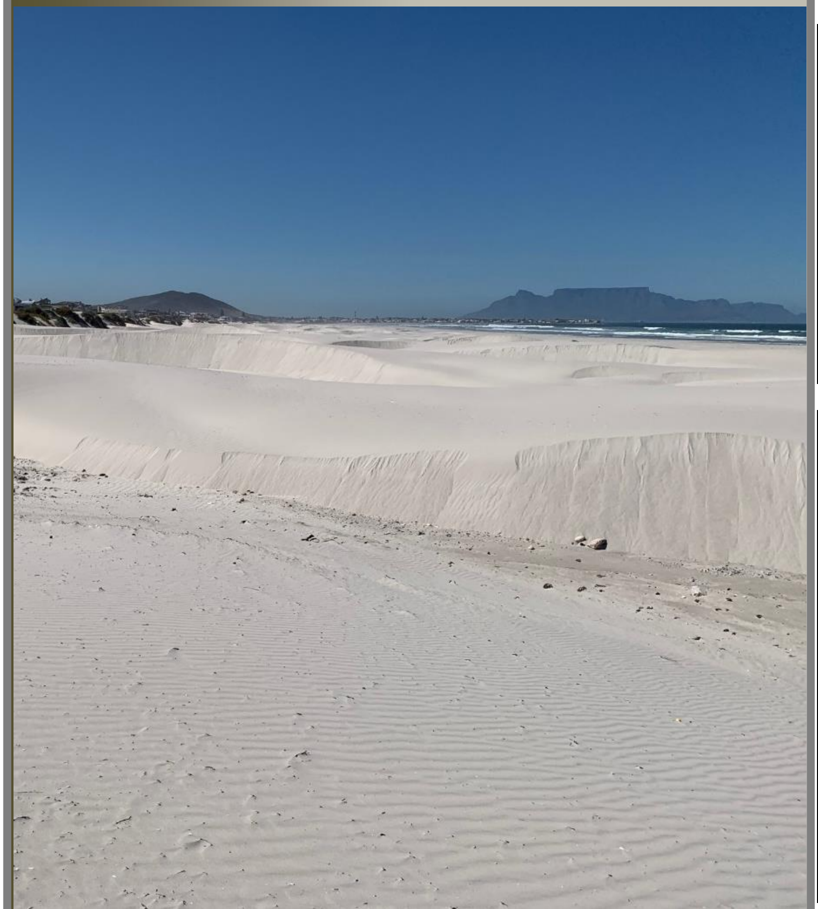

BEACH AND COASTAL DUNE DYNAMICS IMPACT ASSESSMENT

THE PROPOSED MARINE TELECOMMUNICATIONS CABLE AT DUYNEFONTEIN BEACH, ON THE WEST COAST OF SOUTH AFRICA

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Sustainable Development Projects cc

Compilled for: Acer (Africa) Environmental Consultants

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BEACH AND COASTAL DUNE DYNAMICS IMPACT ASSESSMENT FOR A PROPOSED MARINE TELECOMMUNICATIONS CABLE AT DUYNEFONTEIN BEACH ON THE WEST COAST OF SOUTH AFRICA.

Contents

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Front page image	Dune structure at Duynefontein Beach

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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

20 April 2021

PARTICULARS OF AUTHORS/ECOLOGISTS

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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)

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KEY COMPETENCIES AND EXPERIENCE

Natalie de Wet is an intern at SDP Ecological and Environmental Services. 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 also interned at EnviroPro where she job-shadowed Environmental Assessment Practitioners and Environmental Control Officers.

EXECUTIVE SUMMARY

The proposed construction of a marine telecommunications cable system by Alcatel Submarine Networks (ASN) is the subject of an Environmental Impact 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 components of the beach and frontal dune cordon at Duynefontein, as well as to provide recommendations on environmental management measures to be employed, following establishment of the cable.

The coastal dune cordon at Duynefontein lies leeward of a wide dissipative beach. The cordon comprises of a number of dune structures and a wide, permanently wet dune slack. Consideration of recent imagery indicates that the dune cordon is undergoing severe transgression and regression. Notably the proposed route of the cable follows that of a previous cable laid around 2016/2017.

This report identifies that mobilization of sediment is a significant issue that is locally significant and is leading to the alteration of the supra tidal environment across the Melkbosstrand coastline. With this in mind it is proposed that :

1. **The most prudent approach to the landing and routing of the 2AFRICA/GERA (East) cable is through the utilization of the existing cable route occupied by the ACE submarine cable.**

2. **Coastal eco-morphological impacts associated with the use of this route are considered to be low to very low, subject to the application of selected management measures during the laying of the cable.**

3. **Such management measures include the avoidance of infilling or encroachment into the dune slack, but most significantly the suitable stabilization of the frontal primary dune following the infilling of trenchwork. Such infilling should be stabilized using geofabric or other materials.**

Given the above, it is recommended that authorities should sanction the proposed cable landing, subject to the recommended routing being adhered to by contractors and that management interventions are instituted at site.

