely to be low.

The **nature** of impacts, should they to occur, will be negative because the finite and non-renewable nature of heritage resources means that they cannot recover if disturbed, damaged or destroyed.

The potential impacts of the installation of the 2AFRICA/GERA (East) cable system on archaeological sites and material can be summarised as follows:

	Spatial Extent	**Duration**	**Intensity**	**Frequency**	**Probability**	**Irreplaceability & Reversibility**	**Significance**	**Confidence**
Without mitigation	Site specific	Short-term	Low	Once off	Improbable	- High irreplaceability - Non-reversible	Medium	Low
	Essential mitigation measures: • Should any archaeological sites or material be encountered during the course of laying the cable, work must cease in that area until the project archaeologist and the ECPHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it; • Should any burials or human remains be encountered at any stage during the installation of the cables, work in the vicinity must cease immediately, the remains must be left in situ but made secure and the project archaeologist and ECPHRA must be notified immediately so that a decision can be made on how best to deal with the remains.							
With mitigation	Site specific	Short-term	Low	Once off	Improbable	- High irreplaceability - Non-reversible	Low	Low

11. CONCLUSIONS AND RECOMMENDATIONS

This assessment of the heritage resources within the study area established around the 2AFRICA/GERA (East) cable system suggests that although there is the potential for the presence of submerged prehistoric archaeological and palaeontological material on or in the seabed, particularly above the -120 m contour, the patchiness in the distribution of these heritage resource and the minor seabed interventions associated with the installation of the cable system mean that impacts to such material are very unlikely.

The nature of buried prehistoric archaeological sites and palaeontological material means that it will be virtually impossible to detect such sites during ploughed offshore cable burial. No mitigation is thus proposed in respect of submerged prehistoric archaeological or palaeontological resources in the inshore or Shallow Water areas of the cable route, although it is recommended that a Chance Fossil Finds Protocol is included in the EMPr for the project.

In the Inshore Waters and on the beach crossing, it is recommended that an alert for the occurrence of fossil bones and teeth, as well as potential submerged prehistoric archaeological material, be included in the EMPr for the project, specifically for the divers working in the shoreface and the operators excavating the trench in the beach and dune, particularly if rock trenching is required.

Due to the dynamic nature of the environment, should any possible archaeological or palaeontological material be accidentally disturbed during these activities it must be immediately reported to the ECO and/or the monitoring archaeologist for further advice. Any finds accidently disturbed must be recorded, and their contextual information (a report) must be lodged with a SAHRA-approved institution.

With regard to historical shipwrecks, the proposed 2AFRICA/GERA (East) cable system has a very low potential for impacts on such sites arising out of the installation of the seabed cable. However, in view of the potential, albeit very small, for the presence of currently unknown wrecks close to the cable route, the following recommendations are made in respect of mitigation measures to be applied during the installation of the cable system:

- If any <u>further</u> geophysical data, particularly in the Inshore and Shallow Waters portions of the cable route, are generated to support the installation of the cable system they are archaeologically reviewed for the presence of historical shipwrecks or related material. If possible, the project archaeologist should be consulted before data are collected to ensure that the survey specifications and data outputs are suitable for archaeological review;
- Should the data identify wreck material at or near the location of any portion of the cable, micro-siting of the cable and/or the possible implementation of an exclusion

zone around the archaeological feature should be sufficient to mitigate the risks to the site;

- Should any archaeological material be accidentally encountered during the course of cable installation, work must cease in that area until the project archaeologist and SAHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it.

In respect of terrestrial archaeological sites or material, the following recommendations are made:

- Should any archaeological sites or material be encountered during the course of laying the cable, work must cease in that area until the project archaeologist and the ECPHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it; and
- If any burials or human remains are encountered at any stage during the installation of the cables, work in the vicinity must cease immediately, the remains must be left in situ but made secure and the project archaeologist and ECPHRA must be notified immediately so that a decision can be made on how best to deal with the remains.

11.1. Acceptability of the Proposed Activity with Respect to Heritage Resources

Based on the information and assessment above, it is our reasoned opinion that the proposed installation of the 2AFRICA/GERA (East) cable system to Port Elizabeth raises no red flags, contains no fatal flaws and is unlikely to have any significant impact on heritage resources. It is, therefore, considered acceptable.

12. REFERENCES

ACER (Africa) Environmental Consultants. 2021. Proposed 2AFRICA/GERA (East) Submarine Fibre Optic Cable System to be Landed at Port Elizabeth, South Africa: Final Scoping Report. Unpublished report for Vodacom (Pty) Ltd.

Axelson, E. 1973. *The Portuguese in South-East Africa, 1488-1600*. Wits University Press. Johannesburg.

Bamford, M. 2021. *Palaeontological Impact Assessment for the proposed ASN-2Africa-PE onshore-offshore cables, Summerstrand, Port Elizabeth, Eastern Cape Province*. Unpublished report for ACO Associates.

Binneman, J.N.F. 1997. Results from a test excavation at the Havens Cave, Cambria Valley, South-eastern Cape, *Southern African Field Archaeology*, 6, 93-105.

Binneman, J.N.F. 2016. *A Phase 1 Archaeological Impact Assessment for the Proposed Upgrade and Expansion of the Cape Recife Waste Water Treatment Works in Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape Province*. Unpublished report for CEN Integrated Environmental Management Unit.

Binneman, J. and Booth, C. 2010. *A phase 1 archaeological impact assessment (AIA) for the proposed 20MW wind farm on three alternative sites: Erf 121, Driftsands (site alternative 1), Bushy Park Farm, remainder of Erf 26, as well as portions 5, 6 and 7 thereof (site alternative 2) and Rietfontein Farm, Erf 594, Van Stadens East (Site Alternative 3), Nelson Mandela Metropolitan Municipality, Port Elizabeth, Eastern Cape Province*. Unpublished report prepared for SRK Consulting. Port Elizabeth.

Binneman, J and Reichert, K. 2015. *A Phase 1 Archaeological Impact Assessment for the Proposed Development of a Parking Bay and Associated Infrastructures at Sardinia Bay, Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape Province*. Unpublished report for CEN Integrated Environmental Management Unit.

Binneman, J.N.F., and Webley, L., 1997. *Coega industrial development zone: cultural sensitivity report*, Unpublished report prepared for Portnet.

Broad, D.S., Jungslager, E.H.A., McLachlan, I.R., Roux, J., 2006. Offshore Mesozoic Basins. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of*

South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 553-572.

Burman, J. 1976. *The Bay of Storms: Table Bay 1503-1860*. Cape Town. Human & Rousseau.

Cawthra, H.C., Compton, J.S., Fisher, E.C., Machutchon, M.R. and Marean, C.W. 2016. Submerged shorelines and landscape features offshore of Mossel Bay, South Africa. In Harff, J., Bailey, G. and Luth, F. (eds). *Geology and Archaeology: Submerged Landscapes of the Continental Shelf*. Geological Society, London, Special Publications, 411, 219– 233.

Chirikure, S. 2014. Land and Sea Links: 1500 Years of connectivity between southern Africa and the Indian Ocean rim regions, AD 700 to 1700. *African Archaeological Review*, 31:4, 705-724.

Compton, J.S. 2011. Pleistocene sea-level fluctuations and human evolution on the southern coastal plain of South Africa. *Quaternary Science Reviews* 30: 506-527.

Deacon, H.J., 1970, The Acheulian occupation at Amanzi Springs, *Annals of the Provincial Museums*, 8:11, 89 - 189.

Deacon, H.J., 1976, Where hunters gathered, *SA Archaeological Society Monograph Series* 1, 1-232.

Deacon, H.J., and Deacon, J., 1963, Scott's Cave: The late Stone Age site in the Gamtoos Valley, *Annals of the Provincial Museums*, 3, 96 - 121.

De Beer, H., 1986. *Rooikrans. Weeds A.7*. Plant Protection Research Institute. ARC, Pretoria.

Fisher, E.C., Bar-Matthews, M., Jeradino, A. and Marean, C.W. 2010. Middle and Late Pleistocene paleoscape modeling along the southern coast of South Africa. in *Quaternary Science Reviews*, 29, pp 1382-1398.

