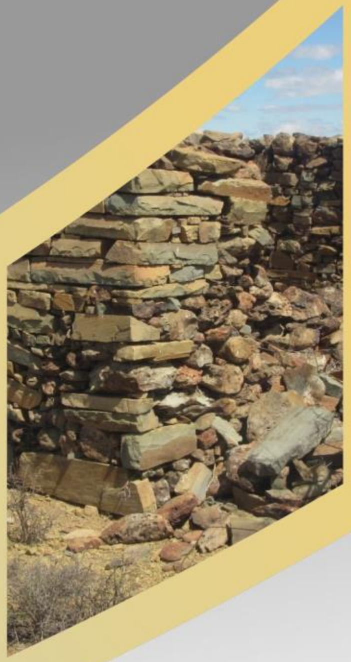
Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D



Specialist Reports

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Appendix D.2:	Visual Impact Assessment
Appendix D.3:	Heritage Impact Assessment (Archaeology, Cultural Landscape and Palaeontology)
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Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.1





Agriculture Compliance Statement

Johann Lanz
Soil Scientist (Pr.Sci.Nat.)
Reg. no. 400268/12

Cell: 082 927 9018
e-mail: johann@johannlanz.co.za

1A Wolfe Street
Wynberg
7800
Cape Town
South Africa

SITE SENSITIVITY VERIFICATION

AND

AGRICULTURAL COMPLIANCE STATEMENT

FOR

BASIC ASSESSMENT PROCESSES FOR THE PROPOSED DEVELOPMENT OF SEVEN 132 KV OVERHEAD TRANSMISSION POWERLINES AND ITS ASSOCIATED ELECTRICAL INFRASTRUCTURE NEAR BEAUFORT WEST IN THE WESTERN CAPE PROVINCE

Report by
Johann Lanz

26 June 2022

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EXECUTIVE SUMMARY

The key findings of this study are:

- The agricultural impact (loss of future agricultural production potential) resulting from the proposed 7 overhead power lines is totally insignificant in the context of the agricultural environment. This is because an insignificantly small amount of land will be excluded from agricultural production and that land has very limited production potential, anyway.
- The conclusion of this assessment is that the proposed development of all 7 of the overhead power lines will have insignificant agricultural impact and will therefore be acceptable in terms of their impact on the agricultural production capability of the site.
- The only potential source of impact is minimal disturbance to the land (erosion and topsoil loss) during construction (and decommissioning). Land disturbance can be completely and fairly easily mitigated through generic mitigation measures. However, farmers frequently complain that these impacts occur because the EMPr is not adequately implemented.
- From an agricultural impact point of view, it is recommended that all 7 overhead power lines be approved.

1 INTRODUCTION

Environmental authorisation is being sought for the proposed development of seven 132 kV overhead transmission powerlines and its associated electrical infrastructure near Beaufort West in the Western Cape Province (see location in Figure 1). In terms of the National Environmental Management Act (Act No 107 of 1998) (NEMA), an application for environmental authorisation requires an agricultural assessment, in this case an Agricultural Compliance Statement.

Johann Lanz was appointed as an independent agricultural specialist to conduct the agricultural assessment. The objective and focus of an agricultural assessment is to assess whether or not the proposed development will have an unacceptable agricultural impact, and based on this, to make a recommendation on whether or not it should be approved.

Figure 1. *Locality map of the proposed overhead lines (blue line) south of the town of Beaufort West.*

The purpose of the agricultural component in the Environmental Authorisation process is to preserve the agricultural production potential of, particularly scarce arable land, by ensuring that development does not exclude existing or potential agricultural production from the land or impact it to the extent that its future production potential is reduced. However, this proposed development poses zero threat to arable land and insignificant threat to any agricultural production potential.

2 PROJECT DESCRIPTION

ABO Wind renewable energies (Pty) Ltd ("the Developer") is proposing the construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12- 16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022. The seven proposed 132 kV overhead transmission powerlines will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

Overall, seven 132 kV overhead transmission powerlines will be assessed and seven separate applications for Environmental Authorisation (EA) will be submitted to the Department of Forestry, Fisheries and the Environment (DFFE). Therefore, seven separate EAs will be issued at the end of the BA Processes.

Because of the insignificant agricultural impact of electrical grid infrastructure, it is not necessary to consider the detail of the design and layout of the development in this assessment. It would have insignificant agricultural impact, regardless of its design and layout.

3 TERMS OF REFERENCE

The terms of reference for this study is to fulfill the requirements of the *Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources* gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) and (H) and 44 of NEMA, 1998).

The level of agricultural assessment required in terms of the protocol for this development is an Agricultural Compliance Statement because the site is of less than high agricultural sensitivity on the screening tool and the development is a linear activity.

The terms of reference for an Agricultural Compliance Statement, as stipulated in the protocol, are listed below, and the section number of this report which fulfils each stipulation is given after it in brackets.

1. The Agricultural Compliance Statement must be prepared by a soil scientist or agricultural specialist registered with the South African Council for Natural Scientific Professions (SACNASP) **(Appendix 1)**.

2. The compliance statement must:
    1. be applicable to the preferred site and proposed development footprint;
    2. confirm that the site is of “low” or “medium” sensitivity for agriculture **(Section 7)**; and
    3. indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site **(Section 9.6)**.
3. The Agricultural Compliance Statement must contain, as a minimum, the following information:
    1. details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the statement including a curriculum vitae **(Appendix 1)**;
    2. a signed statement of independence by the specialist **(Appendix 2)**;
    3. a map showing the proposed development footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool **(Figure 2)**;
    4. confirmation from the specialist that all reasonable measures have been taken through micro-siting to avoid or minimize fragmentation and disturbance of agricultural activities **(Section 9.4)**;
    5. a substantiated statement from the soil scientist or agricultural specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not of the proposed development **(Section 9.6)**;
    6. any conditions to which this statement is subjected **(Section 11)**;
    7. in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase **(Section 9.5)**;
    8. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr **(Section 10)**; and
    9. a description of the assumptions made and any uncertainties or gaps in knowledge or data **(Section 5)**.

4 METHODOLOGY OF STUDY

4.1 Methodology for assessing the agro-ecosystem

This report adheres to the process and content requirements of the gazetted agricultural protocol as outlined in Section 3 above. As per the requirement, the assessment was based on a desktop analysis of existing soil and agricultural potential data for the site.

The following sources of information were used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries (DAFF). This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the DAFF, Pretoria.
- Field crop boundaries were sourced from Crop Estimates Consortium, 2019. *Field Crop Boundary data layer, 2019*. Pretoria. Department of Agriculture, Forestry and Fisheries.
- Rainfall and evaporation data was sourced from the SA Atlas of Climatology and Agrohydrology (2009, R.E. Schulze) available on Cape Farm Mapper.
- Grazing capacity data was sourced from the 2018 DAFF long-term grazing capacity map for South Africa, available on Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.

5 ASSUMPTIONS, UNCERTAINTIES OR GAPS IN KNOWLEDGE OR DATA

There are no specific assumptions, uncertainties or gaps in knowledge or data that affect the findings of this study.

6 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

Power lines require the registration of a servitude for each farm portion crossed. In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA), the registration of a power line servitude requires written consent of the Minister unless either of the following two conditions apply:

1. if the servitude width does not exceed 15 metres; and
2. if Eskom is the applicant for the servitude.

If one or both of these conditions apply, then no agricultural consent is required. The second condition is likely to apply, even if another entity gets Environmental Authorisation for and constructs the power line, but then hands it over to Eskom for its operation. Eskom is currently exempt from agricultural consent for power line servitudes.

Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). A consent in terms of CARA is required for the cultivation of virgin land. Cultivation is defined in CARA as "any act by means of which the topsoil is disturbed mechanically". The purpose of this consent for the cultivation of virgin land is to ensure that only land that is suitable as arable land is cultivated. Therefore, despite the above definition of cultivation, disturbance to the topsoil that results from the construction of an overhead power line and its associated infrastructure does not constitute cultivation as it is understood in CARA. This has been corroborated by Anneliza Collett (Acting Scientific Manager: Natural Resources Inventories and Assessments in the Directorate: Land and Soil Management of the Department of Agriculture, Land Reform and Rural Development (DALRRD)). The construction and operation of the facility will therefore not require consent from the Department of Agriculture, Land Reform and Rural Development in terms of this provision of CARA.

7 SITE SENSITIVITY VERIFICATION

In terms of the gazetted agricultural protocol, a site sensitivity verification must be submitted that:

1. confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
2. contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.

However, the verification of agricultural sensitivity of the power line route has very little relevance to this assessment because the agricultural impacts of a power line are insignificant in such an agricultural environment, regardless of the level of agricultural sensitivity of the land which it traverses.

Agricultural sensitivity, as used in the national web-based environmental screening tool, is a direct function of the capability of the land for agricultural production. The general assessment of agricultural sensitivity that is employed in the national web-based environmental screening tool, identifies all arable land that can support viable crop production, as high (or very high) sensitivity. This is because there is a scarcity of arable production land in South Africa and its conservation for agricultural use is therefore a priority. Land which cannot support viable crop production is much less of a priority to conserve for agricultural use, and is rated as medium or low agricultural sensitivity.

It is important to recognise that the agricultural sensitivity of land, in terms of a particular development, is not only a function of the screening tool sensitivity, but is also a function of the severity of the impact which that development poses to agriculture. This is not recognised in the screening tool classification of sensitivity. So, for example, the sensitivity of an agricultural environment to overhead power lines is not what the screening tool classifies the sensitivity as, because most agricultural environments have a very low sensitivity to overhead power lines because these have negligible agricultural impact, regardless of the agricultural production potential of the land that they cross (see Section 9). Therefore, in the context of the development of overhead power lines, almost no land can be considered to have high sensitivity for impacts on agricultural resources.

The screening tool classifies agricultural sensitivity according to only two independent criteria – the land capability rating and whether the land is used for cropland or not. All cropland is classified as at least high sensitivity, based on the logic that if it is under crop production, it is indeed suitable for it, irrespective of its land capability rating.

The screening tool sensitivity categories in terms of land capability are based upon the Department of Agriculture's updated and refined, country-wide land capability mapping, released in 2016. The data is generated by GIS modelling. Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land, based on its soil, climate and terrain. The higher land capability values (≥8 to 15) are likely to be suitable as arable land for crop production, while lower values are only likely to be suitable as non-arable grazing land.

A map of the proposed entire corridor in which all 7 power lines will be located, overlaid on the screening tool sensitivity, is given in Figure 2. As noted above, the screening tool sensitivity of the power line corridors is irrelevant to agricultural impact. Because none of the land is classified as cropland, agricultural sensitivity is purely a function of land capability. The land capability of the corridor on the screening tool is predominantly 5, which translates to a low agricultural sensitivity, but it varies from 4 (low sensitivity) to 7 (medium sensitivity).

The predominantly low agricultural sensitivity, as identified by the screening tool, is confirmed by this assessment. The motivation for confirming the sensitivity is that the climate data with a low rainfall of 144 to 168 mm per annum (Schulze, 2009) proves the area to be arid, and therefore of limited land capability. A land capability of 5 and consequent low agricultural sensitivity is entirely appropriate for this land which is totally unsuitable for dryland crop production.

This site sensitivity verification verifies the entire site as being of less than high agricultural sensitivity and predominantly of low agricultural sensitivity. The required level of agricultural assessment is therefore confirmed as an Agricultural Compliance Statement.

Figure 2. *The proposed corridor in which the 7 power lines will be located (dark blue outline) overlaid on agricultural sensitivity, as given by the screening tool (green = low; yellow = medium; red = high).*

8 BASELINE DESCRIPTION OF THE AGRO-ECOSYSTEM

The arid climate (low rainfall of approximately 144 to 168 mm per annum and high evaporation of approximately 1,360 mm per annum) (Schulze, 2009) is the limiting factor for land capability, regardless of the soil capability and terrain. Moisture availability is insufficient for crop production without irrigation and the potential agricultural land use of the site is therefore limited to grazing. The land has a long term grazing capacity of 30 to 32 hectares per large stock unit. Because climate is the limiting factor that controls production potential, it is the only aspect of the agro-ecosystem description that is required for assessing the agricultural impact of this development.

9 ASSESSMENT OF AGRICULTURAL IMPACT

9.1 General

An agricultural impact is a temporary or permanent change to the future production potential of land. The significance of the agricultural impact is directly proportional to the extent of the change in production potential. If a development will not change the future production potential of the land, then there is no agricultural impact.

The proposed electrical grid infrastructure has insignificant agricultural impact for two reasons:

- There is no loss of future agricultural production potential under transmission lines because all agricultural activities that are viable in this environment, can continue completely unhindered underneath transmission lines. The direct, permanent, physical footprint of the development that has any potential to interfere with agriculture, including a service track below the lines, is insignificantly small within an agricultural environment of large farms with low density grazing.
- The affected land across the entire corridor has very limited agricultural production potential, anyway.

The only sources of impact is minimal disturbance to the land (erosion and topsoil loss) during construction (and decommissioning). Land disturbance can be completely and fairly easily mitigated through generic mitigation measures included in the EMPr. However, farmers frequently complain that these impacts occur because the EMPr is not adequately implemented.

There is likely to be some nuisance disturbance to agricultural activities during construction. A common complaint from farmers is that gates are left open by contractors. However nuisance disturbances are highly unlikely to translate into a change in agricultural production and therefore do not constitute an agricultural impact as defined in the first paragraph of this section.

9.2 Cumulative impact

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. It is important to note that the cumulative impact assessment for a particular project, like what is being done here, is not the same as an assessment of the impact of all surrounding projects. The cumulative assessment for this project is an assessment only of the impacts associated with this project, but seen in the context of all surrounding impacts. It is concerned with this project's contribution to the overall impact, within the context of the overall impact. But it is not simply the overall impact itself.

The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss of future agricultural production potential. The defining question for assessing the cumulative agricultural impact is this:

> What level of loss of future agricultural production potential is acceptable in the area, and will the loss associated with the proposed development, when considered in the context of all past, present or reasonably foreseeable future impacts, cause that level in the area to be exceeded?

There are a number of renewable energy developments that are leading to loss of agricultural grazing land in the area. However, because this overhead line itself leads to insignificant agricultural land loss, its cumulative impact must also logically be insignificant. It therefore does not make sense to conduct a more formal assessment of the development's cumulative impacts as per DFFE requirements for cumulative impacts. Many times more electricity grid infrastructure than currently exists, or is currently proposed, can be accommodated before acceptable levels of change in terms of loss of production potential are exceeded. In reality the landscape in this environment could be covered with power lines and agricultural production potential would not be affected.

Due to the considerations discussed above, the cumulative impact of loss of future agricultural production potential can confidently be assessed as not having an unacceptable negative impact on the area. In terms of cumulative impact, the proposed development is therefore acceptable and it is therefore recommended that it be approved.

9.3 Impacts of the no-go alternative

The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. There is no agricultural impact of the no-go option. Therefore, the extent to which the development (insignificant impact) and the no-go alternative will impact agricultural production are more or less equal, which results in there being, from an agricultural impact perspective only, no preferred alternative between the development and the no-go. However, the no-go option would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of renewable energy in South Africa.

9.4 Micro-siting to minimize fragmentation and disturbance of agricultural activities

The agricultural protocol requires confirmation that all reasonable measures have been taken through micro-siting to minimize fragmentation and disturbance of agricultural activities. However, the agricultural uniformity and low agricultural potential of the environment, means that the exact positions of all infrastructure will make no material difference to agricultural impacts and disturbance.

9.5 Confirmation of linear activity impact

The protocol requires confirmation in the case of a linear activity, that the land can be returned to the current state within two years of completion of the construction phase. It is hereby confirmed that the land under the overhead power line route can be returned to the current state within two years of construction.

9.6 Impact assessment and statement

An Agricultural Compliance Statement is not required to formally rate agricultural impacts. It is only required to indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site. It must provide a substantiated statement on the acceptability, or not, of the proposed development and a recommendation on the approval, or not of the proposed development.

Nevertheless, it is hereby confirmed that the agricultural impact of the proposed development which includes all 7 overhead power lines is insignificant.

The conclusion of this assessment is that the proposed development will have an insignificant and therefore acceptable impact on the future agricultural production potential of the sites. This is because:

- There is no loss of future agricultural production potential under transmission lines because all agricultural activities that are viable in this environment, can continue completely unhindered underneath transmission lines. The direct, permanent, physical footprint of the development that has any potential to interfere with agriculture, including a service track below the lines, is insignificantly small within an agricultural environment of large farms with low density grazing.

- The affected land across the entire corridor has very limited agricultural production potential, anyway.

Therefore, from an agricultural impact point of view, it is recommended that all 7 overhead power lines be approved.

10 ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

There are no additional mitigation measures required, over and above what has already been included in the Generic EMPr for overhead electricity transmission and distribution infrastructure as per Government Notice 435, which was published in Government Gazette 42323 on 22 March 2019.

11 CONCLUSIONS

The conclusion of this assessment is that the development of each of the 7 overhead power lines will have insignificant agricultural impact and will therefore be acceptable in terms of their impacts on the agricultural production capability of the sites. This is substantiated by the facts that the loss of agricultural production potential resulting from the development of all 7 power ines is insignificant because of the insignificant amount of land excluded from agricultural production and because of the land's very limited production potential.

The only sources of impact are minimal disturbance to the land (erosion and topsoil loss) during construction (and decommissioning). Land disturbance can be completely and fairly easily mitigated through generic mitigation measures.

From an agricultural impact point of view, it is recommended that the development of all 7 power lines be approved.

The conclusion of this assessment on the acceptability of the proposed power lines and the recommendation for their approval is not subject to any conditions.

12 REFERENCES

Crop Estimates Consortium, 2019. *Field Crop Boundary data layer, 2019*. Pretoria. Department of Agriculture, Forestry and Fisheries.

Department of Agriculture Forestry and Fisheries (DAFF), 2018. Long-term grazing capacity map for

South Africa developed in line with the provisions of Regulation 10 of the Conservation of Agricultural Resources Act, Act no 43 of 1983 (CARA), available on Cape Farm Mapper. Available at: https://gis.elsenburg.com/apps/cfm/

Department of Agriculture, Forestry and Fisheries, 2017. National land capability evaluation raster data layer, 2017. Pretoria.

Schulze, R.E. 2009. SA Atlas of Climatology and Agrohydrology, available on Cape Farm Mapper. Available at: https://gis.elsenburg.com/apps/cfm/

APPENDIX 1: SPECIALIST CURRICULUM VITAE

Johann Lanz
Curriculum Vitae

Education

M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - 1997
B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I have been registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science since 2012 (registration number 400268/12) and am a member of the Soil Science Society of South Africa.

Soil & Agricultural Consulting **Self employed** **2002 - present**

Within the past 5 years of running my soil and agricultural consulting business, I have completed more than 170 agricultural assessments (EIAs, SEAs, EMPRs) in all 9 provinces for renewable energy, mining, electrical grid infrastructure, urban, and agricultural developments. I was the appointed agricultural specialist for the nation-wide SEAs for wind and solar PV developments, electrical grid infrastructure, and gas pipelines. My regular clients include: Zutari; CSIR; SiVEST; SLR; WSP; Arcus; SRK; Environamics; Royal Haskoning DHV; ABO; Enertrag; WKN-Windcurrent; JG Afrika; Mainstream; Redcap; G7; Mulilo; and Tiptrans. Recent agricultural clients for soil resource evaluations and mapping include Cederberg Wines; Western Cape Department of Agriculture; Vogelfontein Citrus; De Grendel Estate; Zewenwacht Wine Estate; and Goedgedacht Olives.

In 2018 I completed a ground-breaking case study that measured the agricultural impact of existing wind farms in the Eastern Cape.

Soil Science Consultant **Agricultural Consultors International (Tinie du Preez)** **1998 - 2001**

Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

Contracting Soil Scientist **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

Completed a contract to advise soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

APPENDIX 2: DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

BASIC ASSESSMENT PROCESSES FOR THE PROPOSED DEVELOPMENT OF SEVEN 132 KV OVERHEAD TRANSMISSION POWERLINES AND ITS ASSOCIATED ELECTRICAL INFRASTRUCTURE NEAR BEAUFORT WEST IN THE WESTERN CAPE PROVINCE

Kindly note the following:

- This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
- This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
- A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
- All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
- All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address: Department of Environmental Affairs, Attention: Chief Director: Integrated Environmental Authorisations, Private Bag X447, Pretoria, 0001
Physical address: Department of Environmental Affairs, Attention: Chief Director: Integrated Environmental Authorisations, Environment House, 473 Steve Biko Road, Arcadia
Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Johann Lanz – Soil Scientist			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Johann Lanz			
Specialist Qualifications:	M.Sc. (Environmental Geochemistry)			
Professional affiliation/registration:	Registered Professional Natural Scientist (Pr.Sci.Nat.) Reg. no. 400268/12 Member of the Soil Science Society of South Africa			
Physical address:	1a Wolfe Street, Wynberg, Cape Town, 7800			
Postal address:	1a Wolfe Street, Wynberg, Cape Town, 7800			
Postal code:	7800	Cell:	082 927 9018	
Telephone:	082 927 9018	Fax:	Who still uses a fax? I don't	
E-mail:	johann@johannlanz.co.za			

2. DECLARATION BY THE SPECIALIST

I, **Johann Lanz**, 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

Johann Lanz – Soil Scientist (sole proprietor)

Name of Company:

02/06/2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Johann Lanz**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

Johann Lanz – Soil Scientist (sole proprietor)

Name of Company

02/06/2022

Date

Matthew Wedel

Signature of the Commissioner of Oaths

2022-06-02

Date

SOUTH AFRICAN POLICE SERVICE
STATION COMMANDER
WYNBERG
2022 -06- 02
STASIEBEVELVOEDER
WYNBERG
SOUTH AFRICAN POLICE SERVICE

Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.2




Visual Impact Assessment

VISUAL IMPACT SPECIALIST ASSESSMENT

Basic Assessment for the Proposed Development of a 132 kV Overhead Transmission Powerline and its associated electrical grid infrastructure in support of the proposed Kwagga WEF 1-3, near Beaufort West, Western Cape

KWAGGA EGI - SECTION 6

Prepared for

ABO Wind Renewable Energies (Pty) Ltd
Unit B1, Mayfair Square
Century Way, Century City
Cape Town
7441

Prepared by

BAPELA CAVE KLAPWIJK
LAND PLANNING AND DESIGN
Menno Klapwijk
P.O Box 11651
HATFIELD
0028

JUNE 2022

Bapela Cave Klapwijk
Landscape Architects and Environmental Planners
11651 Hatfield 0028 (012) 362 4684 (012) 362 0394 cka@mweb.co.za

REPORT TITLE:	Visual Impact Assessment (VIA) for the Kwagga 132kV Overhead Transmission Powerline and its associated electrical grid infrastructure Section 6
CLIENT:	ABO Wind Renewable Energies (Pty) Ltd
PROJECT NAME:	132kV OHLs for the proposed Kwagga EGI Section 6 Visual Impact Assessment Report
REPORT STATUS:	Draft v1
BCK PROJECT NUMBER:	22002
PLACE AND DATE:	Pretoria, June 2022
KEYWORDS AND PHRASES:	Visual Impact Assessment Report, Overhead Transmission Powerline, Western Cape Province, Visual Impact Assessment, ABO

APPROVED

M KLAPWIJK

PROPONENT

Kwagga Wind Energy Facility 1 (Pty) Ltd is the project proponent who has commissioned this VIA. Contact details are as follows:

Proponent:	Kwagga Wind Energy Facility 1 (Pty) Ltd
Contact Person:	Rob Invernizzi
Physical address:	Unit B1, Mayfair Square, Century Way, Century City, Cape Town
Postal address:	Unit B1, Mayfair Square, Century Way, Century City, Cape Town
Telephone:	+27 (0) 21 180 3672
Fax:	n/a
Email:	rob.invernizzi@abo-wind.com

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Consultant:	Council for Scientific and Industrial Research (CSIR)
Contact Person:	Paul Lochner, Lizande Kellerman, Dhiveshni Moodley and Rohaida Abed (CSIR)
Physical address:	11 Jan Celliers Street, Stellenbosch
Postal address:	PO Box 320, Stellenbosch 7599
Telephone:	+27 21 888 2400
Fax:	+27 21 888 2693
Email:	lkellerman@csir.co.za / dmoodley1@csir.co.za

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INDEPENDENT VISUAL IMPACT ASSESSMENT CONSULTANT

Consultant:	Bapela Cave Klapwijk
Contact person:	Mr Menno Klapwijk
Physical address:	168 Nicolson Street, Brooklyn, Pretoria
Postal address:	P O Box 95702 Waterkloof, Pretoria, 0045
Telephone:	012-362 4684 0832558127
Fax:	012-362 0394
E-mail:	menno@bcksa.co.za

Menno Klapwijk has specialised for 38 years in environmental planning, construction rehabilitation and control, visual impact assessment, and landscape site design. Significant visual impact projects include: N3 De Beers Pass, Mzimvubu Government Water Scheme, Aggeneys Solar Park, Moatize Power Plant (Mozambique), Transnet Multi-purpose Pipeline, Saldanha Steel, Mozal (Alusaf – Mozambique), Letsibogo Dam (Botswana), Blue Circle Cement Factory (East London), Phlogopite Factory (Phalaborwa), Iscor Heavy Minerals Smelter (Empangeni), many VIA's for Eskom 765 kV and 400kV transmission lines and substations, Mmamabula 400kV Transmission Line, Mine and Power Plant (Botswana), West Coast Combined Cycle Gas Turbine Power Plant (CCGT), De Hoop Dam and Pipeline (Sekhukuneland), Tugela Water Project (KwaZulu-Natal), Delportshoop Tower Mast (Delportshoop, Northern Cape), N3 Toll Road, Cedara (KwaZulu-Natal) to Heidelberg (Gauteng), Maputo Steel Project (Maputo, Mazambique), Ga-Pila Village (Potgietersrus, Limpopo Province) and Pom Pom Camp (Okavango, Botswana).

He has more than 100 publications and reports dealing mostly with environmental planning, environmental rehabilitations and control specification, environmental impact assessment and visual impact assessment.

1983:	B. Sc (Land Arch), Texas A & M
1986:	Environmental Impact Assessment, Graduate School of Business, UCT
Registered:	South African Council for Landscape Architecture Practitioners (SACLAP)
Member:	Institute of Landscape Architects of South Africa (ILASA)
Member:	International Association of Impact Assessors (SA)
Past Council Member:	Council for the Built Environment (CBE)

DECLARATION OF INDEPENDENCE
I, Menno Klapwijk, as authorised representative of Cave Klapwijk and Associates, hereby confirm my independence as a specialist and declare that neither I nor Cave Klapwijk and Associates have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Cave Klapwijk and Associates was appointed as Visual Impact Assessor in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Visual Impact Assessment for the Hatherley Township Establishment Environmental Impact Assessment. I further declare that I am confident in the results of the studies undertaken and conclusions drawn as a result of it – as is described in my attached report.

Signed………………….. Date: 27 June 2022

EXECUTIVE SUMMARY

VISUAL IMPACT SPECIALIST ASSESSMENT REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS, AS AMENDED

KWAGGA EGI - SECTION 6

Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 to the proposed Kwagga Wind Energy Facility 1, near Beaufort West in the Western Cape Province

INTRODUCTION

ABO Wind renewable energies (Pty) Ltd ("the Developer") is proposing the construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022.

The seven proposed 132 kV overhead transmission powerlines, in the Central Karoo District Municipality situated to the south of Beaufort West in the Western Cape Province, (Refer to **Figure 1 Regional Locality Map** which identifies the study area)**,** will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

Overall, seven 132 kV overhead transmission powerlines will be assessed **(See Section 6, Figure 3 Proposed Grid Infrastructure)** and seven separate applications for Environmental Authorisation (EA) will be submitted to the Department of Forestry, Fisheries and the Environment (DFFE). Therefore, seven separate EAs will be issued at the end of the BA Processes.

METHOD

In order to address the objectives of the impact assessment study the following method has been used:

- In terms of the EIA process a site sensitivity verification process was initiated. This report provided recommendations based on the site's sensitivity to the proposed development;

- Define the extent of the affected visual environment, the viewing distance and the critical views;

- Determine the setting, visual character and land use of the area surrounding the area, and the Genius Loci (sense of place). This was done in terms of:

  - Topography
  - Vegetation cover
  - Land use
  - Visibility
  - Landscape diversity
  - Landscape character
  - Landscape quality

- Discussions and meetings with the specialist consultant team to identify specific aspects of the construction and development which would affect the visual quality of a setting;

- Define the extent of the affected visual environment, the viewing distance and the critical views;

- An evaluation was made of the landscape characteristics against which impact criteria ratings were applied;

- The method used was both a desktop study using Google Earth and a site inspection. The Screening report generated by the National Web-Based Environmental Screening Tool, as provided by the CSIR, was used as a point of departure.

- The viewshed, the area within which the proposed project can be visible, was determined using digital 1:50 000 topographic maps with 20 m contour intervals analysed by the Geographic Information System (GIS), algorithms available in the ArcView Software Suite.

- A site visit was undertaken over the period of 11 to 13 May 2022.

- The purpose of the site visit was to determine the extent of the potential visibility of the turbine structures and to understand and document the receiving environment.

- The field study entailed travelling public roads that surrounded and crossed the study area to determine the potential visibility from these areas. The route (**Figure 2: Locality Map with Photo/Viewpoints**) followed a west to east road to the south of the area. The route then followed a road on the east in a north-easterly direction, then cutting back west off the Rietbron Road through the centre of the study area back to the N12. The route then followed the N12 south to Viewpoint VP16).

LIMITATIONS, CONSTRAINTS AND ASSUMPTIONS

The following assumptions and limitations are applicable to this study:

The basis for this assessment is that scenic wilderness areas form the core of eco-tourism due to the high positive aesthetic appeal.

- The assessment is based on assumed demographic data. No detailed study was done to determine accurate data on potential viewers of the project components. If necessary, these studies could be undertaken during the design phase of the project;

- Determining a visual resource in absolute terms is not achievable. Evaluating a landscape's visual quality is both complex and problematic. Various approaches have been developed but they all have one problem in common: unlike noise or air pollution, which can be measured in a relatively simple way, for the visual landscape mainly qualitative standards apply. Therefore, subjectivity cannot be excluded in the assessment procedure (Lange 1994). Individually there is a great variation in the evaluation of the visual landscape based on different experiences, social level and cultural background. Exacerbating the situation is the inherent variability in natural features. Climate, season, atmospheric conditions, region, sub-region all affect the attributes that comprise the landscape. What is considered scenic to one person may not be to another (NLA, 1997);

- Localized visual perceptions of the economically depressed communities have not been tested as these may be influenced rather by the economic and job opportunities that would exist rather than the direct visual perception of the project;

- The viewshed map is computer generated and does not take into account local and minor visual interruptions in the landscape such as trees on the edge of roads, minor landforms, buildings, etc. As a result, the visibility on these maps could be overstated.

- The assessment does not consider the ancillary project infrastructure and components such as borrow pits, spoil dumps, construction camp sites, etc. These components will be assessed in detail during the design phase should the project be implemented;

- The 'Do Nothing' alternative was not specifically addressed as it is likely that the existing landscape will remain in its existing condition;

If the study, however, determined that the negative visual impact is of such a magnitude and significance that it will seriously influence the decision on whether or not to build, it will then be necessary to test and determine the visual perceptions of neighbouring communities. Such a study is involved, costly and time consuming.

FINDINGS

The impact assessment was undertaken for only the main components of the project i.e., the overhead transmission powerlines and associated infrastructure. The study excluded ancillary components such as borrow pits, quarries, lay-down areas and construction camps. This study evaluated the visual impact of the project with a view to assessing its severity based on the author's experience, expert opinion, and accepted techniques.

The description of the visual impacts of the phases of construction and decommissioning are not considered as significant visual impacts since the period of activity is of relatively short duration and of a primary impact (localized, of short duration and easily mitigated at the end of the phase). The fact that disturbed areas, e.g., camps / lay-down areas will be rehabilitated also reduces the impacts of these phases.

It is the operational phase that presents the most significant long term visual impact. This is due primarily to the scale and form of the proposed development. Visibility reduces exponentially the further the viewer is from the proposed development.

Table 3, **High Level Impact Table - Visual**, summarises the impacts for the construction, operation, and decommissioning phases.