1. INTRODUCTION

Acer (Africa) Environmental Consultants have commenced with an environmental impact assessment process (through an Environmental Impact Assessment), to review and obtain authorisation from the National Department of Environment, Forestry and Fisheries, for the installation of a marine telecommunications cable. The cable is part of the 2AFRICA/GERA (East) submarine cable system linking Africa to Europe and parts of the Middle East (Annexure A). This telecommunication cable will allow for increased internet traffic in Africa through increased speed and data capacity. The offshore cable is to be landed at Duynefontein, located within the Cape Town Metropolitan Municipal area (Figure 1). Duynefontein is positioned at 33˚41' S / 18˚26' E and can be accessed from Otto Du Plessis Drive, at Melkbosstrand.

This report serves to provide a bio-physical overview of the inter tidal and supra tidal coastal environment within and adjacent to the proposed landing point associated with this cable. The investigation has been conducted utilising various, selected parameters and identifies factors associated with the area that may be considered drivers that determine coastal processes and ecological function. In addition, the investigation considers the ecological impacts that may arise within the dune system from the establishment of the cable, the most appropriate route the cable, as well as mitigation and management measures should be employed during and post the installation phase.

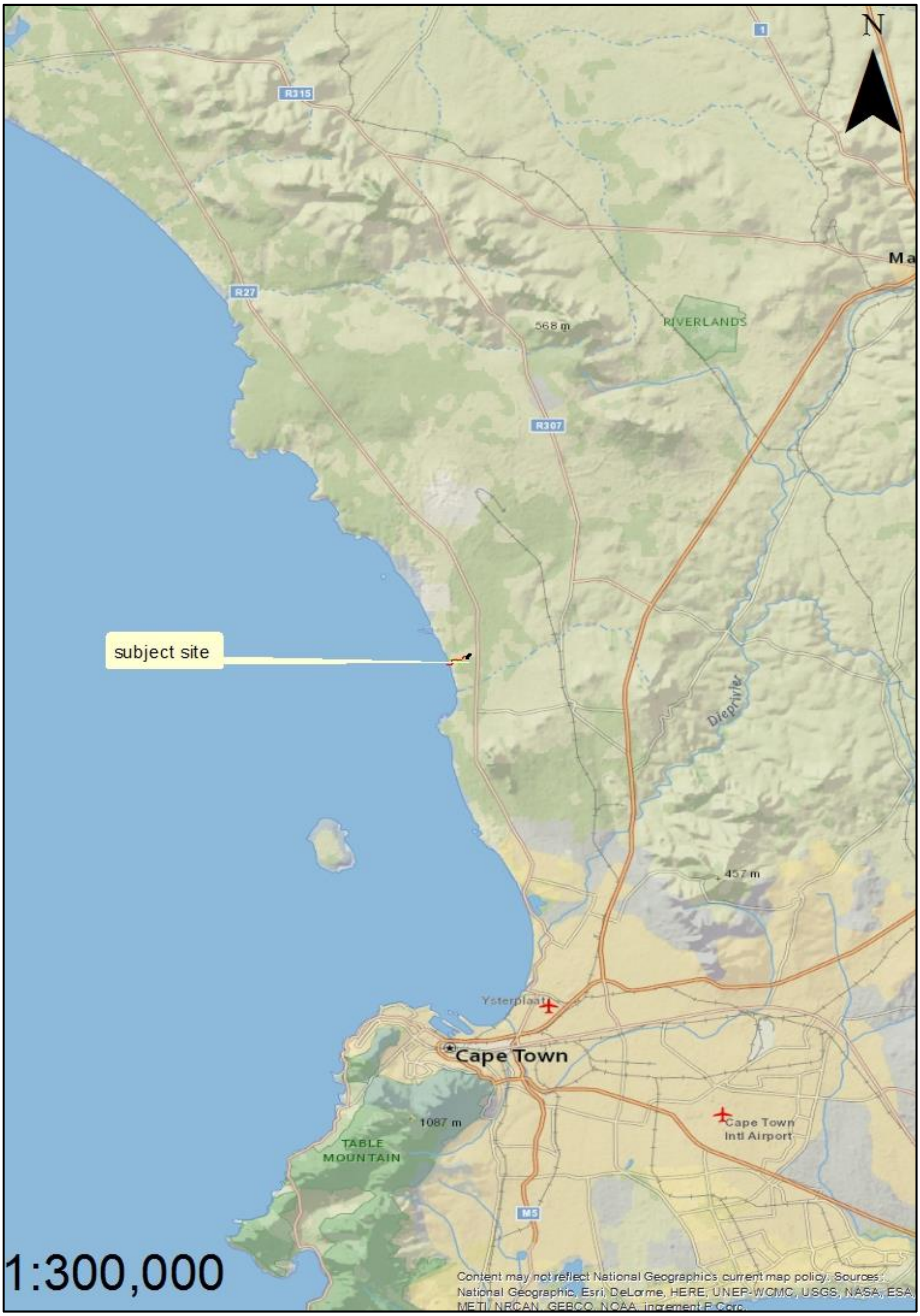

Figure 1. Regional map image of the subject site

2. PROJECT DESCRIPTION

Telecommunications company, MTN, wish to establish a submarine cable that will be landed within the Cape Town region (Figure 1). The cable will benefit businesses and consumers with increased internet capacity and services. The project will see a cable being established that traverses' a portion of the sub-tidal, inter-tidal, beach and dune environment at Duynefontein (Figure 2). The cable will follow an alignment from the inshore, sub-tidal environment, where it is to be landed, across the inter-tidal and supra-tidal environments to a Beach Manhole (BMH) which will be located within a stabilised point within the dune cordon (Annexure A; Figure 2). After being landed at a BMH, the cable will be routed underground, landwards.