Fitch, S., Thomson, K. and Gaffney, V. 2005. Late Pleistocene and Holocene depositional systems and the palaeogeography of the Dogger Bank, North Sea. *Quaternary Research*, 64, 185-196.

Franklin, J., Potts, A.J., Fisher, E.C., Cowling, R.M., and Marean, C.W. 2015. Paleodistribution modelling in archaeology and paleoanthropology. *Quaternary Science Reviews* 110, 1-14.

Gaffney, V., Fitch, S., and Smith, D. 2010. *Europe's Lost World: The Rediscovery of Doggerland.* Research Report 160. London. Council for British Archaeology.

Garlake, P.S. 1968. The Value of Imported Ceramics in the Dating and Interpretation of the Rhodesian Iron Age. *The Journal of African History* 9:1, 13-33.

Goschen, W.S. and Schumann, E.H., 2011, *The physical oceanographic processes of Algoa Bay, with emphasis on the western coastal region*, A SAEON internal publication, complied by the SAEON Egagasini Node for Offshore Marine Systems with contributions from the Institute for Maritime Technology and the SAEON Elwandle Node for Coastal-Inshore Systems.

Gribble, J. 2002. The Past, Present and Future of Maritime Archaeology in South Africa. *International Handbook of Underwater Archaeology* (eds Ruppe and Barstad). New York. Plenum Press.

Gribble, J. and Sharfman, J. 2013. Maritime Legal Management in South Africa. *Online Encyclopaedia of Global Archaeology*, pp 6802-6810.

Fink, H. 2021. *2AFRICA Subsea Cable Network: Volume – Segment E2 BMH PORT ELIZABETH – BU PEZ Book 01 Survey Report*. Unpublished reports produced for Alcatel Submarine Networks Limited. Fugro Germany Marine.

Huffman, T.N. 1972. The Rise and Fall of Zimbabwe. *The Journal of African History* 13:3, 353-366.

Inggs, J.E., 1986, *Liverpool of the Cape: Port Elizabeth Harbour Development 1820-70*, Unpublished Masters dissertation, Rhodes University.

Ingpen, B.D., 1979, *South African Merchant Ships: An illustrated recent history of coasters, colliers, containerships, tugs and other vessels*, A.A. Balkema, Cape Town.

Knox-Johnston, R., 1989, *The Cape of Good Hope: A Maritime History*, Hodder and Stoughton, London.

Lastovica, E and Lastovica A. 1982. *Bottles & Bygones*. Don Nelson.

Linol, B., Chere, N., Muedi, T., Nengovhela, M., de Wit, M.J., 2016. Deep Borehole Lithostratigraphy and Basin 1 Structure of the Southern Karoo Basin Re-Visited. In: Linol, B. and de Wit, M., (Eds), *Origin and Evolution of the Cape Mountains and Karoo Basin*. Springer, pp 3-16. DOI 10.1007/978-3-319-40859-0_1.

McMillan, I.K 2003. Foraminiferally defined biostratigraphic episodes and sedimentation pattern of the Cretaceous drift succession (Early Barremian to Late Maastrichtian) in seven basins on the South African and southern Namibian continental margin. *South African Journal of Science* 99, (11-12), 537-576.

McMillan, I.K., Brink, G.J., Broad, D.S., Maier, J.J., 1997. Late Mesozoic sedimentary basins off the south coast of South Africa. In: Selley, R.C., (Ed). *Sedimentary Basins of the World. 3: African Basins*. Elsevier, Amsterdam, 319-376.

Morris, W.F., 2005, *The Bay of Lost Cargoes: The Shipwrecks of Algoa Bay and St Francis Bay on the East Coast of South Africa*, Warren Morris, Port Elizabeth.

Peeters, H., Murphy, P., Flemming, N. (eds), 2009, *North Sea Prehistory Research and Management Framework*. Amersfoort.

Peeters, H. 2011. How Wet Can It Get? – Approaches to submerged prehistoric sites and landscapes on the Dutch continental shelf, in Benjamin, J., Bonsall, C., Pickard, C., and Fischer, A. (eds). *Submerged Prehistory*. Oxbow Books. Oxford and Oakville.

Pollard, E., Bates, R., Ichumbaki, E.B. and Bita, C. 2016. Shipwreck Evidence from Kilwa, Tanzania. *The International Journal of Nautical Archaeology* 45:2, 352–369.

Roberts, D.L, 2008, Last Interglacial Hominid and Associated Vertebrate Fossil Trackways in Coastal Eolianites, South Africa, *Ichnos*, 15:3-4, 190-207.

Roberts, D.L., Botha, G.A., Maud, R.R., Pether, J., 2006. Coastal Cenozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 605-628.

Rohling, E.J., Grant, K., Bolshaw, M., Roberts, A. P., Siddall, M., Hemleben, Ch., and Kucera, M. 2009. Antarctic temperature and global sea level closely coupled over the past five glacial cycles. *Nature Geoscience*, 2 July 2009.

Rudner, J. 1968. Strandloper pottery from South and South West Africa. *Annals of the South African Museum*, 49:2.

Schumann, E.H, Churchill, J.R.S. and Zaayman, H.J., 2005, Oceanic variability in the western sector of Algoa Bay, South Africa*, African Journal of Marine Science*, 27:1, 65–80.

Scott, H. 1966. Driftsands. *Looking Back* 6:18-21.

Scott, L., 1976. Palynology of Lower Cretaceous deposits from the Algoa Basin (Republic of South Africa. *Pollen et Spores* 18, 563-609.

Shone, R.W., 2006. Onshore post-Karoo Mesozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 541-552.

Thamm, A.G., Johnson, M.R., 2006. The Cape Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 443 – 460.

Turner, M. 1988. Shipwrecks and Salvage in South Africa: 1505 to the Present. C Struik. Cape Town.

Van Andel, T.H.1989. Late Pleistocene Sea Levels and the Human Exploitation of the Shore and Shelf of the Southern South Africa. *Journal of Field Archaeology* 16:2, 133-155.

Waelbroeck, C., Labeyrie, L., Michela, B.E., Duplessy, J.C., McManus, J.F., Lambeck, K., Balbon, E., and Labracherie, M. 2002. Sea-level and deep water temperature changes derived from benthic foraminifera isotopic records. *Quaternary Science Reviews*, 21: 295–305.

Webley, L. 2005a. *Cultural and historical assessment of Madiba Bay Leisure Park*. Unpublished report repared for Coastal and Environmental Services. Grahamstown.

Webley, L. 2005b. *Phase 1 Heritage Impact Assessment of a proposed water reservoir site near Schoenmakerskop, Port Elizabeth*. Unpublished report for SRK Consulting.

Werz, B.E.J.S and Flemming, N.C. 2001. Discovery in Table Bay of the oldest handaxes yet found underwater demonstrates preservation of hominid artefacts on the continental shelf. *South African Journal of Science* 97: 183-185.

Werz, B.E.J.S., Cawthra, H.C. and Compton, J.S. 2014. Recent Developments in African Offshore Prehistoric Archaeological Research, with an Emphasis on South Africa, In Evans, A.M., Flatman, J.C. and Flemming, N.C. (Eds) *Prehistoric Archaeology on the Continental Shelf: A Global Review.* Springer Science and Business Media. New York. 233-253.

Wood, M. 2012. Interconnections. Glass beads and trade in southern and eastern Africa and the Indian Ocean – 7th to 16th centuries AD. *Studies in Global Archaeology.* 17: 62 pp.

12.1. Online Sources

18th Century shipping mapped using 21st Century technology. http://www.theguardian.com/news/datablog/2012/apr/13/shipping-routes-history-map. Accessed on 8 May 2021.

Manuel de Mesquita Perestrelo. https://en.wikipedia.org/wiki/Manuel_de_Mesquita_Perestrelo. Accessed online 10 May 2021

Port Elizabeth of Yore: The Baakens from Pristine Lagoon to Commercial Area. http://thecasualobserver.co.za/port-elizabeth-yore-baakens-pristine-lagoon-commercial-area/. Accessed on 12 May 2021.