EVALUATION OF THE PROJECT

The project will exert a **negative** influence on the visual environment. This is largely due to the:

- high visibility of the pylons which can be 28 m high, within the study area, especially as it is adjacent to the N12 and that the site when viewed from the road is flat and open sloping down to the east;
- the high visibility of construction and operation activity within the low growing, uniform open Karoo veld of uniform visual pattern;
- the low VAC of the area due to the low and uniform visual pattern of vegetation which does not allow for the project to be visually accommodated within the landscape as a result of the high visual contrast and absent screening;
- the scale of the project in a rural setting;

However, due to the low relative visual quality of the area the overall significance of the visual impact is regarded as **Moderate** (a rating of **3** on a scale of 1-5) for both pre- and post-mitigation during the operational phase. The significance of the visual impact for the construction phase is regarded as **Low** for both pre- and post-mitigation, while the significance of the visual impact after the decommissioning phase is regarded as **Low** pre-mitigation and **Very Low** post-mitigation

CONCLUSIONS

Based on the field observations and the studies herein and with the implementation of the mitigation measures, it is the Visual Specialist's opinion the visual impact of the 132kV Overhead Transmission Powerline and its associated electrical grid infrastructure does not present a potential fatal flaw provided that the recommended mitigation measures are implemented.

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VISUAL IMPACT SPECIALIST ASSESSMENT REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS, AS AMENDED

KWAGGA EGI - SECTION 6

Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 to the proposed Kwagga Wind Energy Facility 1, near Beaufort West in the Western Cape Province

1 INTRODUCTION

ABO Wind renewable energies (Pty) Ltd ("the Developer") is proposing the construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022.

The seven proposed 132 kV overhead transmission powerlines, in the Central Karoo District Municipality situated to the south of Beaufort West in the Western Cape Province, (Refer to **Figure 1 Regional Locality Map** which identifies the study area)**,** will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

Overall, seven 132 kV overhead transmission powerlines will be assessed **(See Section 6, Figure 3 Proposed Grid Infrastructure)** and seven separate applications for Environmental Authorisation (EA) will be submitted to the Department of Forestry, Fisheries and the Environment (DFFE). Therefore, seven separate EAs will be issued at the end of the BA Processes.

The sections are as follows:

- Section 1 (A-B): 132kV OHL from the proposed Beaufort West 132 kV-400 kV Linking Station to the proposed Eskom 132 kV Switching Station (SS)
- Section 2 (B-C): 132kV OHL from the proposed Eskom 132 kV SS to the Kwagga WEF 1
- Section 3 (B-D via C): 132kV OHL from the proposed Eskom 132 kV SS to the Kwagga WEF 2
- Section 4 (B-E via C & D): 132kV OHL from the proposed Eskom 132 kV SS to the Kwagga WEF 3
- Section 5 (C-D): 132kV OHL from Kwagga WEF 1 to Kwagga WEF 2
- Section 6 (C-E via D): 132kV OHL from Kwagga WEF 1 to Kwagga WEF 3
- Section 7 (D-E): 132kV OHL from Kwagga WEF 2 to Kwagga WEF 3

It must be noted that this report only covers the proposed 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 1 to the proposed Kwagga Wind Energy Facility 3 ('Section 6')

As required in Part A of the Government Gazette 43110, GN 320, a site visit was undertaken to confirm the current land use and environmental sensitivity of the proposed project area. The details of the site visit are noted below:

Date of Site Visit	11-12 May 2022
Specialist Name	Menno Klapwijk
Professional Registration Number	87006
Specialist Affiliation / Company	South African council for the Landscape Architectural Professions (SACLAP) Bapela Cave Klapwijk
Specialist Topic	Visual Impact Assessment
Proposed Project Name	Kwagga 132kV OTP Section 6

The study area was determined as the site and a 20 km assessment zone around it. (**Figure 1 Regional Locality Map).** The visibility of the powerlines would be insignificant beyond this point.

Figure 1: Regional Locality Map

2 BACKGROUND AND BRIEF

This visual assessment is a specialist study to determine the visual effects of the proposed development on the surrounding environment.

The primary objective of this specialist study is therefore to describe the potential impact of these structures on the visual character and sense of place of the area. This Specialist Study will have the following objectives:

- Determine the visual character of the areas along the proposed route by evaluating environmental components such as topography, current land use activities, surrounding land use activities, etc.
- Identify elements of particular visual quality that could be affected by the proposed project.
- Assessment of the preferred project layout following the site sensitivity verification and layout identification.
- Viewshed for various elements of the proposed development must be calculated, defined and presented, and the varying sensitivities of these viewsheds must be highlighted;
- Specification of development setbacks or buffers required, and provide clear motivations for these recommendations;
- Identification and assessment of the potential direct, indirect and cumulative impacts of the proposed development on the receiving environment from a visual perspective;
- Cumulative impacts to be assessed by considering renewable energy projects and other applicable (and relevant) projects within 20 km of the proposed projects.
- Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project.
- Identification and presentation of schematic portrayals of the visual impact of the proposed project infrastructure on the different viewsheds. All impacts should be considered under varying conditions as appropriate to the assessment i.e. day, night, clear weather, cloudy weather, etc.
- Maps depicting viewsheds across the sites should be generated and included in the VIA Report. These maps must indicate current viewsheds/visual landscape/obstructions, as well as expected visual impacts during the construction, operational and decommissioning phases of the proposed project.
- An impact statement indicating the acceptability of the proposed development and EA condition recommendations;
- A description of assumptions and limitations in the report;
- A section indicating how the National Web-Based Screening Tool was interrogated and whether classification of the site is accurate or not. If not, it must be motivated why the classification is not accurate;
- Identification of any additional protocols, licensing and/or permitting requirements that are relevant to the project and the implications thereof;
- Provide recommendations with regards to potential monitoring programmes; and
- Determine mitigation and/or management measures, which could be implemented to as far as possible, reduce the effect of negative impacts and enhance the effect of positive impacts. Also, identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This will be included in the EMPr, which will be appended to the EIA Report.

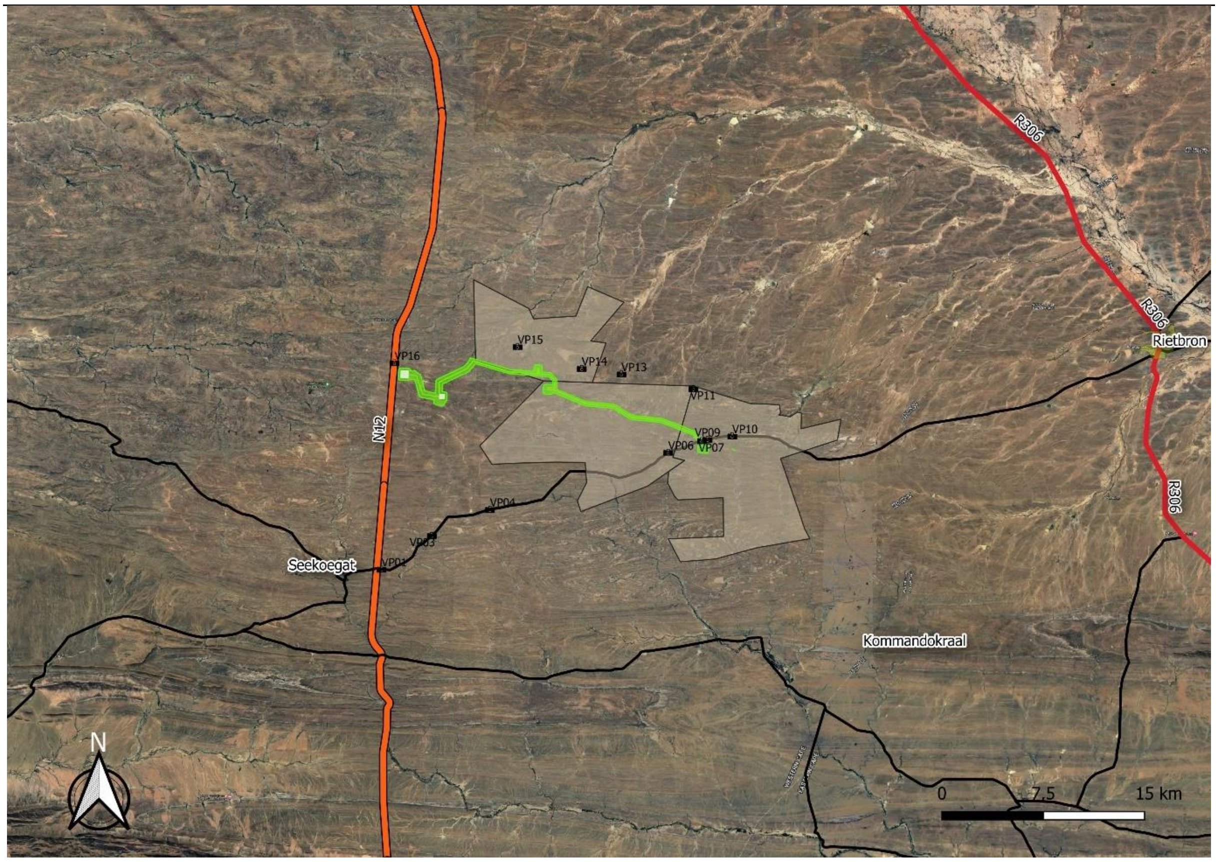


Figure 2: Local Locality Map with Photo/Viewpoints

3 METHOD

In order to address the objectives of the impact assessment study the following method has been used:

- In terms of the EIA process a site sensitivity verification process was initiated. This report provided recommendations based the site's sensitivity to the proposed development;

- Define the extent of the affected visual environmental, the viewing distance and the critical views;

- Determine the setting, visual character and land use of the area surrounding the area, and the Genius Loci (sense of place). This was done in terms of:

  - Topography
  - Vegetation cover
  - Land use
  - Visibility
  - Landscape diversity
  - Landscape character
  - Landscape quality

- Discussions and meetings with the specialist consultant team to identify specific aspects of the construction and development which would affect the visual quality of a setting;

- Define the extent of the affected visual environmental, the viewing distance and the critical views;

- An evaluation was made of the landscape characteristics against which impact criteria ratings were applied;

- The method used was both a desk top study using Google Earth and a site inspection. The Screening report generated by the National Web-Based Environmental Screening Tool, as provided by the CSIR, was used as a point of departure.

- The viewshed, the area within which the proposed project can be visible, was determined using digital 1:50 000 topographic maps with 20 m contour intervals analysed by the Geographic Information System (GIS), algorithms available in the ArcView Software Suite.

- A site visit was undertaken over the period of 11 to 12 May 2022.

- The purpose of the site visit was to determine the extent of the potential visibility of the turbine structures and to understand and document the receiving environment.

- The field study entailed travelling public roads that surrounded and crossed the study area to determine the potential visibility from these areas. The route (**Figure 2: Locality Map with Photo/Viewpoints**) followed a west to east road to the south of the area. The route then followed a road on the east in a north-easterly direction, then cutting back west off the Rietbron Road through the centre of the study area back to the N12. The route then followed the N12 south to Viewpoint VP16).

4 LIMITATIONS, CONSTRAINTS AND ASSUMPTIONS

The following assumptions and limitations are applicable to this study:

- The assessment is based on assumed demographic data. No detailed study was done to determine accurate data on potential viewers of the project components. If necessary, these studies could be undertaken during the design phase of the project; Google Earth was used to identify homesteads and structures that may be visually impacted. This information was used during the site inspection. It was not possible to determine whether these structures were occupied as most of them were closed when the site visit was conducted. It could also be that these structures are occupied on a temporary basis.

- Determining a visual resource in absolute terms is not achievable. Evaluating a landscape's visual quality is both complex and problematic. Various approaches have been developed but they all have one problem in common: unlike noise or air pollution, which can be measured in a relatively simple way, for the visual landscape mainly qualitative standards apply. Therefore, subjectivity cannot be excluded in the assessment procedure (Lange 1994). Individually there is a great variation in the evaluation of the visual landscape based on different experiences, social level and cultural background. Exacerbating the situation is the inherent variability in natural features. Climate, season, atmospheric conditions, region, sub-region all affect the attributes that comprise the landscape. What is considered scenic to one person may not be to another (NLA, 1997);

- Localized visual perceptions of the economically depressed communities have not been tested as these may be influenced rather by the economic and job opportunities that would exist rather than the direct visual perception of the project;

- The viewshed map is computer generated and does not take into account local and minor visual interruptions in the landscape such as trees on the edge of roads, minor landforms, buildings, etc. As a result, the visibility on these maps could be overstated.

- The assessment does not consider the ancillary project infrastructure and components such as borrow pits, spoil dumps, construction camp sites, etc. These components will be assessed in detail during the design phase should the project be implemented;

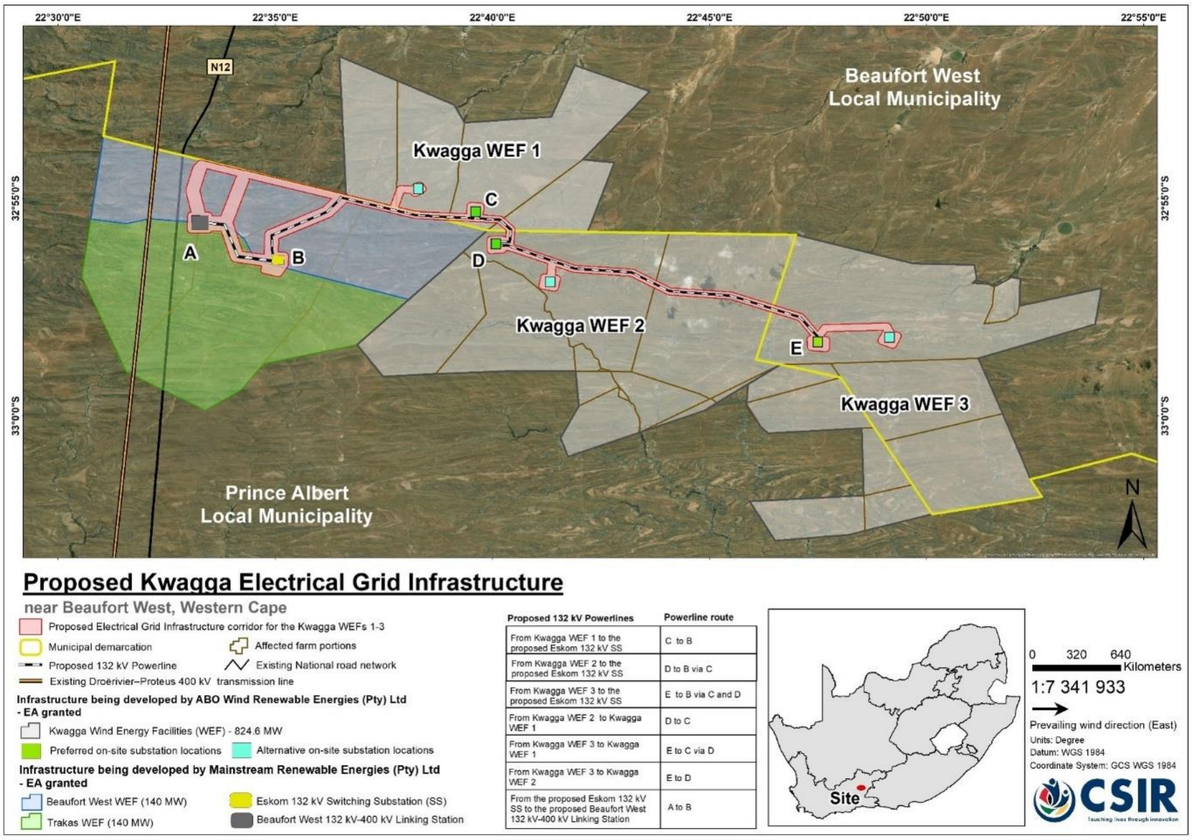
- The 'Do Nothing' alternative was not specifically addressed as it is likely that the existing landscape will remain in its existing condition;

If the study, however, determined that the negative visual impact is of such a magnitude and significance that it will seriously influence the decision on whether to build, it will then be necessary to test and determine the visual perceptions of neighbouring communities. Such a study is involved, costly and time consuming.

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 Description of the Works

It is understood that the proposed Eskom 132 kV Switching Substation and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1) will be constructed by South Africa Mainstream Renewable Power Developments (Pty) Ltd (“Mainstream”) in support of their Beaufort West WEF (DFFE Ref: 12-12-20-1784-1-AM2) and the Trakas WEF (DFFE Ref: 12-12-20-1784-2-AM2) that are to be located on land directly adjacent to the proposed Kwagga WEFs 1-3. ABO Wind has signed a servitude agreement and relevant powers of attorney with the landowner of the relevant Beaufort West and Trakas WEFs affected land portions and obtained agreement with Mainstream to facilitate the connection of the proposed Kwagga WEFs 1-3 via 132 kV overhead powerlines, via the aforementioned Eskom Switching Substation and the Beaufort West 132 kV-400 kV Linking Station, to the existing Droërivier–Proteus 400 kV overhead powerline that runs parallel to the N12 in a north-south direction.



Proposed 132 kV Powerlines	Powerline route
From Kwagga WEF 1 to the proposed Eskom 132 kV SS	C to B
From Kwagga WEF 2 to the proposed Eskom 132 kV SS	D to B via C
From Kwagga WEF 3 to the proposed Eskom 132 kV SS	E to B via C and D
From Kwagga WEF 2 to Kwagga WEF 1	D to C
From Kwagga WEF 3 to Kwagga WEF 1	E to C via D
From Kwagga WEF 3 to Kwagga WEF 2	E to D
From the proposed Eskom 132 kV SS to the proposed Beaufort West 132 kV-400 kV Linking Station	A to B

Figure 3 Proposed Grid Infrastructure

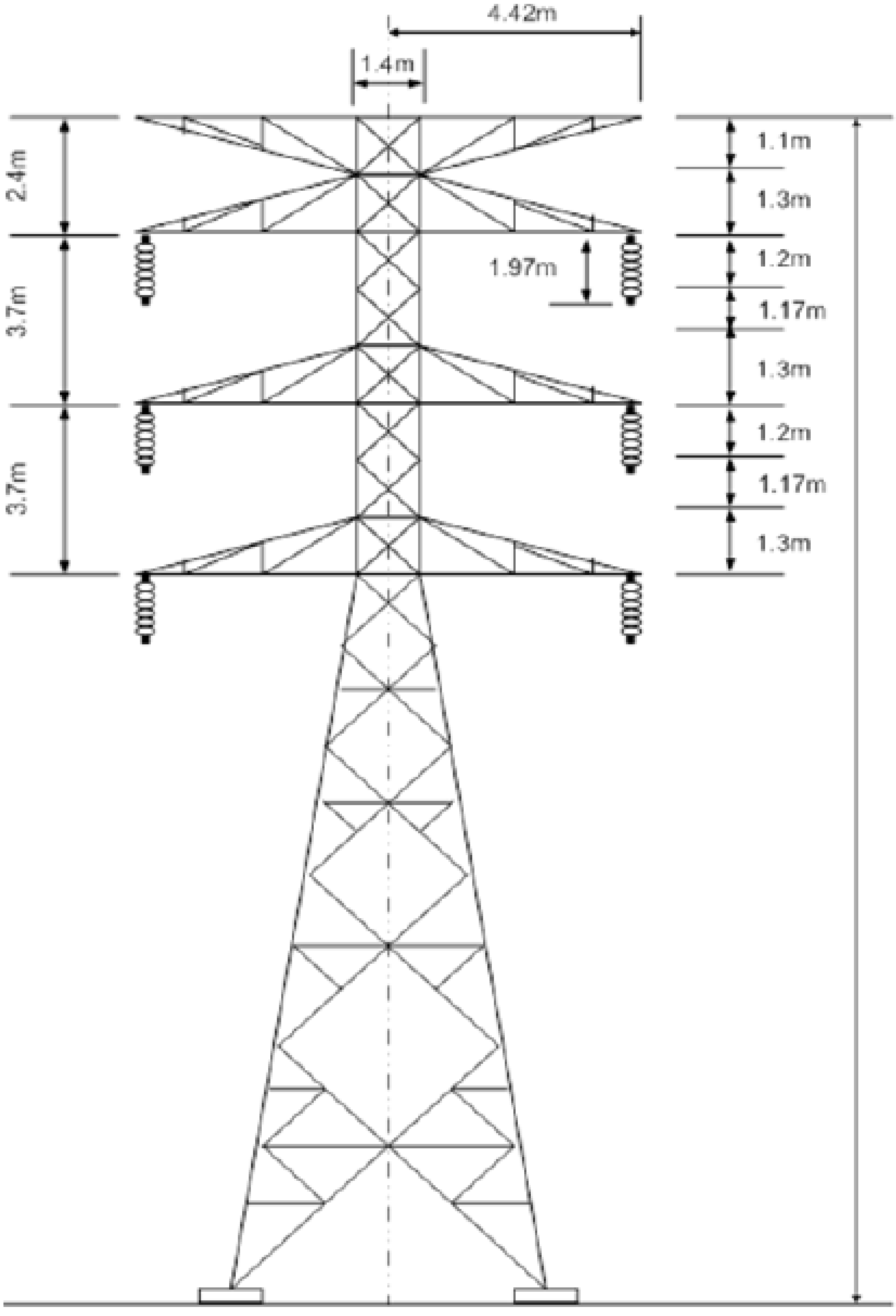


Figure 4 Diagram of Proposed Tower

5.2 Description of the Affected Receiving Environment

The extent of the visual impact of the project will depend on the following characteristics of the receiving environment:

Topography

Topography describes the landform that gives rise the physical setting.

Vegetation Cover

Vegetation refers to the vegetation cover in terms of visual diversity and not in terms of botanical characteristics.

Land Use*

Land use is described in terms of the visual mix of land uses that is a function of land diversity and character.

Visibility

Visibility is described in terms of the areas that theoretically have direct line of sight in relation to distance the viewer is away from the object. Critical affected views are also described.

Landscape Diversity

Landscape diversity is a function of topography, vegetation and land use. The greater the diversity, the greater is the potential for the proposed development to blend with the surrounding landscape.

Landscape Character

The spirit, or sense of place, is that quality imparted by the aspects of scale, colour, texture, landform, enclosure, and in particular, the land use. According to K. Lynch (1992) ‘it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular character of its own’.

The quality of *Genius Loci* is a function of attributes such as the scenic beauty or uniqueness and distinctive character of the built and cultural landscape.

Visual Quality

The visual quality is the visual significance given to a landscape determined by cultural values and the landscape’s intrinsic physical properties (Smardon, *et al*, 1986). While many factors contribute to a landscape’s visual quality, they can ultimately be grouped under three headings: vividness, intactness and unity.

The visual quality can be categorised under relative headings such as high, medium and low visual quality for the study area. High refers to those areas that have a high aesthetic appeal such as mountains, river valleys, unspoilt coastal zones, and wilderness areas. The medium areas are those that have high visual diversity, but which have already been modified by human activity comprising the aesthetic appeal such as roads, minor infrastructure and settlements. The low visual quality areas are those that are relatively highly populated, and which have been heavily impacted on by human activity such as industrial and mining areas or which have a low aesthetic appeal due to a lack of landscape diversity or interest.

The study area focuses on a 50 km radius around each of the project components.

5.2.1 Topography

The landscape is a relatively flat to rolling basin with low ridges and covered with low growing and sparse vegetation between the escarpment (the Nuweveld Mountains). to the north and the Cape Folded Mountains (Swartberg) to the south. Soils are very shallow and stony and are derived from the Beaufort Group shales and sandstones which give rise to very poor soils. Shallow drainage lines occur that trend generally from west to east across the study area. Both the hills around Beaufort West to the north and the mountain range of the Swartberg form the edge of the visual periphery

Implications for the Project

The flat landscape does not assist in limiting the visual exposure of the affected area. There are no rising landforms, other than on the visual periphery, that will screen views from any of the sensitive visual receptors such as farm homesteads and the main roads such as the N12, R306 and the R61. Any tall structure within the study area will be visible for extended distances.

5.2.2 Vegetation Cover

The very nature of the vegetation in this area, Gamka Karoo and Prince Albert Succulent Karoo (Musina and Rutherford 2006) and which forms part of the Nama Karoo Biome **(Figure 5: Vegetation**) is low growing and visually uniform which does not provide much visual screening (see Photos 1 and 2). The vegetation is dominated by a variety of dwarf shrubs. Trees never dominate the landscape (Low and Rebelo,1996). Although the vegetation is not overly sensitive to the development, it does not assist in reducing the visual expose of the turbines. The vegetation is typical of the Karoo ambience, and it is this together with the topography which provides the Karoo sense of place.

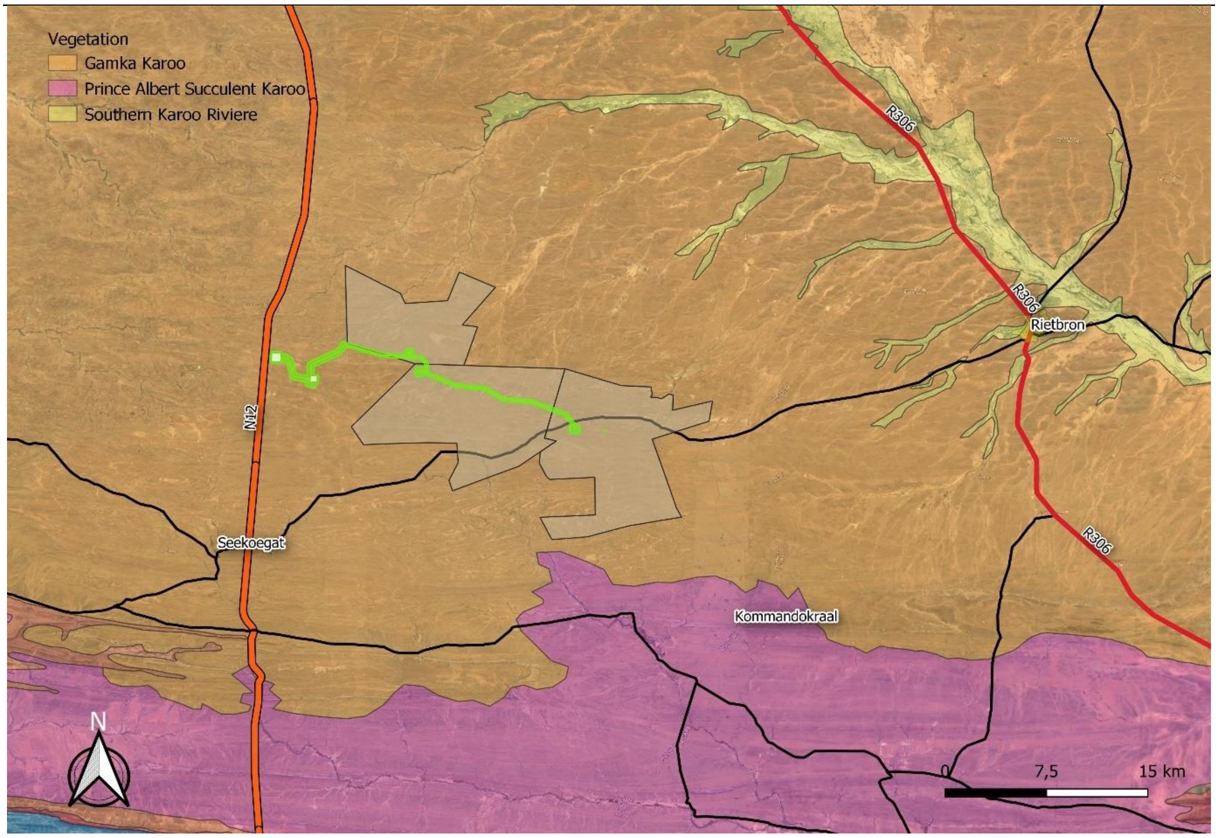


Figure 5: Vegetation

Photo 1: Typical sparse and open Karoo landscape with iconic windmill

Photo 2 Typical sparse and open Karoo landscape

Implications for the Project

The relatively flat and uniformly textured vegetation of the landscape types will visually contrast significantly with the proposed turbines and associated infrastructure making it more visible in the landscape.

The low vegetation height does not assist in screening the proposed development, nor does it assist in blending it with the landscape.

5.2.3 Land-use

The current visible land-use is predominantly low-density small stock farming which include Dorper and Merino Sheep and Boer Goats.

The area appears to be sparsely populated, which was borne out during the site visit. Many of the homesteads appear to be uninhabited.

The largest town in the area is Beaufort West, which lies approximately 55 km to the north with smaller villages and settlement such as Rietbron 45 km to the east and, Klaarstroom 45 km to the south. The N12 links Beaufort West and De Rust.

There are few establishments that rely on the sense of place of the Karoo such as guest houses and game farms that will potentially be affected by the proposed development.

Implications for the Project

The area, with its current pastural land-use and sparse population would be minimally affected in terms of land-use. The towns and villages are all beyond 20 km away and the visual impact on them would be insignificant.

5.2.4 Visibility

Visibility

The visibility is dependent on the topography. The existing topography is very flat which does not assist in limiting the views. Visibility of the structures, will, in places, be continuous and uninterrupted to beyond 20 km. It is considered that beyond 20 km views of the development, though still potentially visible, will be insignificant in the landscape due to the exponential diminishing effect of distance.

The critical views are from those visual receptors that are most impacted by the visual intrusion of the proposed development. These would include users of public roads, towns, villages, game farms and lodges, settlements as well as farmsteads in the nearby vicinity.

Although not all homesteads are occupied fulltime, (see dots on **Figure 6: Visual Receptors**) many of these will be in direct line of sight and within the 0-1 km zone where the magnitude of impact could be high. Other sensitive receptors include travellers on the main roads such as the N12, R306 and the R61, activities and institutions that rely on the aesthetic environment such as game farms, national parks, lodges, guesthouses as well as hunting and or photographic safari operations.

Landscape receptors are physical areas that are regarded as visually interesting and which provide sense of place, such as the typical Karoo ambience, to that area. These receptors include rivers and drainage ways, mountains, ridges, vegetation, and any other interesting features (**See Figure 7: Landscape Receptors**).

The pylon towers, due to the open and flat topography and lack of screening vegetation, are visually prominent but unlikely to be visible much beyond the 20 km zone. The views are mainly to the north and south. This is a result of the topography dipping down in these directions. Views to the east and south-east are limited to less than 5km.

