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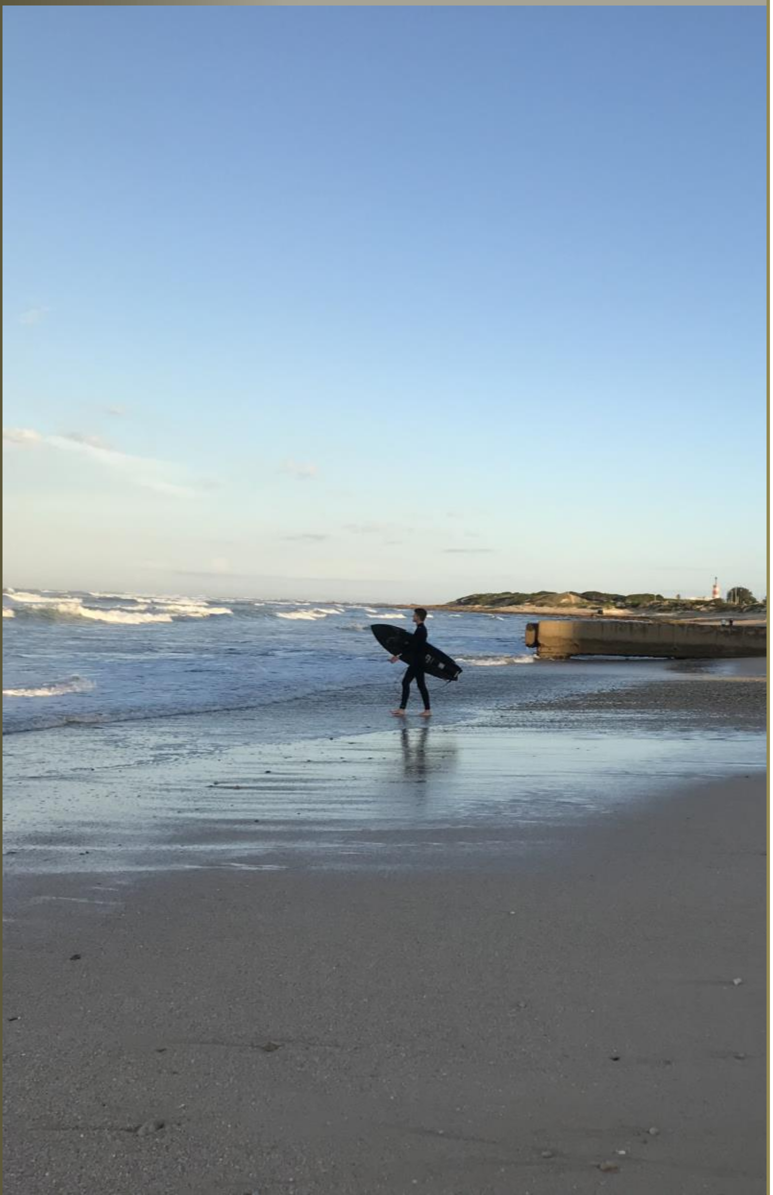

COASTAL IMPACT ASSESSMENT

THE PROPOSED MARINE TELECOMMUNICATION CABLE AT PORT ELIZABETH, EASTERN CAPE PROVINCE, SOUTH AFRICA

Compiled by:
S C Bundy BSc MSc (Pr.Sci. Nat.)
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Compiled for:
Acer (Africa) Environmental Consultants

Date:
May 2021

Reference:
ecol_acer_pe_180721

BEACH AND COASTAL DUNE DYNAMICS IMPACT ASSESSMENT

PROPOSED MARINE TELECOMMUNICATIONS CABLE SYSTEM AT PORT ELIZABETH, EASTERN CAPE, SOUTH AFRICA

Contents

Compilation Date	May 2021. Rev July 2021(2)
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Front page image	Beach and dune structure

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Glossary of Terms and Abbreviations

Associes	Groupings of species, particularly plants commonly found to occur together.
Dissipative	A dissipative beach is a wide beach with a low profile associated with high energy surf zones.
Dune heel	The leeward extreme of a dune
Dune toe	The seaward extreme of a dune
Eco-morphological	The physical and ecological result of plant and morphological drivers,
Hs	Significant wave height
Psammo-	Of dunes
Slack	A valley or depression with the dune cordon

DECLARATION BY THE SPECIALIST

I, **Simon C. Bundy**, declare that --

- I act as the independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the EIA Regulations, 2014;
- 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;
- 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 Waste Act and NEMA, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Waste Act and NEMA, 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 am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

SDP Ecological and Environmental Services

15 May 2021

PARTICULARS OF AUTHORS/ECOLOGISTS

NAME Simon Colin Bundy. BSc. MSc Dip Proj Man
DATE OF BIRTH 7 September 1966 **PLACE OF BIRTH**: Glasgow, Scotland.
MEMBERSHIP OF PROFESSIONAL BODIES: South African Council of Natural Scientific Professionals No. 400093/06 – Professional Ecologist; Southern African Association of Aquatic Scientists

KEY COMPETENCIES AND EXPERIENCE

Simon Bundy has been involved in environmental and development projects and programmes since 1991 at provincial, national and international level, with employment in the municipal, NGO and private sectors, providing a broad overview and understanding of the function of these sectors. From a technical specialist perspective, Bundy focusses on coastal and xeric ecological systems. He is competent in a large number of ecological and analytical methods including multivariate analysis and canonical analysis. Bundy is competent in wetland delineation and has formulated ecological coastal set back methodologies for EKZN Wildlife and Department of Environmental Affairs. Bundy acts as botanical and environmental specialist for Eskom. Based in South Africa, he has engaged in projects in the Seychelles, Mozambique, Mauritius and Tanzania as well as Rwanda, Lesotho and Zambia. Within South Africa , Bundy has been involved in a number of large scale mega power projects as well as the development of residential estates, infrastructure and linear developments in all provinces. In such projects Bundy has provided both technical support, as well as the undertaking of rehabilitation programmes.

SELECTED RELEVANT PROJECT EXPERIENCE

Ecological investigations for numerous renewable energy projects, including "Kalbult", "Dreunberg", "jUWI", "Kenhardt Pv1 - 6", "Solar Capital 2 and 3" and "Lindes".
Ecological investigations Tongaat and Illovo Desalination Plants : CSIR –(2013 - 2016)
Ecological investigations and Rehabilitation Planning : Sodwana Bay :iSimanagaliso Wetland Park Authority – (2014 - 2018)
Ecological evaluation and monitoring: Plastic pellet (nurdles) clean-up MSC Susanna Marine Pollution Event : West of England Insurance, United Kingdom (2018 - 2020)

PUBLICATIONS

Over a dozen scientific publications, numerous popular articles and contributions to books and documentaries in local and international journals

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PROFESSION BSc Biodiversity and Ecology (Hons), Stellenbosch University
DATE OF BIRTH 20 March 1997

KEY COMPETENCIES AND EXPERIENCE

Natalie de Wet has been working at SDP Ecological and Environmental Services since January 2021. She recently graduated from Stellenbosch University with a BSc (Honours) Biodiversity and Ecology. Her honours thesis assessed the population genetics of the Critically Endangered Riverine Rabbit *Bunolagus Monticularis*. Further course work included research projects on Proteaceae, Sugarbird *Promerops cafer*, rocky intertidal communities as well as global change. Natalie has previously interned at EnviroPro where she job-shadowed Environmental Assessment Practitioners and Environmental Control Officers.

EXECUTIVE SUMMARY

The proposed landing of a marine telecommunications cable at Port Elizabeth, is the subject of a basic assessment evaluation in terms of the National Environmental Management Act (107 of 1998). This report has been compiled to evaluate the bio physical impacts that the laying of such a cable would have on the various inshore coastal processes at Port Elizabeth, as well as to provide recommendations on environmental management measures to be employed during and following establishment of the cable.