Port Elizabeth of Yore: The Saga of the Drift Sands. http://thecasualobserver.co.za/port-elizabeth-yore-saga-drift-sands/. Accessed on 18 May 2021.

Port Elizabeth of Yore: Town Officials and Residents in the 1840s. http://thecasualobserver.co.za/port-elizabeth-yore-town-officials-residents-1840s/. Accessed on 12 May 2021.

SAHRIS. http://www.sahra.org.za/sahris. Accessed online 10 May 2021.

What Kind Of Projects Does The Aimure Undertake?
http://www.aimure.org/index.php/aimure-projects. Accessed online 10 May 2021.

APPENDIX 1: PALAEONTOLOGICAL IMPACT ASSESSMENT (BAMFORD 2021)

Palaeontological Impact Assessment for the proposed ASN-2Africa-PE onshore-offshore cables, Summerstrand, Port Elizabeth, Eastern Cape Province

Desktop Study (Phase 1)

For

ACO Associates

18 April 2021

Prof Marion Bamford
Palaeobotanist
P Bag 652, WITS 2050
Johannesburg, South Africa
Marion.bamford@wits.ac.za

12.1.1. Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 32 years research; 24 years PIA studies

12.1.2. Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by ACO Associates, Cape Town, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature:

Executive Summary

A Palaeontological Impact Assessment was requested for the proposed international maritime fibre cable landfall site at Pollock Beach, Summerstrand, Port Elizabeth. In order to comply with regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed project.

The proposed landfall site lies on the aeolian dune and coastal sands of the Quaternary that are covered with modern or invasive vegetation as well as existing roads, building and amenities. The stratum is indicated as very highly sensitive on the SAHRIS palaeosensitivity map BUT young aeolian sands do not preserve fossils, other than very small transported fragments, and the site is small and already disturbed, so there is only a very small chance that any fossils would be present in the project footprint. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no palaeontological site visit is required unless fossils are found when excavations commence.

The maritime section of the fibre cable is unlikely to impact on the fossil heritage.

13. Table of Contents

1. BACKGROUND

An international maritime and terrestrial fibre cable is planned to make one of its landfalls at Pollock Beach, Summerstrand, south of Port Elizabeth, Eastern Cape Province (Figures 1, 2). The proposed cable routes are within existing road reserves, and the burial depth is only going to be in the order of 1m. The onshore geology is readily available in the maps from the Council for geosciences and publications, but the offshore geological information has been taken from various publications.

A Palaeontological Impact Assessment was requested for the fibre cable project. To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is presented herein.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (amended 2017)

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report	Appendix C
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix C
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 70
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A

h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 4
k	Any mitigation measures for inclusion in the EMPr	Section 7, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 7, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	N/A
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies if any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A

Figure 1: Google earth map showing the maritime route and landfall site for the international fibre cable ASN-2Africa-PE. Map supplied by ACO.

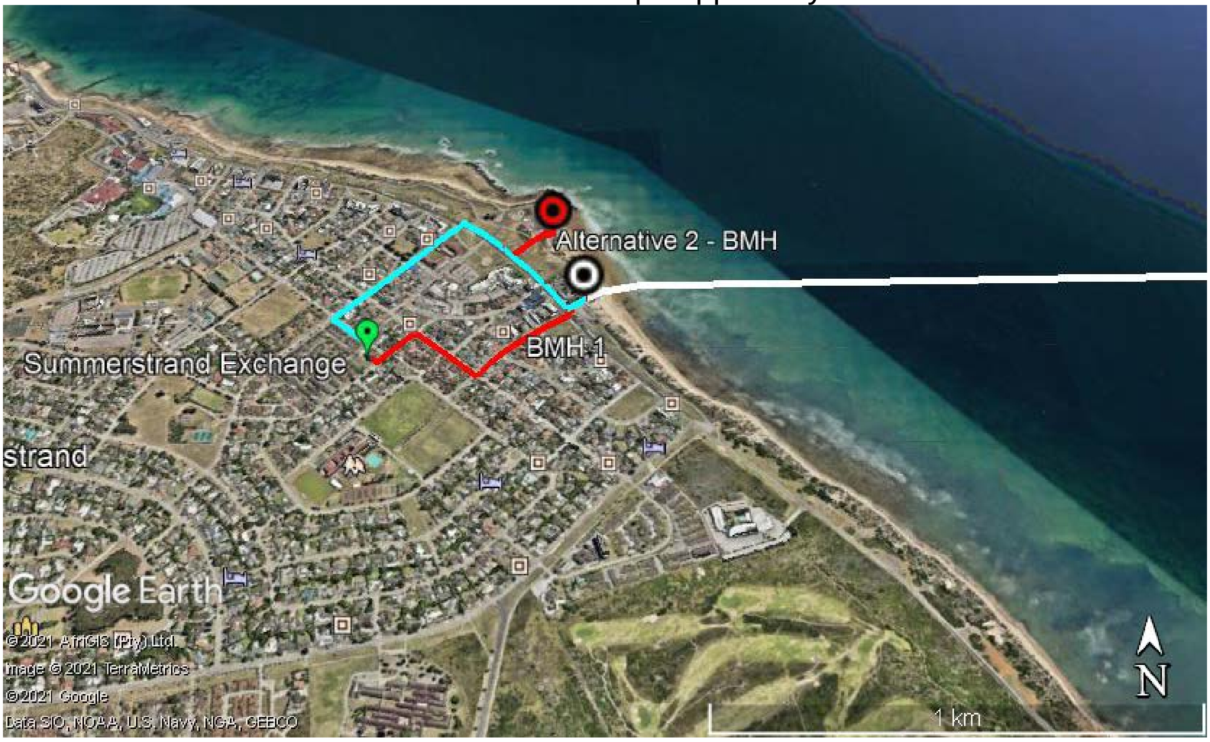

Figure 2: Google Earth map of the two proposed alternative terrestrial routes for the fibre cable on Pollock Beach, Summerstrand, Port Elizabeth.

2. METHODS AND TERMS OF REFERENCE

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.
The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. GEOLOGY AND PALAEONTOLOGY