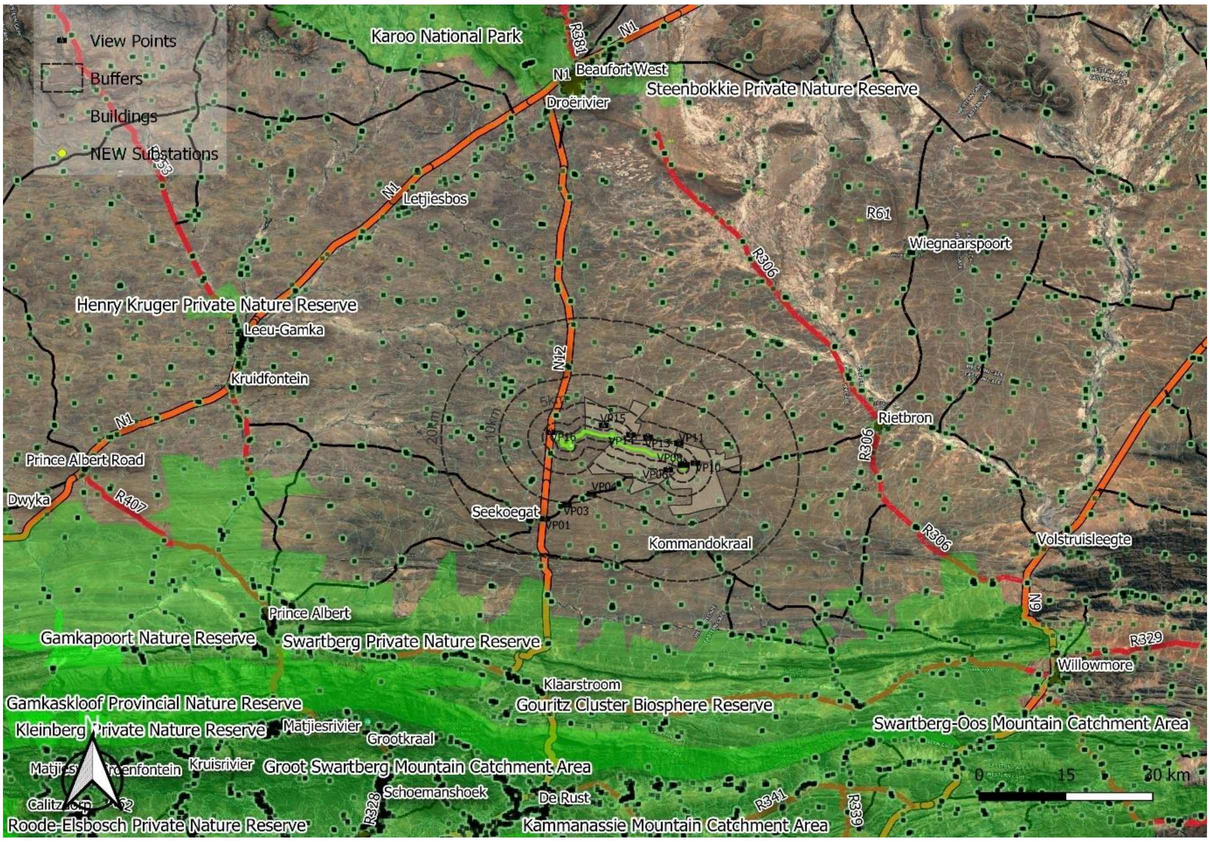


Figure 6: Visual Receptors

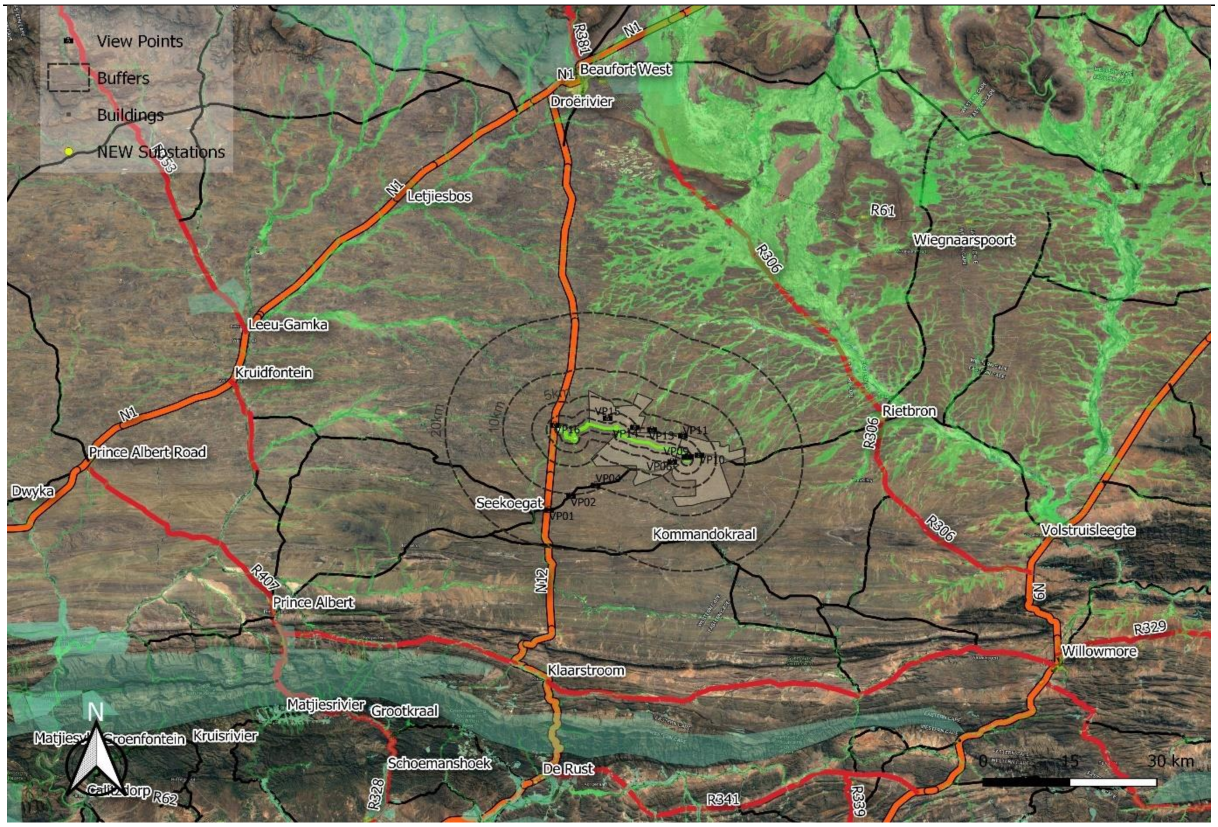


Figure 7: Landscape Receptors

Undulations in the topography to the north tend to be limit views intermittently to not much beyond 10 km. However, the north-south running N12, on the western side of the proposed project site falls outside the limit of pre-eminence zone. **(See Figure 8: Viewshed of Grid Section 6)** At this distance the pylons are not a major focus of visual attention, drawing and holding one's visual attention. The development will occupy a substantial portion of the field of view and the repeated vertical lines of the towers contrasting strongly with the horizontal landforms.. The grid, as a whole, is likely to be perceived by some viewers as having a large visual impact. This will be true for all critical visual receptors within this 1 km zone. However, most of the visual receptors that rely on the visual quality of the visual environment, such as game farms, national parks, lodges, and guesthouses are located more than 25 km away to the south of the study area. The powerlines will generally be seen together with the wind turbines and will add to the visual clutter.

Implications for the Project

Visibility is generally uninterrupted up to 5km throughout the study area. The greatest impact is within the 1 km zone. The powerlines, though not dominant in the scene when viewed together with the wind turbines, will add to the magnitude of the visual clutter. There is little that topography and vegetation can help to mitigate this impact. This will have a high impact on the critical visual receptors such as the farmsteads and occupied buildings as well as users of the main roads such as the N12, R306 and the R61. However, most of the establishments that rely on the aesthetics of the visual environment are on the periphery of the study area approximately 50 km away.

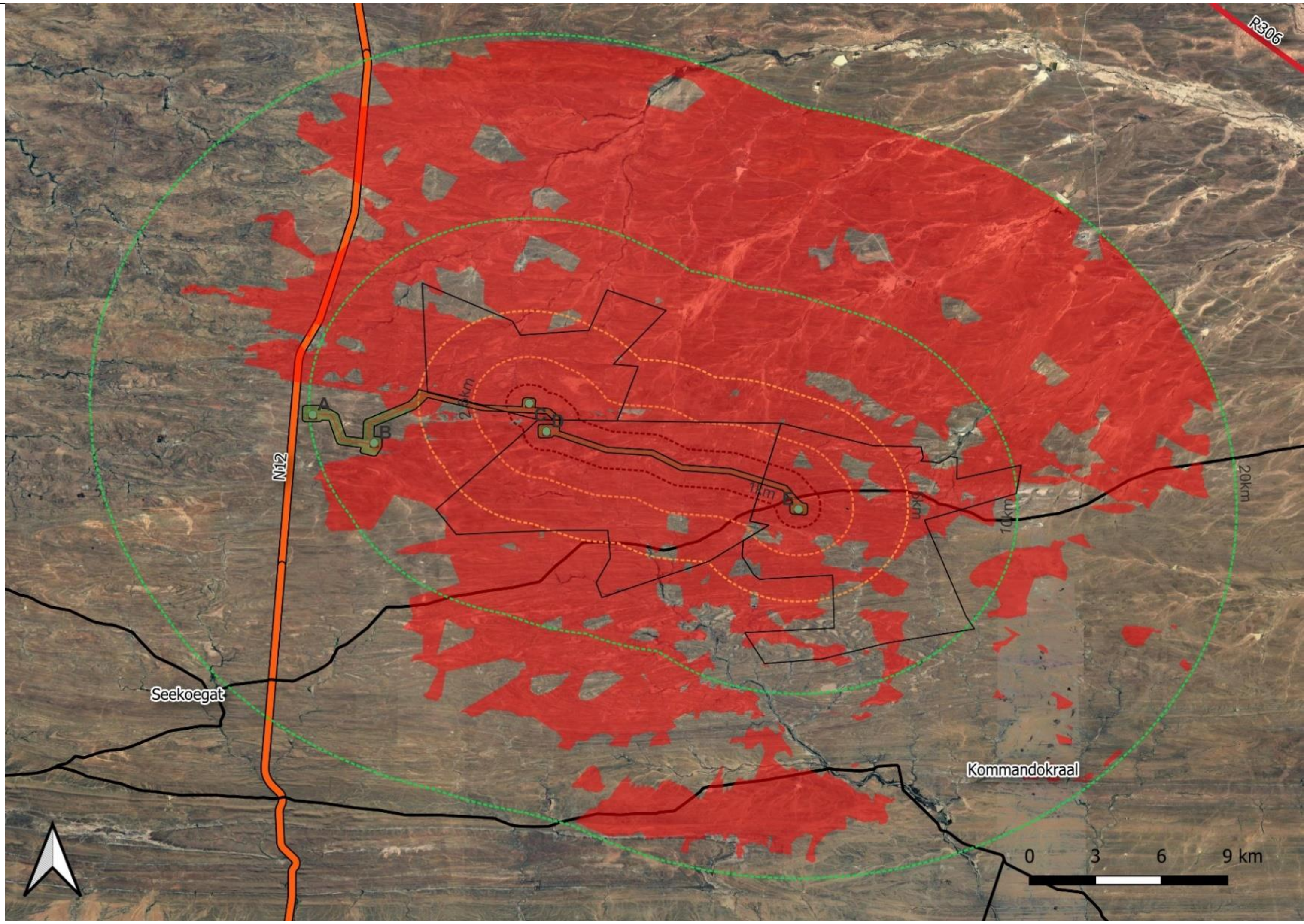


Figure 8: Viewshed of Grid Section 6

5.2.5 Landscape Diversity

Landscape diversity within the study area is primarily based on the topographical features as well the vegetation, namely the Karoo veld and the existing land uses. The greater the diversity, the greater is the potential for the proposed development to blend with the surrounding landscape.

The landscape is a relatively flat to rolling basin with low ridges and covered with low growing and sparse vegetation and is generally featureless except for the mountain ranges to the south and north. The existing land-use do not add to the diversity of the area being mainly low-density small stock farming. Low hills and shallow drainage ways occur. The tallest structures in the area are power lines and wind pumps. The area exhibits a low visual diversity.

Implications for the Project

The higher the visual diversity, the greater is the opportunity to visually blend the project with the environment as these will more readily accept visual change or any structure placed within them. The higher the diversity, the higher the Visual Absorption Capacity (VAC) or the ability of the environment to accept visual change.

The low visual diversity of area will result in a low VAC and will in turn result in any large scale or tall structure to be highly visible due to the lack of screening and the high visual contrast. The hills and mountains to the north and south on the visual periphery over 50 km away contain the views and terminate the views.

5.2.6 Landscape Quality and Character

The spirit, or sense of place, is that quality imparted by the aspects of scale, colour, texture, landform, enclosure, and in particular, the land use. According to K. Lynch (1992) ‘it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular character of its own’.

The quality of *Genius Loci* is a function of attributes such as the scenic beauty or uniqueness and distinctive character of the built and cultural landscape.

The *Genius Loci* or sense of place of the study area is typical Nama Karoo with its low arid bushes, wide open landscape and the sheep and goat farming. The only tall structures in the area are the odd wind pump and transmission lines.

The visual quality can be categorised as low visual quality for the study area. The low visual quality is based on the lack of visual diversity as a result of the uniformity of the vegetation which lack specific interest, and the surrounding flat and open landscape.

Implications for the Project

The proposed development will add to the WEF infrastructure and will significantly alter the existing ambience and character of the area from a rural open landscape to one that is industrial in nature.

6 IDENTFICATION OF POTENTIAL RISK SOURCES

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as both negative and positive. The following general risks are associates with the visual intrusion in the landscape.

6.1 Risk Sources

6.1.1 Construction Phase

It is anticipated that the major risk source during construction would be:

Negative Risk Sources

- Excessive clearing and stripping of topsoil for preparing the area for the development,
- Edge shaping and embankment landscape stabilisation of the platforms not done or unsuccessful;
- The relatively random and disorganised lay down of building materials, vehicles and offices;
- The extent and intensity of the security and construction lighting at night;
- Dust from construction activities;
- Open and un-rehabilitated landscape scarring; and
- High seed bank of alien species in the topsoil can lead to the uncontrolled spread of exotic invader plant species. This could create a vegetated area that is visually contrary to the surrounding landscape.

Positive Risk Sources

- Image of construction activity could lead to a perceived view of progress and benefit to the community.

6.1.2 Operational Phase

It is anticipated that the major risk source during operation would be:

Negative Risk Sources

- Areas and /or specific sites of aesthetic value may be disfigured by the introduction of a wind farm within the viewshed resulting in a permanent change to the existing visual quality of visually sensitive areas;
- Constant disruption of rural night ambience by red warning flashing lights;
- The compromising of views from or the alteration of the ambience of natural areas;
- Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated;
- Need to keep certain areas such as road reserves, platform edges etc. clear of vegetation which will result in visual scarring;

Positive Risk Sources

- The development could be the visual affirmation of progress and prosperity for the region. Localised visual perceptions of the economically depressed communities of the population have not been tested as these may be influenced rather by the economic

  and job opportunities that could exist rather than the direct visual perception of the project.

7 THE VISUAL ASSESSMENT

7.1 The Visual Analysis

This section describes the aspects which have been considered in order to determine the intensity of the visual impact on the area. The criteria include the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints.

7.1.1 The Viewshed

The viewshed is a topographically defined area which includes all possible observation sites from which the project will be visible. The boundary of the viewshed, which connects high points in the landscape, is the boundary of possible visual impact (Alonso, et al, 1986). Local variations in topography and man-made structures would cause local obstruction of views. The viewshed, based on the GIS assessment and fieldwork, extends for the main part varying from <1 km to greater than 20 km in several areas (**Figure 8**).

7.1.2 The Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988).

Thus, the visual impact at 1000 metres would be approximately a quarter of the impact as viewed from 500 metres. Consequently, at 2000 metres, it would be one sixteenth of the impact at 500 metres. The view of the project components would appear so small from a distance of 5000 metres or more that the visual impact at this distance is insignificant. On the other hand, the visual impact of the project components from a distance of 500 metres or less would be at its maximum (**Figure 9**). Views are possible up to 50 km with views of the WEF within 16 km (being the limit of visual pre-eminence) seen as a major focus of visual attention, drawing and holding one's visual attention (see **Section 5.2.4: Visibility**)

7.1.3 Critical Views

Views identified as being critical have been discussed under Section 4.2. These have been overlaid on the viewshed to determine the extent of these within the viewing zones radiating out from the project components. In summary the critical views are those sensitive receptors which include travellers on the main roads such as the N12, R306 and the R61, activities and institutions that rely on the aesthetic environment such as game farms, national parks, lodges, guesthouses as well as hunting and or photographic safari operations.

7.1.4 The Visual Absorption Capacity

The Visual Absorption Capacity (VAC) is a measure of the landscape's ability to visually accept / accommodate or embrace a development. Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them. In this case the VAC has been defined as a function of three factors.

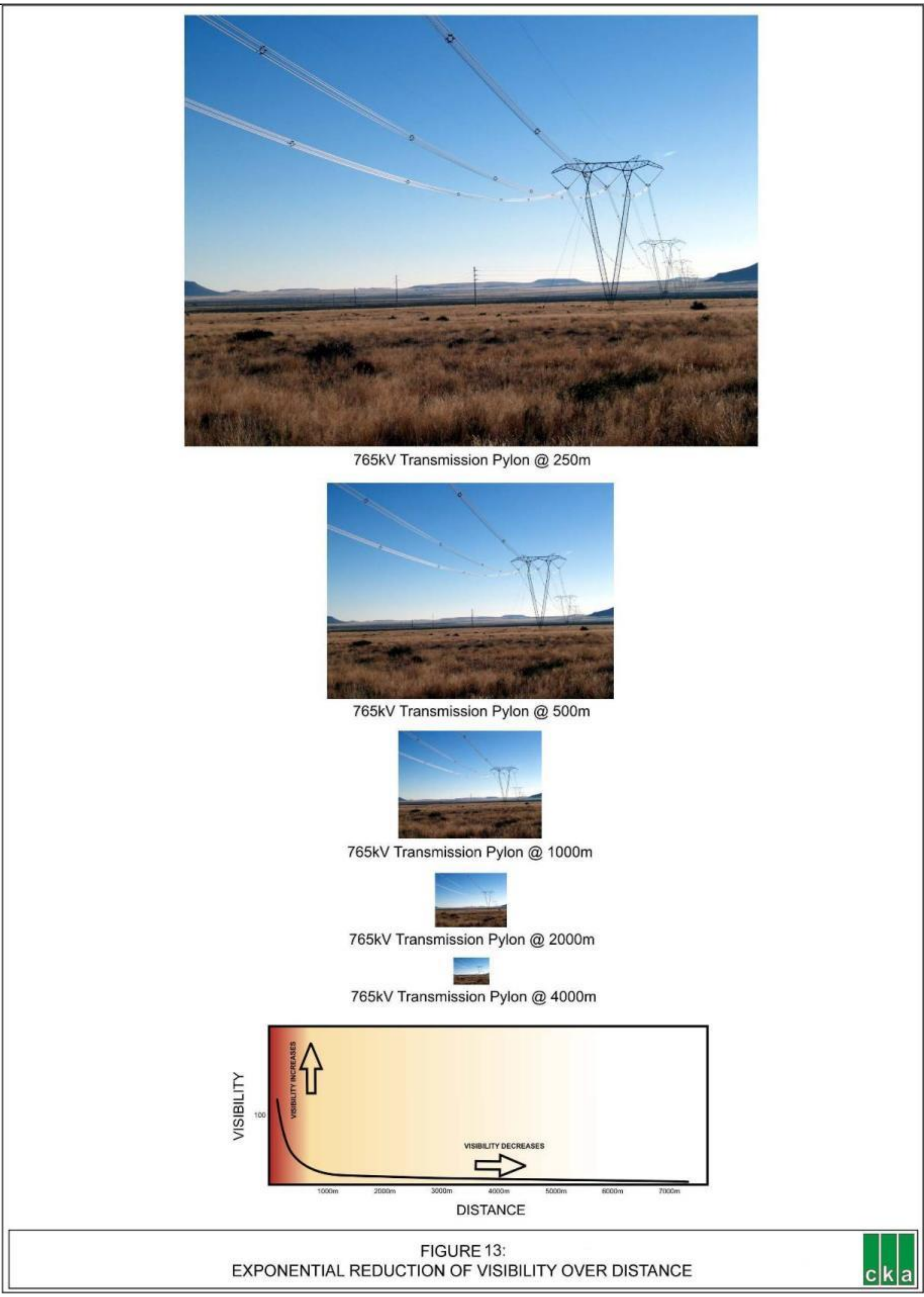


Figure 9: An Example of Exponential Reduction of Visibility over Distance

The VAC was determined, based on the author's field experience, taking the following into account:

- Slope
- Visual pattern (landscape texture) with regard to vegetation and structures
- Vegetation height

Table 1: Visual Absorption Factors and their Numerical Values

VAC Factor		Categories		
Slope	Range Numerical Value VAC	0-3 % 3 Low	3-6 % 2 Moderate	> 6 % 1 High
Vegetation Height	Range Numerical Value VAC	< 1 m 3 Low	1-6 m 2 Moderate	6 m 1 High
Visual Pattern	Description Numerical Value VAC	Uniform 3 Low	Moderate 2 Moderate	Diverse 1 High

It is therefore concluded that the VAC can be regarded as:

It has a combined rating of 9 which equates with a **Low VAC** due to flat open landscape and arid grassland.

This implies that the areas with a **Low** VAC are inherently unable to visually accommodate or accept the visual change made by the proposed wind facility.

7.1.5 Cumulative Impacts

Visual impacts have been assessed in terms of the impact the development will have on the visual environment. Visual assessment is a component of the human aesthetics and is considered part of a suite of social impacts such as noise and sense of place which together may result in a higher cumulative impact than if it were read in isolation. This study assesses only the visual impacts.

Cumulative visual impacts may arise where more than one WEF development is visible from the same point. Each development will have its associated powerlines and grid infrasture There are several renewable energy generation facilities approved and in the planning stages in the area as indicated in Figure 10 below in addition to the Kwagga WEFs approved. One that is approved is directly west of Kwagga 2 and straddles the N12. A second approved development is further north on the western side of the N12 (**Figure 10: Regional EA Applications for Renewable Energy Projects Located Within a 50 km Radius from the Proposed Kwagga WEFs Study Areas).**

This increase cannot be measured empirically. However, it can be assumed that, as visual impacts reduce exponentially with distance, conversely doubling the size and volume of a development may increase the impact exponentially.

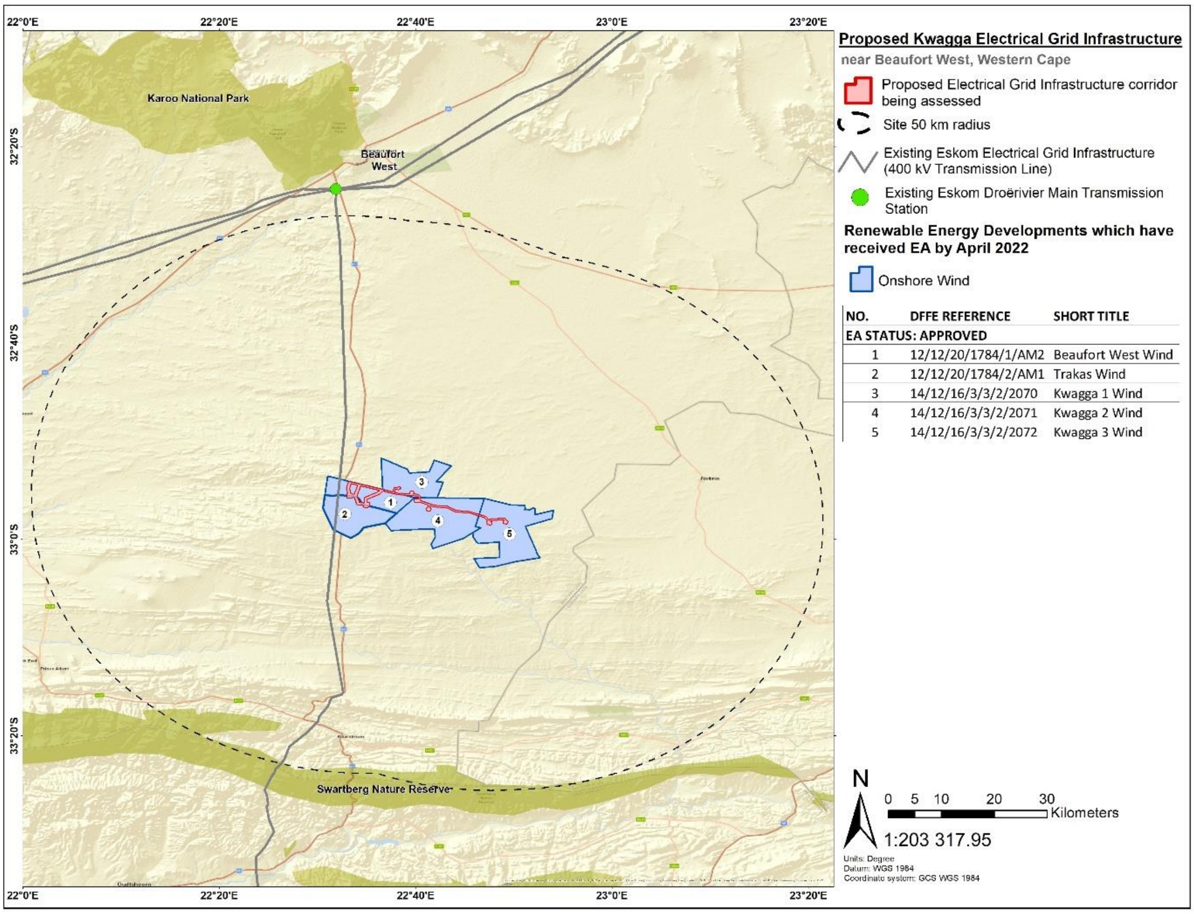


Figure 10: Regional EA Applications for Renewable Energy Projects Located Within a 50 km Radius from the Proposed Kwagga WEFs Study Areas (Source: DFFE – Q4, 2021)

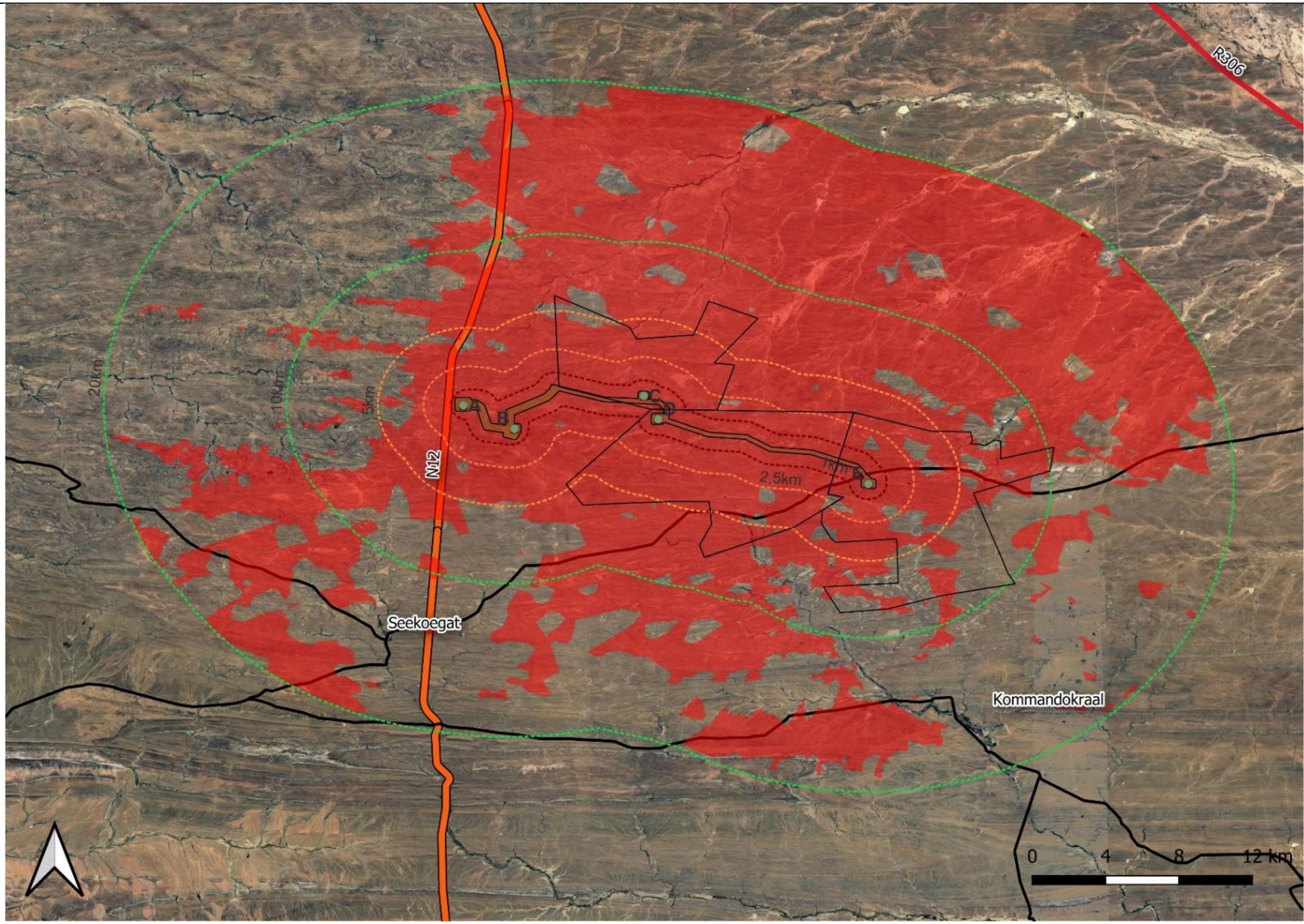


Figure 11: Combined Viewshed of the Overhead Transmission Powerline and Associated Infrastructure

8 EVALUATION CRITERIA

The visual impact assessment has been evaluated against the standard criteria as provided by the CSIR:

Table 2: Impact Criteria Assessment and Rating Scales

Criteria	Rating Scales	Notes
Status	Positive	Environment overall will benefit from the impact
	Negative	Environment overall will be adversely affected by the impact
	Neutral	Environment overall will not be affected
Spatial Extent	Site specific	Site-specific, affects only the development footprint.
	Local	Local (limited to the site and its immediate surroundings, including the surrounding towns and settlements within a 10 km radius).
	Regional	Regional (beyond a 10 km radius and <100 km) to national.
	National	>100 km
	International	e.g. Greenhouse gasses or migrant birds
Duration	Very short term	Instantaneous
	Short term	0-1 years (i.e. duration of construction phase).
	Medium term	1-10 years.
	Long term	More than 10 years. Impact will cease after the operational life of the activity.
	Permanent	The impact will occur beyond the project decommissioning
Intensity	Low	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.
	Medium	Where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.
	High	Where natural, cultural or social functions and processes are altered to the extent that the impact will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.
Reversibility	Low	Low reversibility of impacts
	Moderate	Moderate reversibility of impacts
	High	Impact is highly reversible at end of project life
	Permanent	The impact is permanent i.e. non-reversable
Potential for impact on irreplaceable resources	Reversable	Resource is easy to replace/rehabilitate
	Low	No irreplaceable resources will be impacted.
	Moderate	Resources that will be impacted can be replaced, with effort.

	High	There is no potential for replacing a particular vulnerable resource that will be impacted.
Consequence (a combination of extent, duration, intensity and the potential for impact on irreplaceable resources).	Slight	Where no natural systems/environmental functions, patterns or processes are affected.
	Moderate	Where the environment continues to function but in a modified manner.
	Substantial	Environmental functions and processes are altered such that they temporarily or permanently cease.
	Severe	Environmental functions and processes are altered to where they temporarily or permanently cease
	Extreme	Environmental functions and processes are altered to where they permanently cease
Probability (the likelihood of the impact occurring)	Extremely unlikely	Little or no chance of occurring
	Very unlikely	<30% chance of occurring
	Unlikely	30-50% chance of occurring.
	Likely	51-90% chance of occurring
	Very likely	> 90% chance of occurring regardless of mitigation measures
Significance (All impacts including potential cumulative impacts)	Very low	The risk/impact may result in very minor alteration of the environment and can be easily avoided by implementing appropriate mitigation measures and will not have an influence on the decision-making
	Low	The risk/impact may result in minor alteration of the environment and can be easily avoided by implementing appropriate mitigation measures and will not have an influence on the decision-making if not mitigated.
	Moderate	The risk/impact will result in moderate alteration of the environment and can be avoided by implementing appropriate mitigation measures and will only have an influence on the decision-making if not mitigated.
	High	The risk/impact will result in major alteration of the environment even with the implementation of appropriate mitigation measures and will have an influence on the decision-making.
	Very high	The risk/impact will result in a very major alteration of the environment even with the implementation of appropriate mitigation measures and will have an influence on the decision-making (i.e. the project cannot be authorised unless major changes to the design are carried out to reduce the significance rating

8.1 The Visual Impact

The visual impact of the project in the landscape is a function of many factors or criteria. Some of the factors are measurable such as viewing distance, the visual absorption capacity of the surrounding landscape, and the scale of the surrounding environment and landform. Other factors are subjective viewpoints, which are extremely difficult to consistently categorise the opinion of the community.

Studies in the USA have shown that professionals and environmental groups view modification of the natural landscape more negatively than other groups (McCool, *et al* 1986).

The critical appraisal of the visual impact of the project and associated works on the landscape is presented from the viewpoint of the informed citizen and professional. To the more economically depressed communities surrounding the proposed project, it may well be that they do not, or will not, object to the visual intrusion in their immediate environment. It may be that they welcome it since they could perceive it as a symbol of prosperity and personal advancement opportunity.

The visual impact will, however, vary when evaluated against the criteria of intensity of visual impact and the significance of the impact.

An example is the situation where a project component such as a toll plaza or bridge is located within a fairly narrow undisturbed valley between two rising landforms. The visual impact's intensity is low since it cannot be seen from surrounding areas. The component has the hillsides as a backdrop and therefore blends into the valley texture. The significance, however, is high within the context of the scenic value of the pristine valley because the sense of place and the character of the valley are severely compromised.

The converse is also true in that a high visual intensity impact can have a low significance. The visual impact assessment will therefore be based on the criteria of intensity and significance relative to land use and the nearness to important viewpoints.