Figure 2. Image indicating the proposed cable route at Duynefontein.

To install the cable, plant machinery and excavators will be utilised to dig a trench of approximately 2 m below the prevailing, natural ground level. Where trenching within dune systems is required, such depths may be as deep as 5 m. Given the nature of dune and beach sediments, excavations may be relatively wide to accommodate trenching operations at such a depth. The BMH will form the anchor point for the cable. In addition, a sea earth plate will be buried in the saturated soil near the beach water line. Once installed, the plate is not visible, however, the impacts of installation require consideration. Importantly, excavated material is to be reinstated over both the sea earth plate and cable to the prevailing natural ground level. It is anticipated that wave and wind will reinstate the prevailing beach morphology.

2.1 Seasonality and limitations

The assessment was undertaken during January 2021, which is representative of a summer period and generally inflated beach environment. The seasonality is given due consideration in the interpretation of data. No data or observations for other seasons were available for comparison. Where such data was required for assessment models, assumptions were made, based on accepted trends and predicable seasonal changes. This study did not consider antecedent weather conditions and was conducted during COVID-19 beach restrictions.

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

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. Such desktop investigations included:

- Review of recent and historical aerial imagery dating from 2000 to 2020.
- Identification and delineation of various plant community associes and habitats associated with the frontal dunes.
- Review of information gathered by SDP Ecological and Environmental Services in 2016, whereby an assessment was conducted to determine the anticipated impacts and changes that may arise as a consequence of establishing a cable following the preferred and alternative landing route.
- Dominant coastal processes were evaluated using available wave and wind data.

In addition, field reconnaissance was undertaken on 20 January 2021 whereby:

- Specific features within the supra-tidal environment were identified and logged using a Garmin Montana GPS. It should be noted that access to the beach was restricted at this time, however pertinent information was collated around the cable landing point.

- Dominant species were identified and recorded from the edge of the vegetation at the beach, eastward in a landward direction.

- General observations were noted along the dune cordon in terms of the gradient of the dune face and the nature and structure of the vegetation at the beach–dune interface.

Notably, an alternative option for the landing of the cable was presented to the south of the alternative route, however this option was dismissed on account of the fact that the applicant wishes to make use of existing infrastructure on an existing cable, as described below.

Figure 3. Image indicating specific features and points logged along the cable route at Duynefontein.

4. REGIONAL PERSPECTIVE OF THE SUPRA TIDAL ENVIRONMENT

The Duynefontein (Van Riebeeckstrand) beach is a wide embayment of approximately 10 kilometres in length that is bound by the Soutrivier in the south and a promontory to the north, known as Ouskip, see Figure 1 above. However, the placement of infrastructure within the marine, inter tidal and supra tidal environment at the Koeberg Nuclear Power Station has served to further entrain this bay to the south.

The coastline and dune form at Duynefontein trends in a north–south direction with a wide, dissipative beach being evident along the shore. Much of the Cape Town metropolitan region has been subject to urban development and settlement, which has seen both the drainage of inland, wetland areas, as well as the stabilization of formerly mobile dune forms.

Coastal processes in the nearshore and supra tidal environment are driven by a number of complex bio-physical processes (Elko 2016) and as such, changes in wind and wave regimen, climate state, beach morphology and other factors influence the eco-morphology of dune systems (Hesp 2012).

The wave climate along the Atlantic coastline of Cape Town has been described by Roussouw (1989), as a high energy regime, with the most proximal wave rider buoy in the region, recording a H_s (max) of

10.8 m with the most frequently occurring wave height being 3 m (Joubert and van Niekerk; 2013). Such parameters indicate a coastline subject to significant marine inundation, accounting for the dissipative beach environments common within the region.

The dune structure along the Atlantic coastline is affected by primarily two dominant wind directions, namely, southerly to south easterly and north to north westerly winds (Figure 4). The former direction often results in particularly strong winds which tend to move large volumes of sand. As such, the resultant drift direction of supra tidal sediments along the Atlantic coastline in Cape Town is aligned to these winds.