The point of the cable landing at Pollock Beach has been shown to be a highly transgressive and eroding portion of coastline. This state has been aggravated by anthropogenic responses to the transgressive nature of the shoreline, with reclamation and stabilisation of the sand sharing system. Pedestrian movement along and over the beach and sand sharing system is also a further impact on this environment. As such, the site can be considered to be a highly altered system. It follows from the above that the establishment of a submarine telecommunications cable at Pollock Beach will have little impact on the eco-morphology of the sand sharing system and the coastline in general.

A number of remediation and mitigation methods are proposed, should the cable be landed at this point, these include:

1. Burial of the cable to a point approximating 1m below natural beach level. This may require excavation into the shingle and/or bedrock to reach a suitable depth.

2. Where excavation of the bedrock is to be undertaken, this is anticipated to approximate 300mm in depth and 300mm in width. Excavated material from the trench should be set into an epoxy resin that is used as a cement to reinstate the excavated trench and re-establish the antecedent level of beach rock. Beach sediment should also be set in place.

3. Where disturbance of the vegetated dune arises, the affected area should be raked back to an angle of repose ~ 27°, stabilised using a geofabric bag and suitably planted with appropriate vegetation.

4. It is to be understood that horizontal directional drilling is an alternative method of establishing the cable across the beach and dune, howsoever this option will only be utilised where trenching is not possible. This method would result in minor variation to the deeper sub-surface geologies/sediments and is considered to be of minor ecological significance subject to the prevailing geology and sedimentology at a fine scale.

STATEMENT

It is contended that the landing of a telecommunications cable and the establishment of related anchor mechanisms along the shoreline and beach-dune interface at Pollock Beach will, if implemented with the conditions and recommendations presented in this report, give rise to negligible ecological repercussions in the subject area.

1. INTRODUCTION

Acer (Africa) Environmental Consultants have commenced with an environmental impact assessment process (through a basic assessment application), to review and obtain authorisation from the National Department of Environmental Affairs, for the installation of a marine telecommunications cable. The cable is part of the 2AFRICA/GERA (East) Cable System linking Africa with Europe and other centres through submarine cables which aims to improve internet traffic through increased speed and data capacity. This offshore cable is to be landed at Pollock Beach in Port Elizabeth located within the Nelson Mandela Bay Municipal area (Figure 1, Appendix A). Pollock Beach (also referred to as "Pipe") is positioned at 33°59'13.57"S / 25°40'22.89"E and can be accessed from the meeting point of 10th Avenue and Marine Drive.

This report serves to provide a bio-physical overview of the beach and dune cordon within and adjacent to the proposed cable landing route proposed for the site. The investigation has been undertaken utilising various, selected parameters and identifies bio physical factors associated with the area that may be considered drivers that determine the status and ecological function of the beach and dune cordon. In addition, the investigation considers the ecological impacts that may arise within the dune system from the establishment of the cable, the most appropriate routing for the cable, as well as mitigation and management measures that may be employed during and post the installation phase.

Figure 1. The study site shown on a regional and local scale.

2. PROJECT DESCRIPTION

Telecommunications company, Vodacom, plan to establish a submarine cable that will land at a point along Pollock Beach, located in Summerstrand in the Eastern Cape, South Africa. The cable will effectively improve international internet traffic via submarine cable to Europe and thereafter other global centres. Ultimately, the cable will traverse the intertidal zone and connect to a BMH (Beach Manhole) which is to be established. The BMH will be situated at the shoreline above the HWM (high water mark).

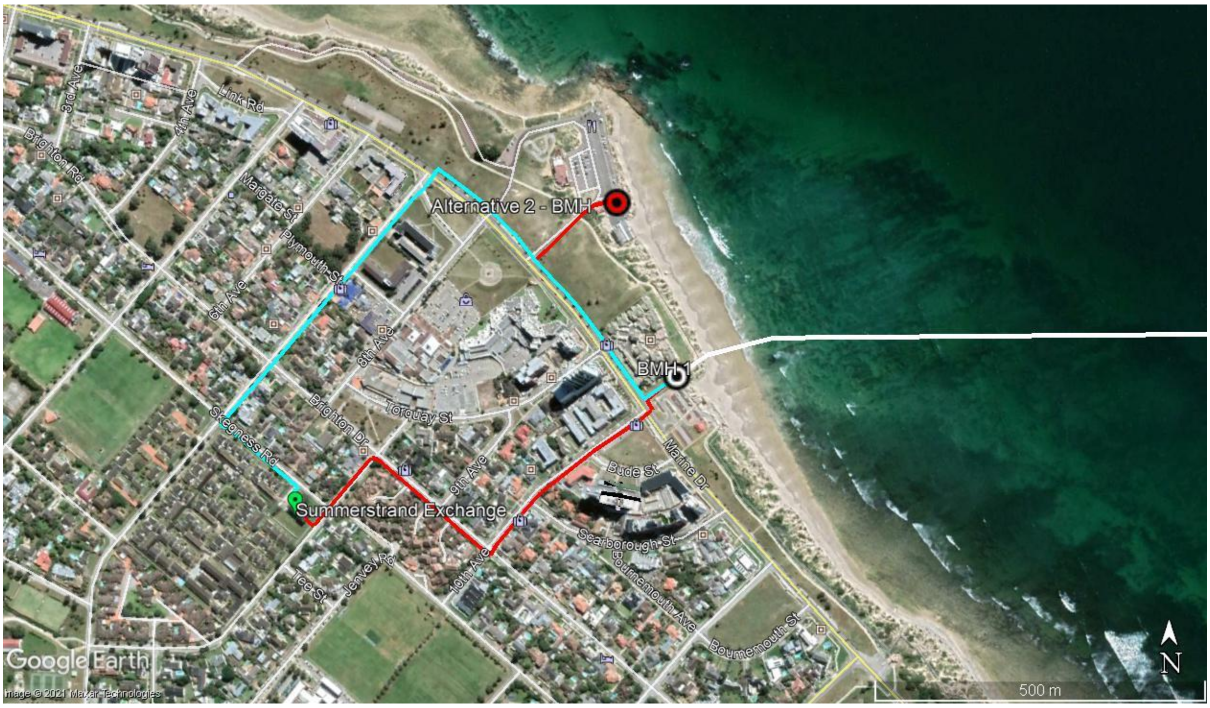


Figure 2. Image of site of cable landing at Pollock Beach, Summerstrand, Port Elizabeth.

To install the cable, plant machinery and excavators will be utilised to establish a trench of approximately 1 - 2m below the prevailing natural ground level. Given the nature of dune and beach sediments, excavations may be relatively wide, in order to accommodate trenching operations to this depth. Where cable burial is not possible within the beach sand it is proposed that a trench be established in which the cable is to be laid. Horizontal Directional Drilling may be utilised as a final response, but will be avoided on account of technical difficulties within the site and environmental constraints. The BMH will form the anchor point for the cable. Within the relic dune form, excavated material is to be reinstated over the cable and the necessary "rehabilitation" methods are to be employed.

2.1 Seasonality and limitations

The assessment was undertaken during May 2021, which aligns with the southern hemisphere autumn period. Autumn weather conditions in Port Elizabeth are associated with high rainfall and medium-high average wind speeds. The beach conditions in early autumn are generally inflated, but are advancing towards a deflated state, typical of winter.

In addition, the assessment was conducted during spring tides, which allowed the inspection of a large portion of the beach face. The seasonality and tides are given due consideration in the interpretation of data. No data or observations for other seasons or tides were available for comparison. Where such data was required for assessment models, assumptions were made, based on accepted trends and predicable seasonal changes. Notably, this study did not consider antecedent weather conditions.