8.1.1 Spatial Extent

The visual impact for construction of the wind turbines will occur on a **local** scale due to the localized extent of the development. However, the visual impact for the operational phase will extend as far as it can be seen, which can be up to 50 km and beyond either side and therefore is at a **regional** scale. This includes the impact of the shadow flicker. The impact for the construction and operation of the substations and the access road will occur on a **local** scale.

The viewshed analysis suggests that theoretically some of the project components can at times be seen for over 50 km. Due to the exponential decrease in visibility, the visibility of these components should be insignificant beyond 32 km.

The fact that the majority of the viewers, many of whom could be tourists, are in transit and are not viewing from a static or stationary viewpoint, implies that the viewer carries the visual impact effect with him or her beyond the physical visible confines. Views from the N12 are extensive.

8.1.2 Duration

The duration of the impact during construction will be **short term** due to the relatively short construction period and the rehabilitation of the disturbed areas.

The duration of the impact during the operational phase will be **long term**, in other words greater than 10 years and as long as the anticipated lifetime of the project, with the impact terminating only after a possible decommissioning of the project.

8.1.3 Intensity or Severity

The intensity of the visual impact during construction and operation will be **high** within the 8 000 m zone wherever the project components intrude in the critical viewpoints. The large extent of the project will be highly visible at night due to the security lighting and the red hazard lighting on top of the masts.

8.1.4 Frequency of Occurrence

The frequency of occurrence of the impact is **continuous** while it remains visible, i.e., 24 hours. The project will also be visible at night due to the security lights which creates a beacon effect in an area that is not excessively lit at night.

8.1.5 The Probability of Occurrence

To determine the significance of an identified impact/risk, the consequence must be multiplied by probability (quantitatively as shown in **Figure 12** below)

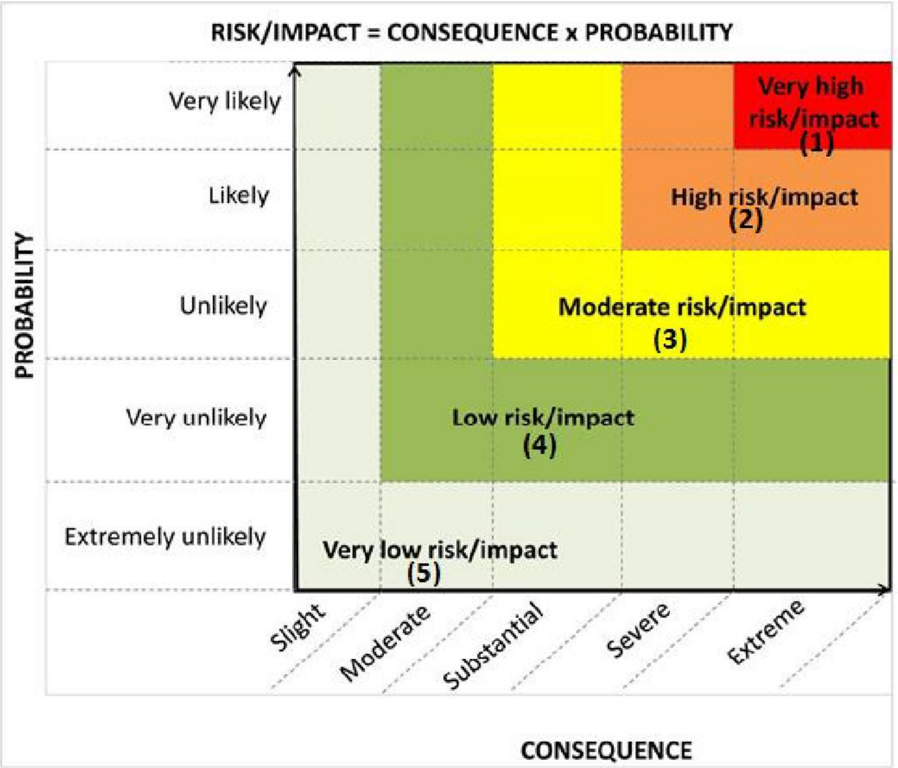


Figure 12: Guide to Assessing Risk/Impact Significance as a result of Consequence and Probability.

The construction and operational impact described is probable and can be regarded as **likely**. It must be recognized, however, that much of this assessment is subjective and that it is not possible to empirically state that the impact will occur.

8.1.6 Reversibility

The impact on reversibility is regarded as having a **high** rating due to the fact that the vegetation and landforms can to some extent be recreated, restored or rehabilitated to the original form. This is dependent on how much disturbance to the natural vegetation takes place during construction. If the entire area is first stripped of vegetation and or topsoil and drainage channels altered prior to construction and operation the ability to reverse the impact becomes far more difficult or even impossible.

8.1.7 Irreplaceable Loss of Resources

The impact is regarded as **Replaceable.**

8.1.8 Consequence

The consequence during construction and operation is regarded as **Moderate**.

8.1.9 Significance

The significance of the impact during construction, pre- and post-mitigation, is **low** ... The significance of the impact during the operational phase, pre- and post-mitigation, is **moderate.** The significance during decommissioning is **low** pre-mitigation and **very low** post-mitigation

8.1.10 Status of the Impact

The impact status is considered **negative** for the construction and operational phases.

8.1.11 Degree of Confidence in Predictions

The confidence is considered to be **high** as the level of judgement is based generally on common sense, general knowledge, the author's field experience and the inherently subjective nature of this type of assessment.

8.1.12 Legislation

There are no specific legal requirements nor is there any direct reference to the visual environment in the legislation. General legislation pertaining to the environment is contained in the National Environmental Management Act (NEMA) (Act No. 107 of 1998) as well as the National Heritage Resources Act No. 25, 1999 and the associated provincial regulations provide legislative protection for listed or proclaimed site, such as urban conservation areas, nature reserves and proclaimed scenic routes.

The National Environmental Management Principles as contained in NEMA require that sustainable developments require the following considerations (amongst others):

2(4)(ii) that pollution and degradation of the environment are avoided, or, that where they cannot be altogether avoided, are minimised and remedied; and
2(4)(iii) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied.

The National Heritage Resources Act refers, under Part 1 General Principles, to the National Estate:

3.(2)(d) Landscapes and natural features of cultural significance

Visual pollution is controlled to a limited extent, by the Advertising on Roads and Ribbons Act (Act No. 21 of 1940) which deals mainly with signage on public roads.

The Protected Areas Act (NEMA) (Act 57 of 2003, Section 17) is also intended to protect natural landscapes

The Western Cape DEA&DP have produced 'A Guideline for Involving Visual and Aesthetic Specialists in EIA Processes'

8.1.13 Ability to Adapt

The affected receptors include travellers on the main roads such as the N12, R306 and the R61, activities and institutions that rely on the aesthetic environment such as game farms, national parks, lodges, B&B's as well as hunting and or photographic safari operations. Their ability to adapt is a response to their livelihood, economic activity and sense of well-being. The impact on the affected receptor's ability to adapt is considered low (-) wherever the surrounding land use has no inherent high scenic qualities that can be utilised for future tourism.

Table 3: High Level Impact Table - Visual

<table>
<tr><th>Impact</th><th colspan="2">Impact Criteria</th><th>Significance and Ranking (Pre-mitigation)</th><th>Potential mitigation measures</th><th>Significance and Ranking (Post-mitigation)</th><th>Confidence Level</th></tr>
<tr><td colspan="7">VISUAL</td></tr>
<tr><td colspan="7">DIRECT – CONSTRUCTION PHASE</td></tr>
<tr><td rowspan="7">Visual intrusion by 132kV overhead transmission Powerline and its Associated Electrical Grid Infrastructure on visual and landscape receptors</td><td>Status</td><td>Negative</td><td rowspan="7">Low (4)</td><td rowspan="7">• Limit area of disturbance for access roads, and construction camp sites
• Locate construction camps and all related facilities such as stockpiles, lay-down areas, batching plants in areas already impacted such as existing farmyards or in unobtrusive locations away from the main visual receptors.
• Limit access tracks for construction and maintenance vehicles to existing roads where possible. Once established do not allow random access through the veld
• Suppress dust during construction.
• Blend edges of road and platforms with surrounding landscape
• Rehabilitate exposed disturbed areas
• Avoid vegetation stripping in straight lines but rather non-</td><td rowspan="7">Low (4)</td><td rowspan="7">High</td></tr>
<tr><td>Spatial Extent</td><td>Local</td></tr>
<tr><td>Duration</td><td>Short Term</td></tr>
<tr><td>Consequence</td><td>Moderate</td></tr>
<tr><td>Probability</td><td>Likely</td></tr>
<tr><td>Reversibility</td><td>High</td></tr>
<tr><td>Irreplaceability</td><td>Replaceable</td></tr>
</table>

				geometric shapes that blend with the landscape • Limit need for security lighting • Use non-reflective materials • Paint all other project infrastructure elements such as operational buildings, support poles etc. a dark colour • Avoid bright colour/patterns and logos		
DIRECT – OPERATIONAL PHASE						
Visual intrusion by 132kV overhead transmission Powerline and its Associated Electrical Grid Infrastructure on visual and landscape receptors	***Status***	***Negative***	Moderate (3	• Maintain rehabilitated disturbed areas	*Moderate (3)*	*High*
	Spatial Extent	***Local***				
	Duration	***Long term***				
	Consequence	***Moderate***				
	Probability	***Likely***				
	Reversibility	***High***				
	Irreplaceability	***Replaceable***				
DIRECT – DECOMMISSIONING PHASE						
Visual intrusion by 132kV overhead transmission Powerline and its Associated Electrical Grid Infrastructure on visual and landscape receptors	***Status***	***Neutral***	Low (4)	• Remove all project components from site • Rip all compacted hard surfaces such as platforms, words areas, access and service roads etc. and reshape to blend with the surrounding landscape • Rehabilitate/revegetate all disturbed areas to visually the original state by shaping and planting	*Very low (5)*	*High*
	Spatial Extent	***Local***				
	Duration	***Medium term***				
	Consequence	***Moderate***				
	Probability	***Likely***				
	Reversibility	***High***				
	Irreplaceability	***Replaceable***				

9 RECOMMENDED GENERAL MITIGATION / MANAGEMENT MEASURES

9.1 Earthworks and Landscaping

- The mitigation measures during operation will need to focus on effective rehabilitation of the construction area. These specifications must be explicit and detailed and included in the contract documentation (Environmental Management Plan) so that the tasks can be costed and monitored for compliance and result.

- It is recommended that that a suitably qualified person, such as a landscape architect, is appointed to give attention to the concept and design of the aesthetic aspects of the project during the detailed design phase of the project prior to construction to integrate the design especially the shape of the cut and fill slopes with the surrounding landscape to ensure that the project blends in physically and aesthetically with the environment. The cut and fill slopes should not be steeper than 1:2.5 vertical to horizontal as this allows vegetation to establish more easily. This will also reduce erosion of the soil surface.

- A detailed landscape and rehabilitation plan should be developed timeously by the landscape architect. The general landscaping shall reflect the existing surrounding landscape. Shape and blend edges of roads and platforms with surrounding landscape.

- Sculpturing or shaping the slopes and access roads to angles and forms that are reflected in the adjacent landscape can reduce the visual impact. By blending the edges with the existing land-forms the visual impression made, is that the project component has followed the natural shape of the landscape, rather than been “engineered” through the landscape.

- Limit the area of disturbance for turbine footprint, access roads, construction camp or sites, lay-down areas, batching plants, substations etc.

- Locate construction camps and all related facilities such as stockpiles, lay-down areas, batching plants in areas already impacted such as existing farmyards or in unobtrusive locations away from the main visual receptors.

- Limit access tracks for construction and maintenance vehicles to existing roads where possible. Once established do not allow random access through the veld.

- It is essential that all slopes, as well as all areas disturbed by construction activity, are suitably topsoiled and vegetated as soon as is possible after final shaping. The progressive rehabilitation measures will allow the maximum growth period before the completion of the project.

- All areas affected by the construction works will need to be rehabilitated and re-vegetated.

- For access / service roads and servitudes, avoid straight edges and corridors. These lines should complement the landscape through which they pass (Litton, 1980).

- The special conditions of contract must include for the stripping and stockpiling of topsoil (whatever is there available) from the construction areas for later re-use. Topsoil is considered to be at least the top 300 mm of the natural soil surface and includes grass, roots and organic matter. The areas to be cleared of topsoil should be all areas that will be covered by structures, roads and construction camps These areas should be topsoiled and re-vegetated. If the topsoil thickness is less than 300mm then a minimum of 100mm should be stripped and stored.

- All areas that will be affected by construction activities and where dust will be generated will require dust suppression by regular wetting, possibly by means of a water bowser or by means of an environmental friendly soil binding compound. The importance of suppressing the visual aspects of dust cannot be overstressed since the visibility will generate the impression of a polluting industry.

- All existing large trees (if any) that fall outside the earthworks area must be retained. These will assist in softening the forms of the structures and obscure views to them.

- Rehabilitate exposed disturbed areas. The rehabilitation and stabilisation of vegetation of all rehabilitated areas, buffer strips and new landforms must be done as soon as the forms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (erosion, die back, lack of grass cover) are identified early so that corrective measures can be taken.

9.2 Lighting

- As night lighting during both construction and operation is one of the more objectionable forms of visual impact, it is important that selective and sensitive location and design of the lighting requirements for the construction camp and the sub-station are developed. For instance, reduce the height from which floodlights are fixed and identify zones of high and low lighting requirements with the focus of the lights being inward, rather than outward.

- Avoid up-lighting of structures but rather direct the light downwards and focused on the object to be illuminated. Avoid directing the light towards the direction from where it would be most experienced/visible. Light spill, particularly upwards, must be minimised. This can be achieved by implementing the following recommendations:

It is recommended that lighting is designed by a lighting engineer in collaboration with the landscape architect for the project. The aspects of the lighting solution should include the following:

- Light fittings should have shields to eliminate sight of the light source;
- Down lighting of areas is preferred to up lighting;
- Any perimeter lights are to be directed downwards and inwards;
- Emitted light colour should be a softer light than sodium (yellow) or mercury halide (blue-white). The light colour should also be chosen with knowledge of what colour will attract insects. It is important that a colour type and spread of light will not cause insects to be attracted to it and in so doing deplete the insect diversity of the region. For this purpose an entomologist familiar with the effect of light frequencies on insects should be consulted.
- Florescent lights attract insects although they provide a softer illumination effect;
- The use of flood lights to illuminate structures, large areas or features should not be considered. Rather incorporate concealed lights to shine downwards. Darker areas on the building elevations will provide a less visually noticeable structure;
- No light fittings should spill light upwards or be directed upwards from a distance towards the area or building to be illuminated;
- The lighting plan should strive to maximise the light energy use. This should include a hierarchy of lights that differentiates their function so that the best type is used. Some may be switched on only when needed;

- Security lights should not flood the area with light continuously but should be activated by a motion sensor;
- It is now accepted that lighting of new projects should be subdued and energy efficient.

9.3 Colours for Roofs, Buildings and Structures

The colour of the components of the project components will make a difference to the visual fit of the project into the landscape and setting.

Tones and tints of selected complementary colours that fit the setting should be considered.

Subdued and complimentary natural shades and tints blend easily into a landscape setting.

Vivid primary or bright or reflective colours or surfaces will accentuate the visual presence of the development and should be avoided.

10 PHOTOS

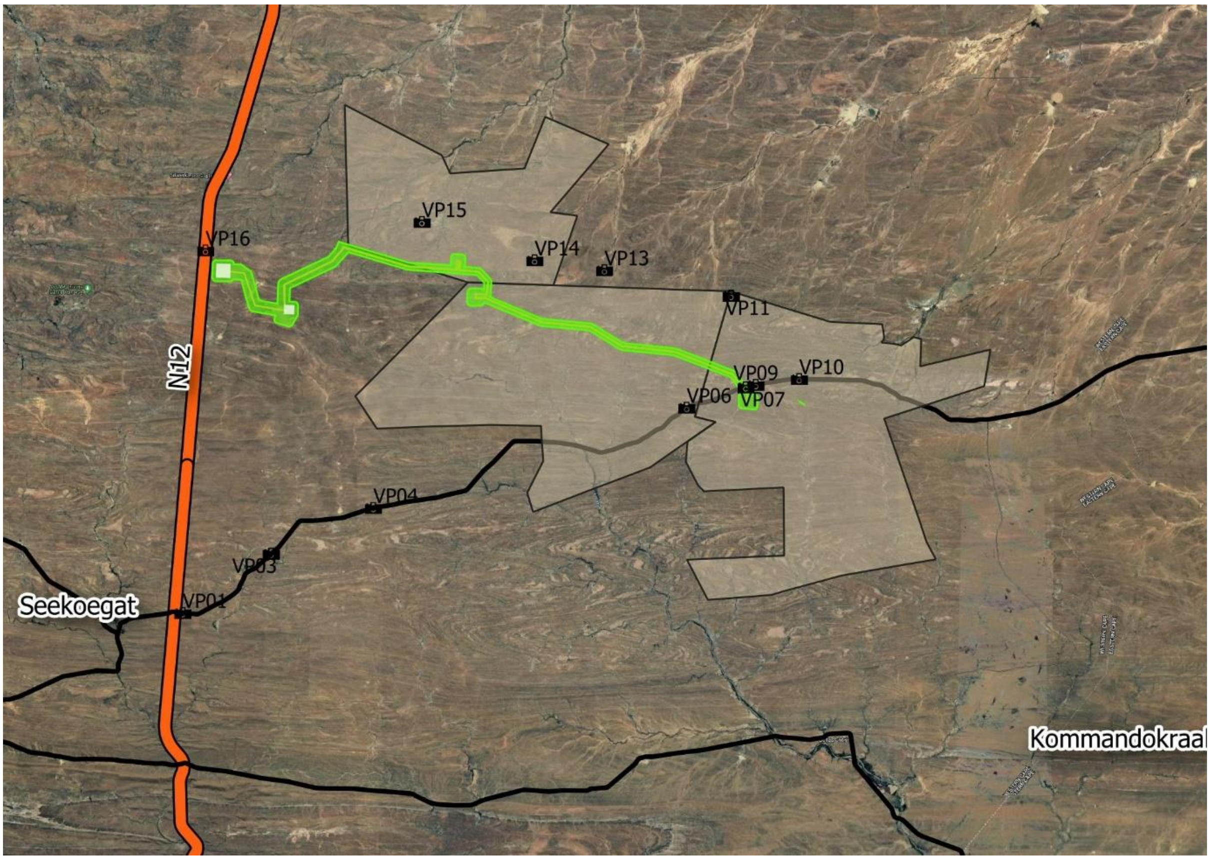


Figure 13: Camera Locations

Viewpoint 1 (see Figure 13)

Viewpoint 2

Viewpoint 3

Viewpoint 4

Viewpoint 5

Viewpoint 6

Viewpoint 7

Viewpoint 8

Viewpoint 9

Viewpoint 10

Viewpoint 11

Viewpoint 12

Viewpoint 13

Viewpoint 14

Viewpoint 15

Viewpoint 16

11 DISCUSSION AND CONCLUSIONS

The impact assessment was undertaken for only the main components of the project i.e. the overhead transmission powerlines and associated infrastructure. The study excluded ancillary components such as borrow pits, quarries, lay-down areas and construction camps. This study evaluated the visual impact of the project with a view to assessing its severity based on the author's experience, expert opinion and accepted techniques.

The description of the visual impacts of the phases of construction and decommissioning are not considered as significant visual impacts since the period of activity is of relatively short duration and of a primary impact (localized, of short duration and easily mitigated at the end of the phase). The fact that disturbed areas, e.g. camps / lay-down areas will be rehabilitated also reduces the impacts of these phases.

It is the operational phase that presents the most significant long term visual impact. This is due primarily to the scale and form of the proposed development. Visibility reduces exponentially the further the viewer is from the proposed development.

Table 3, **High Level Impact Table - Visual**, summarises the impacts for the construction, operation, and decommissioning phases.

12 FINAL SPECIALIST STATEMENT AND AUTHORISATION RECOMMENDATION

12.1 Statement and Reasoned Opinion

The project will exert a **negative** influence on the visual environment. This is largely due to the:

- high visibility of the pylons which can be 28 m high, within the study area, especially as it is adjacent to the N12 and that the site when viewed from the road is flat and open sloping down to the east;
- the high visibility of construction and operation activity within the low growing, uniform open Karoo veld of uniform visual pattern;
- the low VAC of the area due to the low and uniform visual pattern of vegetation which does not allow for the project to be visually accommodated within the landscape as a result of the high visual contrast and absent screening;
- the scale of the project in a rural setting;

However, due to the low relative visual quality of the area the overall significance of the visual impact is regarded as **Moderate** (a rating of **3** on a scale of 1-5) for both pre- and post-mitigation during the operational phase. The significance of the visual impact for the construction phase is regarded as **Low** for both pre- and post-mitigation, while the significance of the visual impact after the decommissioning phase is regarded as **Low** pre-mitigation and **Very Low** post-mitigation

12.2 EA Condition Recommendations

Based on the field observations and the studies herein and with the implementation of the mitigation measures, it is the Visual Specialist’s opinion the visual impact of the 132kV Overhead Transmission Powerline and its associated electrical grid infrastructure does not present a potential fatal flaw provided that the recommended mitigation measures are implemented.

13 REFERENCES

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APPENDICES

Appendix A- Sensitivity report

SITE SENSITIVITY VERIFICATION
VISUAL IMPACT ASSESSMENT
FOR SECTION 6

SITE SENSITIVITY REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS, AS AMMENDED – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

Prepared for

ABO Wind Renewable Energies (Pty) Ltd

Prepared by

BAPELA CAVE KLAPWIJK
LAND PLANNING AND DESIGN
Menno Klapwijk
P.O Box 95702
WATERKLOOF
0145

Bapela Cave Klapwijk
Landscape Architects and Environmental Planners
11651 Hatfield 0028 (012) 362 4684 (012) 362 0394 cka@mweb.co.za

REPORT TITLE:	Site Sensitivity Verification Visual Impact Assessment (VIA) for the Kwagga 132kV Overhead Transmission Powerline and its associated electrical grid infrastructure Section 6
CLIENT:	ABO Wind Renewable Energies (Pty) Ltd
PROJECT NAME:	132kV OHLs for the proposed Kwagga EGI Section 6 Site Sensitivity Verification Visual Impact Assessment Report
REPORT STATUS:	Draft
BCK PROJECT NUMBER:	22002
PLACE AND DATE:	Pretoria, June 2022
KEYWORDS AND PHRASES:	Site Verification Report, Western Cape Province, Visual Impact Assessment, ABO

APPROVED

M KLAPWIJK

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LIST OF FIGURES

SITE SENSITIVITY VERIFICATION
VISUAL IMPACT ASSESSMENT
KWAGGA 1 WEF

SITE SENSITIVITY REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

1) INTRODUCTION

As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification was undertaken to confirm the current land use and environmental sensitivity of the proposed project area. The details of the site sensitivity verification are noted below:

Date of Site Visit	11-13 May 2022
Specialist Name	Menno Klapwijk
Professional Registration Number	87006
Specialist Affiliation / Company	South African council for the Landscape Architectural Professions (SACLAP) Bapela Cave Klapwijk
Specialist Topic	Visual Impact Assessment
Proposed Project Name	Kwagga 132kV OTP Section 6

2) METHOD OF THE SITE SENSITIVITY VERIFICATION

The study area was determined as the site and a 20 km buffer zone around it. The visibility of the pylons would be insignificant beyond this point. Refer to **Figure 1 Regional Locality Map,** which identifies the study area.

The method used was both a desk top study using Google Earth and a site inspection. The Screening report generated by the National Web-Based Environmental Screening Tool, as provided by the CSIR, was used as a point of departure.

Figure 1: Regional Locality Map

Google Earth was used to identify homesteads and structures that may be visually impacted. This information was used during the site inspection.

A site visit was undertaken over the period of 11 to 13 May 2022.

The purpose of the site visit was to determine the extent of the potential visibility of the turbine structures and to understand and document the receiving environment.

The field study entailed travelling public roads that surrounded and crossed the study area to determine the potential visibility from these areas. The route (**Figure 2: Locality Map with Photo/Viewpoints**) followed a west to east road to the south of the area. The route then followed a road on the east in a north-easterly direction, then cutting back west off the Rietbron Road through the centre of the study area back to the N12. The route then followed the N12 south to Viewpoint VP16).

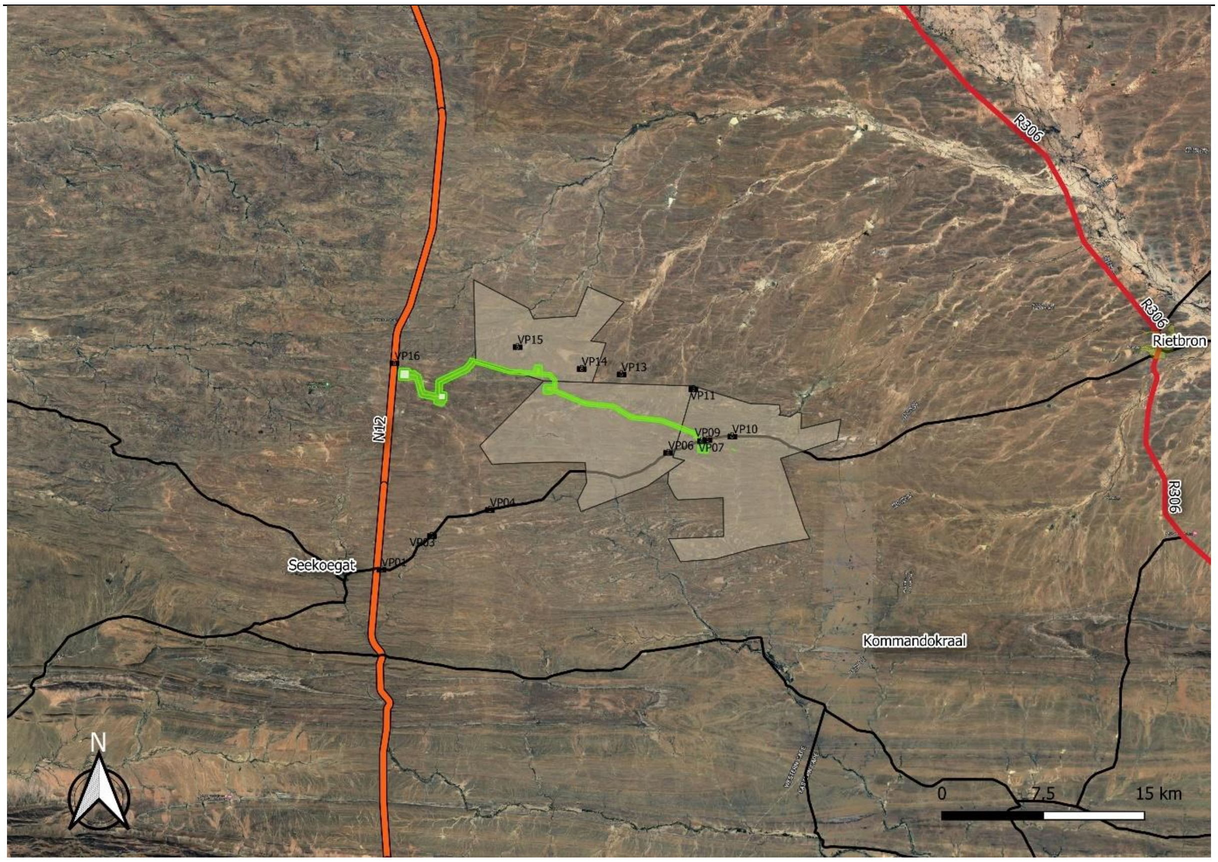


Figure 2: Locality Map with Photo/Viewpoints

3) OUTCOMES

3.1 Confirmation or dispute the current use of the land and the environmental sensitivity

The Screening Tool report provided a Flicker Theme Sensitivity map (See Figure 3: Relative Flicker Theme Sensitivity) that showed areas of low sensitivity and very high sensitivity, which specifically relate to areas with "potential temporarily or permanently inhabited residence". This coincided with the information obtained from Google Earth in terms of homesteads and structures. However, many of the homesteads appeared to be unoccupied or even abandoned. If this is the case the issue regarding flicker would not be applicable to all these dwellings.

The Screening Tool indicated that the Plant Theme Sensitivity (**Figure 3: Plant Theme Sensitivity)** was low sensitivity. However, the very nature of the vegetation in this area (Gamka Karoo and Prince Albert Succulent Karoo Musina and Rutherford 2006 **(Figure 4: Vegetation**) is low growing and visually uniform which does not provide much visual screening. Although the vegetation is not overly sensitive to the development it does not assist in reducing the visual expose of the turbines. The vegetation is typical of the Karoo ambience and it is this together with the topography which provides the Karoo sense of place.

The Screening Tool also contains a map of relative landscape theme sensitivity as it relates to wind developments. The map shows that the proposed site intersects with the following areas:

- High sensitivity - Slope between 1:4 and 1:10;
- High sensitivity - Within 500 m of a river;

- Low sensitivity - Slope less than 1:10;
- Medium sensitivity - Within 1000 m of a wetland;
- Very High sensitivity - Mountain tops and high ridges;
- Very High sensitivity - Slope more than 1:4; and
- Very High sensitivity - Within 250 m of a river.

These relative landscape themes do not relate specifically to the visual impact except for the more aesthetically pleasing mountain tops and high ridges as well as rivers and wetlands. The flatter slopes and the low vegetation increase the visual sensitivity of the area. The mountains are on the visual periphery at least 50 km to the north and south.[1]

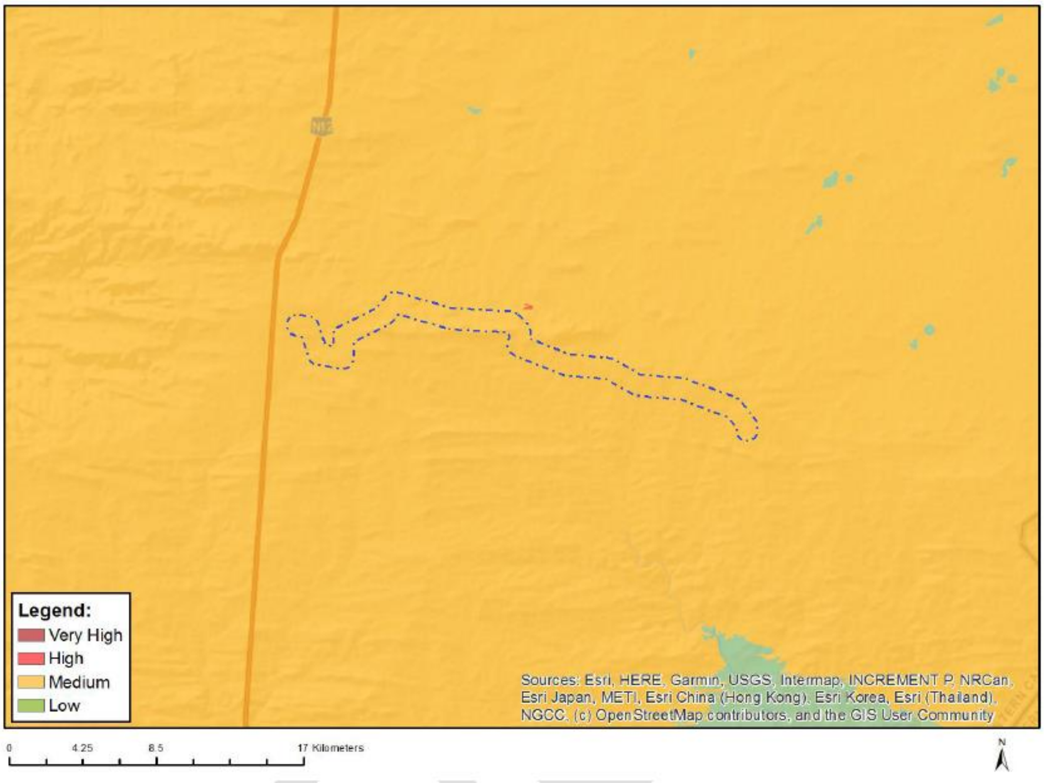


Figure 3: Plant Theme Sensitivity

3.2 Motivation and evidence of either the verified or different use of the land and environmental sensitivity

The study area's landscape is relatively flat to rolling with low ridges and covered with low growing and sparse vegetation (see Photos 1 and 2). The current land-use is primarily small stock grazing. The peripheral visual boundaries to the north and south are truncated by the Swartberg Mountains in the south and the Nuweveld Mountains in the north. The area appears to be sparsely populated, which was borne out during the site visit. The study area is not regarded as having a high visual quality when compared to other areas in the region such as the Swartberg Mountains, Meiringspoort and the mountains around Beaufort West and the Karoo National Park but it does display the typical and iconic Karoo landscape.