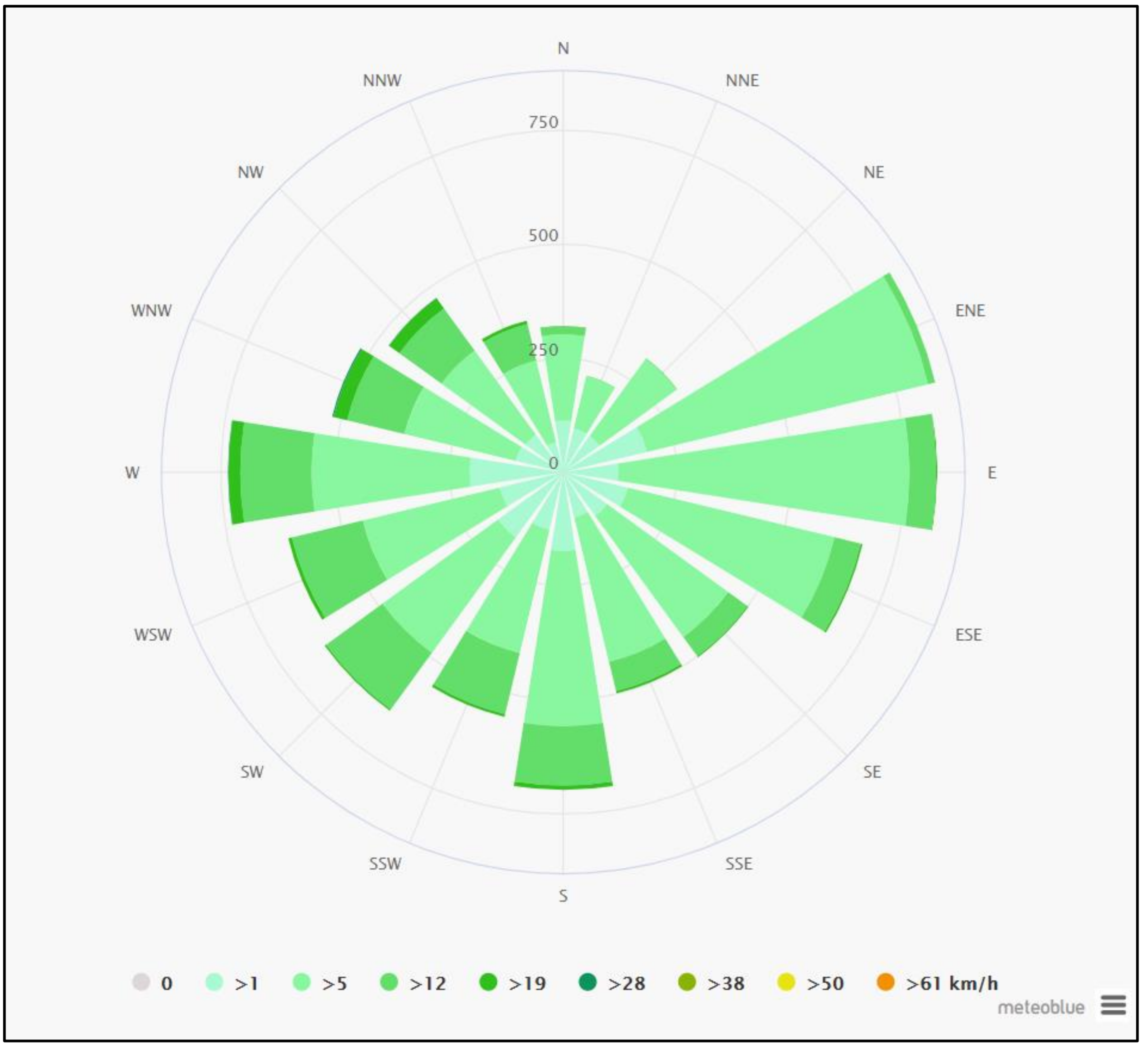

Figure 4. Annual wind rose for Melkbosstrand, located approximately 4km from Duynefontein (Accessed from https://www.meteoblue.com/).

According to Koeppen Geiger, the Western Cape region is classified as *warm temperate: summer dry: summer hot* (Csa) region with predictions of increased aridity, reduced winter rainfall and more severe storm events (http://koeppen-geiger.vu-wien.ac.at/present.htm). In addition to these predictions, sea level rise is expected to occur at a rate varying between 0.42 and 1.87 mm/year (Blake *et al* 2011). The National Oceanographic and Atmospheric Administration (NOAA) identifies a sea level rise rate of 2.18mm/year (https://tidesandcurrents.noaa.gov/sltrends/sltrends.html) for the Cape Town region, a slightly higher rate of increase than that reported by South African authors. Given the above, inundation along low lying areas of the Cape Town coastline is anticipated by authorities. However, in terms of dune systems, saline intrusion into sub surface, freshwater systems are likely to have a more significant impact on the state and structure of these coastal features.

From an ecological perspective, habitat complexity and species diversity play a significant role in determining the state of a dune form (Hesp 2012). Using SANBI data, the subject area comprises of two types of habitat, namely Cape Seashore Vegetation and the Cape Flats Dune Strandveld (Mucina and Rutherford 2006), (Figure 5). Of these veld types, Cape Seashore Vegetation is considered to be "least threatened" from a habitat conservation perspective, while Cape Flats Dune Strandveld is considered to be "endangered". Cape Flats Dune Strandveld is threatened by urban sprawl and alien plant invasions (Mucina and Rutherford 2006).

Figure 5. Map indicating subject site and the two vegetation types recorded in the region (SANBI 2006).

Given the above, the Department of Environment, Forestry and Fisheries have identified the subject area and the greater region around Duynefontein as being of “very high sensitivity” from a terrestrial biodiversity perspective (Figure 6). Figure 6 also suggests that some portions of the coastline may be of low sensitivity, primarily due to urban settlement. However, the dune cordon and supratidal environment along the Duynefontein coastline, remains of very high ecological sensitivity.