2.2. Applicable legislation

The National Environmental Management Act (Act no. 107 of 1998)

This Act serves to control the disturbance of land and its utilisation within certain habitats. Legislation applicable to the proposed activity include Section 19 of Listing Notice 1, which states -

"The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from-
(i) a watercourse;
(ii) the seashore; or
(iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater"

Integrated Coastal Management Amendment Act (36 of 2014)

ICMA presents several principles that relate to sound coastal management practices. Principles applicable to the proposed activity include Chapter 7, Section 58, which stipulates the duty of care and remediation of environmental damage which includes the duty to avoid negative effects on the receiving environment. As such, this Act applies to any activity that has an adverse effect on the coastal environment.

3. METHOD

As per the requirements of Government Gazette 43110 "Protocol for the specialist assessment and minimum reporting content requirements", consideration of The Department of Environment, Forestry and Fisheries' screening tool (https://screening.environment.gov.za), indicates the subject site to be of a "low aquatic biodiversity sensitivity" (Figure 3). The same tool indicates the subject site to have a "high terrestrial biodiversity sensitivity" (Figure 4). As such, an ecological assessment of the coastal environment was undertaken using the method and approaches discussed below.

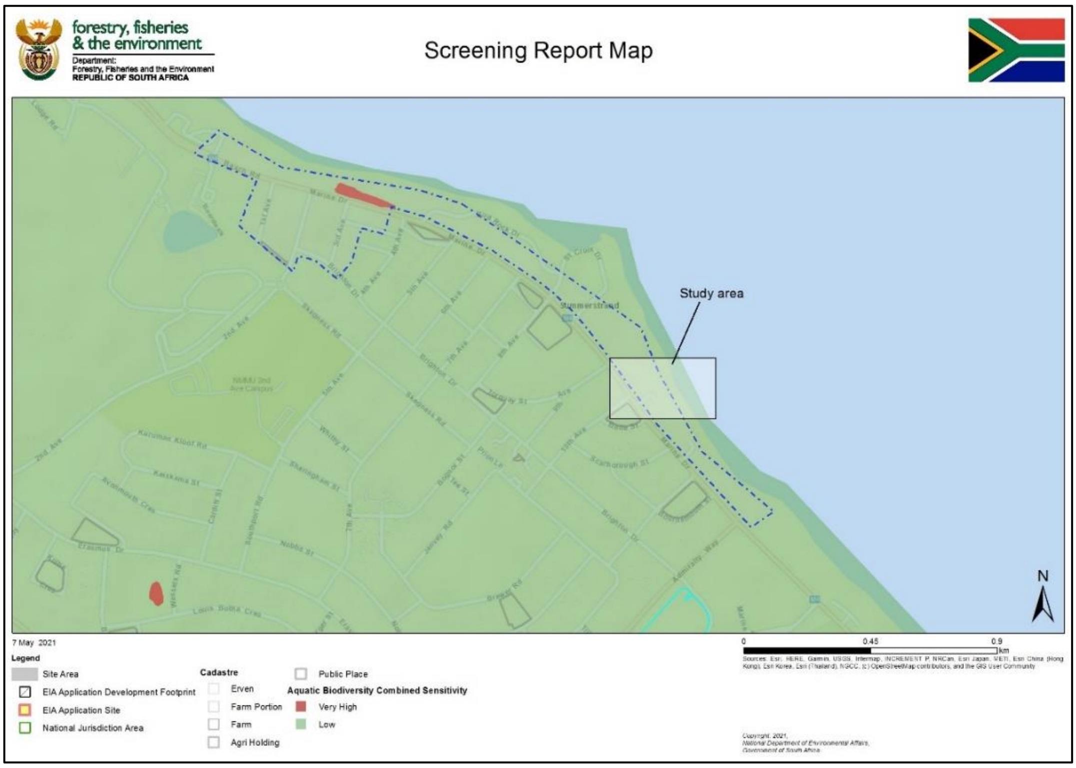


Figure 3. Screening Report Map for the project site showing predicted aquatic species sensitivity (Department of Environment, Forestry and Fisheries 2021)

In the compilation of this eco-morphological report a desktop review of literature and pertinent information relating to the site was undertaken. Specific consideration was given to aerial imagery of the shoreline and dune cordon. Desktop investigations included the following:

- Review of recent and historical aerial imagery dating from 1978 to 2020.
- Identification and delineation of various plant community associes associated with the frontal dunes.
- Dominant coastal processes were evaluated using available wave and wind data.

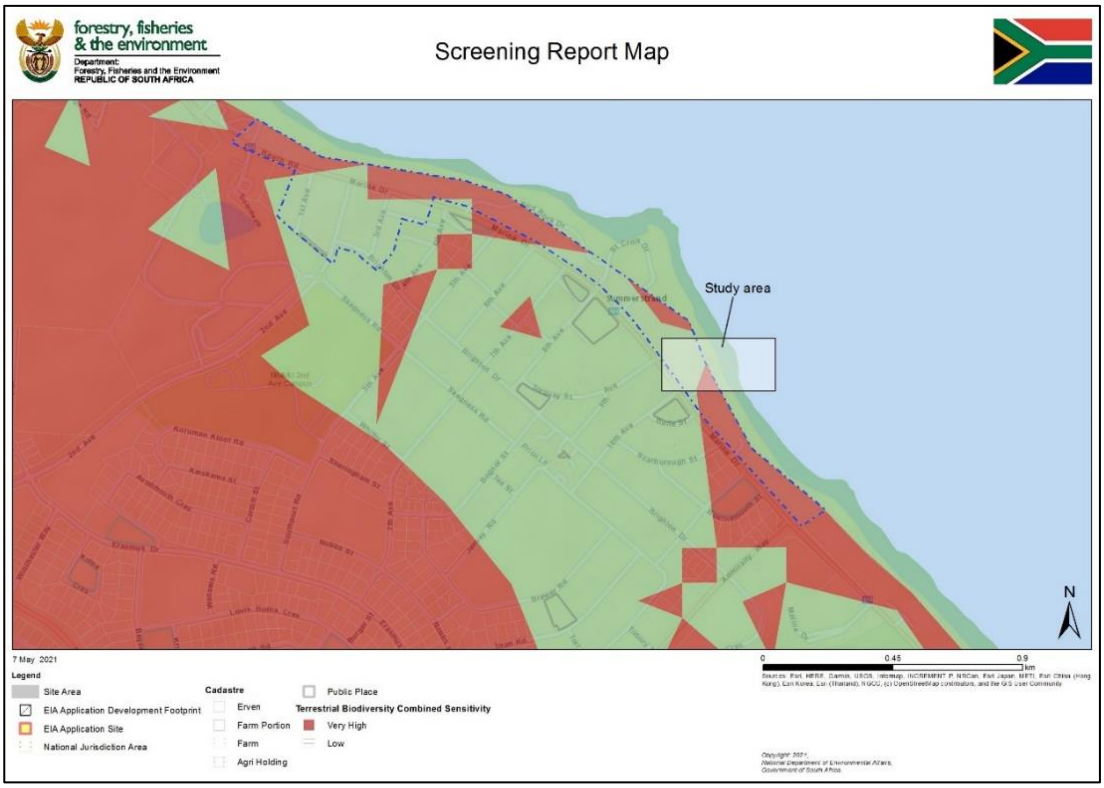


Figure 4. Screening Report Map for the project site showing predicted terrestrial species sensitivity (Department of Environment, Forestry and Fisheries 2021)

In addition, field reconnaissance was undertaken on the 7th of May 2021 whereby:

- Specific features within the supra-tidal environment were identified and logged using a Garmin Montana GPS (Figure 5).

- Dominant species were identified and recorded at the point of landing and such information was used in an integrated manner to confirm the influence of coastal processes on the beach and back of beach environment.
- General observations at each point were made in respect of the gradient of the dune face and the nature and structure of the vegetation at the beach – dune interface.