[1] Mucina, L. and Rutherford, M.C. (eds). Reprint 2011. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Photo 1: Typical sparse and open Karoo landscape with iconic windmill

Photo 2 Typical sparse and open Karoo landscape

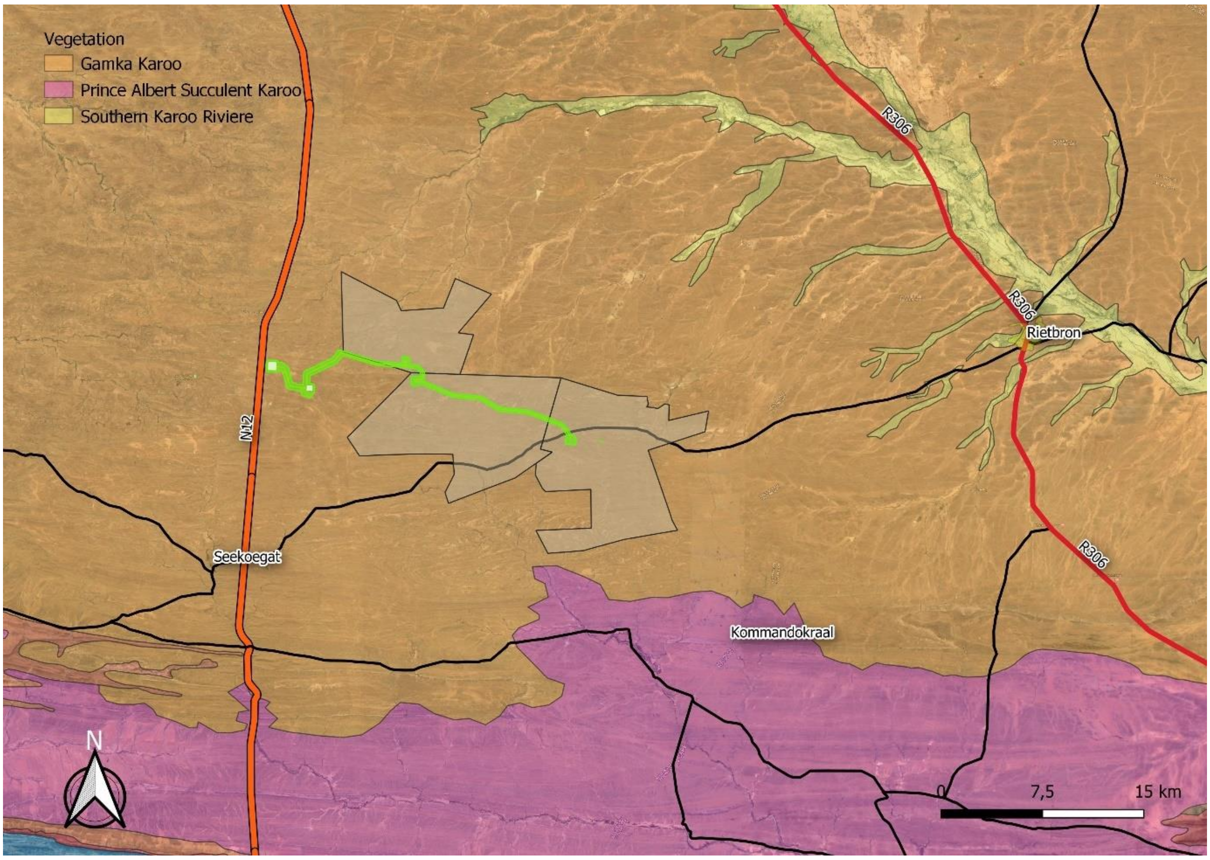


Figure 4: Vegetation

3.3 Description of the high-level impacts that may occur due to the proposed development of the WEF project

The sensitive receptors within the study area are those receptors that will be directly impacted by the visual intrusion by the turbines. (**See Figure 5: Visual Receptors**).

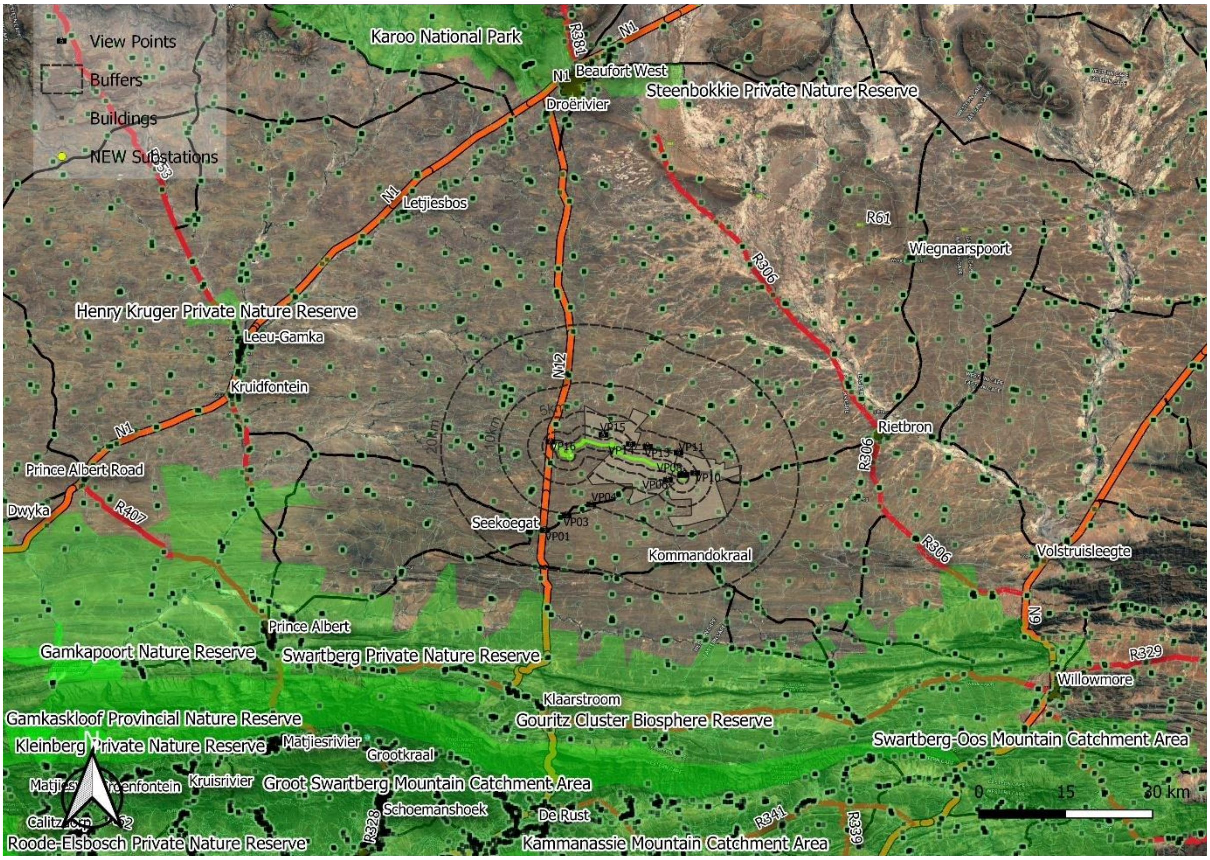


Figure 5: Visual Receptors

Although not all homesteads are occupied fulltime, (see dots on Figure 5) many of these will be in direct line of sight and within the 0-5km zone where the magnitude of impact could be high. Other sensitive receptors include travellers on the main roads such as the N12, R306 and the R61, activities and institutions that rely on the aesthetic environment such as game farms, national parks, lodges, and B&B's.

Landscape receptors are physical areas that are regarded as visually interesting and which provide sense of place, such as the typical Karoo ambience, to that area. These receptors include rivers and drainage ways, mountains, ridges, vegetation, and any other interesting features (**See Figure 6: Landscape Receptors**).

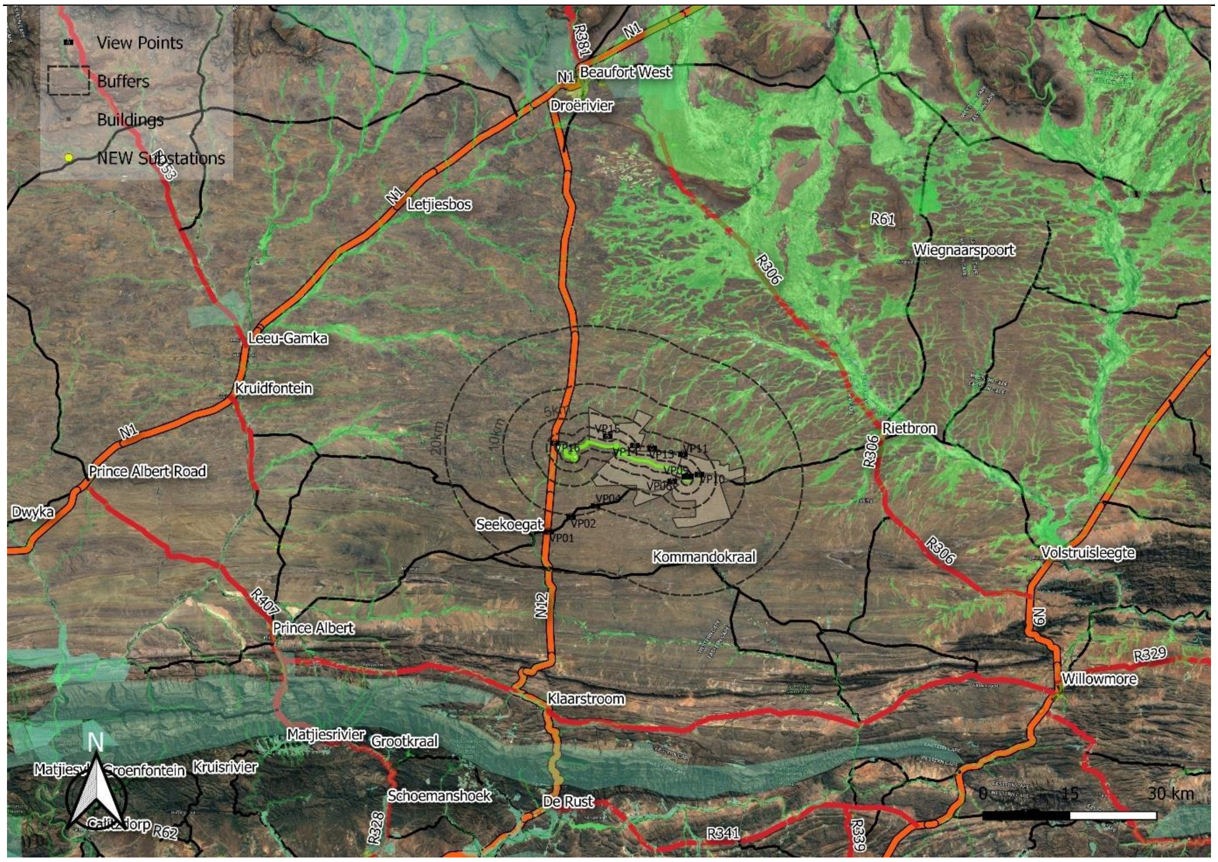


Figure 6: Landscape Receptors

3.4 Review input on the preferred infrastructure locations

The opportunity to alter pylon positions and routes is limited as positions of these are based on the approved positions of the wind turbines, topography, wind conditions and other technical considerations..

3.5 Description of the potential direct, indirect and cumulative impacts that will require further assessment in the EIA Phase.

Direct impacts that need to be considered are the impacts on sensitive receptors such as homesteads, tourists and those establishments that rely on the natural aesthetics of the environment such as conservation area, national parks, guest houses and B&B's as well as hunting and or photographic safari operations.

The Karoo is renowned and highly valued for its dark night skies. External security lighting will increase the visual impact of the project at night therefore attention should be given to their selection for the specific function

Cumulative visual impacts will arise where the powerlines are viewed together with the approved WEF's where the wind turbine development is visible from the same point. There are several renewable energy generation facilities approved and in the planning stages in the area as indicated in **Figure 7** below. One that is approved is directly west of Kwagga 1 and straddles the N12. A second approved development is further north on the western side of the N12.

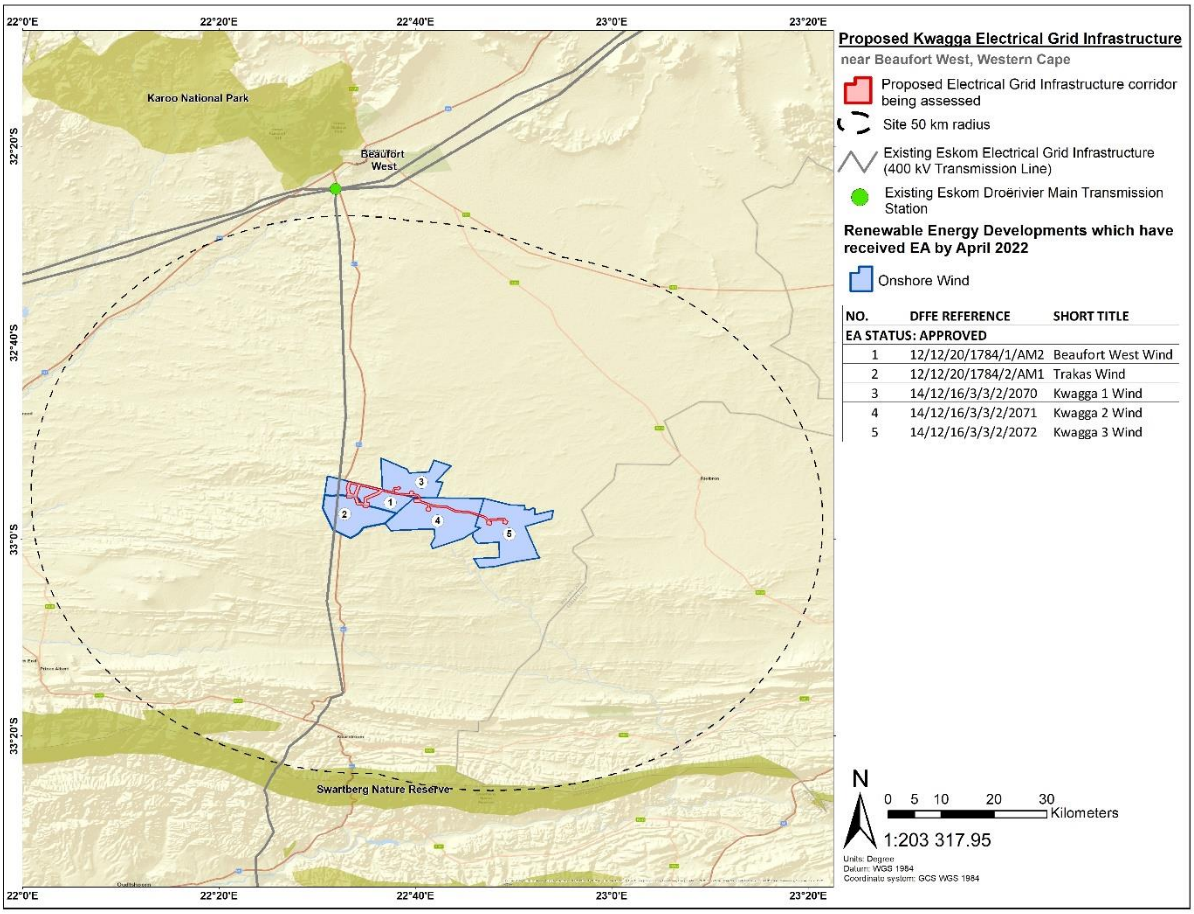


Figure 7: Regional EA Applications for Renewable Energy Projects Located Within a 50 km Radius from the Proposed Kwagga WEFs Study Areas (Source: DEFF – Q2, 2020)

3.6 Applicable Legislation

There are no specific legal requirements nor is there any direct reference to the visual environment in the legislation. General legislation pertaining to the environment is contained in the National Environmental Management Act (NEMA) (Act No. 107 of 1998) as well as the National Heritage Resources Act No. 25, 1999 and the associated provincial regulations provide legislative protection for listed or proclaimed site, such as urban conservation areas, nature reserves and proclaimed scenic routes.

The National Environmental Management Principles as contained in NEMA require that sustainable developments require the following considerations (amongst others):
2(4)(ii) that pollution and degradation of the environment are avoided, or, that where they cannot be altogether avoided, are minimised and remedied; and
2(4)(iii) that the disturbance of landscapes and sites that constitute the nation’s cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied.

The National Heritage Resources Act refers, under Part 1 General Principles, to the National Estate:
3.(2)(d) Landscapes and natural features of cultural significance

Visual pollution is controlled to a limited extent, by the Advertising on Roads and Ribbons Act (Act No. 21 of 1940) which deals mainly with signage on public roads.

The Protected Areas Act (NEMA) (Act 57 of 2003, Section 17) is also intended to protect natural landscapes

The Western Cape DEA&DP have produced ‘A Guideline for Involving Visual and Aesthetic Specialists in EIA Processes’

Appendix B- Specialist Expertise

MENNO KLAPWIJK

LANDSCAPE ARCHITECT AND ENVIRONMENTAL PLANNER

PRESENT POSITION IN FIRM	Principal – Bapela Cave Klapwijk
TELEPHONE NO	0832558127
WEBSITE	www.bck.co.za
ADDRESS	891 Jan Shoba Street Brooklyn Pretoria 0181
DATE OF BIRTH	9 June 1954
NATIONALITY	South African born in Johannesburg
LANGUAGE	Mother Tongue: English Others: Afrikaans

ACADEMIC QUALIFICATIONS

1983 : B.Sc. (Landscape Architecture) Texas A&M University, USA.
1986 : Environmental Impact Assessment, Graduate School of Business, University of Cape Town.

PROFESSIONAL QUALIFICATIONS

Registered Landscape Architect

KEY FIELDS OF EXPERIENCE

Particular aspects of experience include:

- Visual impact assessment.
- Planning and design for conservation areas, natural resource areas, nature reserves and game farms
- Landscape design for parks, corporate headquarters, office and industrial parks, housing developments, hotels, plazas and pedestrian malls.
- Recreation planning.
- Environmental Monitoring and Auditing.

- Site / master planning and development.
- Integrated environmental assessment and planning for existing and future land uses.
- Mining and quarry reclamation and development planning and design.

PROFESSIONAL REGISTRATION AND MEMBERSHIP

Registered: South African Council for Landscape Architecture (SACLAP) Reg No. 87006

- Member: Institute of Landscape Architects of South Africa (ILASA).
- Member: American Society of Landscape Architects (ASLA).
- Member: International Association of Impact Assessors (SA) (IAIA-SA).

YEARS OF EXPERIENCE AND CAREER SUMMARY

Thirty seven years as landscape architect and environmental planner in the United States of America, Namibia, Botswana, Lesotho, Swaziland, Mozambique, Angola and South Africa

1989 - present: Bapela Cave Klapwijk, Pretoria - Principal

1988 - 1989: Plan Associates, Pretoria –Associate, Senior Landscape Architect.

1983 - 1988: Chris Mulder Associates Inc., Pretoria - Senior Landscape Architect..1982 - 1983: Austin and Landphair (SHWC), Landscape Architects, College Station, Texas.

ADVISORY POSITIONS

- Executive Central Council Member (Institute of Landscape Architects of South Africa) (1986-1991).

- Elected member of the Board of Control for Landscape Architects of South Africa (BOCLASA now SACLAP)

- City Council of Pretoria, ILASA representative on CCP Town Planning and Aesthetics Committee (1987 - 2001).

- External Examiner, Department of Landscape Architecture, University of Pretoria (1985 - 2016).

- CSIR panel of experts to assist in the development of visual impact guidelines for the Western Cape

- Council for the Built Environment Council member (June 2010 – June 2014)

- Member of Alien and Invasive Species Review Panel 2020

PEER REVIEWER

- VIA Shell Ultra City, Johannesburg for CSIR
- VIA Alpha Cement Factory, Saldanha for Mark Wood Consultants
- VIA Coega IDZ and Harbour, Port Elizabeth for African Environmental Solutions

EDITORIAL BOARDS

- Environmental Planning and Management (EMP) Journal
- Landscape SA Journal

PROFESSIONAL AWARDS AND COMPETITIONS

2015 Institute of Landscape Architects of South Africa (ILASA) National Award of Excellence: Category Design: Taung Skull World Heritage Site – Picnic Site

2007 Institute of Landscape Architects of South Africa (ILASA) National Award of Excellence: Category Environmental Planning: Taung Skull World Heritage Site

2001 Institute of Landscape Architects of South Africa (ILASA) National Award of Excellence: Category Environmental Planning: Driekoppies Dam

1997 SAACE Construction World: Olifants-Sand Water Transfer Scheme.

1996 Premier and National Awards from the Concrete Manufacturer's Association for paving design: Hatfield Plaza.

1995 EPPIC National Premium Award: Venetia Balance.

- South African Landscape Contractors Institute (SALI). Silver Award: Bentel Abramson Head Office (with Eksklusiewe Tuine).
- South African Landscape Contractors Institute (SALI). Silver Award: AFCOL Head Office (with Eksklusiewe Tuine).

1994 South African Landscape Contractors Institute (SALI). Gold Award: Hampton Park (with Eksklusiewe Tuine).

- South African Landscape Contractors Institute (SALI). Silver Award: Gilooly's View (with Eksklusiewe Tuine).

1992 Institute of Landscape Architects of South Africa (ILASA). Commendation: Tourism RSA.

1991 Institute of Landscape Architects of South Africa. National Award of Merit: Category Environmental Planning: Limpopo (Greefswald) Government Water Scheme for DWAF.

- First place in design competition for the Chris Barnard Health Centre (with H Taljaard Carter and Partners).

1987 American Society of Landscape Architects. Honour Award: Category Planning and Research: Songimvelo Natural Resource Areas (with CMAI).

1986 Commendation: Design competition for Bloemfontein Urban River Front.

1983 Sigma Lambda Alpha Landscape Architecture Academic Honour Society (USA).
Merit Award for academic excellence, Texas Chapter ASLA.

1982 Faculty Award, Texas A&M University.

1981 Faculty Award, University of Pretoria.

1980 ILASA Student Award, University of Pretoria.

1979 ILASA Student Award, University of Pretoria.

Appendix C- Specialist Declaration

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Scoping and Environmental Impact Assessment for the Proposed Development of the 279 MW Wind Energy Facility (i.e. Kwagga WEF 1), near Beaufort West, Western Cape

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs Attention: Chief Director: Integrated Environmental Authorisations Environment House 473 Steve Biko Road Arcadia Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at: Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Bapela Cave Klapwijk			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	B-BBEE
Specialist name:	Menno Klapwijk			
Specialist Qualifications:	Landscape Architect			
Professional affiliation/registration:	South African Council for the Landscape Architectural Professions Registration no 87006			
Physical address:	168 Nicolson Street Brooklyn Pretoria			
Postal address:	P O Box 95702 Waterkloof			
Postal code:	0154	Postal code:	0154	
Telephone:	0832558127	Telephone:		
E-mail:	menno@bcksa.co.za	E-mail:	menno@bcksa.co.za	

2. DECLARATION BY THE SPECIALIST

I, Menno Klapwijk, 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

Bapela Cave Klapwijk
Name of Company:

21 September 2021
Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Menno Klapwijk, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

Bapela Cave Klapwijk
Name of Company

21 September 2021
Date

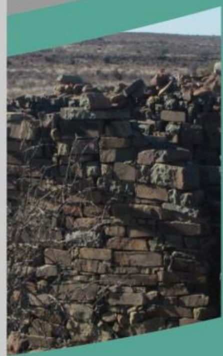
Signature of the Commissioner of Oaths

Date

Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.3





Heritage Impact Assessment (Archaeology, Cultural Landscape and Palaeontology)

HERITAGE IMPACT ASSESSMENT:
BASIC ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF SECTION 6 OF A 132 kV OVERHEAD TRANSMISSION POWERLINE AND ASSOCIATED ELECTRICAL INFRASTRUCTURE NEAR BEAUFORT WEST, WESTERN CAPE

Required under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999)

HWC Case No.: 20220518SB0519E

Report for:

CSIR – Environmental Management Services
P.O. Box 320, Stellenbosch, 7599
Tel:
Email:

On behalf of:

ABO Wind renewable energies (Pty) Ltd

Dr Jayson Orton
ASHA Consulting (Pty) Ltd
23 Dover Road, Muizenberg, 7945
Tel: (021) 788 1025 | 083 272 3225
Email: jayson@asha-consulting.co.za

22 June 2022

Specialist declaration

I, ____Jayson Orton____, 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: ____ASHA Consuylting (Pty) Ltd_____

Date: _____22 June 2022_________________________

EXECUTIVE SUMMARY

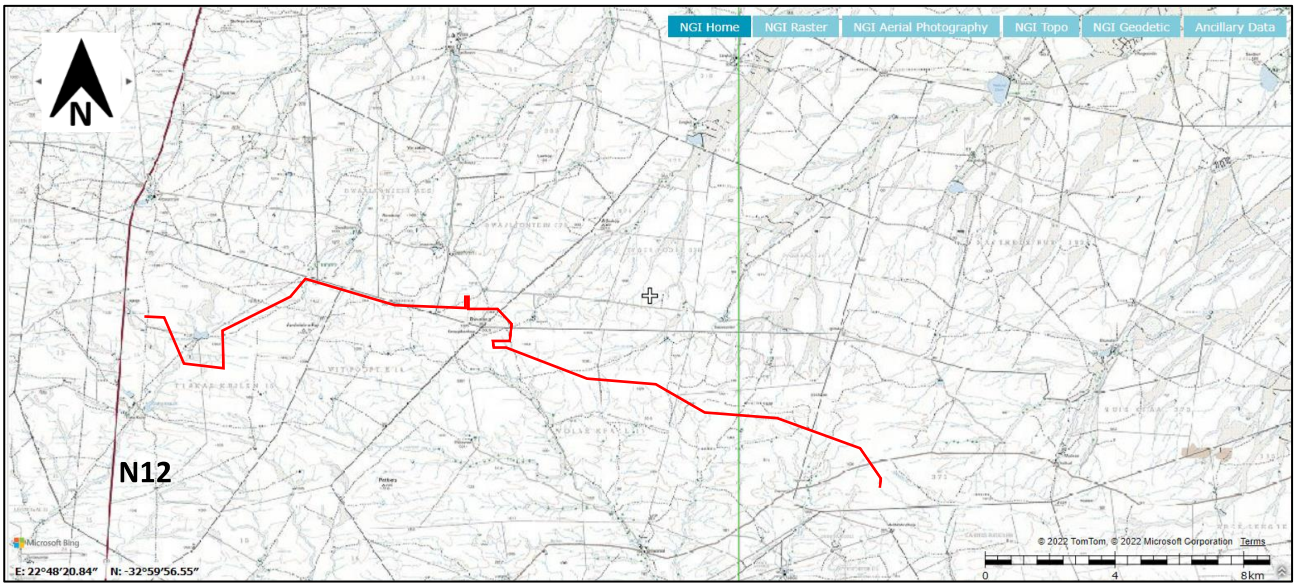
1. Site Name

Kwagga EGI Corridor – Section 6

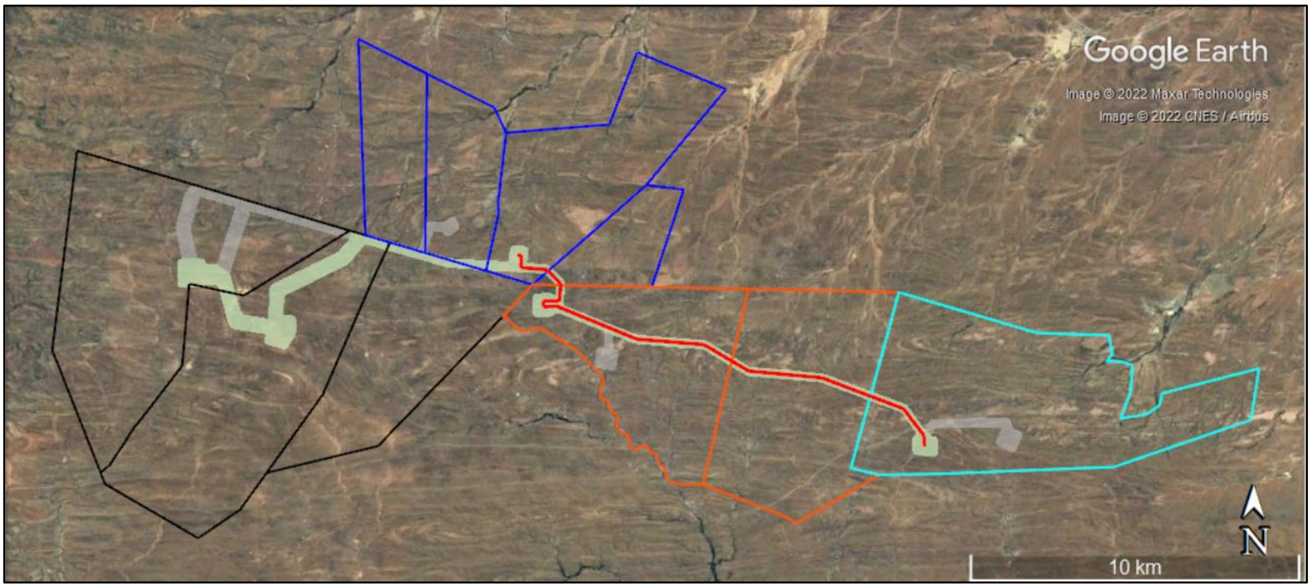
2. Location

Off:	the N12, about 63 km south of Beaufort West
Farm portions for Section 6:	Remainder of the Farm Dwaalfontein Wes No. 377, Portion 3 of the Farm Tyger Poort No. 376, Portion 1 of the Farm Dwaalfontein Wes No. 377, Remainder of the Farm Dwaalfontein No. 379, Remainder of the Farm Wolve Kraal No. 17, Portion 9 of the Farm Wolve Kraal No.17, Portion 7 of the Farm Muis Kraal No. 373, Portion 1 of the Farm Witpoortje No. 16
Centre point for Section 6:	S32° 56’ 46.8” E22° 43’ 22.0”

3. Locality Plan



The red line shows the broader corridor alignment within which the project would be situated.



The Section 6 powerline is the red line within the green corridor.

4. Description of Proposed Development

The proposed powerline is one of seven proposed within a corridor. Each will consist of the components listed below. The exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction (subsequent to the issuing of an EA, should such an authorisation be granted for the proposed projects), but that the information provided below is seen as the worst-case scenario for the projects.

- Overhead Transmission Powerlines
    - Line capacity: Up to 132 kV
    - Line/pylon height: Up to 30 m
    - Pylon type: Monopole

    - The registered servitude for each of the seven proposed 132 kV overhead transmission powerlines will be up to 50 m wide, or where multiple adjacent powerlines occur, in line with the Eskom guidelines as described in Table 2 below. Note that the entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant standards and specifications (Table 2 - Eskom Distribution Guide Part 19: Building Line Restrictions, Servitude Widths, Line Separations and Clearances from Power Lines).
- Associated electrical infrastructure (including but not limited to feeder bays, busbars, new transformer bays (up to 500 MVA) and possible extension to the existing footprint at the proposed Eskom 132 kV Switching Substation). The following approved substations are relevant to these BA projects as end points (the first two may need to be upgraded to facilitate connections, but the three WEF substations will remain as approved):
    - Proposed Eskom 132 kV substation (Footprint: approximately 17 ha)
    - Proposed Beaufort West 132 kV- 400 kV Linking Station (Footprint: approximately 35 ha)
    - Proposed Kwagga WEF 1
        - - Preferred substation (Footprint: approximately 5.21 ha)
        - - Alternative substation (Footprint: approximately 7.59 ha)
    - Proposed Kwagga WEF 2
        - - Preferred substation (Footprint: approximately 18.5 ha)
        - - Alternative substation (Footprint: approximately 11.7 ha)
    - Proposed Kwagga WEF 3
        - - Preferred substation (Footprint: approximately 17 ha)
        - - Alternative substation (Footprint: approximately 17.7 ha)

5. Heritage Resources Identified

The assessment was based on the surveys of five adjoining and adjacent wind energy facilities. Although archaeologically resources were widespread but fairly sparsely distributed on the landscape, very few were located in or close to the proposed corridor. This is because the project layout was designed to avoid sensitive features. All sites currently on record within or close to the corridor are rated as NCW resources. Fossils also occur in the landscape but are very sparsely distributed. Impacts to graves were considered, but none are known in the vicinity of the corridor and he chances of any occurring in this fairly rocky landscape are minimal.