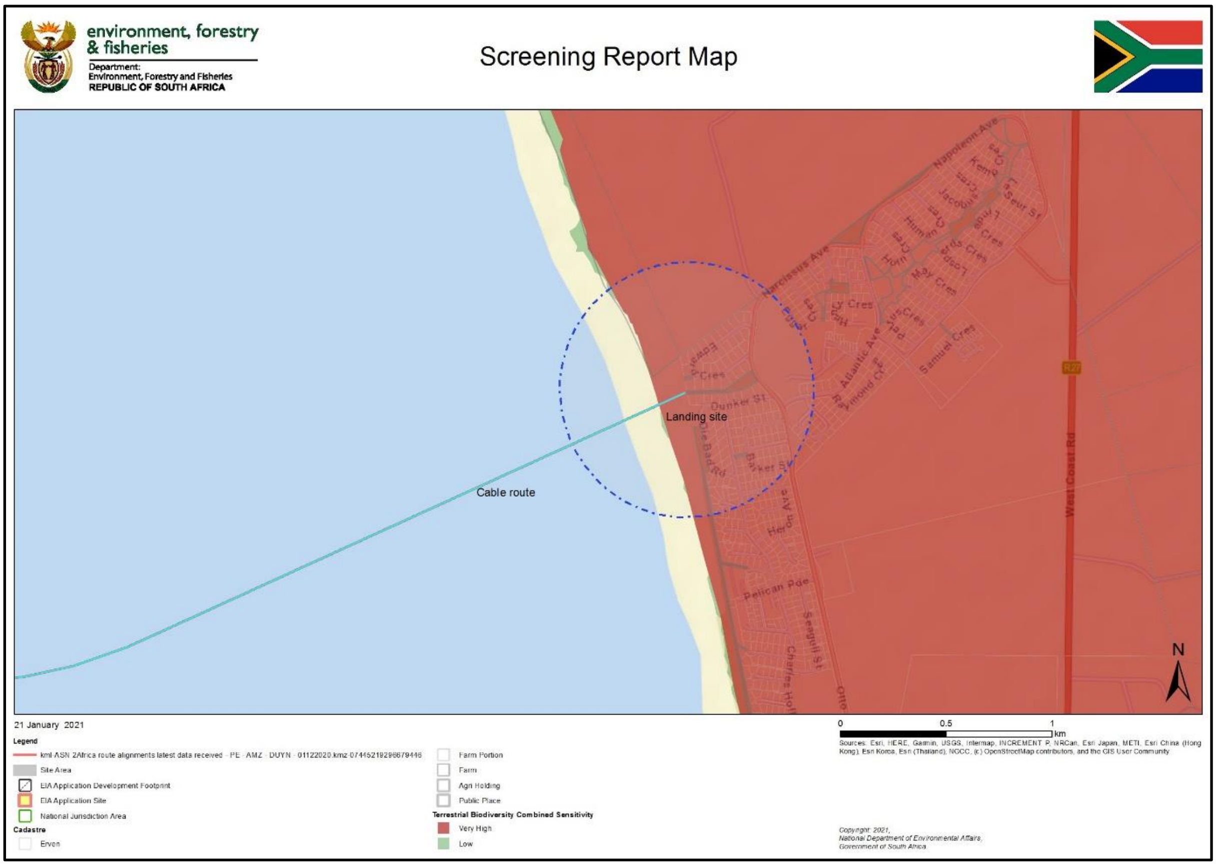

Figure 6. National Department of Environmental, Forestry and Fisheries screening report map (2021). Red shows terrestrial biodiversity of “high sensitivity”, while green shows terrestrial biodiversity of “low sensitivity”.

According to the National Coastal and Marine CBA Map Version 1.0 (26-02-2021 release), the Duynefontein landing point is not considered to be of critical importance from a conservation perspective(Figure 7).

Figure 7. The extent of Critical Biodiversity Areas in the vicinity of Duynefontein cable

5. SITE SPECIFIC REVIEW OF CABLE ROUTE

The shoreline and dune cordon at the subject site comprises of a wide dissipative beach with a narrow back beach. Breaker height, wave period and grain size are fundamental drivers of beach state (Short 1981) and it is evident that fine sediments along this coastline, together with a moderate to higher energy wave conditions have given rise to the present beach morphology (Figure 8).

Figure 8. Image of beach and dune cordon, showing dissipative nature of beach and intertidal zone.

The outer and inner beach sandbars and definitive trough are indicative of dissipative beaches. From site reconnaissance and review of historical aerial imagery, it is evident that this arrangement is the most frequently occurring offshore and beach state along this portion of coastline. Wright and Short (1983) indicated that dissipative beaches are generally flat, shallow formations and are associated with extensive, subaqueous sand storage. As such, the nature of the dune form at Duynefontein is a function of the dissipative morphology of the beach and accounts for the dune forms evident along the cordon.

The dune cordon comprises of three differing dune structures, backed by a wide, permanently wet and inundated dune slack (Figure 9). The three dune forms comprise of embryonic or hummock dunes, which are most closely associated with the back beach environment and longitudinal dunes, which form a secondary dune cordon.