- Holes were dug along the shoreline to assess the depth of the bedrock.

Figure 5. Image showing features identified and sample points evaluated at the cable landing point. "GF" refers to geofabric bags, a form of coastal erosion prevention.

4. REGIONAL PERSPECTIVE OF THE SUPRA-TIDAL ENVIRONMENT

Beach and dune environments are continuously changing and shaped by sediment transport within the sand sharing system (Psuty 1994). The sand sharing system is the underlying process, whereby marine sediments are shared between the offshore surf bar and the dune cordon. The system is dynamic and is driven by wave and wind energy, with biological components, primarily vegetation, adapted to living within the harsh environment, characteristic of dune systems. Therefore, changes in wind, wave regimen, climate state, beach morphology and additional factors influence the eco-morphology of coastal and in particular, dune systems (Hesp 2012).

The sand sharing system, including the sub tidal, intertidal, the beach and dune system components, can be considered to be, over any given extended temporal period, in a state of equilibrium (Figure 6). It follows that disturbance to this equilibrium results in a shift, with concomitant effects on the system. Such effects may lead to the erosion of beaches, engulfment of vegetation and generally undesirable effects upon the coastline. Such consequences may have serious direct, indirect and cumulative effects upon ecological, social and economic environments.

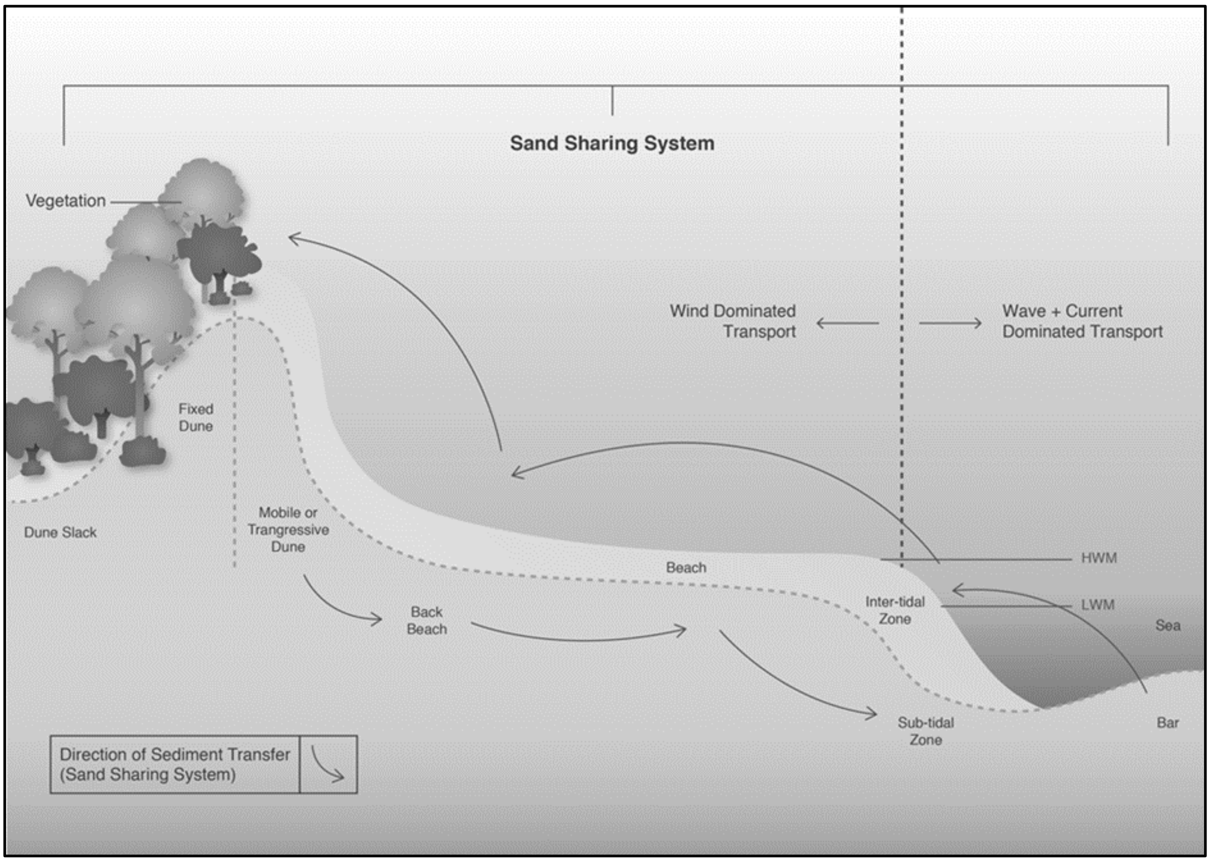


Figure 6. Graphic image showing a sand sharing system and associated processes.

It follows that the most effective "test" in evaluating the impact of activities on a coastline, is to consider where and how, such activity may affect the sand sharing system. This test forms the basis for consideration in this review and evaluation of the cable – laying activities that are proposed for Pollock Beach, Summerstrand.

The subject area lies within Summerstrand, a residential suburb within the Nelson Mandela Bay Municipality (see Figure 1 above). Summerstrand is a well-established urban settlement lying on the southern extent of Algoa Bay. Its first formal structures were established prior to the 1900s, when Strandfontein farm, became developed as the Summerstrand beach suburb of Port Elizabeth. During most of the 20th century urban expansion along the beach front has seen the stabilisation of much of the frontal dune cordon which has interrupted and altered the sand sharing system along the coastline at this point and beyond. Figure 7 presents the nature of the region in 1978, in comparison with the present nature of the coastline. These comparative images show that supra tidal sediment transfer or "sand by pass" systems have been infilled and dysfunctionalised by beach reclamation activities, while other influences on the sediment transport system include the installation of geofabric sea defence systems and stabilisation using vegetation. As such, much of the terrestrial components of the sand sharing system have become highly transformed, altering the dynamism within the sand sharing system.