a. Project location and geological context

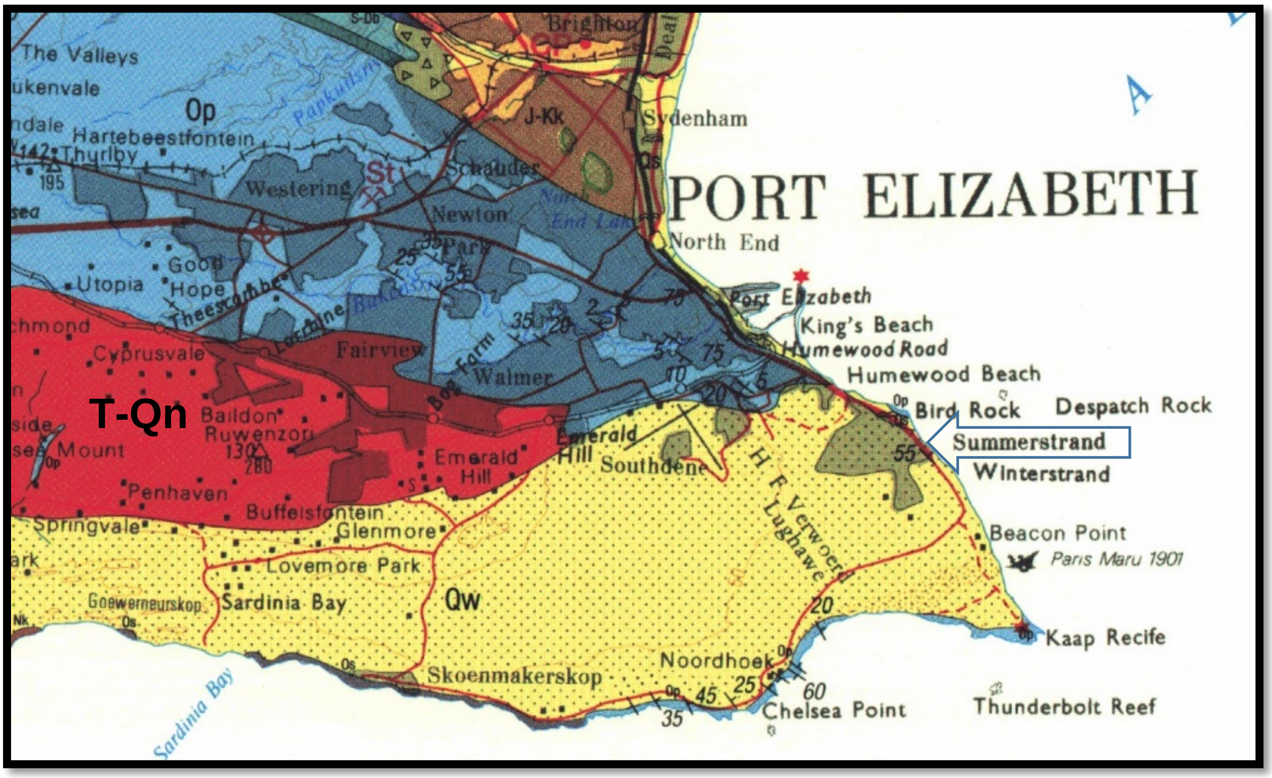

Figure 3: Geological map of the area around Algoa Bay, Port Elizabeth and the Summerstrand peninsula. The location of the proposed landfall site is indicated by the blue arrow. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 3324 Port Elizabeth

Table 2: Explanation of symbols for the geological map and approximate ages (Roberts et al., 2006; Thamm and Johnson, 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qw	Quaternary sands	Aeolian sands	Quaternary, last 2.5 Ma
T-Qn	Nanaga Fm, Algoa Group	Aeolianite	Miocene-Pliocene
Op	Peninsula Fm, Table Mountain Group, Cape SG	Quartzitic sandstone	Ordovician

The international fibre cable is planned to pass through the southern part of the Algoa Basin and make landfall on Pollock Beach, Summerstrand (Figures 1, 2). Onshore the underlying rocks are those of the Cape Supergroup (Thamm and

Johnson, 2006; Figure 3) and they extend offshore for at least 100km (Linol et al., 2016). The Peninsular Formation is in the lower Table Mountain Group (Cape Supergroup) and is composed of quartzitic sandstone that was deposited in a fluvial braid-plain and shallow marine setting (Thamm and Johnson, 2006). Overlying these are the Late Jurassic to Early Cretaceous Uitenhage Group rocks that are exposed onshore to the north of the proposed cable route (Shone, 2006) and extend offshore in the Port Elizabeth Trough and the Uitenhage Trough (Broad et al., 2006). See their fig. 5 reproduced here as Figure 4. Offshore deposits are overlain by a series of Cretaceous and Tertiary sediments (see Appendix B).

Onshore, the overlying the older rocks are much younger aeolianites (cemented windblown sands) and aeolian sands of the Algoa Group, the Nanaga Formation (Figure 3), that are Pliocene to Pleistocene in age (Roberts et al., 2006). The formation comprises coastal palaeo-dune fields, with medium-grained cross-bedded, calcareous sandstone and calcretes up to 250m thick (ibid). The southern part of the peninsular is overlain by dune and shore sands that have been stabilised by natural vegetation, and more recently, by introduced and invasive vegetation, rooikrans (Acacia cyclops) (De Beer, 1986).

b. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The onshore or landfall site for the fibre cable is in the Nanaga Formation aeolianites. Dunefields with crossbedding would not preserve any fossils because the sands are windblown, in alternating directions. Cemented sands in wet pockets or seeps might preserve shells, worm burrows or root traces but these tend to be very fragmentary and very recent.

Offshore, the younger sediments are nearer the coastline and become older away from the coast, in general, but the pattern is disrupted by the canyons in the Algoa Basin, and the Port Elizabeth and Uitenhage Troughs (Figure 8 in Appendix B). Palynological analyses of offshore sediments have been done by Scott (1976) for the Kirkwood Formation strata. In a borehole core and he found spores of ferns and lower plants and pollens of cycads, bennettitaleans and conifers. McMillan analysed the marine micro-organisms from cores and used the taxa the determine the ages of the Cretaceous and Tertiary sediments in this basin and other offshore basins (McMillan et al., 1997; McMillan, 2003).

From the SAHRIS map below (Figure 4) the landfall site is indicated as very highly sensitive (red) for the Quaternary aeolian sands, however, these sands are aeolian so would only be able to entrap very small fragments of fossils. In seeps or wet areas, root casts or almost modern shells might accumulate.

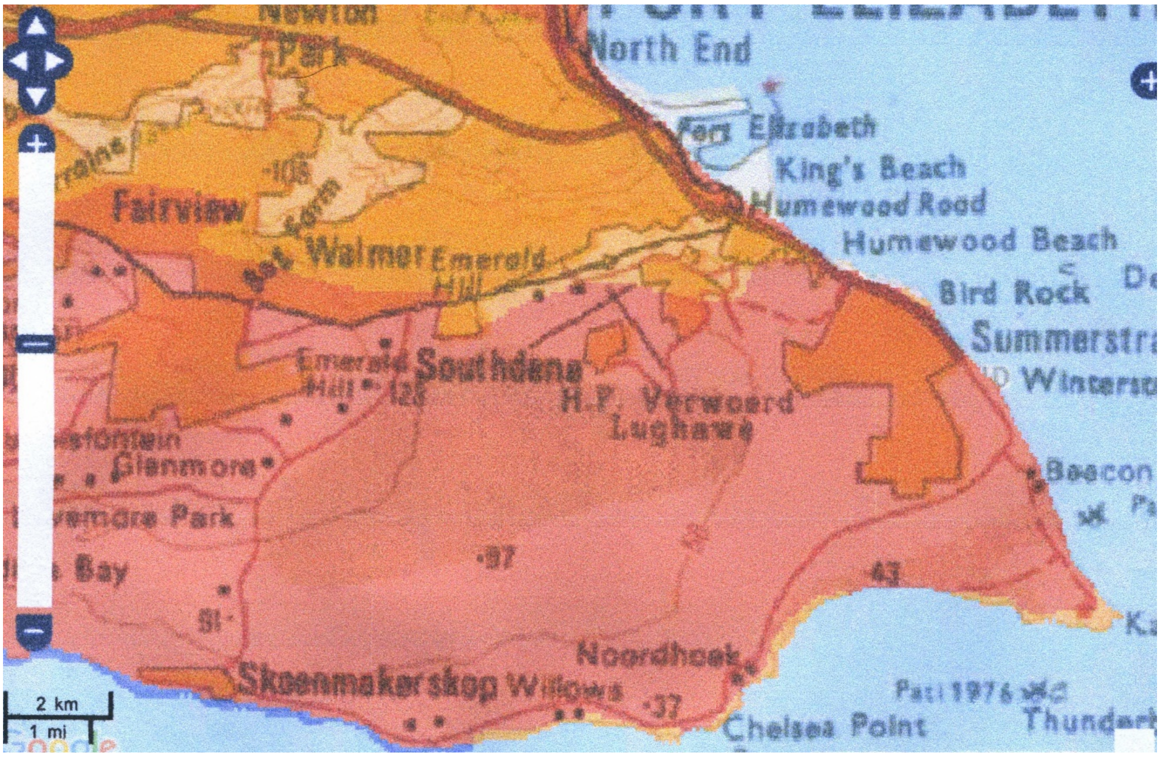

Figure 4: SAHRIS palaeosensitivity map for the site for the proposed fibre cable landfall on Pollock Beach, Summerstrand shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

4. IMPACT ASSESSMENT

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

Table 3a: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.

Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 3b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	**H**	-
	M	-
	L	Aeolian sands do not preserve fossils because they are windblown; fragments from oher sites might be entrapped in the sands and stabilised sites/seeps might preserve root casts, burrows or marine shells; so far there are no records from the site of plant or animal fossils so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be root casts, burrows or shell fragments from historical-modern gastropods (and difficult to distinguish from the modern ones), the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	**H**	**-**
	M	**-**
	L	It is extremely unlikely that any fossils would be found in the loose sand that has been disturbed by vegetation and urban activity .Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the sands are aeolian (windblown, transported and sorted) and very young. Furthermore, the material to be impacted does not preserve fossils. Since there is an extremely small chance that fossils from a seep or consolidated/cemented sand may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is very low.