The cultural landscape is also identified as a resource, but it must be noted that five wind energy facilities have been approved around the proposed corridor and the proposed powerlines would not be constructed if the three WEFs that they would support do not get constructed. As such, no new impacts to the cultural landscape are expected.

6. Anticipated Impacts on Heritage Resources

No significant impacts are expected. This is due to the project being designed to avoid sensitive sites on the ground and because the project will not be constructed in the absence of the adjoining WEFs.

7. Recommendations

It is recommended that the proposed Section 6 powerline should be authorised, but subject to the following recommendations which should be included as condition of authorisation:

- A palaeontologist must conduct a preconstruction survey of the final authorised alignment well in advance of construction to determine whether any areas require avoidance or mitigation;
- An archaeologist must conduct a preconstruction survey of the final authorised alignment well in advance of construction to determine whether any areas require avoidance or mitigation;
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

8. **Author/s and Date**

Heritage Impact Assessment: Jayson Orton, ASHA Consulting (Pty) Ltd, 22 June 2022
Archaeological specialist study: Jayson Orton, ASHA Consulting (Pty) Ltd, 22 June 2022
Palaeontological specialist study: John Almond, Natura Viva cc, June 2022

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Handaxe: A bifacially flaked, pointed stone tool type typical of the Early Stone Age.

Holocene: The geological period spanning the last approximately 10-12 000 years.

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Pleistocene: The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BA: Basic Assessment

CSIR: Council for Scientific and Industrial Research

CRM: Cultural Resources Management

DFFE: Department of Forestry, Fisheries and the Environment

EA: Environmental Authorisation

ECO: Environmental Control Officer

EGI: Electricity Grid Infrastructure

EMPr: Environmental Management Program

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

HWC: Heritage Western Cape

LSA: Later Stone Age

MSA: Middle Stone Age

NCW: Not Conservation Worthy

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

NID: Notification of Intent to Develop

PPP: Public Participation Process

REDZ: Renewable Energy Development Zone

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Compliance with Appendix 6 of the 2014 EIA Regulations

Requirements of Appendix 6 – GN R326 (7 April 2017)	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.4 Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii (Preliminary Section of this report)
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3
(cA) an indication of the quality and age of base data used for the specialist report;	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 7.6, 7.4, 7.8
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying alternatives;	Sections 1.1.3 & 5
g) an identification of any areas to be avoided, including buffers;	Not Applicable
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;	Section 5
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3.6
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 5 Section 12
k) any mitigation measures for inclusion in the EMPr;	Sections 8 & 13
l) any conditions for inclusion in the environmental authorisation;	Section 13
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity and 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, and where applicable, the closure plan;	Sections 12.1 & 13
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 11
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 11
q) any other information requested by the competent authority.	Not Applicable
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	Part A of the Assessment Protocols published in Government Notice No. 320 on 20 March 2020 is applicable (i.e. Site sensitivity verification requirements where a specialist assessment is required but no specific assessment protocol has been prescribed). See Appendix 3.

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by the Council for Scientific and Industrial Research (CSIR) to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of seven 132 kV overhead transmission powerlines and associated electrical infrastructure to support three approved wind energy facilities (WEFs) in an area some 63 km south of Beaufort West, Western Cape (Figures 1 & 2). The powerlines would be constructed end to end and/or side by side on the same pylons as required within a single corridor. The western end of the development area is at S32° 55’ 30.0” E22° 33’ 05.0”, while the eastern end is at S32° 58’ 10.0” E22° 49’ 20.0”. The approximate mid-point of Section 6 assessed in this report is at S32° 56’ 46.8” E22° 43’ 22.0”.

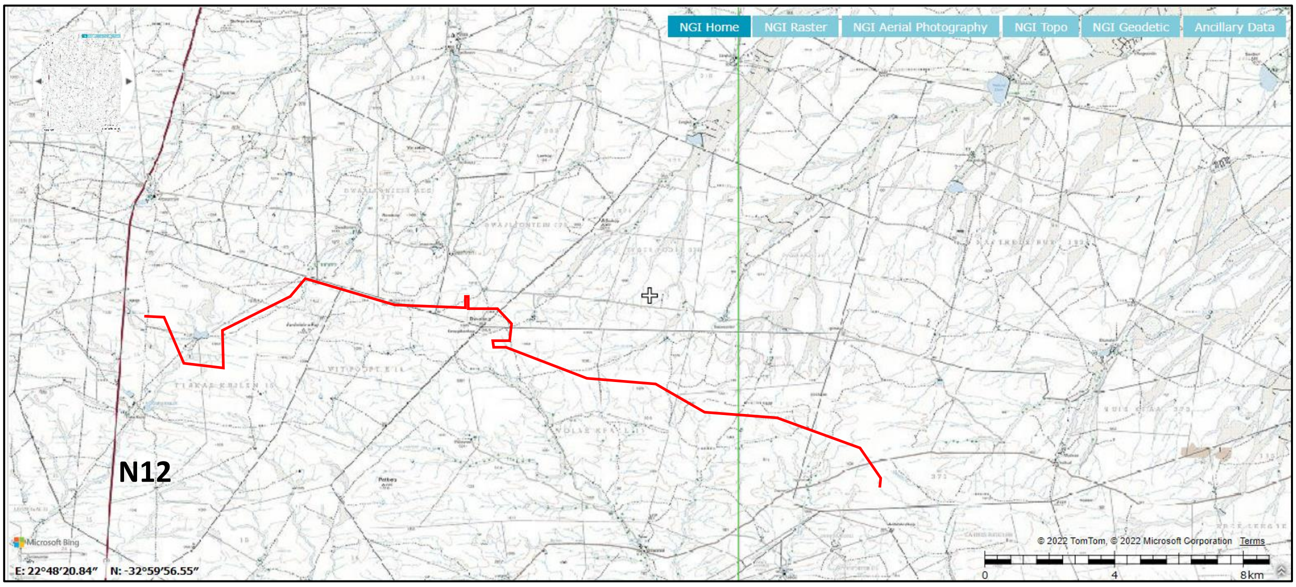


Figure 1: *Extract from 1:50 000 topographic map 3222DC & DD showing the location of the preferred alignment. Source: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

1.1. The proposed project

1.1.1. Project description

ABO Wind renewable energies (Pty) Ltd (“the Developer”) is proposing the construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022.

The seven proposed 132 kV overhead transmission powerlines will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

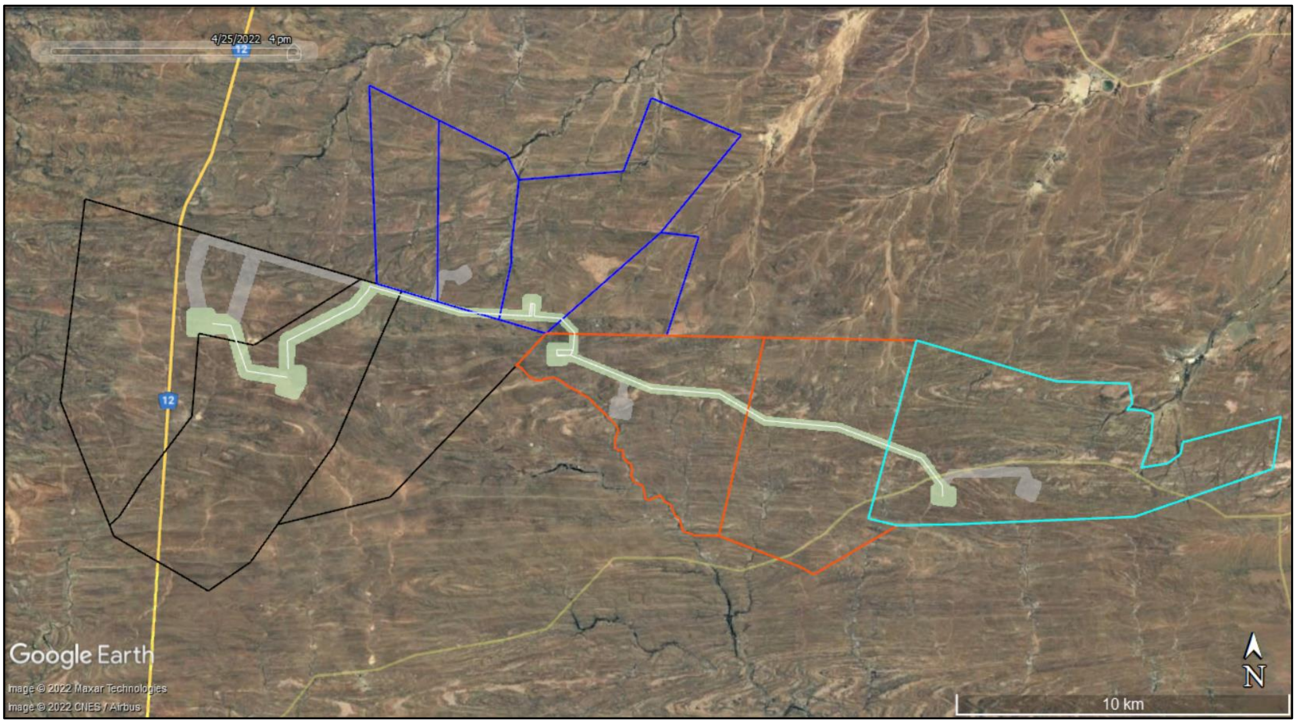


Figure 2: *Aerial view of the broader study area showing the farm portions (coloured polygons showing the WEF projects – Kwagga 1 in blue, Kwagga 2 in orange, Kwagga 3 in turquoise, neingbouring Beaufort West and Trakas WEFs in black). The preferred alignments for assessment all fall within the corridor shown in green with white centre line, while the alternatives (not for formal assessment) are in grey.*

It is understood that the proposed Eskom 132 kV Switching Substation and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1) will be constructed by South Africa Mainstream Renewable Power Developments (Pty) Ltd ("Mainstream") in support of their Beaufort West WEF (DFFE Ref: 12-12-20-1784-1-AM2) and the Trakas WEF (DFFE Ref: 12-12-20-1784-2-AM2) that are to be located on land directly adjacent to the proposed Kwagga WEFs 1-3. ABO Wind has signed a servitude agreement and relevant powers of attorney with the landowner of the relevant Beaufort West and Trakas WEFs affected land portions and obtained agreement with Mainstream to facilitate the connection of the proposed Kwagga WEFs 1-3 via 132 kV overhead powerlines, via the aforementioned Eskom Switching Substation and the Beaufort West 132 kV-400 kV Linking Station, to the existing Droërivier–Proteus 400 kV overhead powerline that runs parallel to the N12 in a north-south direction.

The farm portions potentially affected by the projects are as shown in Table 1, while Figure 3 shows an overview of the broader project and Figure 4 maps the specific project assessed in this report. The substations are excluded from this assessment which only deals with the powerlines, although possible upgrades to the Beaufort West Linking Station and Eskom Switching Station are included in those projects linking to those substations (i.e. Sections 1 to 4).

Table 1: *Potentially affected farm portions for the seven projects (including linking to the previously assessed substation alternatives). The project assessed in the present report is highlighted in blue and illustrated in Figure 4.*

	From the proposed Eskom 132 kV SS to the proposed Beaufort West 132 kV-400 kV Linking Station	**From Kwagga WEF 1 to the proposed Eskom 132 kV Substation (SS)**	**From Kwagga WEF 2 to the proposed Eskom 132 kV SS**	**From Kwagga WEF 3 to the proposed Eskom 132 kV SS**	**From Kwagga WEF 2 to Kwagga WEF 1**	**From Kwagga WEF 3 to Kwagga WEF 1**	**From Kwagga WEF 3 to Kwagga WEF 2**
Section number	1	2	3	4	5	6	7
Remainder of the Farm Dwaalfontein Wes No. 377 (300m wide corridor)		x	x			x	
Portion 3 of the Farm Tyger Poort No. 376 (300m wide corridor)			x	x	x	x	
Portion 1 of the Farm Dwaalfontein Wes No. 377 (300m wide corridor)		x	x			x	
Remainder of the Farm Dwaalfontein No. 379 (300m wide corridor)		x	x	x	x	x	
Remainder of the Farm Wolve Kraal No. 17 (300m wide corridor)			x	x	x	x	x
Portion 9 of the Farm Wolve Kraal No.17 (300m wide corridor)				x		x	x
Portion 7 of the Farm Muis Kraal No. 373 (300m wide corridor)				x		x	x
Portion 1 of the Farm Witpoortje No. 16 (500m wide corridor)	x	x	x			x	
Portion 1 of the Farm Trakas Kuilen No. 15 (500m wide corridor)		x	x	x			
Remainder of the Farm Trakas Kuilen No. 15 (500m wide corridor)	x						
Servitude length	3 km	9 km	12 km	25 km	3 km	16 km	13 km

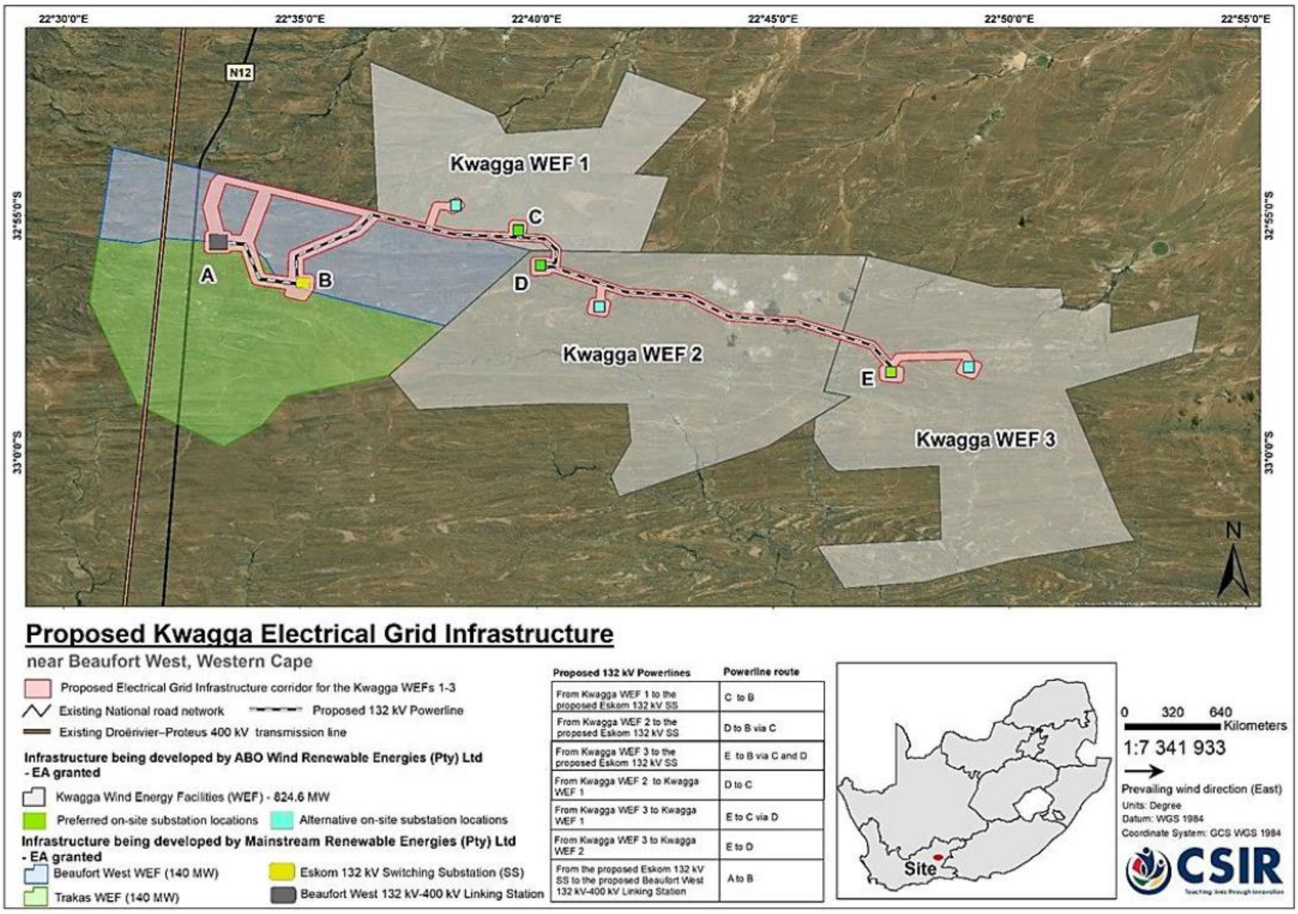


Figure 3: *Map showing the locations of the various proposed powerline projects (refer to Table 1). The substations are labelled as follows: A = Beaufort West Linking Station, B = Eskom Switching Station, C = Kwagga 1 Substation, D = Kwagga 2 Substation, E = Kwagga 3 Substation.*

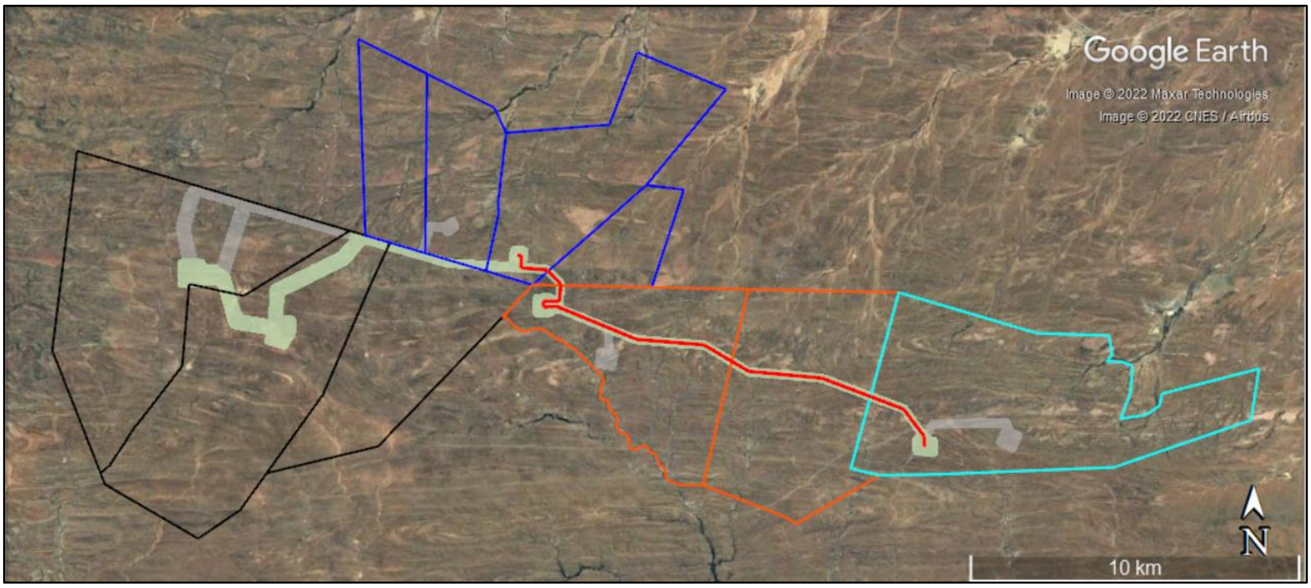


Figure 4: *Aerial view showing the location and routing of the Section 6 powerline which is assessed in the present report (red line within corridor).*

Each of the proposed EGI projects will consist of the components listed below. It is important to note at the outset that the exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction (subsequent to the issuing of an EA, should such an authorisation be granted for the proposed projects), but that the information provided below is seen as the worst-case scenario for the projects.

- Overhead Transmission Powerlines
  - Line capacity: Up to 132 kV
  - Line/pylon height: Up to 30 m
  - Pylon type: Monopole
  - The registered servitude for each of the seven proposed 132 kV overhead transmission powerlines will be up to 50 m wide, or where multiple adjacent powerlines occur, in line with the Eskom guidelines as described in Table 2 below. Note that the entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant standards and specifications (Table 2 - Eskom Distribution Guide Part 19: Building Line Restrictions, Servitude Widths, Line Separations and Clearances from Power Lines).
- Associated electrical infrastructure (including but not limited to feeder bays, busbars, new transformer bays (up to 500 MVA) and possible extension to the existing footprint at the proposed Eskom 132 kV Switching Substation). The following approved substations are relevant to these BA projects as end points (the first two may need to be upgraded to facilitate connections, but the three WEF substations will remain as approved):
  - Proposed Eskom 132 kV substation (Footprint: approximately 17 ha)
  - Proposed Beaufort West 132 kV- 400 kV Linking Station (Footprint: approximately 35 ha)
  - Proposed Kwagga WEF 1
    - - Preferred substation (Footprint: approximately 5.21 ha)
    - - Alternative substation (Footprint: approximately 7.59 ha)
  - Proposed Kwagga WEF 2
    - - Preferred substation (Footprint: approximately 18.5 ha)
    - - Alternative substation (Footprint: approximately 11.7 ha)
  - Proposed Kwagga WEF 3
    - - Preferred substation (Footprint: approximately 17 ha)
    - - Alternative substation (Footprint: approximately 17.7 ha)

1.1.2. Identification of alternatives

It is necessary to formally apply for a single line routing but alternative routings have been considered in the assessment such that should an amendment be required in the future then this can be more easily achieved. As such, no location alternatives are formally assessed. Because multiple lines would be placed on single pylons, only monopoles are being considered. The assessment therefore only considers the preferred project and the No-Go option.

1.1.3. Description of project aspects relevant to the heritage study

All aspects of the proposed development are relevant, since excavations for foundations may impact on archaeological and/or palaeontological remains, while the above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

1.2. Terms of reference

ASHA Consulting was asked to do the following:
- Describe regional and local heritage features of the receiving environment;
- Conduct a field survey to search for sensitive areas and sites of heritage significance;
- Map sensitive features;
- Assess (identify and rate) the potential impacts on heritage resources;
- Identify relevant legislation and legal requirements; and
- Provide recommendations on possible mitigation measures and management guidelines.

From Heritage Authority

A Notification of Intent to Develop (NID) covering all seven Sections of the broader project was submitted to Heritage Western Cape (HWC). They responded as follows:

NOTIFICATION OF INTENT TO DEVELOP: PROPOSED CONSTRUCTION OF SEVEN 132 KV OVERHEAD TRANSMISSION POWERLINES IN SUPPORT OF THE PROPOSED KWAGGA WIND ENERGY FACILITY SUBMITTED IN TERMS OF SECTION 38(1) OF THE NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

ERF Numbers: Portion 1 of Trakas Kuilen 15, Remainder of Trakas Kuilen 15, Portion 1 of Wit Poortje 16, Portion 1 ofDwaalfontein Wes 377, Remainder of Dwaalfontein Wes 377, Dwaalfontein 379, Remainder of Wolve Kraal 17, Portion 9 of Wolve Kraal 17, Portion 7 of Farm 373

The matter above has reference.

Heritage Western Cape is in receipt of your application for the above matter received. This matter was discussed at the Heritage Officers Meeting held on 17 May 2022

You are hereby notified that, since there is reason to believe that the proposed construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility will impact on heritage resources, HWC requires that a Heritage Impact Assessment (HIA) that satisfies the provisions of Section 38(3) of the NHRA be submitted. Section 38(3) of the NHRA provides

(3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): ***Provided that the following must be included:***

(a) The identification and mapping of all heritage resources in the area affected;
(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;
(c) an assessment of the impact of the development on such heritage resources;
(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
(f) if heritage resources will be adversely affected by the proposed development, The consideration of alternatives; and
(g) plans for mitigation of any adverse effects during and after the completion of the proposed development.

(Our emphasis)

This HIA must in addition have specific reference to the following:

- Desktop Archaeological Impact Assessment
- Palaeontological Impact Assessment

The HIA must have an overall assessment of the impacts to heritage resources which are not limited to the specific studies referenced above.

The required HIA must have an integrated set of recommendations.

The comments of relevant registered conservation bodies; all Interested and Affected parties; and the relevant Municipality must be requested and included in the HIA where provided. Proof of these requests must be supplied.

1.3. Scope, purpose and objectives of the report

A heritage impact assessment (HIA) is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by the National Department of Forestry and Fisheries and Environment (DFFE) who will review the Basic Assessment (BA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. Details of specialist

This specialist assessment has been undertaken by Dr Jayson Orton of ASHA Consulting (Pty) Ltd. He has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in South Africa (primarily in the Western Cape and Northern Cape provinces) since 2004 (please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP; Member #43) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

A signed specialist statement of independence is included as an appendix to this specialist assessment.

2. LEGISLATIVE CONTEXT

2.1. National Heritage Resources Act (NHRA) No. 25 of 1999

The NHRA protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith”;
- Palaeontological material: “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”;
- Archaeological material: a) “material 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”; b) “rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation”; c) “wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation”; and d) “features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found”;
- Grave: “means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place”; and
- Public monuments and memorials: “all monuments and memorials a) “erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of

government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

Section 3(3) describes the types of cultural significance that a place or object might have in order to be considered part of the national estate. These are as follows:

a) its importance in the community, or pattern of South Africa's history;
b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
i) sites of significance relating to the history of slavery in South Africa.

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

2.2. Approvals and permits

2.2.1. Assessment Phase

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 S.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. Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to a BA. The present report provides the heritage component. HWC is required to provide comment on the proposed project in order to facilitate final decision making by the National Department of Forestry, Fisheries and the Environment (DFFE).

2.2.2. Construction Phase

If archaeological or palaeontological mitigation is required prior to construction, then the appointed archaeologist or palaeontologist would need to obtain a workplan approval from HWC. This would be issued in their name. This is so that the heritage authority can ensure that the appointed practitioner has proposed an appropriate methodology that will result in the mitigation being done properly.

2.3. Guidelines

HWC have issued minimum standards documents for HIAs and specialist studies. There is also a Western Cape Provincial guideline for heritage specialists working in an EIA context and which is generally useful. The reporting has been prepared in accordance with these guidelines. The relevant documents are as follows:

- Heritage Western Cape. 2016. Grading: purpose and management implications.
- Heritage Western Cape. 2019. Public consultation guidelines.
- Heritage Western Cape. 2021. Guide for Minimum Standards for Archaeology and Palaeontology reports submitted to Heritage Western Cape.
- Heritage Western Cape. 2021. Notification of Intent to Develop, Heritage Impact Assessment, (Pre-Application) Basic Assessment Reports, Scoping Reports and Environmental Impact Assessments, Guidelines for submission to Heritage Western Cape.
- Winter, S. & Baumann, N. 2005. Guideline for involving heritage specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 E. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

2.4. Application timeline

The application to DFFE under NEMA is currently in the Impact Assessment phase of the BA Process with submission of the Draft BA Report estimated to be around mid-July 2022.

3. APPROACH AND METHODOLOGY

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. The information sources used in this report are presented in Table 1 with relevant dates of each source referenced in the text as needed. Data were also collected via field surveys for the five adjacent WEF projects (all conducted by the present consultant). No new survey was done for this project because the survey coverage was deemed sufficiently high to give a very good indication of the heritage resources present and their expected density. The data quality is suitable for the purpose of informing this report.

Table 1: *Information sources used in this assessment.*

Data / Information	Source	Date	Type	Description
Maps	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical and current 1:50 000 topographic maps of the study area and immediate surrounds
Aerial photographs	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical aerial photography of the study area and immediate surrounds

Aerial photographs	Google Earth	Various	Spatial	Recent and historical aerial photography of the study area and immediate surrounds
Cadastral data	CapeFarmMapper (http://gis.elsenburg.com/apps/cfm/#)	Current	Spatial	Cadastral boundaries, extents and aerial photography
Cadastral data	Chief Directorate: National Geo-Spatial Information	Various	Survey diagrams	Historical and current survey diagrams, property survey and registration dates
Background data	South African Heritage Resources Information System (SAHRIS)	Various	Reports	Previous impact assessments for any developments in the vicinity of the study area
Palaeontological sensitivity	South African Heritage Resources Information System (SAHRIS)	Current	Spatial	Map showing palaeontological sensitivity and required actions based on the sensitivity.
Background data	Books, journals, websites	Various	Books, journals, websites	Historical and current literature describing the study area and any relevant aspects of cultural heritage.

3.2. Field survey

The site was subjected to foot surveys as follows:

- Kwagga 1-3 WEFs: 3 to 13 November 2020 (yellow tracks ion Figure 5)
- Beaufort West and Trakas WEFs: 21 to 23 February 2022 (white tracks on Figure 5).

These surveys were during summer but, in this very dry area, the season makes no meaningful difference to vegetation covering and hence the ground visibility for the archaeological survey. Other heritage resources are not affected by seasonality. During the survey the positions of finds and survey tracks were recorded on a hand-held Garmin Global Positioning System (GPS) receiver set to the WGS84 datum (Figure 5). Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

It should be noted that the amount of time between the dates of the field inspection and final report do not materially affect the outcome of the report.

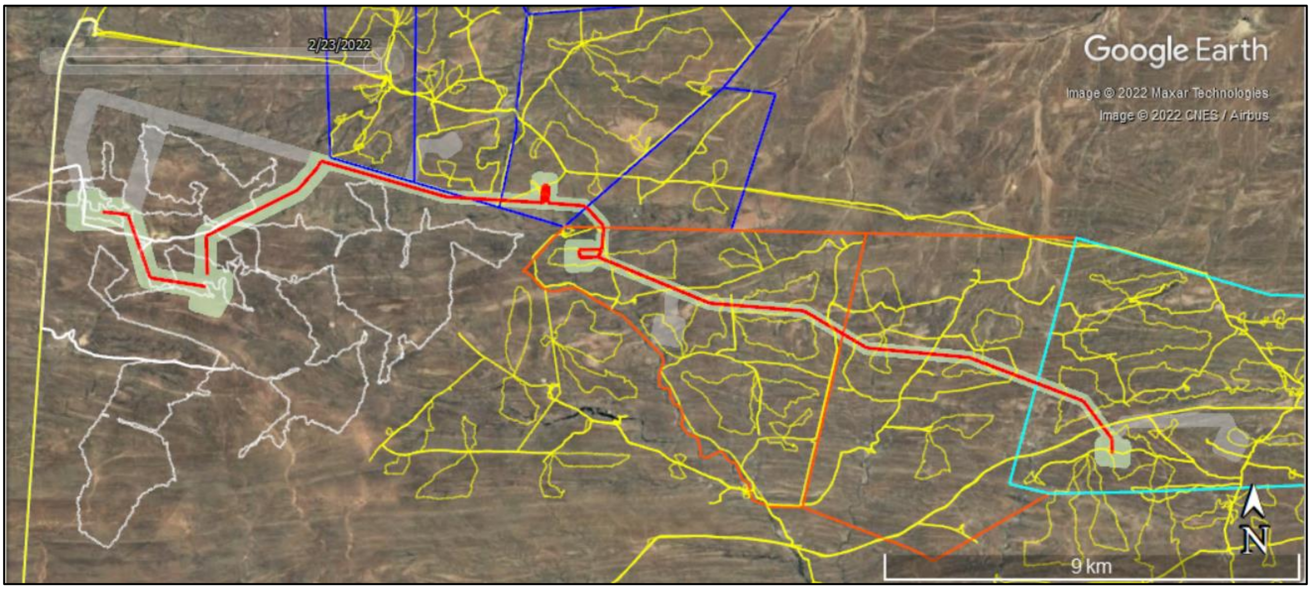


Figure 5: *Aerial view of the study area (key as per Figure 2 but with the proposed routings shown in red within the corridor) showing the survey tracks for the Kwagga 1-3 WEFs (yellow lines) and Beaufort West and Trakas WEFs (white lines).*

3.3. Specialist studies

As per the HWC NID response, specialist assessments of archaeology and palaeontology are required. The former is included within the present report, while palaeontology was subcontracted to Dr John Almond of Natura Viva cc. His findings are summarised in the HIA and his report is appended in full (Appendix 3).

3.4. Impact assessment

For consistency among specialist studies, the impact assessment was conducted through application of a scale supplied by the CSIR.

3.5. Grading

Section 7 of the NHRA provides for the grading of heritage resources into those of National (Grade 1), Provincial (Grade 2) and Local (Grade 3) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade 1 and 2 resources are intended to be managed by the national and provincial heritage resources authorities, while Grade 3 resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. Heritage Western Cape (2016), however, uses a system in which resources of local significance are divided into Grade 3A, 3B and 3C. These approximately equate to high, medium and low local significance, while sites of very low or no significance (and generally not requiring mitigation or other interventions) are referred to as Not Conservation Worthy (NCW).