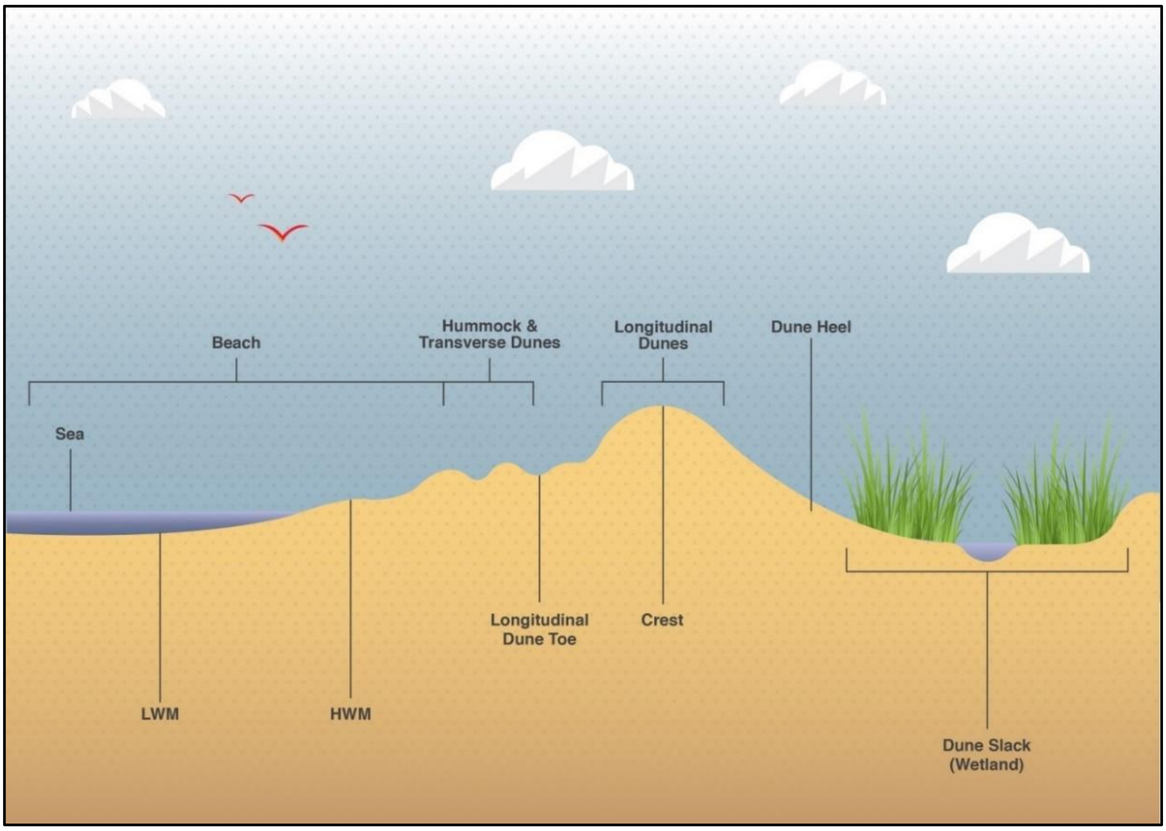

Figure 9. Diagrammatic representation of profile across beach at Duynefontein

Although hummock dunes and transverse dunes are ephemeral and dynamic in character they may be stabilised by vegetation leading to improved stability. They can also be persistent, where formative factors, such as winds, dominate for extended periods of time.

As indicated, a cable was landed at the identified site in 2016 / 2017 and this allows for some comparison of beach and dune form between earlier dates and more contemporary periods. Figure 10, below shows a comparative image of the beach and dune cordon in 2011 and about eight years later in 2019 – after the establishment of the initial submarine cable. The change in the dune cordon is significant. Comparatively, the images below show a regression in stable dune of up to 90 m landward. As such this would equate to a regression approximating 10 m per year over the last decade. The reason for such regression is evidently unknown, but can be suggested as arising from possible inter-decadal meteorological and maritime cycles (e.g. Pacific Decadal Oscillation (Malherbe et al 2015)). Climate change phenomena as well as more direct and site specific changes associated with the back of beach, in particular freshwater availability in the dune slack, may also be playing a role. It is clear that restoration of the dune immediately following establishment of the cable is important, to ensure that disturbance of the dune does not exacerbate dune regression.

Figure 10. Comparative aerial imagery obtained from Google Earth from 2011 and 2019

As indicated above, a wet dune slack lies to the east of the dune heel and is an important driver of vegetation within the more seaward dune cordon (Figure 11). As such, the dune slack is a significant source of freshwater to frontal dune vegetation which is supplied either directly through sub surface inundation and seep, or condensation and capillarity within the proximal dune structure. The regression of the frontal dune cordon and increased transgression discussed above is clearly evident in Figure 11, which shows recent sand deposition in the lee of the dune cordon, with engulfment of vegetation.

Figure 11. Image of permanently wet dune slack at Duynefontein

5.1 Ecological aspects

As indicated above, the frontal dune cordon and dune slack is considered to encompass two habitat forms, namely Cape Seashore Vegetation and Cape Flats Dune Strandveld. However, the dune regression discussed above, has effectively seen a decrease in vegetation cover on the frontal dune cordon, with only the most robust psammoseral vegetation remaining (e.g. *Arctotheca populifolia*). (Figure 12). Along the crest of the longitudinal dune, vegetation cover increases, with typical plant associations including *Sporobolus virginicus* and *Ehrharta villosa*, with *Tertragonia decumbens* and *Didelta carnosa* being common.

Figure 12. Image showing the existing and proposed cable route, with lee of transverse dune on right.

Leeward of the longitudinal dune, the wet slack gives rise to a habitat dominated by *Typha capensis* and *Juncus kraussii*, but where a more mesic environment prevails, species typical of Cape Flats Dune Strandveld veld type are evident, in particular *Chrysanthemoides monilifera* and *Dassispermum suffruticosum*.