5. ASSUMPTIONS AND UNCERTAINTIES

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the aeolianites, sandstones and dune sands are typical for the country and do not contain fossil plant, insect, invertebrate and vertebrate material. The aeolian sands of the Quaternary period would not preserve fossils.

6. RECOMMENDATION

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the coastal dune sands of the Quaternary. Roads, buildings and amenities are already present at the site and they have already disturbed the sediments and introduced foreign materials and plants. The site is not pristine. There is a very small chance that fossils may occur in the aeolianites so a Fossil Chance Find Protocol should be added to the EMPr: if fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. See Appendix B for the offshore geology.

7. REFERENCES

Anderson, J.M., Anderson, H.M., 1985. Palaeoflora of Southern Africa: Prodromus of South African megafloras, Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam. 423 pp.

Broad, D.S., Jungslager, E.H.A., McLachlan, I.R., Roux, J., 2006. Offshore Mesozoic Basins. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 553-572.

Caku, N., Gwavava, O., Liu, K., Baiyegunghi, C., 2020. An Integration of magnetic, gravity and seismic data in evaluating the Algoa Basin in the Eastern Cape Province of South Africa for stratigraphic and structural geodynamics. Pure and Applied Geophysics 177, 4177–4205.

De Beer, H., 1986. Rooikrans. Weeds A.7. Plant Protection Research Institute. ARC, Pretoria.

Green, P.F., Duddy, I.R., Japsen, P., Bonow, J.M., Malan, J.A., 2017. Post-breakup burial and exhumation of the southern margin of Africa. Basin Research 29, 96–127, doi: 10.1111

Linol, B., Chere, N., Muedi, T., Nengovhela, M., de Wit, M.J., 2016. Deep Borehole Lithostratigraphy and Basin 1 Structure of the Southern Karoo Basin Re-Visited. In:

Linol, B. and de Wit, M., (Eds), Origin and Evolution of the Cape Mountains and Karoo Basin. Springer, pp 3-16. DOI 10.1007/978-3-319-40859-0_1

McMillan, I.K 2003. Foraminiferally defined biostratigraphic episodes and sedimentation pattern of the Cretaceous drift succession (Early Barremian to Late Maastrichtian) in seven basins on the South African and southern Namibian continental margin. South African Journal of Science 99, (11-12), 537-576.

McMillan, I.K., Brink, G.J., Broad, D.S., Maier, J.J., 1997. Late Mesozoic sedimentary basins off the south coast of South Africa. In: Selley, R.C., (Ed). Sedimentary Basins of the World. 3: African Basins. Elsevier, Amsterdam, 319-376.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

Roberts, D.L., Botha, G.A., Maud, R.R., Pether, J., 2006. Coastal Cenozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 605-628.

Scott, L., 1976. Palynology of Lower Cretaceous deposits from the Algoa Basin (Republic of South Africa. Pollen et Spores 18, 563-609.

Shone, R.W., 2006. Onshore post-Karoo Mesozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 541-552.

Thamm, A.G., Johnson, M.R., 2006. The Cape Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 443 – 460.

8. CHANCE FIND PROTOCOL

Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations/mining commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (shells, plants, insects or bone) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in

the shales and mudstones (for example see Figure 5-7). This information will be built into the EMP's training and awareness plan and procedures.

4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

Appendix A – Examples of fossils from the Quaternary sands and aeolianites

Figure 5: Shell bed in a coastal aeolianite. Note the fragmentary nature of the shells.

Figure 6: Modern seashells from the south coast of South Africa.

Figure 7: Pleistocene root casts in a cemented sand (rhizoliths).

Appendix B: Offshore geology and stratigraphy

The offshore stratigraphy is complex with successive waves of deposition and some periods of erosion when the sea level was low. The reconstructions given below are based on core material, and more recently on the integration of magnetic, gravity and seismic data.

Assuming that the maritime section of the cable will be placed on the surface of the seashore that is covered with a thin layer of modern sediment and sea debris, then it will have no impact on the potentially fossiliferous rocks below the surface.

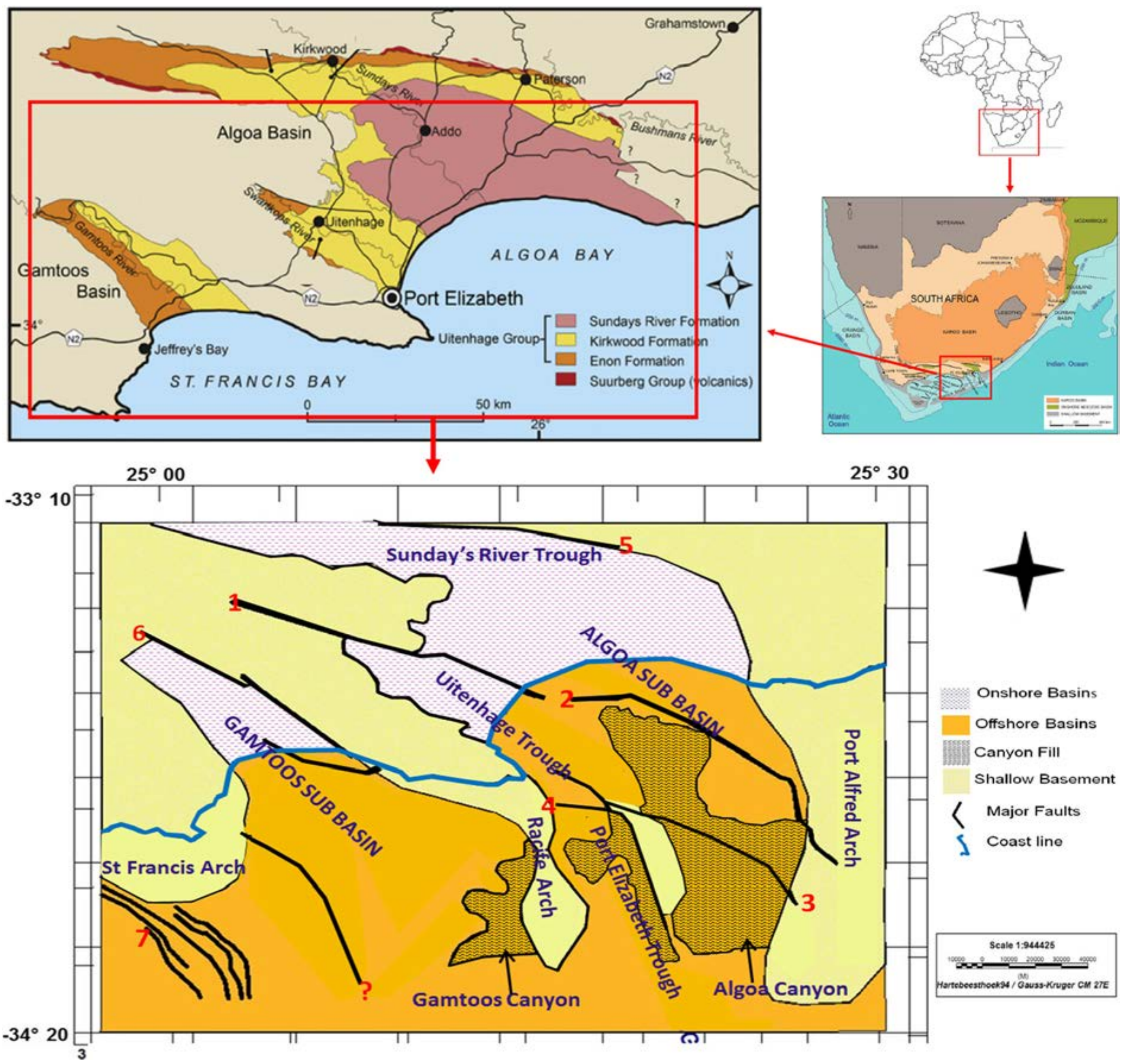

Figure 8: Algoa Basin onshore and offshore geology. Taken from Caku et al., 2020, fig. 1, and based on the reconstruction in McMillan et al., 1997; Broad et al., 2006, fig.5 and Green et al., 2017 fig. 16.