3.6. Assumptions, knowledge gaps and limitations

The study is carried out at the surface only and hence any completely buried archaeological sites will not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. The present assessment is based on extensive field surveys for the five adjacent WEF projects and this did not specifically cover the powerline route assessed here. However, it is assumed that the data is sufficient for the present assessment because a very good understanding of the distribution of heritage resources was obtained during the WEF fieldwork and the layout was designed after that fieldwork so as to avoid sensitive areas. Nonetheless, archaeology can occur almost anywhere but it is assumed that at least most of the important localities would have been recorded. For the cumulative assessment, it is assumed that survey quality is variable among consultants but that the present specialist's general knowledge of the area in combination with a review of other available reports will provide a reliable indication of the likely cumulative impacts.

3.7. Consultation processes undertaken

The draft HIA was submitted to relevant interested and affected parties as required by HWC in their response to the NID application (Section 1.2). The report was also included in the main public participation process (PPP) required under NEMA as part of the EIA.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The study area is located in the southern Karoo in a very remote area. However, the N12 freeway passes within about 500 m of the western end of the broader study. It is an area used only for livestock farming and, due to the size of the farms, farmsteads tend to be well-spaced and often uninhabited on a permanent basis. The only other infrastructure in the area relates to farming and includes fences, wind pumps, small cement reservoirs and earthen-walled dams.

It is noted that the study area does not fall within a Renewable Energy Development Zone (REDZ) or an Electricity Grid Infrastructure (EGI) Corridor but the Beaufort West REDZ and Central EFGI Corridor are located within about 10 km to the northwest of the broader study area (Figure 6).

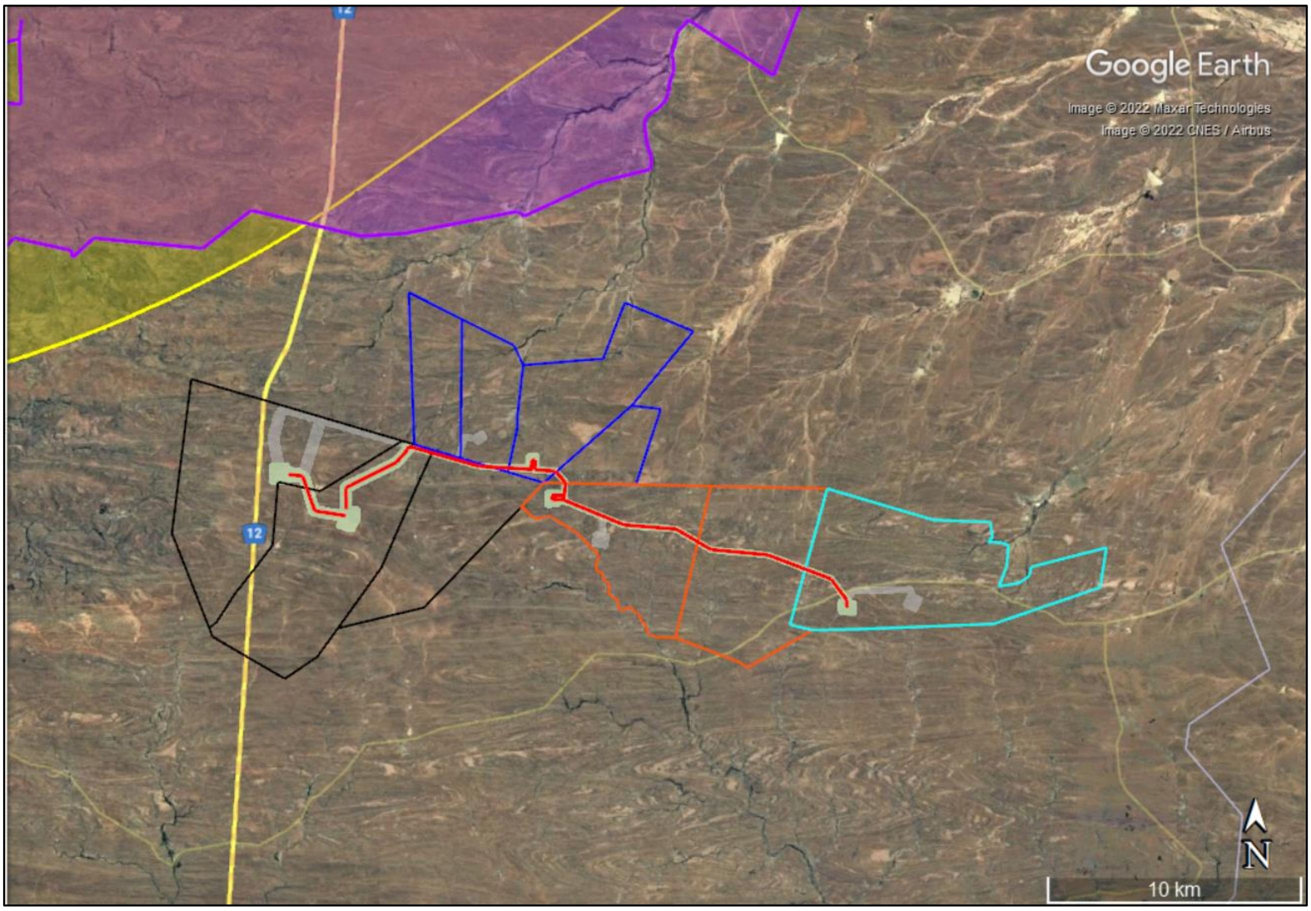


Figure 6: *Aerial view showing the location of the broader study area relative to the N12, the Beaufort West REDZ (purple) and the Central EGI Corridor (yellow).*

4.2. Site description

The study area is an extensive, relatively flat plain in the southern part of the Karoo, but with a broad, low ridge running from west to east through it. The corridor lies to the south of this low ridge in the east, while a short section in the centre lies to its north. The ridge is wider in the west and the corridor sits on top of it. The surface is generally coated in light gravel with rock outcrops being rare and confined largely to a few places along the high ground. Vegetation was very sparse but denser and taller vegetation was evident along the stream beds. Figures 7 to 12 illustrate the characteristics of the broader study area.

Figure 7: *Looking east in the western part of the corridor in the Varswater Collector Substation footprint (23/02/2022).*

Figure 8: *Looking north towards the corridor (400 m distant) in its eastern part (22/02/2022).*

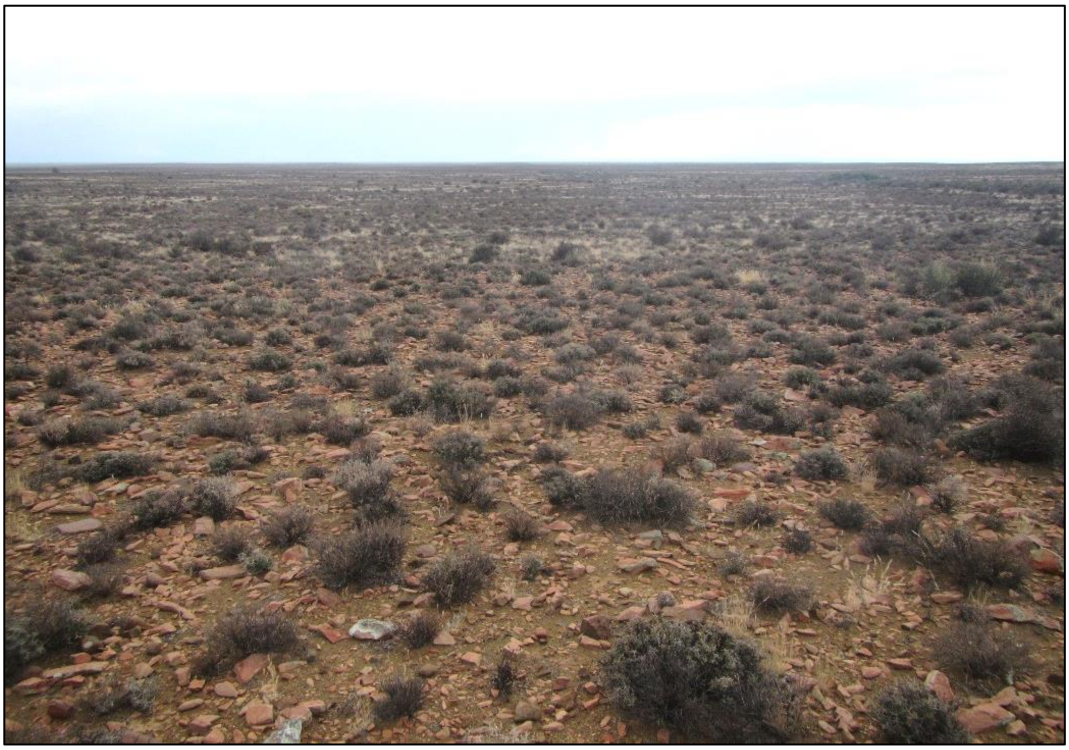


Figure 9: *Looking north in the Kwagga 1 preferred substation footprint (04/11/2020).*

Figure 10: *Looking southeast towards the Kwagga 2 preferred substation site (about 500 m distant) (11/11/2020).*

Figure 11: *Looking northeast towards the Kwagga 3 preferred substation site (about 800 m distant) (08/11/2020).*

5. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project.

5.1. Palaeontology

The SAHRIS Palaeosensitivity Map shows the broader study area to be of very high palaeontological sensitivity (Figure 12). Almond (2022) notes that the corridor is underlain by Middle Permian continental sediments of the Lower Beaufort Group (Karoo Supergroup). These rocks include sparse and largely unpredictably distributed fossil remains, mostly of various subgroups of vertebrates. These fossils can be of high scientific and conservation value but Almond's previous surveys in the area have proved their distribution to be sparse. As such, despite the very high theoretical sensitivity of the study area, he rates it as being of low sensitivity in practice. This applies equally to the entire length of the corridor, i.e. including Section 6 under assessment here.

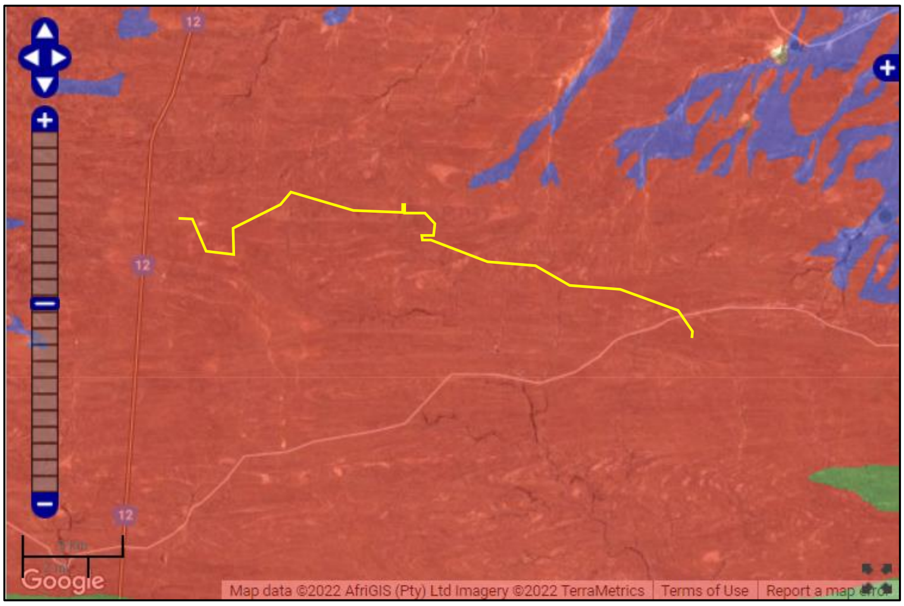


Figure 12: *Extract from the SAHRIS Palaeosensitivity Map showing the entire broader study area to be of very high palaeontological sensitivity (red shading).*

5.2. Archaeology

5.2.1. Desktop study

The Karoo region has a long history going back to the Early Stone Age (ESA) as testified to by occasional diagnostic artefacts from this period (generally handaxes). Middle Stone Age (MSA) artefacts are generally the most commonly encountered Stone Age materials in the Karoo. Later Stone Age (LSA) finds are less common but generally of higher significance because of their better contexts (Orton *et al.* 2016). Aside from the assessments of the Kwagga 1-3, Beaufort West and Trakas WEFs, few impact assessments have been conducted in the surrounding area.

In a survey within the Beaufort West and Trakas area, Patrick *et al.* (2016) only recorded two scatters of MSA materials on high ground. The photographs provided in the report suggest that at least some of the material might in fact be from the LSA. The artefacts were largely of chert, but some fine-grained quartzite was also reported. The Beaufort West and Trakas WEFs themselves had earlier been assessed by Patrick *et al.* (2010) but, due to the lack of fieldwork, no new heritage finds were reported then. Pre-construction surveys of these WEF projects have been recently completed and many LSA scatters located on heuweltjies were found. However, it was noted that they were more frequent in the east than in the west. These scatters were small and usually very ephemeral, sometimes just consisting of a few artefacts. MSA materials appeared to be absent (Orton in prep.). The surveys of the Kwagga WEF projects showed the same sort of material to dominate, but these heuweltjie sites were located throughout the area. Rare older materials, including a small scatter of about ten ESA artefacts were also noted (Orton 2021a, b, c).

To the east of the study area, Kinahan (2008) noted the presence of artefacts from all three Stone Ages with MSA being most the common and ESA the least. Like Patrick *et al.* (2016), he also noted scatters of MSA and LSA artefacts on the crests of low hills and ridges. The presence of Howieson's Poort period segments was noted, but a later assessment of the area was not able to verify this (Webley & Halkett 2015). Kinahan (2008) commented on the general rarity of recent LSA/contact period sites, while noting that the older materials were almost always represented by isolated artefacts (i.e. background scatter). Webley and Halkett (2015) only reported one significant LSA site. This was a large artefact scatter that included many retouched formal tools. Such finds are rare. Their follow up survey in the same general area found no further Stone Age resources (Webley & Halkett 2017).

Other surveys in the Koup (i.e. up to 100 km away) show a similar array of finds but with the densities of sites being variable from place to place (e.g. Dreyer 2005; Kaplan 2007; Nilssen 2011; Orton 2011).

Patrick *et al.* (2016) described a number of historical archaeological features. One of these was the unusual ruin of a small building built from bricks and brick-shaped blocks of dung. Stone kraals and stone or stone and brick house ruins were also documented, sometimes with associated rubbish dumps. Orton (2021a, b, c) reported a variety of historical period finds including stone and/or brick ruins. One feature, probably a now much-degraded kraal, was built with dung blocks. Some historical domestic refuse middens were also found.

Other work in the wider area again documents similar historical period finds. Shepherd's huts, ruined houses, kraals and other farm structures are regularly encountered, as are historical artefacts (e.g. Kaplan 2005, 2007; Orton 2011, 2017). Figure 14 shows an example of a drystone dwelling which is probably what many of the region's ruined stone-walled sites once looked like.

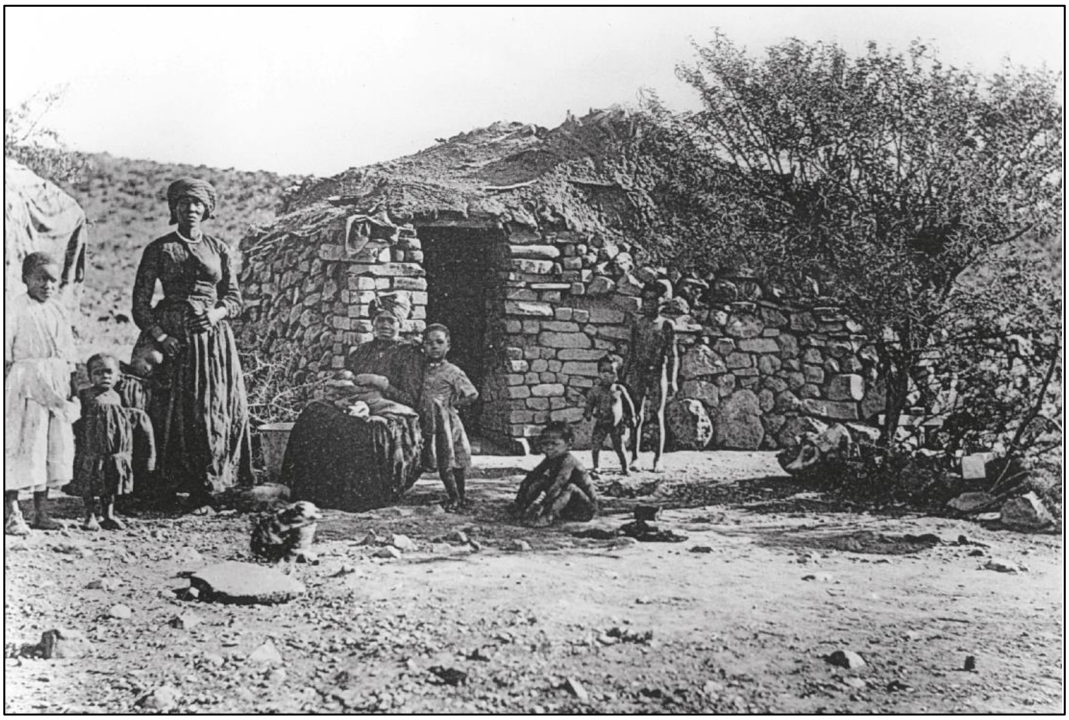


Figure 13: *Shepherds hut on a Beaufort West farm, Jeffrys Collection J1651, National Library of South Africa, Cape Town. Source: Beinart (2018: 3).*

5.2.2. Site visit

Very few of the already recorded archaeological sites are within the corridor due to an attempt in the design to avoid as many known sites as possible. The sites located within the corridor or within

100 m of its edge are listed in Table 2 and mapped in Figure 14. Most such sites in the broader study area were on heuweltjies, but some were in flat areas or small, low ridges. None of these sites has any cultural significance but it is considered possible that other similar sites may occur, either of the same or slightly higher grade. Figures 15 and 16 illustrate the finds from these kinds of scatters (note that not all of these scatters were photographed due to their relative homogeneity and these are the only ones from in or close to the present corridor that were photographed). Also recorded within the corridor was a series of piles of stones. Their context and form suggest that they are not graves (Figures 17 to 20).

Table 2: *List of heritage resources recorded in, or outside but within 100 m (italics) of, the proposed Kwagga EGI corridor. Those highlighted in blue are located close to Section 6.*

Waypoint	Location	Description	Significance Grade
735	S32 55 11.6 E22 33 10.4	Heuweltjie with a few wacke artefacts, a possible very lightly used lower grindstone (face up) and a few pieces of black glass (Orton in prep.)	Very Low NCW
734	S32 55 41.6 E22 33 45.3	Heuweltjie with an ephemeral scatter of wacke artefacts and a few pieces of black glass (Orton in prep.).	Very Low NCW
582	S32 55 54.7 E22 34 01.4	Several piles of rock with no obvious pattern. They have variable size and appear to be very loosely piled. The substrate appears to have bedrock at or very close below the surface and the surrounding area is quite rocky so the clusters are definitely not graves (Orton in prep.).	Very Low NCW
736	S32 55 42.8 E22 35 16.1	Heuweltjie with an ephemeral scatter of wacke flakes and cores and two tuff flakes (Orton in prep.).	Very Low NCW
754	*S32 55 18.2 E22 37 23.4*	*Heuweltjie with an ephemeral scatter of wacke and tuff flakes (Orton in prep.).*	*Very Low NCW*
300	*S32 54 58.2 E22 38 11.3*	*A low density stone artefact scatter in a flat, featureless area. The artefacts included flakes and flake fragments. They were mostly made from tuff but some wacke present as well (Orton 2021a).*	*Very Low NCW*
808	*S32 55 15.3 E22 38 16.4*	*Light scatter of stone artefacts, about 20 m long along a ridge. Material is tuff. Flakes, blades and a single platform and an irregular core present (Orton 2021a).*	*Very Low NCW*
306	S32 55 20.8 E22 39 38.0	An area of extensive background scatter immediately below a sandstone ridge that has at least two tuff bands in it. The artefacts are all of tuff and seem to include mostly flakes. No quarry area was seen along the ridge itself, but the tuff was coming loose in blocks and thus should not have needed to be struck off the outcrop (Orton 2021a).	Very Low NCW
855	*S32 54 04.9 E22 37 21.3*	*A lower grindstone found face up and an ephemeral scatter of wacke flakes alongside a river (Orton 2021b).*	*Very Low NCW*
839	S32 58 20.7 E22 47 28.1	An ephemeral scatter of wacke flakes and cores on a heuweltjie (Orton 2021c).	Very Low NCW

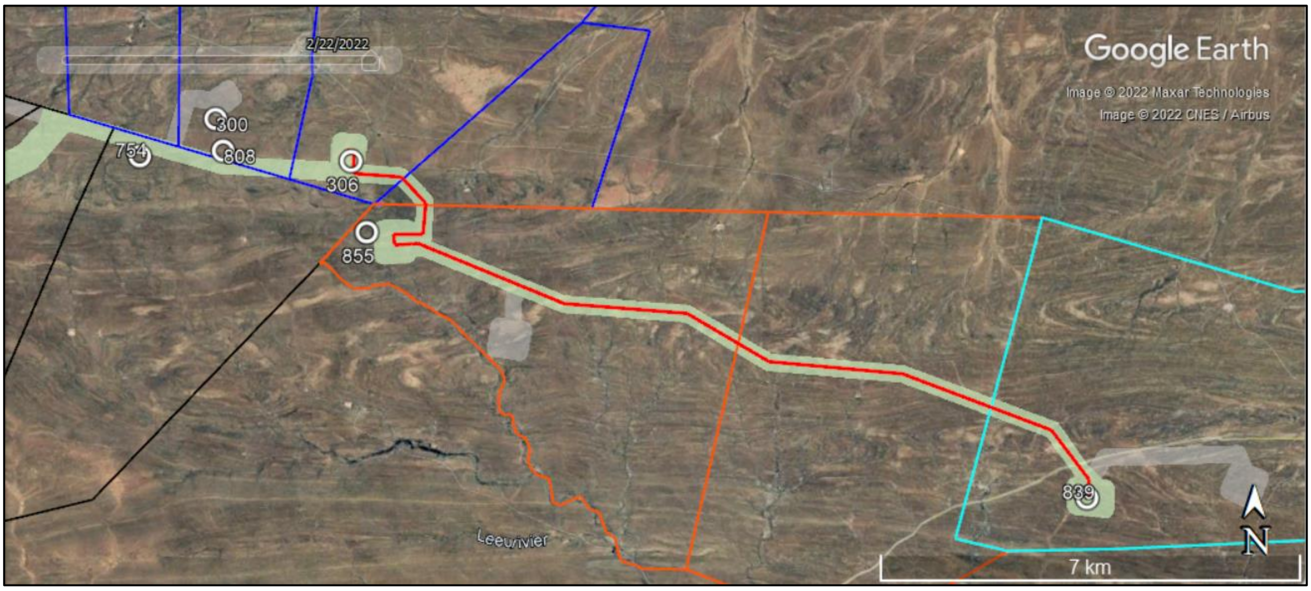


Figure 14: *Aerial view showing the locations of recorded heritage sites in relation to the Section 6 powerline (red line).*

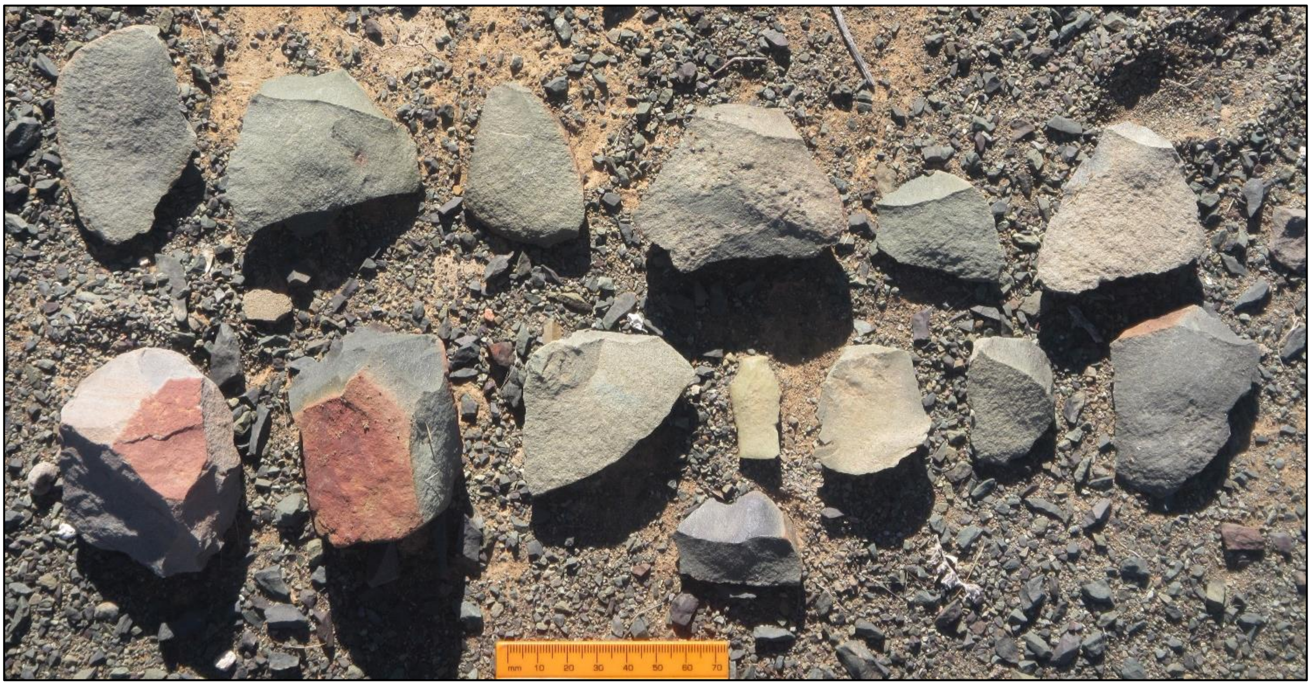
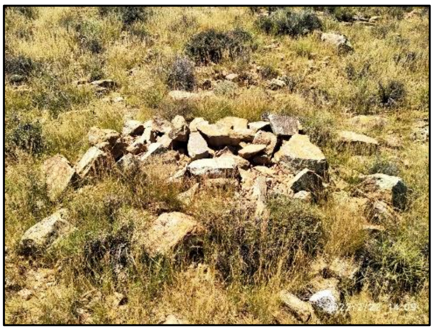


Figure 15: *Stone artefacts found on a heuweltjie at waypoint 736. Scale = 70 mm.*

Figure 16: *Stone artefacts from the scatter at waypoint 300. Sale in cm intervals.*

Figure 17: *The area in which multiple piles of stones were found at waypoint 582.*





Figures 18 to 20: *Individual piles of stones at waypoint 582.*

5.3. Graves

No graves were recorded in or close t the corridor. There is always a possibility of unmarked precolonial burials being present but, given the generally rocky substrate in the area, this seems very unlikely.

5.4. Historical aspects and the Built environment

5.4.1. Desktop study

Farmers first started leaving the Cape Colony during the 18th century. This was partially due to changes in the structure of the Cape Colony, as well as the desire to seek new grazing and independence from Dutch East India Company (VoC) rule. The initial move was into the areas surrounding Cape Town by the class of farmers referred to as free burghers. Willem Adriaan van der Stel, governor of the Colony from 1699 to 1707, abused his power as governor by favouring his own farming activities when supplying ships with food, thereby making the free burgher farmers unhappy. The Colonists were also initially not allowed to trade with the Khoekhoen but this rule was changed in February 1700. Around then Van der Stel gave grazing licences further from the Colony in order to increase pastoral production (Penn 2005). These factors were the ultimate start of Colonial expansion after the Colony had remained confined to the Cape Town area for the first several decades and in fact perpetuated it during the following decades. The Colonists initially focused on the mountain areas where there was all year round rainfall – most notably the Roggeveld – but historical occupation of the area around Beaufort West by stock farmers goes back to the later decades of the 18th Century (Figure 21). This area was known as the Koup by 1763 (Botha 1926) and was already formally part of the Cape Colony by 1798 (Figure 22). Raper (n.d.) notes the word to be of Khoekhoe origin and that it probably means flat, level, open veld.

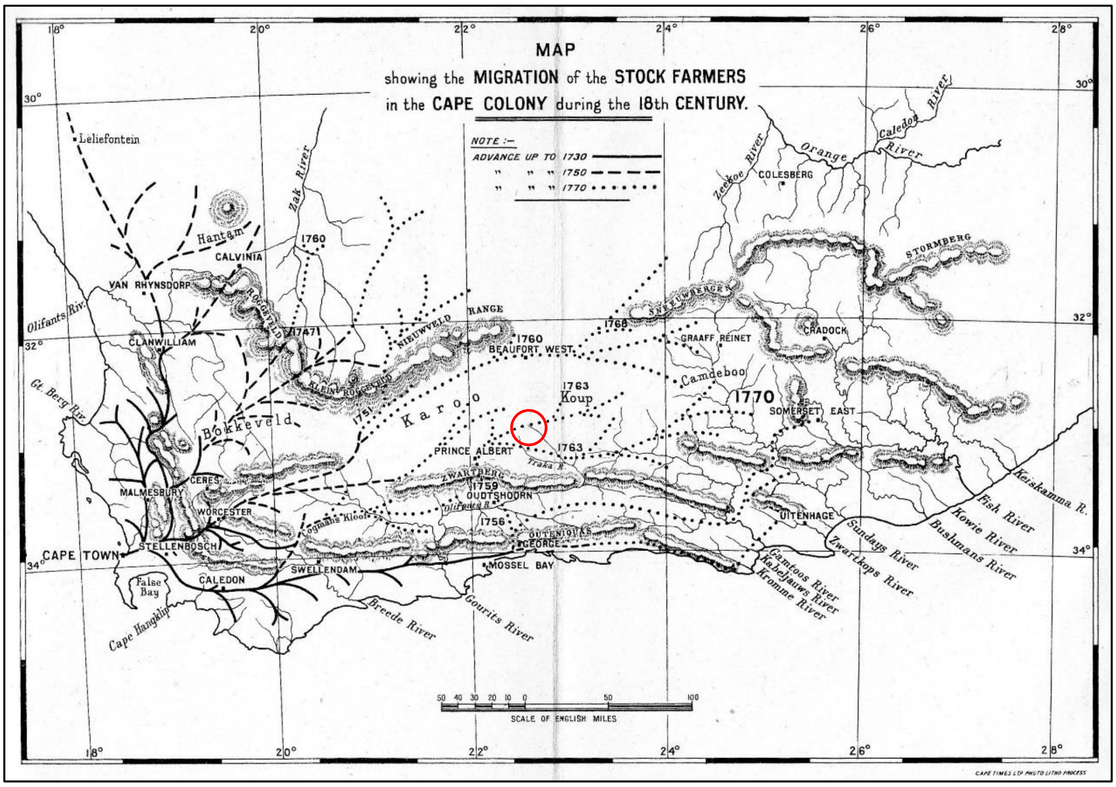


Figure 21: *Map showing the mid-18th century trekboer expansion in the Karoo with the study area (red circle) reached by 1763. Source: Botha (1926: opposite preface).*

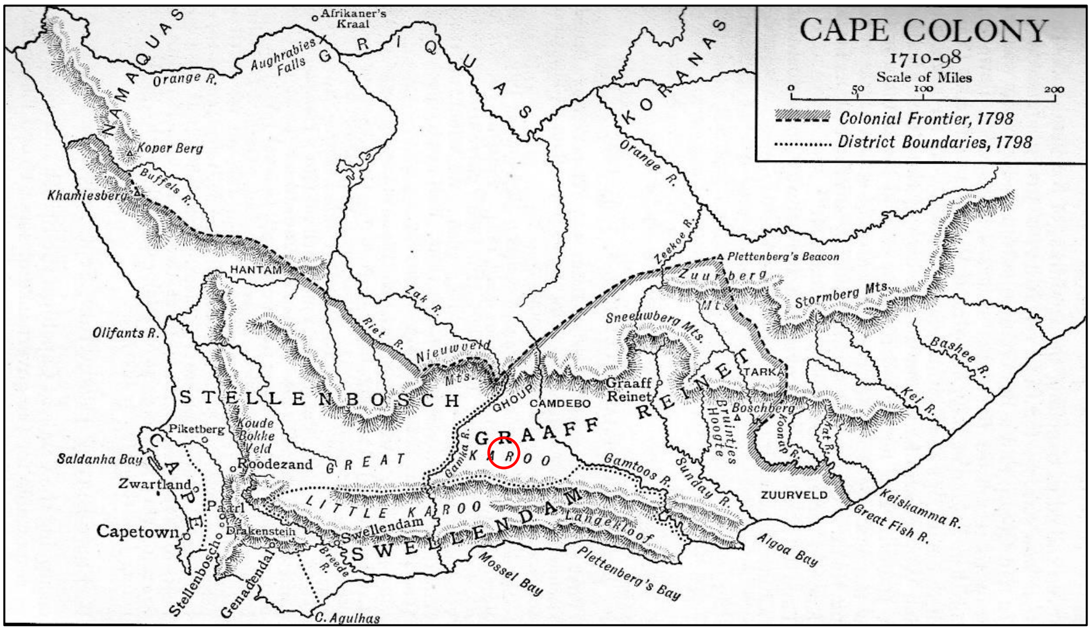


Figure 22: *Map showing the extent of the Cape Colony by 1798. Source: Walker (1928:201). The study area is indicated by the red circle.*

The principal town of the region is Beaufort West which was established on the farm Hooivlakte (originally granted in 1760) in 1818 as a sub-drosty of Graaff-Reinett. The original streets were on a narrow strip of land between the Gamka River in the west and the Kuils River in the east (Fransen 2004). It was originally named Beaufort, but the 'West' was added later to avoid confusion with Fort Beaufort and Port Beaufort.