The leeward habitat has been subject to some level of transformation with the establishment of stormwater outfalls, walkways and other infrastructure (including sub surface cables) being evident. Nonetheless this area can be described as being of high ecological significance, as is common with most coastal wetland environments. Notable is the presence of the Cape dune mole rat (*Bathyergus suillus*), which is typically associated with the wet slack and dune environment. Although considered to be of least concern from a conservation perspective, this species is losing habitat on account of urban expansion along the coastlines of the Western Cape.

Given the ecological significance of the land lying leeward of the primary dune, it would be important to ensure that the establishment of the cable aligns closely with existing disturbed areas, as would be the case with utilisation of the existing cable route, and that disturbed areas are rapidly re-established.

6. ANALYSIS OF IMPACTS

The use of an existing cable route is considered to be the most prudent approach to establishing further cable landing points along the coastline of the Western Cape. While alternative landing points have been proposed for earlier cable landing points, these have been dismissed and the present landing point has been selected. It is apparent that the collation of a number of cables into a singular landing point serves to concentrate disturbance and avoid the widespread excavation and alteration of beach and dune features along the coast.

Figure 12 above indicates that following excavation and laying of the cable, the beach and dune form returns to an equilibrium that reflects the prevailing conditions and resembles the general land form associated with this environment. Figure 13 below, shows an image of the cable route to the lee of the dune and through the dune slack. An existing conduit serving the ACE cable is in place and this conduit will be utilised to tie the cable to an existing landing point. Therefore no excavation of the wet slack and areas landward of the heel of the dune is anticipated.

Of note, anecdotal information obtained from "Leon" a local fisherman from Melkbosstrand indicated that following the establishment of the first cable in 2016 / 2017, the cable remained exposed in the intertidal zone for up to 6 months. He however confirmed that the cable has however not been seen since this time and evidently remains buried. This exposure may be on account of sediment transport dynamics and although the implications to the environment are not obvious or clear, the risk to the cable operator may be significant. Therefore, we recommend that the cable be buried to a depth of at least 2 m to prevent cable exposure in the future.

Figure 13. Image of walkway to beach along which proposed cable is to be routed.

Table 1 shown below summarises the potential impacts that may arise through the laying and operation of the proposed cable on 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.

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

Beach Node **Duynefontein** **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 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
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 may arise, exacerbating present trends towards engulfment. Following cable establishment, sediment transport regime should rapidly reach state of equilibrium. Recommended that geofabric or other methods of stabilising sediments be implemented post laying of cable.
Alteration of habitat/eco-morphology	Local	Short term	Negligible	Once off	Low	Low	High reversibility	Low	Very Low	High	No excavation or disturbance is anticipated landward of the dune crest on account of the presence of an existing sub terranean conduit. However excavation will arise through the primary dune and beach. Reinstatement of materials and natural aeolian winnowing will sculpt excavated area.

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.

7. CONCLUSION AND MANAGEMENT RECOMMENDATIONS

The coastal inshore and supra tidal environment at Duynefontein has been shown to presently be a mobilising system where engulfment and landward transport of sediments of the formerly vegetated dunes is seeing a leeward migration of dunes and engulfment of vegetation. Such transgression of the dune structures has arisen since 2010 and is considered to be quite significant with upwards of 10 m per year being calculated.

The proposed landing of a sub-surface cable at Duynefontein will require the trenching of portions of the intertidal, back beach and dune cordon, to allow for the cable to connect with land-based infrastructure. However, it is notable that the proposed point of landing and alignment of the 2AFRICA (East) cable aligns with an existing cable route and as such it can be deemed that :

1. The proposed route of the cable has been subject to disturbance along its entire length.
2. The use of the same route by both cables would collate impacts into a singular traverse, improving management and restoration initiatives.

Given the above, a prudent approach to such actions on account of the evidently mobilising dune, should ensue. These measures are presented below.

1. A depth approximating 2 m should be achieved in the burial of the cable.
2. Shoring and protective measures should be instituted along the beach and primary dune to prevent slumping and ensure depth of burial is achieved.
3. Once all trenching and backfilling has been completed, following the laying of the cable, it is proposed that the dune be reinstated and sculpted to mimic the pre-construction state.
4. Stabilisation of the dune should be undertaken on a temporary basis utilising geofabric or related materials (Figure 14). Limited planting of materials is proposed.