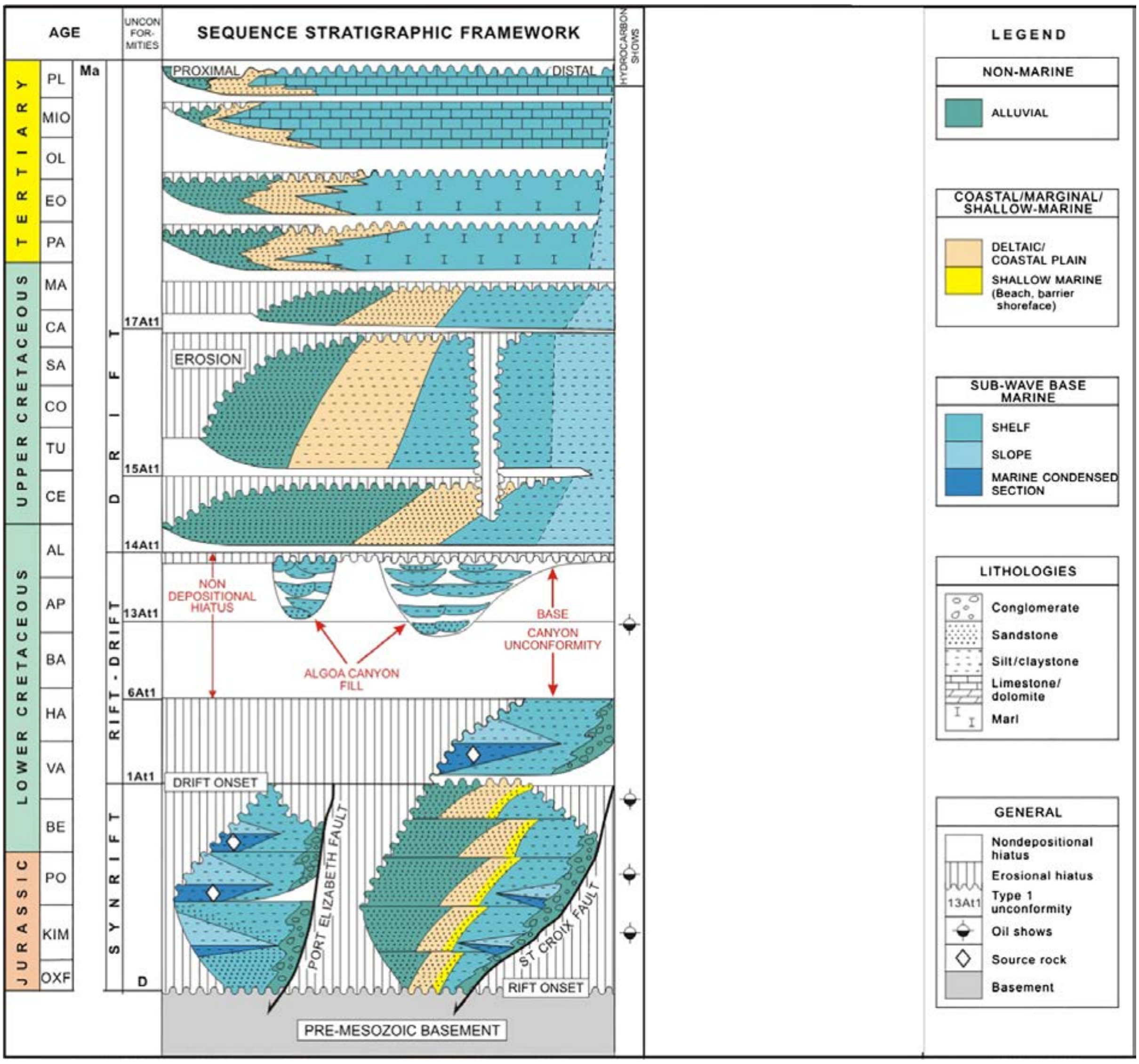

Figure 9: Offshore southern African coastal sequence stratigraphy. Figure 15 of Green et al., 2017.

Appendix C – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD

January 2021

I) Personal details

Surname : **Bamford**

First names : **Marion Kathleen**

Present employment : Professor; Director of the Evolutionary Studies Institute.

Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa-

Telephone : +27 11 717 6690

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ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:

1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.

1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.

1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.

1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):

1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps

1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer

1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa

Royal Society of Southern Africa - Fellow: 2006 onwards

Academy of Sciences of South Africa - Member: Oct 2014 onwards

International Association of Wood Anatomists - First enrolled: January 1991

International Organization of Palaeobotany – 1993+

Botanical Society of South Africa

South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016

SASQUA (South African Society for Quaternary Research) – 1997+

PAGES - 2008 –onwards: South African representative

ROCEEH / WAVE – 2008+

INQUA – PALCOMM – 2011+onwards

vii) Supervision of Higher Degrees

All at Wits University

Degree	Graduated/completed	Current
Honours	11	0
Masters	10	4
PhD	11	4
Postdoctoral fellows	10	5

viii) Undergraduate teaching

Geology II – Palaeobotany GEOL2008 – average 65 students per year

Biology III – Palaeobotany APES3029 – average 25 students per year

Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 2-8 students per year.

ix) Editing and reviewing

Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected – list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.
- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics
- Yzermyne 2014 for Digby Wells
- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting
- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS

- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for EnviroPro
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for EnviroPro

xi) Research Output
Publications by M K Bamford up to December 2019 peer-reviewed journals or scholarly books: over 150 articles published; 5 submitted/in press; 10 book chapters.
Scopus h-index = 29; Google scholar h-index = 35; -i10-index = 92
Conferences: numerous presentations at local and international conferences.

xii) NRF Rating
NRF Rating: B-2 (2016-2020)
NRF Rating: B-3 (2010-2015)
NRF Rating: B-3 (2005-2009)
NRF Rating: C-2 (1999-2004)

APPENDIX 2: RECORDED WRECKS AND SHIPPING CASUALTIES WITHIN & PROXIMATE TO THE MARITIME ARCHAEOLOGICAL STUDY AREA

Ship Name	Place	Latitude/Longitude (estimated)*	Event Type	Vessel Category	Type	Date Wreck
Argalie	Algoa Bay	-33.9646 / 25.6602	Unknown	Sailing Vessel	Barque	1869/09/18
Fidelia	1.7 km north of Cape Recife lighthouse (400m offshore)	-34.0089 / 25.6967	Wrecked	Steel Screw Steamship	Mailship	1873/04/07
Haerlem (SAS)	Humewood Beach / Near Roman Rock	-33.9810 / 25.6966	Scuttled	Motor Vessel	Navy Frigate	1987/11/01
Knysna	Cape Recife	-33.9913 / 25.6873	Scuttled	Motor Vessel	Fishing Vessel	1952/03/31
Balaclava / Balaklava	Roman Rock (near bell buoy)	-33.9816 / 25.6975	Wrecked	Wooden Sailing Vessel	Barque	1867/06/15
Colonial Empire	Thunderbolt Reef (south west of). Near lighthouse	-34.0251 / 25.7071	Wrecked	Steel Sailing Vessel	Barque	1917/09/17
Dane (RMS)	Cape Recife / Great Fish Point - between	-34.0190 / 25.7020	Wrecked	Iron Screw Steamship	Mailship	1865/12/

Itzehoe / Itzahoe	North of Cape Recife Lighthouse	-34.0227 / 25.7025	Wrecked	Twin Funnelled Screw Steamship	Cargo Vessel	1911/05/24
Zephyr	1 mile east of North Jetty	-33.9647 / 25.6518	Wrecked	Wooden Sailing Vessel	Barque / Brigantine	1889/10/16
Unknown stranded wreck	Summerstrand	-34.006 / 25.6923	Unknown	Unknown	Unknown	Unknown
Dangerous wreck	East of Humewood	-34.0072 / 25.7105	Unknown	Unknown	Unknown	Unknown
Obstruction	Summerstrand	-33.9681 / 25.705	Unknown	Unknown	Unknown	Unknown

* **PLEASE NOTE**: The shipwreck positions provided above are estimated positions based on descriptions of loss in the historical record. With the possible exception of the *Haerlem*, confidence in the accuracy of these positions is thus very low and it is unlikely that the vessels concerned will be found at the given co-ordinates.