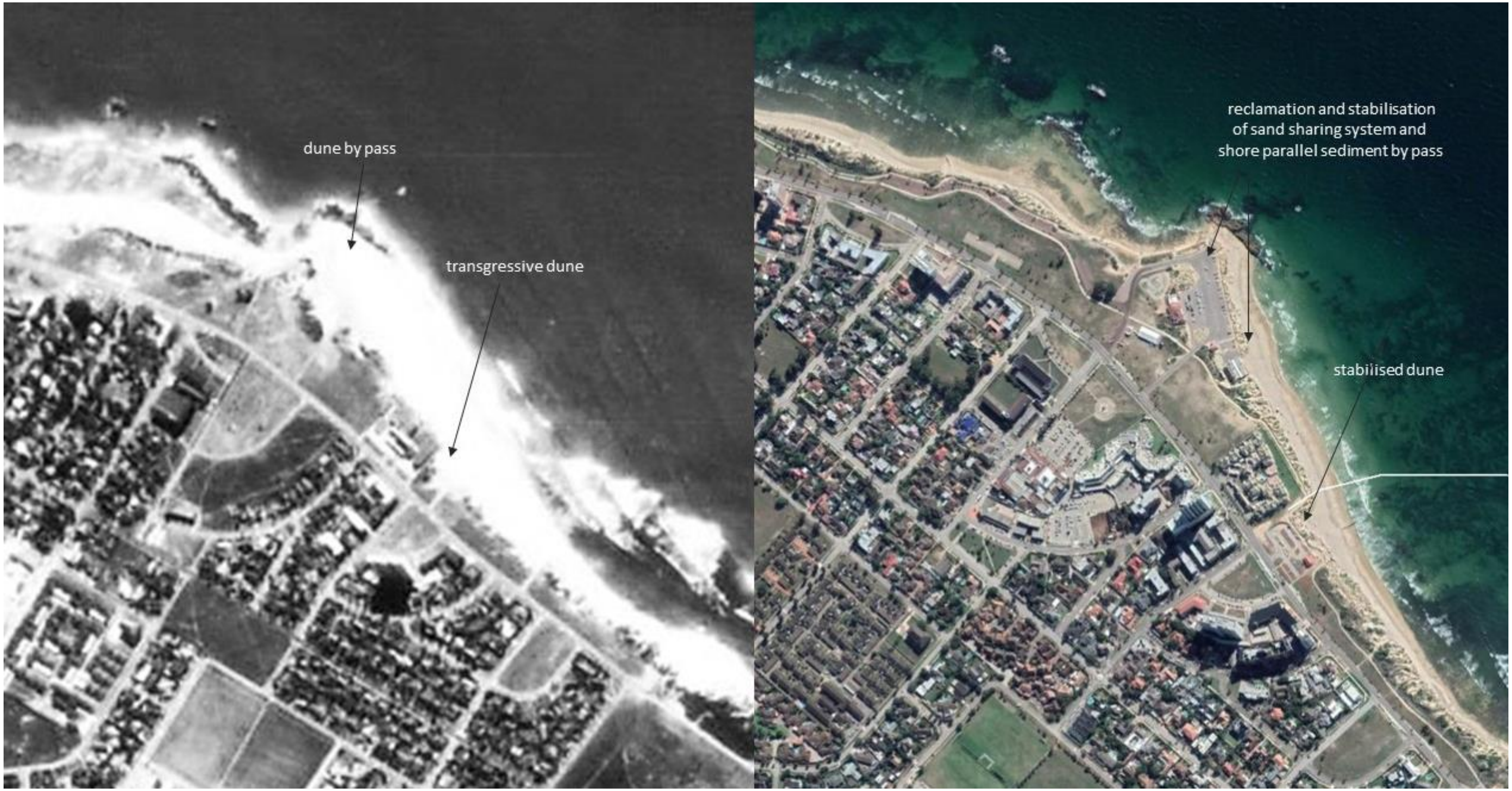


Figure 7. Aerial image of Summerstrand in 1978 and 2020 (source: S3 Technologies).

In addition, other broader factors influence the sediment transport and coastal dynamics within Algoa Bay, including the operations of the nearby harbour, as well as influences arising from terrestrial activities within the various catchments associated with the bay. In addition a significant background factor affecting the Eastern Cape coastline is that of climate change, giving rise to increasing storminess and sea level rise (IPCC 2009).

According to Koeppen Geiger, the Eastern Cape region is classified as *warm temperate: fully humid: warm summer* (Cfb) region with expectations of increasing aridity, reduced winter rainfall periods, and more severe storm events (http://koeppen-geiger.vu-wien.ac.at/). In association with the abovementioned expectations, is the impact of sea level rise, which according to Blake (2011), varies between 0.42 and 1.87 mm/year (Blake et al. 2011) for the region. The National Oceanographic and Atmospheric Administration (NOAA) identifies a sea level rise rate of 2.12mm/year (https://coast.noaa.gov/digitalcoast/tools/slr) for Port Elizabeth, a slightly higher rate of increase than that reported by South African authors. Given the above, marine inundation along low lying areas of the Eastern Cape coastline during storm surges is anticipated by authorities. Beach and dune erosion is anticipated to also escalate with climatic shifts, exacerbated at points by sediment deficits within the bay, where coastal processes have been interrupted by anthropogenic activities.

From an ecological perspective, habitat complexity and species diversity play a significant role in determining the state of beach and dune forms (Hesp 2012). According to SANBI, the coastline of the subject area comprises of Cape Seashore vegetation, and St Francis Dune Thicket, a recently described vegetation form (Figure 8) (Mucina and Rutherford 2006). From a habitat conservation perspective, Cape Seashore vegetation is considered "least threatened" while St Francis Dune Thicket is considered to be of "least concern". In practical terms however, these habitat types are severely threatened by urban sprawl, agriculture and the invasion of alien plant species (SANBI 2021).

The Provincial (Eastern Cape) Conservation Authority consider some portions of the study area to be of critical importance from a conservation perspective, having some areas designated as "Critical Biodiversity Area 1 (CBA) – Irreplaceable". As an urban and transformed environment, Pollock Beach is not considered to be of ecological significance and conservation value. However, Harris *et a*l, (2018) considered of conservation value within marine habitats. These areas are considered to be critical to the ecological function of marine environments and important in meeting biodiversity targets. As is evident from Figure 9, the marine environment Pollock Beach is considered to be of conservation value and significance, primarily on account of the variable sub-tidal habitat (reef and sandy bed).

Figure 8. Map indicating subject site and the vegetation types recorded in the region (SANBI 2016).

Figure 9. The extent of Critical Biodiversity Areas in the vicinity of Pollock Beach, Port Elizabeth (Harris *et a*l 2018).

5. SITE SPECIFIC REVIEW OF SITE

The marine telecommunications cable is proposed to be landed at Pollock Beach, Summerstrand. Pollock Beach is located within Algoa Bay, a crenulate bay, supporting shallow rocky reefs and a narrow beach backed by transgressive, but incised dunes. Pollock Beach is located on the north face of the bay, near Cape Recife. Figure 10 presents an image of the site and also indicates the prevailing winds and wave roses for the region.

The predominant wave direction along the Eastern Cape coastline is from the south west, with swells rarely increasing above 2m (MacLachlan 1983), although wave heights in excess of 5 m have been recorded within the bay during the summer periods (CSIR 1987). The rocky headland at Cape Recife, generally serves to reduce wave energy within Algoa Bay (Goschen and Schumann 2015), resulting in a low to moderate wave height under most conditions.

The prevailing low wave energy, inshore reef and sheltered nature of the bay also gives rise to a fine to medium grained sand on Pollock Beach, which is primarily driven northwards in the prevailing littoral drift, although this is likely to reverse under summer conditions. The underlying shoreline shows a shingle beach, derived from historical erosion of the coastline, as well as extreme storm events (Davidson Arnott, 2012). The jagged and highly differential shoreline and inshore environment makes for a vacillating sediment transport system, in terms of both volumes and direction in and around Pollock Beach. Larger scale sediment transport constraints have arisen updrift of Pollock Beach and this, in conjunction with other factors has promoted beach inflation in and around the cable landing point, as well as reinforcing a highly transgressive supra tidal environment.

As such, a combination of infilling, beach nourishment, geofabric bags and dolosse have been established along the coastline in an attempt to provide protection from coastal erosion. The shoreline and dune cordon at the subject site comprises of a narrow, but dissipative beach, which is backed by a mix of narrow, but steep dunes which have been artificially stabilised using geofabric bags and related sea defence structures (Figure 11). The success of such measures is, however, doubtful and much of the dune cordon at this point has been rendered dysfunctional through the establishment of urban infrastructure, including parking bays, roadways, and residential development.