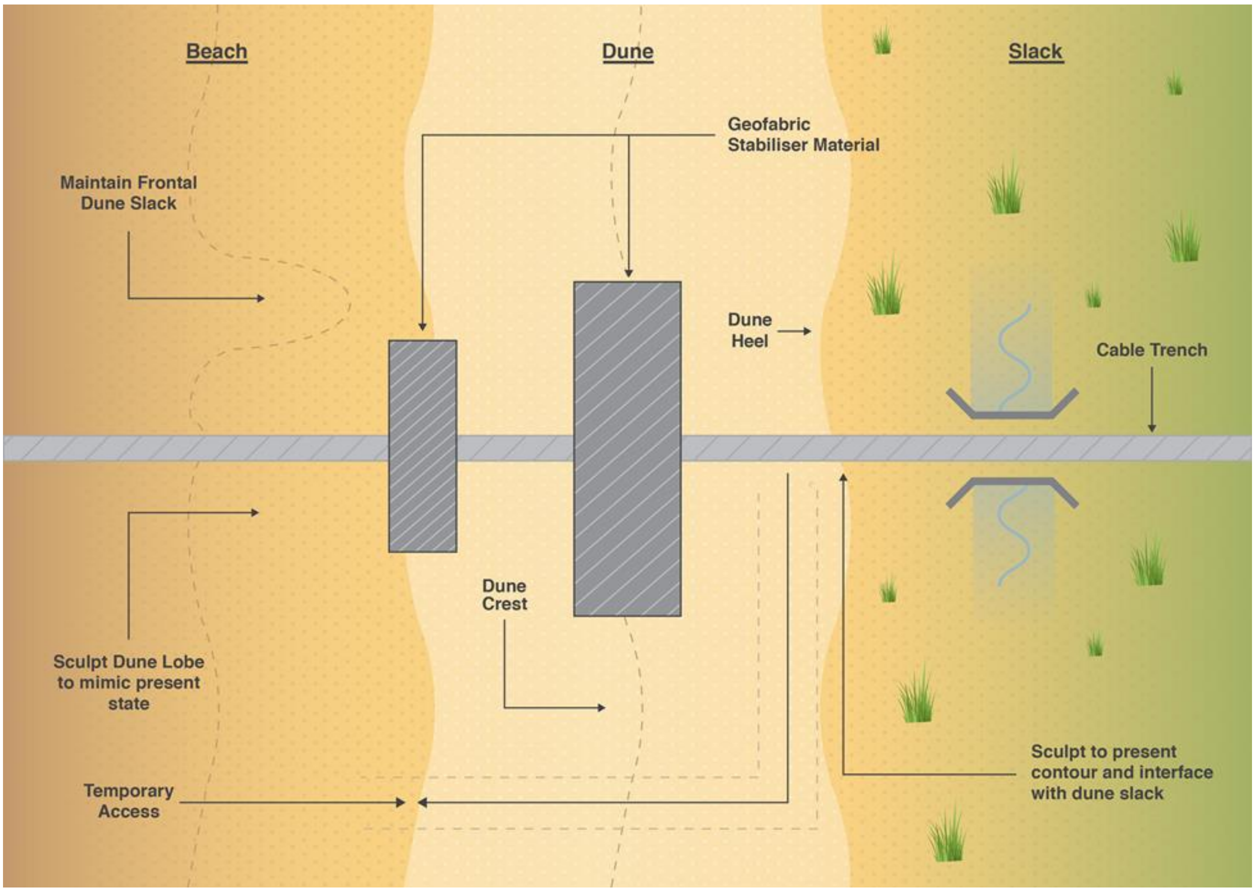

Figure 14. Stylised image of post trenching measures required.

Annexure A: A chart showing the 2 Africa (East) proposed routes for the system cable approach and earth plate.

2 AFRICA GERA (EAST)

DUYNEFONTEIN

SEGMENT E01_01

CHART SHOWING 2 AFRICA (EAST) PROPOSED ROUTES FOR SYSTEM CABLE APPROACH AND EARTH PLATE

ACE SYSTEM & EARTH CABLES

2 AFRICA PROPOSED SYSTEM & EARTH ROUTE

SEA EARTH PLATE

BMH POSITION	33° 41.666'S	18° 26.387'E
EARTH PLATE	33° 41.716'S	18° 26.274'E

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2 AFRICA (EAST) CABLE SYSTEM SEGMENT E01_01
DUYNEFONTEIN EARTH PLATE
CHART NO.01 OF 01

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REV	DESCRIPTION	BY	CHKD	APPR
1	Issued for Review	MB	MB	JC
2	Adjusted for Topo Survey	MB	MB	JC

ALCATEL SUBMARINE NETWORKS

References (cited and uncited)

ACER (Africa) Environmental Consultants. 2021. Background Information Document (Appendix 1).

Elko, N., Brodie, K., Stockdon, H., Nordstrom, K., Houser, C., McKenna, K., Moore, L., Rosati, J., Ruggiero, P., Thuman, R., Walker, I. (2016). Dune management challenges on developed coasts. Shore & Beach, 84(1).

Joubert J.R., van Niekerk, J.L. (2013). South African wave energy resource data: A case study.

Malherbe J, Dieppois B, Maluleke P, Van Staden M, and Pillay, D. L. (2015) South African droughts and decadal variability. Natural Hazards volume 80, pages657–681; Published: 26 September 2015

Mucina, L.M., Rutherford, M. (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelitzia.

Rossouw, J. (1989). Design waves for the South African coastline. PhD dissertation, Stellenbosch University.

Tsoar, H., Levin, N., Porat, N., Maia, L.P., Herrmann, H.J., Tatumi, S., Claudino-Sales, V. (2009). The effect of climate change on the mobility and stability of coastal sand dunes in Ceara State, NE Brazil. *Quaternary Research*, 71(2): 217-226.

Umvoto Africa. (2011). Sea Level Rise and Flood Risk Assessment for a Select Disaster Prone Area Along the Western Cape Coast. Phase 3 Report: West Coast District Municipality Sea Level Rise and Flood Hazard Risk Assessment. Provincial Government of the Western Cape Department of Environmental Affairs and Development Planning: Strategic Environmental Management (First Draft March 2011).

Wright, L.D., Short, A.D. (1984). Morphodynamic variability of surf zones and beaches: A synthesis. *Marine Geology*, 56(4):93-118.