APPENDIX 3: IMPACT ASSESSMENT METHODOLOGY

The following conventions have been adopted and applied to this impact assessment:

- Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
- Indirect impacts of an activity are indirect or induced changes that may occur because of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place because of the activity.
- Cumulative impacts are those that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over time and can include both direct and indirect impacts.
- Nature – the evaluation of the nature is impact specific. Most negative impacts will remain negative, however, after mitigation, significance should reduce:
  - Positive.
  - Negative.
- Spatial extent – the size of the area that will be affected by the impact:
  - Site specific.
  - Local (limited to the immediate areas around the site; < 2 km from site).
  - Regional (would include a major portion of an area; within 30 km of site).
  - National or International.
- Duration – the timeframe during which the impact will be experienced:
  - Short-term (0-3 years or confined to the period of construction).
  - Medium-term (3-10 years).
  - Long-term (the impact will only cease after the operational life of the activity).
  - Permanent (beyond the anticipated lifetime of the project).
- Intensity – this provides an order of magnitude of whether the intensity (magnitude/size/frequency) of the impact would be negligible, low, medium or high):
  - Negligible (inconsequential or no impact).
  - Low (small alteration of natural systems, patterns or processes).
  - Medium (noticeable alteration of natural systems, patterns or processes).
  - High (severe alteration of natural systems, patterns or processes).

- Frequency – this provides a description of any repetitive, continuous or time-linked characteristics of the impact:
    - Once off (occurring any time during construction).
    - Intermittent (occurring from time to time, without specific periodicity).
    - Periodic (occurring at more or less regular intervals).
    - Continuous (without interruption).
- Probability – the likelihood of the impact occurring:
    - Improbable (very low likelihood that the impact will occur).
    - Probable (distinct possibility that the impact will occur).
    - Highly probable (most likely that the impact will occur).
    - Definite (the impact will occur).
- Irreplaceability – of resource loss caused by impacts:
    - High irreplaceability of resources (the project will destroy unique resources that cannot be replaced).
    - Moderate irreplaceability of resources (the project will destroy resources, which can be replaced with effort).
    - Low irreplaceability of resources (the project will destroy resources, which are easily replaceable).
- Reversibility – this describes the ability of the impacted environment to return/be returned to its pre-impacted state (in the same or different location):
    - Impacts are non-reversible (impact is permanent).
    - Low reversibility.
    - Moderate reversibility of impacts.
    - High reversibility of impacts (impact is highly reversible at end of project life).
- Significance – the significance of the impact on components of the affected environment (and, where relevant, with respect to potential legal infringement) is described as:
    - Low (the impact will not have a significant influence on the environment and, thus, will not be required to be significantly accommodated in the project design).
    - Medium (the impact will have an adverse effect or influence on the environment, which will require modification of the project design, the implementation of mitigation measures or both).

    - High (the impact will have a serious effect on the environment to the extent that, regardless of mitigation measures, it could block the project from proceeding).
- Confidence – the degree of confidence in predictions based on available information and specialist knowledge:
    - Low.
    - Medium.
    - High.

APPENDIX 4: SPECIALIST CV

Name:	John Gribble
Profession:	Archaeologist
Date of Birth:	15 November 1965
Parent Firm:	ACO Associates cc
Position in Firm:	Senior Archaeologist
Years with Firm:	2+
Years of experience:	27
Nationality:	South African
HDI Status:	n/a

Education:

1979-1983	Wynberg Boys' High School (1979-1983)
1986	BA (Archaeology), University of Cape Town
1987	BA (Hons) (Archaeology), University of Cape Town
1990	Master of Arts, (Archaeology) University of Cape Town

Employment:

- ACO Associates, Senior Archaeologist and Consultant, September 2017 – present
- South African Heritage Resources Agency, Manager: Maritime and Underwater Cultural Heritage Unit, 2014 – 2017 / Acting Manager: Archaeology, Palaeontology and Meteorites Unit, 2016-2017
- Sea Change Heritage Consultants Limited, Director, 2012 – present
- TUV SUD PMSS (Romsey, United Kingdom), Principal Consultant: Maritime Archaeology, 2011-2012
- EMU Limited (Southampton, United Kingdom), Principal Consultant: Maritime Archaeology, 2009-2011

- Wessex Archaeology (Salisbury, United Kingdom), Project Manager: Coastal and Marine , 2005-2009
- National Monuments Council / South African Heritage Resources Agency, Maritime Archaeologist, 1996-2005
- National Monuments Council, Professional Officer: Boland and West Coast, Western Cape Office, 1994-1996

Professional Qualifications and Accreditation:

- Member: Association of Southern African Professional Archaeologists (No. 043)
- Principal Investigator: Maritime and Colonial Archaeology, ASAPA CRM Section
- Field Director: Stone Age Archaeology, ASAPA CRM Section
- Member: Chartered Institute for Archaeologists (CIfA), United Kingdom
- Class III Diver (Surface Supply), Department of Labour (South Africa) / UK (HSE III)

Experience:

I have nearly 30 years of combined archaeological and heritage management experience. After completing my postgraduate studies, which were focussed on the vernacular architecture of the West Coast, and a period of freelance archaeological work in South Africa and aboard, I joined the National Monuments Council (NMC) (now the South African Heritage Resources Agency (SAHRA)) in 1994. As the Heritage Officer: the Boland I was involved in day to day historical building control and heritage resources management across the region. In 1996 I become the NMC’s first full-time maritime archaeologist in which role was responsible for the management and protection of underwater cultural heritage in South Africa under the National Monuments Act, and subsequently under the National Heritage Resources Act.

In 2005 I moved to the UK to join Wessex Archaeology, one of the UK’s biggest archaeological consultancies, as a project manager in its Coastal and Marine Section. In 2009 I joined Fugro EMU Limited, a marine geosurvey company based in Southampton to set up their maritime archaeological section. I then spent a year at TUV SUD PMSS, an international renewable energy consultancy based in Romsey, where I again provided maritime archaeological consultancy services to principally the offshore renewable and marine aggregate industries.

In August 2012 I set up Sea Change Heritage Consultants Limited, a maritime archaeological consultancy. Sea Change provides archaeological services to a range of UK maritime sectors, including marine aggregates and offshore renewable energy. It also actively pursues opportunities to raise public awareness and understanding of underwater cultural heritage through educational and research projects and programmes, including some projects being developed in South Africa.

Projects include specialist archaeological consultancy for more than 15 offshore renewable energy projects and more than a dozen offshore aggregate extraction licence areas.

In addition to managing numerous UK development-driven archaeological projects, I have also been involved in important strategic work which developed guidance and best practice for the offshore industry with respect to the marine historic environment. This has included the principal authorship of two historic environment guidance documents for COWRIE and the UK renewable energy sector, and the development of the archaeological elements of the first Regional Environmental Assessments for the UK marine aggregates industry. In 2013-14 I was lead author and project co-ordinator on the Impact Review for the United Kingdom of the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage. In 2016 I was co-author of a Historic England / Crown Estate / British Marine Aggregate Producers Association funded review of marine historic environment best practice guidance for the UK offshore aggregate industry.

I returned to South African in mid-2014 where I was re-appointed to my earlier post at SAHRA: Manager of the Maritime and Underwater Cultural Heritage Unit. In July 2016 I was also appointed Acting Manager of SAHRA's Archaeology, Palaeontology and Meteorites Unit.

I left SAHRA in September 2017 to join ACO Associates as Senior Archaeologist and Consultant.

I have been a member of the ICOMOS International Committee for Underwater Cultural Heritage since 2000 and have served as a member of its Bureau since 2009. I am currently the secretary of the Committee.