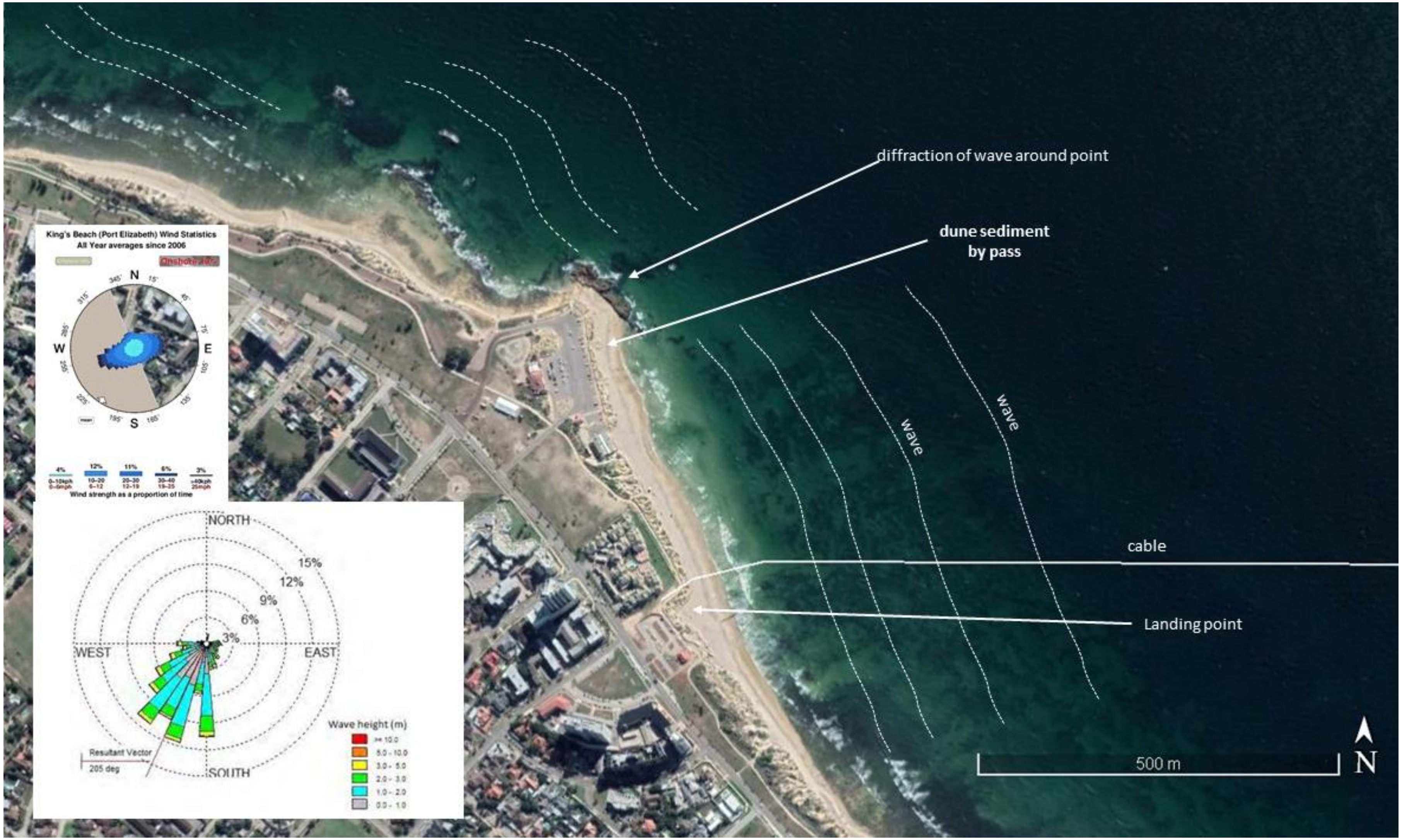


Figure 10. The portion of the supratidal environment that the cable will traverse (Goschen and Schumann 2015).

Once landed, the 2Africa/GERA (East) cable will cross the supratidal environment at Pollock Beach, just south of Summer Seas Apartments. At this point, the shoreline surface supports a combination of shelly material and coarse grained sands, which have accumulated over a wider portion of beach environment. Excavation of the beach indicated that the bedrock underlying these sands are located at a shallow level, with a shingle layer lying at approximately 0.5m below the modal beach surface level. However, the back of beach and dune environment exhibits a predominantly wind-swept, fine-grained beach. The dune environment at this point has minimal vegetation cover and therefore is frequented by the public for beach access (Figure 11). Given the highly transgressive environment at this point, aeolian or wind transport of sediment is high, and interventions to curb sediment transport have been undertaken, including the use of geofabric walls, as well as the stabilisation of sediments using vegetation. As such, the sand sharing system at this point can be considered to be "highly transformed" and eco-morphologically dysfunctional.

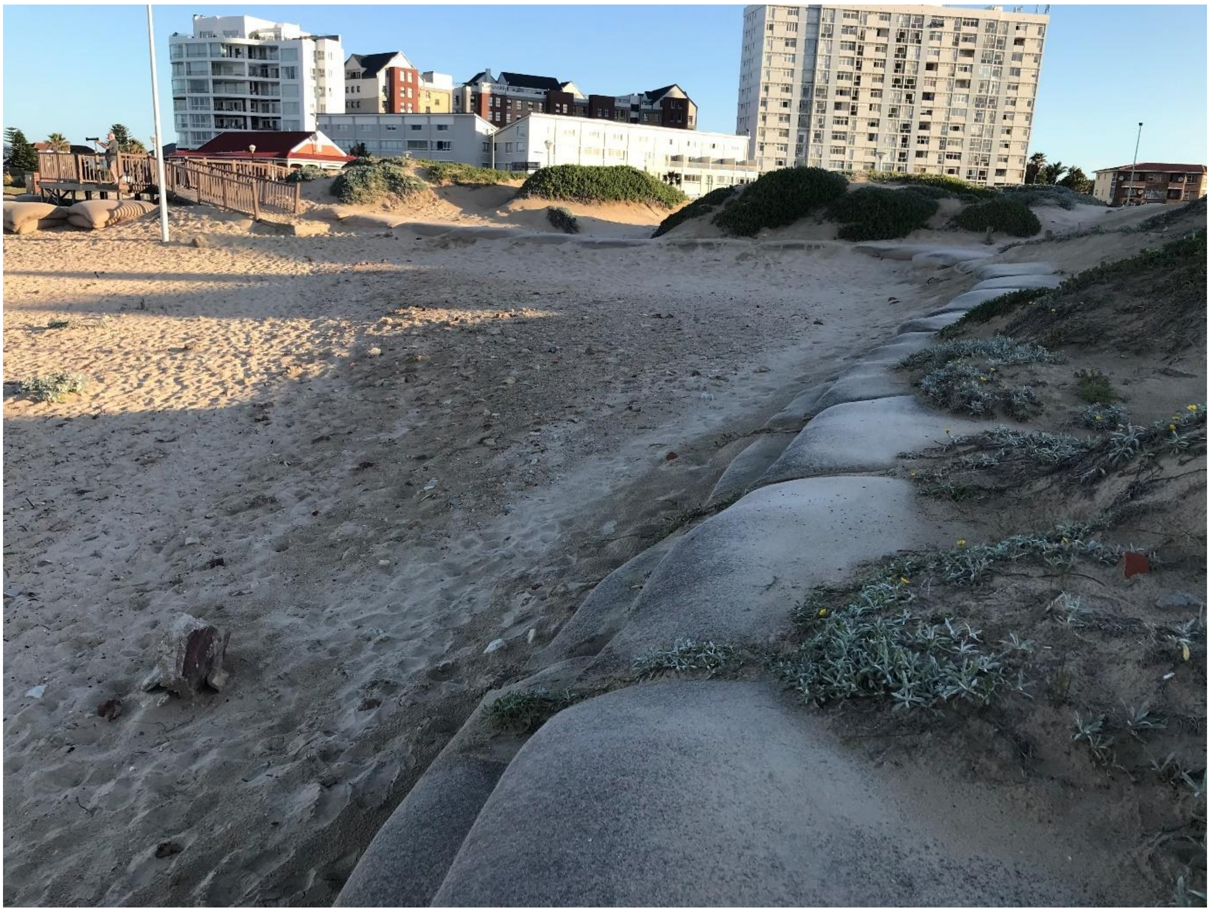


Figure 11. Geofabric bag stabilisation has been implemented along the study area.