I have been a member of the Association of Southern African Professional Archaeologists for more than twenty years and am accredited by ASAPA's CRM section. I have been a member of the UK's Chartered Institute for Archaeologist's (CIfA) since 2005, and served on the committee of its Maritime Affairs Group between 2008 and 2010. Since 2010 I have been a member of the UK's Joint Nautical Archaeology Policy Committee.

I am currently a member of the Advisory Board of the George Washington University / Iziko Museums of South Africa / South African Heritage Resources Agency / Smithsonian Institution 'Southern African Slave Wrecks Project' and serve on the Heritage Western Cape Archaeology, Palaeontology and Meteorites Committee.

Books and Publications:

Gribble, J. and Scott, G., 2017, *We Die Like Brothers: The sinking of the SS Mendi*, Historic England, Swindon

Lloyd Jones, D., Langman, R., Reach, I., Gribble, J., and Griffiths, N., 2016, Using Multibeam and Sidescan Sonar to Monitor Aggregate Dredging, in C.W. Finkl and C. Makowski (eds) *Seafloor Mapping along Continental Shelves: Research and Techniques for Visualizing Benthic Environments, Coastal Research Library 13*, Springer International Publishing, Switzerland, pp 245-259.

Athiros, G. and Gribble, J., 2015, *Wrecked at the Cape Part 2*, The Cape Odyssey 105, Historical Media, Cape Town.

Gribble, J. and Sharfman, J., 2015, The wreck of SS Mendi (1917) as an example of the potential trans-national significance of World War I underwater cultural heritage, *Proceedings of the UNESCO Scientific Conference on the Underwater Cultural Heritage from World War I*, Bruges, 26-28 June 2014.

Gribble, J., 2015, Underwater Cultural Heritage and International Law. Cambridge by Sarah Dromgoole, in *South African Archaeological Bulletin*, 70, 202, pp 226-227.

Athiros, G. and Gribble, J., 2014, *Wrecked at the Cape Part 1*, The Cape Odyssey 104, Historical Media, Cape Town.

Gribble, J., 2014, Learning the Hard Way: Two South African Examples of Issues Related to Port Construction and Archaeology, in Dredging and Port Construction: Interactions with Features of Archaeological or Heritage Interest*, PIANC Guidance Document 124*, pp 97-107.

UK UNESCO 2001 Convention Review Group, 2014, The UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001: An Impact Review for the United Kingdom, ISBN 978-0-904608-03-8.

Sadr, K., Gribble, J. and Euston-Brown, G, 2013, Archaeological survey on the Vredenburg Peninsula, in Jerardino et al. (eds), *The Archaeology of the West Coast of South Africa*, BAR International Series 2526, pp 50-67

Gribble, J. and Sharfman, J, 2013, Maritime Legal Management in South Africa, *Online Encyclopaedia of Global Archaeology*, pp 6802-6810.

Gribble, J., 2011, The UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001, *Journal of Maritime Archaeology* 6:1 77-86.

Gribble, J., 2011, The SS Mendi, the Foreign Labour Corps and the trans-national significance of shipwrecks, in J. Henderson (ed.): *Beyond Boundaries, Proceedings of IKUWA 3, The 3rd International Congress on Underwater Archaeology*, Römisch-Germanische Kommission (RGK), Frankfurt.

Gribble, J., 2011, Competence and Qualifications, in Guèrin, U., Egger, B. and Maarleveld, T. (eds) *UNESCO Manual for Activities directed at Underwater Cultural Heritage*, UNESCO - Secretariat of the 2001 Convention, Paris.

Gribble, J. and Leather, S. for EMU Ltd., 2010, Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector. Commissioned by COWRIE Ltd (project reference GEOARCH-09).

Sadr, K and Gribble, J., 2010, The stone artefacts from the Vredenburg Peninsula archaeological survey, west coast of South Africa, *Southern African Humanities* 22: 19–88.

Gribble, J., 2009, HMS Birkenhead and the British warship wrecks in South African waters in *Proceedings of the Shared Heritage Seminar*, University of Wolverhampton, 8 July 2008

Gribble, J., Parham, D. and Scott-Ireton, D., 2009, Historic Wrecks: Risks or Resources? In *Conservation and Management of Archaeological Sites*, Vol. 11 No. 1, March, 2009, 16–28.

Gribble, J. and Athiros, G., 2008, *Tales of Shipwrecks at the Cape of Storms*, Historical Media, Cape Town.

Gribble, J., 2008, The shocking story of the ss Mendi, in *British Archaeology*, March/April 2008.

Gribble, J., 2007, The Protection of the Underwater Cultural Heritage: National Perspectives in light of the UNESCO Convention 2001 by Sarah Dromgoole, in *The International Journal of Nautical Archaeology*, 36, 1, pp 195-6.

Gribble, J., 2006, The Sad Case of the ss Maori, in Grenier, R., D. Nutley and I. Cochran (eds) *Underwater Cultural Heritage at Risk: Managing Natural and Human Impacts*, pp 41-43, ICOMOS, Paris

Gribble, J., 2006, Pre-Colonial Fish Traps on the South Western Cape Coast, South Africa, in Grenier, R., D. Nutley and I. Cochran (eds) *Underwater Cultural Heritage at Risk: Managing Natural and Human Impacts*, pp 29-31, ICOMOS, Paris.

Forrest, C.S.J., and Gribble, J., 2006, The illicit movement of underwater cultural heritage: The case of the Dodington coins, in *Art and Cultural Heritage: Law, Policy and Practice*, (ed B.T. Hoffman), New York, Cambridge University Press.

Forrest, C.S.J., and Gribble, J., 2006, Perspectives from the Southern Hemisphere: Australia and South Africa, in *The UNESCO Convention for the Protection of the Underwater Heritage: Proceedings of the Burlington House Seminar*, October 2005, JNAPC / NAS.

Gribble, J., 2003, "Building with Mud" – Developing historical building skills in the Karoo, in ICOMOS South Africa, in *The Proceedings of Symposium on Understanding and using urban heritage in the Karoo*, Victoria West, South Africa, 3-5 March 2002.

Forrest, C.S.J., and Gribble, J., 2002, The illicit movement of underwater cultural heritage: The case of the Dodington coins, *International Journal of Cultural Property*, Vol II (2002) No 2, pp 267-293.

Gribble, J. 2002, The Past, Present and Future of Maritime Archaeology in South Africa, *International Handbook of Underwater Archaeology* (eds Ruppe and Barstad), New York, Plenum Press.

Thackeray, F. and Gribble, J., 2001, Historical Note on an Attempt to Salvage Iron from a Shipwreck, *Looking Back*, Vol 40, November 2001, pp 5-7.

Gribble, J., 1998, Keeping Our Heads Above Water – the development of shipwreck management strategies in South Africa, *AIMA Bulletin*, Vol 22, pp 119-124.

Gribble, J. 1996, Conservation Practice for Historical Shipwrecks, Monuments and Sites of South Africa, Colombo, Sri Lanka, ICOMOS 11th General Assembly.

Gribble, J. 1996, National Databases on Monuments and Sites, Monuments and Sites of South Africa, Colombo, Sri Lanka, ICOMOS 11th General Assembly.

Sadr, K, Gribble, J, & Euston-Brown, G L, 1992 The Vredenburg Peninsula survey, 1991/1992 season, Guide to Archaeological Sites in the South-western Cape, Papers compiled for the South African Association of Archaeologists Conference, July 1992, by A.B. Smith & B. Mutti, pp 41-42.

Smith, AB, Sadr, K, Gribble, J, & Yates, R., 1992 Witklip and Posberg Reserve, *Guide to Archaeological Sites in the South-western Cape*, Papers compiled for the South African Association of Archaeologists Conference, July 1992, by A.B. Smith & B. Mutti, pp 31-40.

Smith, AB, Sadr, K, Gribble, J & Yates, R., 1991, Excavations in the south-western Cape, South Africa, and the archaeological identity of prehistoric hunter-gatherers within the last 2000 years, *The South African Archaeological Bulletin* 46: 71-91.