5.1 Ecological aspects

As indicated above, the coastline at Pollock Beach can be considered to be an urban, stabilised and highly manipulated, shoreline environment and therefore a concomitant ecological state has arisen at this point. The frontal dune cordon, where not altered by urban development, presents typical Cape Seashore vegetation. The dominant and typical species encountered along the dune include *Tetragonia decumbens*, *Carpobrotus edulis* and *Gazania rigens* (Figure 14). Many of these specimens are likely to have arisen from horticultural interventions undertaken with the objective of redressing sediment transport along shore. This habitat form is primarily a stoss (frontal dune face), early seral dune complex and on account of the high pedestrian traffic and other chronic disturbance, will remain in an early seral state. At the point of the proposed cable landing, the dune has been subject to excavation, effectively placing much of this portion of the dune in an early seral state, dominated by *Tetragonia decumbens,* an early colonizer of sand dunes.

Given the urban context of the coastline, alteration of the prevailing supra-tidal geomorphology and high level of disturbance at the proposed site of the cable landing, it is evident that such impacts will continue to maintain this habitat in an early seral state, while continuing marine driven erosion is likely to further affect the frontal dune in its entirety. It follows that the implications of further disturbance at the site would have minimal ecological ramifications from an eco-morphological and conservation perspective.

From the information above, it is evident that:

- The sand sharing system at the subject site is associated with a variable longshore drift that predominates in a north to south direction, but is subject to variation because of the nature of the coastline and inshore environment.
- Marine and aeolian sediment transport is a significant factor along the subject portion of coastline.
- The beach profile is variable, with a deflated beach state seeing marine incursion to the toe of the frontal dune, under high seas, while supra tidal aeolian transport is significant and generally onshore.
- Much of the supra-tidal environment and dune cordon have effectively been rendered dysfunctional by stabilisation including buildings and sea defence systems established along the dune frontage, as well as other urban infrastructure.
- Further disturbance associated with excavation and landing of the cable is unlikely to affect any of the abovementioned eco-morphological drivers (wind, wave, sediment or vegetation) in the medium to long term, with a stable but dynamic equilibrium state returning soon after laying of the cable and following suitable reinstatement of the system.

Figure 12. Image of the frontal dune scarp with typical vegetation including, *Tetragonia decumbens* (top left); *Carpobrotus edulis* (top right); *Gazania rigens* (below).

6. ANALYSIS OF IMPACTS

Wave height, period and grain size are fundamental drivers of beach state (Short 1981) and it is evident that these natural features, in combination with strong wind, are drivers of the present state of the shoreline at the proposed point of cable landing at Pollock Beach. Habitat form may be considered a fourth driver, where its presence acts as a feedback mechanism for the above factors.

The landing point will traverse the dune cordon, which can be considered an artificial or highly manipulated system. As such, the anticipated impacts on the surrounding environment arising from the establishment of the landing cable, are considered low. Nevertheless, the dune cordon and beach environment will require remediation measures to be implemented, once the cable has been laid to return the dune to its current state. It is proposed that excavation of the shingle and to some extent beach aeolianite (compact calcareous, beach rock) is a likely scenario in the establishment of the cable, in order to reach a suitable depth of cover. In this regard the sub surface geology will effectively be altered along a minor traverse of +/- 300mm x 300mm.

Two alternative BMHs have been proposed. However, at the time of this study only one cable landing route along the beach was considered. The following summary of the nature of the proposed landing point can be presented:

- The landing site is subject to ongoing erosion and disturbance arising from natural processes influencing coastal dynamics at this point.
- The abovementioned natural processes have been exacerbated and compounded by urban development and sea defence measures, which in turn have further altered the state of the shoreline and coast at this point.
- Eco-morphological processes have thus been disrupted in and around the point of the cable landing point and the supra tidal dune cordon and back beach can be considered to be dysfunctional in terms of its influence and response to coastal processes .

The use of two methods of enabling the traverse of the cable from the low water mark to the dune form (and BMH) are proposed, these being :

1. The establishment of a trench across the beach and dune environment, and
2. Horizontal Directional Drilling at a depth >2m below natural ground level.

The former method will effectively alter the upper strata of beach form including shingle, beach rock and sand. Once the cable is layen this material will be reinstated to into its former natural form and levels. A cementing material will be utilised to reinstate rock material excavated from the sub surface geology.

The latter method would involve the use of sub surface drilling that would not alter the surface state of the beach and dune form. It will however, require a significant timeframe to complete this task (+/- 4 weeks) and would alter the geology of the site, particularly at points in and around the surface or entry points of the cable into the excavated tunnel. This option, although not visually apparent on the surface has largely unknown influences on the supra tidal and intertidal environment, particularly on account of the fact that the nature of the prevailing geology through which excavation is to be established, is unknown.

6.1 Direct and indirect impacts

Table 1 below, summarises the nature and form of direct and indirect impacts anticipated for the proposed cable landing, that may arise on the three eco-morphological drivers of coastal systems, namely *wind and wave, sediment transport dynamics* and the prevailing *biotic or vegetated dune form*. These impacts are evaluated to identify their significance and the status of the impact.

From Table 1, it is clear that any negative impacts that arise in response to the establishment of the cable, will be of short duration, evident during the laying of the cable. Establishment of the cable at a suitable depth, will minimise any likelihood of such impacts arising over an extended duration.

Table 1. Review of ecological impacts arising from utilisation of the proposed cable alignment route at Port Elizabeth.

Beach Node **Port Elizabeth** **IMPACT**	**Spatial extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Irreplaceability**	**Reversibility**	**Significance**	**Status**	**Confidence**	**Mitigation**
Alteration of drivers of coastal process, (e.g. wind and wave)	Local	Short term	Negligible	Once off	Very Low	Low	High reversibility	Very low	Very Low	High	Cable will align approximately shore perpendicular and lie at point 1m – 0.5m subsurface, effectively having no impact on localized wind and wave regime. Some minor disruption of inter-tidal and supra-tidal wave regime may arise in the short-term during laying of cable. HDD option may be utilised as optional alternative where geology is conducive to its use. Impacts limited to entrance and egress of excavated tunnel.
Interruption of sediment transport regime	Local	Short term	Negligible	Once off	Low	Low	High reversibility	Low	Low	High	Minor perturbation expected during construction, with excavation of dune, beach and intertidal zone. Sediment mobilisation at the point of excavation through dune/stabilised dune may arise, exacerbating present trends towards engulfment. Following cable establishment, sediment transport regime should rapidly reach state of equilibrium. Impacts from use of HDD will be minimal with impacts confined to either extent of tunnelled excavation. Recommended that geofabric or other methods of stabilising sediments be implemented post laying of cable to align with existing state.
Alteration of habitat/eco-morphology	Local	Short term	Negligible	Once off	Low	Low	High reversibility (with rock excavation addressed)	Low	Very Low	High	Excavation will arise through the primary dune and beach as well as the potential to establish a trench through sub surface beach rock. Where trenching of beach rock arises, use of an epoxy cement will be undertaken to re-establish a solid sub-surface geology akin to the prevailing geology. HDD option may be utilised as alternative option to establish excavation through prevailing solid geologies. Reinstatement of materials and natural aeolian winnowing will sculpt excavated area. Measures to stabilise and possibly replant habitat may be considered at this point. Effectively removal and replacement of geofabric defence structures will be required.

Spatial Extent: Denotes the affected area, - site, local, regional or national.

Duration: The period of time over which the impact will be noted. This may be "long term" (greater than the duration of project), "moderate or medium term" (occurs during the lifetime of the project) or "short term" (less than the lifetime of the project and primarily during the implementation stage of the project).

Intensity: An order of magnitude. 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: a description of any repetitive, continuous, or time-linked characteristics of the impact. Once Off, Intermittent; Periodic; Continuous
Probability: The likelihood of the impact occurring as a result of the project being undertaken. Such probability may be “high”, “moderate” or “very low” and “low”
Irreplaceability: Resource loss caused by impacts. This may be “high” (the project will destroy unique resources that cannot be replaced), “moderate” (the project will destroy resources, which can be replaced with effort), “low” (the project will destroy resources, which are easily replaceable).
Reversibility: The ability of the impacted environment to return/be returned to its pre-impacted state. Non-reversible, low reversibility, moderate reversibility of impacts, or high reversibility of impacts.
Significance: The nature of the impact in respect to the status quo (i.e. alteration of status quo). Such levels of severity may be “high”, “moderate”, or “low”.
Confidence: An indication of the level of surety that the impacts or the parameters identified, will occur.

6.2 Cumulative impacts

The cumulative impacts anticipated as arising from this activity are predominantly associated with disturbance to the dune cordon. The removal of vegetation and the uplifting of beach sand and geofabric defence systems may result in the destabilisation of the dune cordon. However, as a historically and contemporarily transformed beach, little cumulative impact can be discerned from such actions. Nevertheless, it is recommended that geofabric bags are established before reinstating the dune cordon to its previous morphology, which will include raking it to an angle of 27° degrees and planting vegetation to stabilise this area.

7. CONCLUSION

The point of the proposed cable landing at Pollock Beach has been shown to be a highly transgressive and eroding portion of coastline, that has been subject to various anthropogenic impacts, many of which are designed to redress the evident erosion and onshore sediment transport. Pedestrian movement along and over the beach and sand sharing system in this area will remain a further 'high impact' on this environment. As such, the site can be considered to be a highly altered system. It is also clear that erosion and further disturbance of the system may be exacerbated under a changing climate and maritime regimen, with a vacillating beach state and further erosion of the frontal dune anticipated. It follows from the above that the establishment of a submarine telecommunications cable at Pollock Beach will have little impact on the eco-morphology of the sand sharing system and the coastline in general.

Despite the highly transformed nature of the coastline, with the establishment of the cable, management interventions should be implemented to minimise anticipated impacts. These can be summarised as:

1. The cable should be buried within the beach to a depth approximating ~1m below the deflated beach state and thereby probably lying within the shingle or beach aeolianite (beach rock) strata of the beach. Machinery may be required to excavate a trench through the sand and beach rock to the required depth, this being to a depth approximating 300mm. Trench width would also approximate 300mm. Such excavation should be addressed through the use of an excavator or perhaps "jack hammer", with displaced material being set aside. Once the cable has been set in place, excavated material should be set back into the trench using an epoxy material, to the antecedent level of the beach rock. Surface sands should be set in place to cover the excavation.

2. The alternative option of using horizontal directional drilling (HDD), which entails the tunnelling and establishment of the cable through the prevailing dune and beach geology, may be considered where the option of trenching cannot be implemented. It follows that impacts would be largely unknown and remain latent. However although this option may be of limited impact this option is only considered to be implemented as an alternative method of cable establishment due to the cost and time associated with such technique.

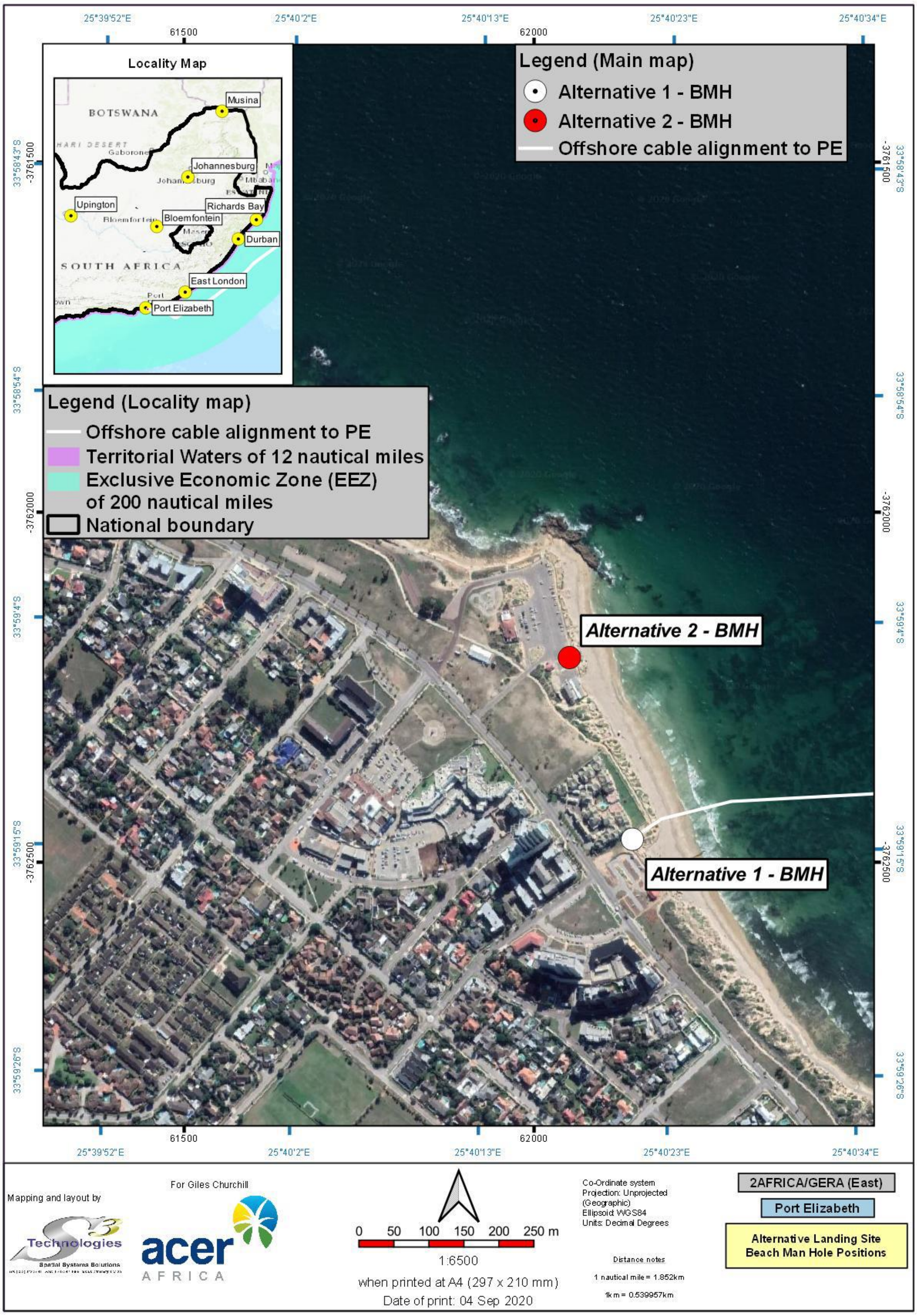
3. Some monitoring of the excavated trench may be required from time to time, particularly following periods of beach scour or significant storm events to ensure that the reinstated trench and cover material remains intact and cable/conduit exposure has not arisen.

4. If machinery is utilised, such as an excavator, stringent management measures must be implemented to prevent negative impacts on the coastal environment. Access to the beach may prove difficult where sizable plant machinery is utilised. The Environmental Control Officer (ECO) should address and oversee such matters. Following establishment of the trench, the excavated material must be laid in a similar order to the previous state.

5. Where disturbance of the vegetated dune arises, the affected area should be raked back to an angle of repose ~ 27°, stabilised using geofabric bags and suitably planted with appropriate vegetation (ideally the same dune species that are currently present on the dune cordon – see Figure 12).

6. An alternative pedestrian walkway should be established during the laying of the cable and restoration stage of the project. In addition, the dune cordon should be fenced off to prevent use by the public for beach access.

Appendix A: A map showing the 2AFRICA/GERA (East) proposed routes for the system cable approach and landing.



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