Historical farm buildings are recorded in most surveys of the area (e.g. Orton 2021a, 2021b, 2021c, Patrick *et al.* 2016; Webley & Halkett 2015, 2017). The earliest structures are probably mostly in ruin, or else modified beyond recognition. Figure 23 shows an example of a Karoostyle (Marincowitz 2006) farmhouse. Such structures are now rarely seen in good condition outside of the Karoo towns. Figure 2 shows a stone-walled kraal system in use by a sheep farmer. These kraals are rarely in good condition and/or still in use with the vast majority having tumbled and/or had rocks stolen for more recent use elsewhere.

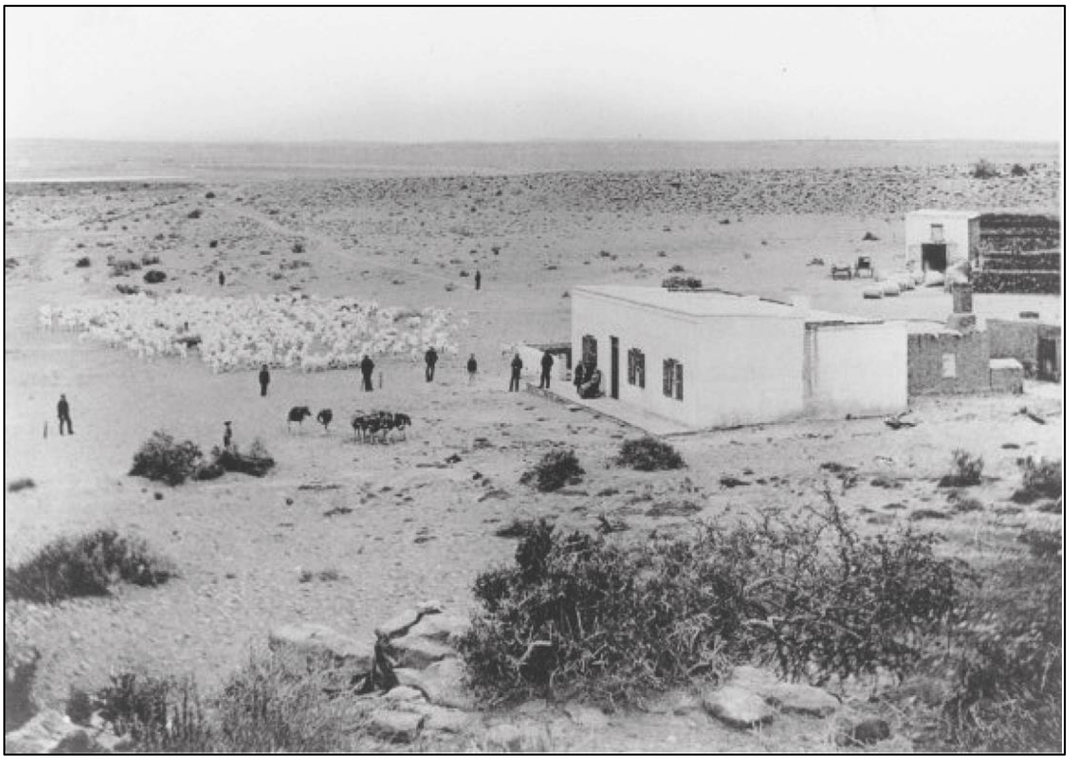


Figure 23: *A farmhouse without fences on a sheep and ostrich farm in the Karoo, possibly Beaufort West, Jeffrys Collection J1650, National Library of South Africa, Cape Town. Source: Beinart (2018:5).*

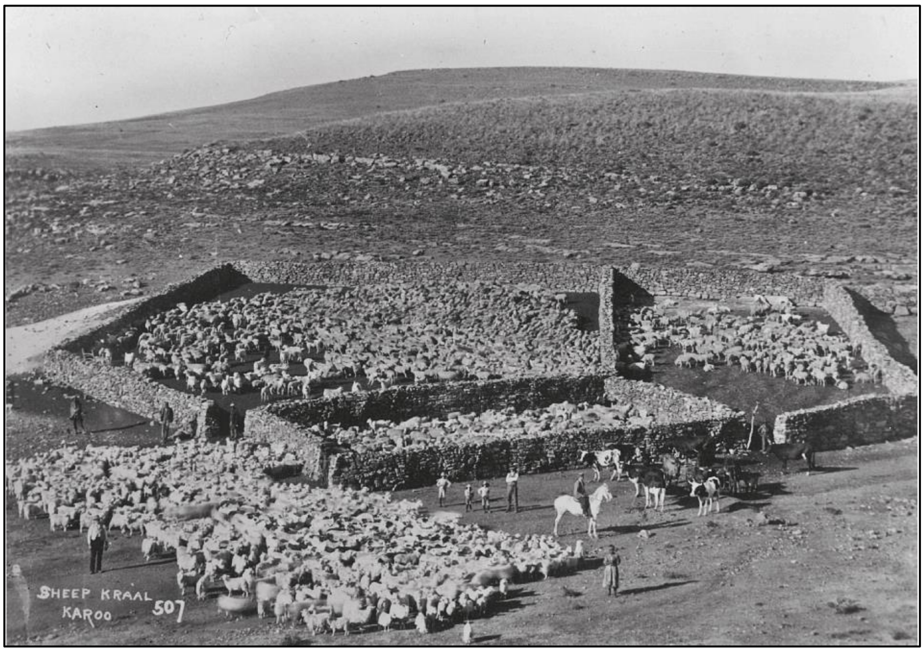


Figure 24: *A sheep kraal in the Karoo, Jeffrys Collection J1335, the National Library of South Africa, Cape Town. Source: Beinart (2018:5).*

5.4.2. Site visit

The wider area contains many historical sites and these generally carry higher significance than the Stone Age resources discussed above. All such sites have been well avoided by the proposed corridor and thus no historical sites are relevant to this assessment. Examination of aerial photography shows that no buildings occur anywhere close to the corridor.

5.5. Cultural landscapes and scenic routes

The landscape has cultural significance for its aesthetic value. However, it is necessary to consider the remoteness of the study area and the degree to which it would be visited. The nearby N12 can certainly be regarded as a scenic route and has been rated by Winter and Oberholzer (2013) as an "important linking route" which they assign a Grade III significance to. The study area comes to within 0.5 km of the N12 and the landscape is generally quite featureless with only very low topography (see Figures 7 to 11 above) and minimal anthropogenic input. It is largely lacking in features of visual interest.

There is, of course, a Stone Age cultural landscape but, because it leaves so few visible traces, it is largely natural in character. The historical landscape is limited to houses, fences, farm tracks, dams and occasional wind pumps and is a more tangible landscape. It is noted that the project would not be developed without the accompanying WEFs and that the Beaufort West and Trakas WEFs are preferred bidders that are likely to be constructed in the near future.

5.6. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined in Section 3(3) of the NHRA (see Section 2 above).

Palaeontological resources are likely to be largely of low cultural significance and graded IIIC. A small chance exists, however, of material Grade IIIB or possibly even IIIA being found.

The archaeological resources are deemed to have low to very low cultural significance at the local level for their scientific value and can be graded NCW. It is possible, however, that resources of up to grade IIIC could be found within the corridor.

Graves are deemed to have high cultural significance at the local level for their social value. They would be allocated a grade of IIIA but none are known from the immediate vicinity of the corridor.

The cultural landscape is largely a natural landscape with aesthetic value and is rated as having medium cultural significance at the local level. It can be graded IIIB. However, with construction of WEFs the landscape would lose some of its cultural value and likely be seen as a IIIC resource.

No grade map is shown here since no sites of cultural significance are yet known in the study area and there are thus none that require avoidance.

5.7. Summary of heritage indicators

Palaeontological resources may occur quite widely and are sensitive to disturbance.

- Indicator: Uncontrolled damage to fossils should be minimised as far as possible.

Archaeological resources occur quite widely in the landscape and it is likely that others – especially Stone Age ones – occur in areas not yet surveyed. These sites are sensitive to disturbance.

- Indicator: Buffers of at least 30 m should be maintained around known significant archaeological sites as far as possible.
- Indicator: Direct damage to archaeological sites should be avoided as far as possible and, where some damage to significant sites is unavoidable, scientific/historical data should be rescued.
- Indicator: Direct impacts to graves must be avoided completely with a 30 m buffer.

The cultural landscape is not a strongly developed one in terms of anthropogenic input and is largely a natural environment. However, because the project would only be developed if the WEFs are developed, there are no particular indicators for this aspect of heritage. The same applies to buildings, since none occur anywhere close to the study area.

6. ISSUES, RISKS AND IMPACTS

6.1. Identification of Potential Impacts/Risks

The potential heritage issues identified include:

Construction phase:

- The destruction of archaeological sites;
- The destruction of graves;
- The destruction of palaeontological; and
- Impacts to the cultural landscape.

Operation phase:

- Impacts to the cultural landscape.

Decommissioning phase:

- Impacts to the cultural landscape.

Cumulative impacts:

- The destruction of archaeological sites;
- The destruction of palaeontological; and
- Impacts to the cultural landscape.

6.2. Summary of Issues identified during the Public Consultation Phase

No consultation was carried out during the preparation of this report but, as per HWC requirements, the local municipality and registered heritage conservation bodies were afforded an opportunity to comment on the final report prior to submission. Please see Section 11 of this report.

7. IMPACT ASSESSMENT

7.1. Construction Phase

Please note that impacts to palaeontology are assessed in the relevant specialist report (see Appendix 3 of this HIA).

7.1.1. Impacts to archaeological resources

Direct impacts to archaeological resources would occur during the construction phase when construction equipment is brought onto site and excavations commence. Impact significance is expected to be **low negative**, largely because of the low probability of culturally significant sites being affected. Mitigation measures would focus on locating sites and sampling them before construction and would reduce the impacts to **very low negative** (Table 3).

There are no fatal flaws in terms of construction phase impacts to archaeology.

7.1.2. Impacts to graves

Direct impacts to graves would occur during the construction phase when construction equipment is brought onto site and excavations commence. Despite the consequence being rated extreme (because it is human remains), the impact significance is expected to be **low negative** because of the extremely low probability of graves actually being found and impacted. Mitigation measures would focus on locating graves and protecting or rescuing them before construction as well as ensuring that any chance finds made during development get reported. This would reduce the impacts to **very low negative** (Table 3).

There are no fatal flaws in terms of construction phase impacts to graves.

7.1.3. Impacts to the cultural landscape

Direct impacts to the cultural landscape would occur during the construction phase when construction equipment is brought onto site and work gets underway. The impacts would only last for the duration of the construction period and because the powerlines would not be developed without the WEFs and substations, the consequence of the impact is seen as slight. The resulting impact significance is **very low negative**. Mitigation measures would entail minimising the duration of construction and minimising landscape scarring but the significance would still be **very low negative** (Table 3).

There are no fatal flaws in terms of construction phase impacts to the cultural landscape.

7.2. Operation Phase

7.2.1. Impacts to the cultural landscape

Direct impacts to the cultural landscape would occur during the operation phase through the presence of the powerline in the landscape. However, because it would only be there in tandem with the WEFs and substations, this impact is rated **very low negative**. Mitigation would only entail ensuring that maintenance work does not go outside the authorised footprint. With mitigation the impact significance would still be **very low negative** (Table 3).

There are no fatal flaws in terms of operation phase impacts to the cultural landscape.

7.3. Decommissioning Phase

Direct impacts to the cultural landscape would occur during the decommissioning phase when construction equipment is brought onto site and work gets underway to remove the powerlines. The impacts would only last for the duration of the construction period and because the powerlines would not be developed without the WEFs and substations (which, it is assumed, would also be decommissioned if the powerlines are decommissioned), the consequence of the impact is seen as slight. The resulting impact significance is **very low negative**. Mitigation measures would entail minimising the duration of decommissioning and minimising landscape scarring through effective rehabilitation but the significance would still be **very low negative** (Table 3).

There are no fatal flaws in terms of decommissioning phase impacts to the cultural landscape.

7.4. Cumulative Impacts

The local landscape has many heritage resources but the vast majority are of very low cultural significance. Impact assessment and preconstruction surveys go a long way towards ensuring the most sites are avoided and protected. However, it is still likely that some impacts would occur, especially to archaeological and palaeontological resources. The potential impact significance of this is rated as low negative, but mitigation would reduce this to **very low negative** (Table 3). Cumulative impacts to the landscape are of more concern and would largely result from the WEFs and substations which would result in a greater degree of visual intrusion into the landscape. This impact is rated as being **moderate negative** significance before mitigation and, because mitigation is not expected to do much to reduce the visual intrusion of all these facilities, the post-mitigation assessment remains **moderate negative** (Table 3).

These impacts are not seen as a fatal flaw.

Table 3: *Assessment of impacts for the Section 6 powerline.*

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level
Construction Phase						
Damage or destruction of archaeological materials	Status	Negative	Low (4)	- Preconstruction survey - Micrositing of infrastructure where possible to minimise impacts - Sampling of any sites that cannot be avoided - Report any chance finds	Very low (5)	High
	Spatial extent	Site specific				
	Duration	Permanent				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Non-reversible				
	Irreplaceability	High				
Damage or destruction of graves	Status	Negative	Low (4)	- Preconstruction survey - Micrositing of infrastructure to avoid impacts - Report any chance finds - Protect graves *in situ* and appoint archaeologist to exhume	Very low (5)	High
	Spatial extent	Site specific				
	Duration	Permanent				
	Consequence	Extreme				
	Probability	Very unlikely				
	Reversibility	Non-reversible				
	Irreplaceability	High				
Intrusion of powerlines and equipment into the landscape	Status	Negative	Very low (5)	- Minimise duration of construction period - Minimise cut-and-fill and landscape scarring in general - Ensure effective rehabilitation of areas not needed during operation	Very low (5)	High
	Spatial extent	Local				
	Duration	Short term				
	Consequence	Slight				
	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Moderate				
Operational Phase						
Intrusion of powerlines into the landscape	Status	Negative	Very low (5)	- Ensure that all maintenance vehicles stay within designated areas	Very low (5)	High
	Spatial extent	Local				
	Duration	Long term				
	Consequence	Slight				
	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Moderate				
Decommissioning Phase						
Intrusion of powerlines and equipment into the landscape	Status	Negative	Very low (5)	- Minimise duration of construction period - Minimise cut-and-fill and landscape scarring in general - Ensure effective rehabilitation of all areas	Very low (5)	High
	Spatial extent	Local				
	Duration	Short term				
	Consequence	Slight				

	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Moderate				
Cumulative impacts						
Impacts to archaeology, graves, buildings	Status	Negative	Low (4)	- Preconstruction survey - Micrositing of infrastructure where possible to minimise impacts - Sampling of any sites that cannot be avoided - Report any chance finds - Protect graves *in situ* and appoint archaeologist to exhume	Very low (5)	High
	Spatial extent	Regional				
	Duration	Permanent				
	Consequence	Moderate				
	Probability	Very likely				
	Reversibility	Non-reversible				
	Irreplaceability	High				
Intrusion of powerlines and equipment into the landscape	Status	Negative	Moderate (3)	- Minimise duration of construction period - Minimise cut-and-fill and landscape scarring in general - Ensure effective rehabilitation of areas not needed during operation	Moderate (3)	High
	Spatial extent	Regional				
	Duration	Long term				
	Consequence	Substantial				
	Probability	Very likely				
	Reversibility	Moderate				
	Irreplaceability	Moderate				

7.5. Evaluation of impacts relative to sustainable social and economic benefits

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

Several employment opportunities will be created during the construction of the EGI; however, at this stage it is difficult to specify the actual number of jobs that will be created during the Construction Phase. It is estimated that the construction period will last between 12 and 18 months.

While the powerline would not result in any major socio-economic benefits, there are clear economic and social benefits that would accrue from the generation of electricity that would happen. If mitigation is applied as suggested above, then the socio-economic benefits outweigh the residual impacts.

7.6. Existing impacts to heritage resources

There are currently no obvious threats to heritage resources on the site aside from the natural degradation, weathering and erosion that will affect archaeological materials and fossils. Trampling from grazing animals and/or farm/other vehicles could also occur. These impacts would be of **negligible negative** significance. There is very little to no action occurring in the landscape on a daily basis aside from very low intensity livestock farming. This does not result in any significant impacts to the cultural landscape.

7.7. The No-Go alternative

If the project were not implemented then the site would stay as it currently is (impact significance of **neutral**). Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is perhaps less desirable in heritage terms.

7.8. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many publicly accessible vantage points is undesirable. Because the development would only occur in tandem with already approved WEFs and substations, such an impact to the landscape is not envisaged.

8. IMPACT ASSESSMENT SUMMARY

The overall impact significance essentially follows the most significant impact in each phase following the implementation of the proposed mitigation measures. These are shown in Table 4.

Table 4: *Overall Impact Significance (Post Mitigation)*

Phase	Overall Impact Significance
Construction	Very low

Operational	Very low
Decommissioning	Very low
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	Moderate
Cumulative - Operational	Moderate
Cumulative - Decommissioning	Moderate

9. LEGISLATIVE AND PERMIT REQUIREMENTS

This report and the proposed recommendations will need to be approved by HWC. There are no further legislative requirements for the approval process under the NHRA but if archaeological or palaeontological mitigation is needed then the appointed archaeologist or palaeontologist will need to submit a Workplan to HWC to do the work. This must be carried out well in advance of construction to ensure that there is enough time for HWC to approve the mitigation work before construction commences.

10. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

The actions recorded in Table 5 should be included in the environmental management program (EMPr) for the project.

Table 5: *Heritage considerations for inclusion in the EMPr for Section 6.*

Impact	Mitigation / management objectives & outcomes	Mitigation / management actions	Monitoring		
			Methodology	Frequency	Responsibility
Impacts to archaeology and graves					
Damage or destruction of archaeological sites or graves	Avoid impacts (preferred) or locate and sample or rescue sites/burials before disturbance	Pre-construction survey, micrositing of infrastructure	Appoint archaeologist to conduct survey well before construction	Once-off	Project developer
Damage or destruction of archaeological sites or graves	Rescue information, artefacts or burials before extensive damage occurs	Reporting chance finds as early as possible, protect *in situ* and stop work in immediate area	Inform staff to be vigilant and carry out inspections of new excavations	Ongoing basis	Construction Manager or Contractor
				Whenever on site (at least weekly during construction period only)	ECO
Impacts to the cultural landscape					
Visible landscape scarring	Minimise landscape scarring	Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.	Monitoring of surface clearance relative to approved layout	Ongoing basis	Construction Manager or Contractor
				As required	ECO

11. CONSULTATION WITH HERITAGE CONSERVATION BODIES

To be completed prior to submission to HWC.

12. CONCLUSIONS

The heritage indicators and project responses are shown in Table 6.

Table 6: Heritage indicators and project responses.

Indicator	Project Response
Uncontrolled damage to fossils should be minimised as far as possible.	This will be ensured through implementation of a preconstruction palaeontological survey of the final alignment.
Buffers of at least 30 m should be maintained around known significant archaeological sites as far as possible.	None required at present but a preconstruction survey will determine whether any buffers need to be implemented during construction.
Direct damage to archaeological sites should be avoided as far as possible and, where some damage to significant sites is unavoidable, scientific/historical data should be rescued.	No impacts currently expected, but this will be ensured through implementation of a preconstruction palaeontological survey of the final alignment.
Direct impacts to graves must be avoided completely with a 30 m buffer.	No impacts currently expected, but this will be ensured through implementation of a preconstruction palaeontological survey of the final alignment.

There are no significant concerns for this project and, on current information, there are no areas requiring protection.

12.1. Statement and reasoned opinion of the specialist

Given the limited impacts to heritage resources that are expected, it is the opinion of the heritage specialist that the proposed Section 6 powerline from Kwagga WEF 1 to Kwagga WEF 3 should be authorised in full.

13. RECOMMENDATIONS

It is recommended that the proposed Section 6 powerline should be authorised, but subject to the following recommendations which should be included as condition of authorisation:

- A palaeontologist must conduct a preconstruction survey of the final authorised alignment well in advance of construction to determine whether any areas require avoidance or mitigation;
- An archaeologist must conduct a preconstruction survey of the final authorised alignment well in advance of construction to determine whether any areas require avoidance or mitigation;

- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

14. REFERENCES

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APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 23 Dover Road, Muizenberg, 7945
Telephone: (021) 788 1025
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science) 1997	
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
  Stone Age archaeology (awarded 2007)
  Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
  Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP) membership number: 43

- Accredited Professional Heritage Practitioner

➢ *Memberships and affiliations:*

South African Archaeological Society Council member	2004 – 2016
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
UCT Department of Archaeology Research Associate	2013 –
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –
Kalk Bay Historical Association	2016 –
Association of Professional Heritage Practitioners member	2016 –

Fieldwork and project experience:

Extensive fieldwork and experience as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Feasibility studies:

- Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
    - Notification of Intent to Develop applications (for Heritage Western Cape)
    - Desktop-based Letter of Exemption (for the South African Heritage Resources Agency)
    - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
    - Archaeological specialist studies
    - Phase 1 archaeological test excavations in historical and prehistoric sites
    - Archaeological research projects
- Development types
    - Mining and borrow pits
    - Roads (new and upgrades)
    - Residential, commercial and industrial development
    - Dams and pipe lines
    - Power lines and substations
    - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

- ESA open sites
    - Duinefontein, Gouda, Namaqualand
- MSA rock shelters
    - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
    - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
    - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
    - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
    - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
    - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
    - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
    - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Awards:

Western Cape Government Cultural Affairs Awards 2015/2016: Best Heritage Project.

APPENDIX 2 - Site Sensitivity Verification

As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool. The details of the site sensitivity verification are noted below:

Date of Site Visit	3 to 13 November 2020 and 21 to 23 February 2022 (fieldwork was for the associated and adjacent WEF projects but covered the powerline corridor as well)
Specialist Name	Dr Jayson Orton
Professional Registration Number	Association of Southern African Professional Archaeologists (ASAPA): 233 Association of Professional Heritage Practitioners (APHP): 043
Specialist Affiliation / Company	ASHA Consulting (Pty) Ltd

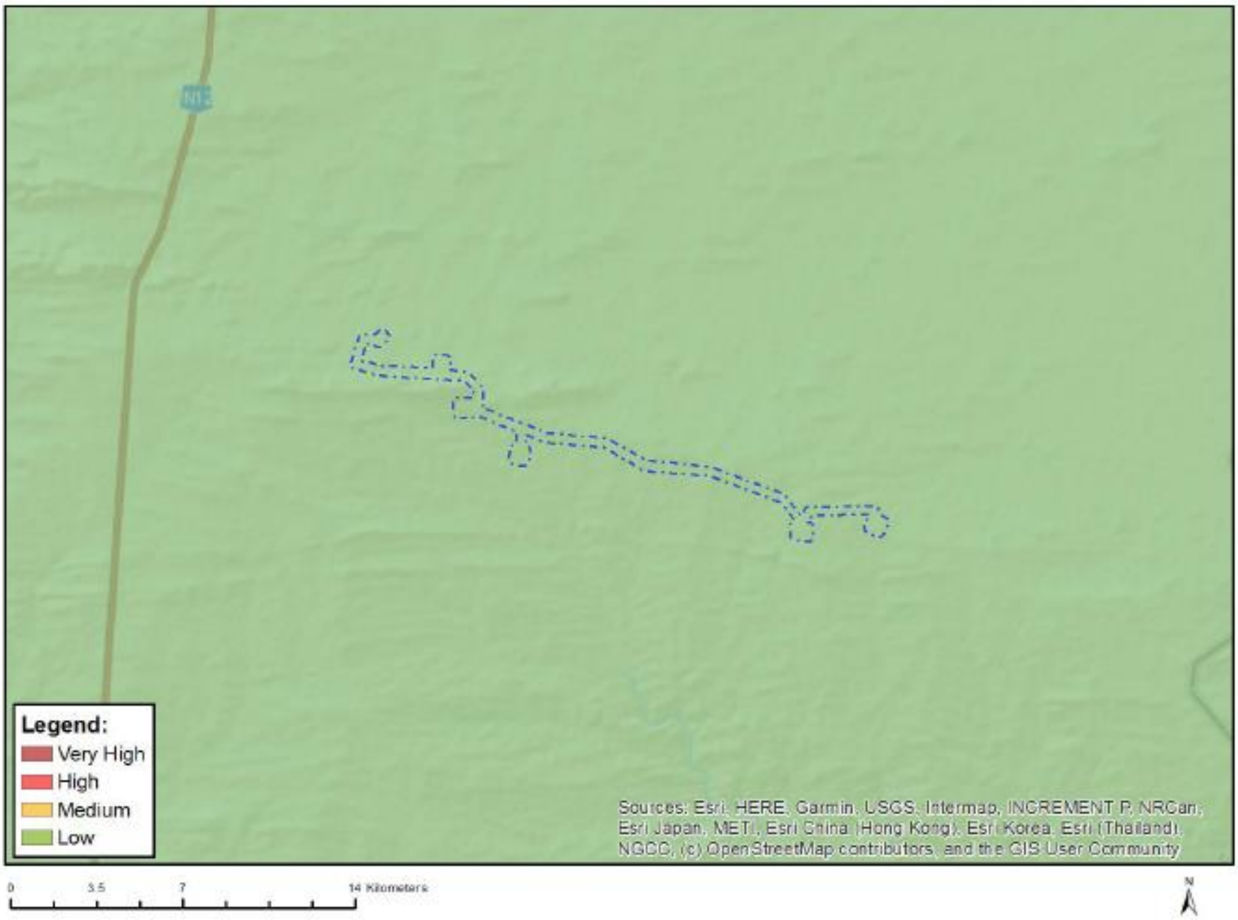
<u>Method of the Site Sensitivity Verification</u>

Initial work was carried out using satellite aerial photography in combination with the author's accumulated knowledge of the local landscape. This was used to provide sensitivity data. Subsequent fieldwork served to ground truth the site, including areas identified as potentially sensitive. Desktop research was also used to inform on the heritage context of the area. This information is presented in the report (Sections 5.2.1 and 5.4.1).

<u>Outcome</u>

- Provide a description of the outcome of the site sensitivity verification in order to:
(a) confirm or dispute the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.; and
(b) include a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.

The map below is extracted from the screening tool report and shows the archaeological and heritage sensitivity to be low throughout the corridor. The site visits showed that this is true since only very small areas of higher sensitivity were found in the broader study area but none of these occurred within the proposed powerline corridor in which the Section 6 powerline would be constructed. A photographic record and description of the relevant heritage resources from within the corridor are contained within the impact assessment report. The specialist thus confirms the Screening Tool sensitivity rating as low.



Screening Tool Report map for the Archaeology and Cultural Heritage theme.

APPENDIX 3 – Palaeontological study

ATTACHED.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Basic Assessment Processes for the Proposed Development of seven 132 kV overhead transmission powerlines and its associated Electrical infrastructure near Beaufort West in the Western Cape Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	ASHA Consulting (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	0
Specialist name:	Dr Jayson Orton			
Specialist Qualifications:	D.Phil (Archaeology, Oxford, UK) MA (Archaeology, UCT)			
Professional affiliation/registration:	ASAPA CRM member No. 233 APHP member No. 043			
Physical address:	23 Dover Road, Muizenberg, 7945			
Postal address:	23 Dover Road, Muizenberg			
Postal code:	7945	Cell:	083 272 3225	
Telephone:	021 788 1025	Fax:	n/a	
E-mail:	jayson@asha-consulting.co.za			

2. DECLARATION BY THE SPECIALIST

I, JAYSON ORTON, 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

ASHA CONSULTING (PTY) LTD

Name of Company:

07 JULY 2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, JAYSON ORTON, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

ASHA CONSULTING (PTY) LTD.

Name of Company

07 JULY 2022.

Date

Signature of the Commissioner of Oaths

07 JULY 2022

Date

SUID-AFRIKAANSE POLISIEDIENS
COMMUNITY SERVICE CENTRE
MUIZENBERG
07 JUL 2022
COMMUNITY SERVICE CENTRE
MUIZENBERG
SOUTH AFRICAN POLICE SERVICE

PALAEONTOLOGICAL HERITAGE SPECIALIST ASSESSMENT:

Basic Assessment for the Proposed Development of seven 132 kV Overhead Transmission Powerlines and associated electrical grid infrastructure in support of the proposed Kwagga WEF 1-3, near Beaufort West, Central Karoo District, Western Cape Province

Report prepared for:	*Report prepared by:*
ABO Wind Renewable Energies (Pty) Ltd **Unit B1, Mayfair Square** **Century Way, Century City** **7441 Western Cape, RSA**	**John E. Almond PhD (Cantab.)** ***Natura Viva* cc** **PO Box 12410 Mill Street,** **Cape Town 8010, RSA** **naturaviva@universe.co.za**

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Executive Summary

ABO Wind renewable energies (Pty) Ltd is proposing the construction of seven 132 kV overhead transmission powerlines in support of the adjoining authorised Kwagga Wind Energy Facilities (WEFs) 1-3 on a site located *c*. 65 km south of Beaufort West in the Central Karoo District of the Western Cape Province. Each powerline project is subject to a separate Basic Assessment process.

The combined Electrical Grid Infrastructure (EGI) corridor for the Kwaggas WEF 1-3 developments is underlain by Middle Permian continental sediments of the Lower Beaufort Group (Karoo Supergroup). These bedrocks are characterized by sparse, largely unpredictable fossil remains – notably those of various vertebrate subgroups – that may be of high scientific and conservation value. Provisional sensitivity mapping using the DFFE Screening Tool assigns a Very High Palaeosensitivity to the combined EGI corridor. However, several recent palaeontological field surveys of the adjoining ABO Kwaggas WEF 1-3 and Mainstream Beaufort west Cluster WEF project areas suggest that the EGI project area is, in practice, of overall Low Palaeosensitivity.

Only a few (*c*. 10) fossil sites, some of which have since been collected (Table 4), and no palaeontological heritage No-Go areas have been identified within the EGI corridor. However, the majority of the corridor has not yet been surveyed in detail during previous palaeontological field studies for the ABO Kwagga 1-3 WEFs and adjoining Mainstream Beaufort West Cluster WEFs.

Potential impacts on local fossil heritage resources as a result of the proposed EGI developments are confined to the Construction Phase and the project footprints. They entail the damage, disturbance or destruction of fossils preserved at or beneath the ground as a result of surface clearance and bedrock excavations.

Each of the seven proposed EGI developments for the Kwagga WEF 1-3 are assigned an overall impact significance rating (Construction Phase) of NEGATIVE LOW before mitigation and NEGATIVE VERY LOW after mitigation. No significant further impacts on fossil heritage resources are anticipated in the planning, operational and decommissioning phases. The No-Go Option might have a NEUTRAL impact significance. Anticipated overall cumulative impacts in the context of several planned or authorized renewable energy projects in the region are assessed as NEGATIVE MEDIUM before mitigation and NEGATIVE LOW after mitigation, falling within acceptable limits.

Given their very similar geological and palaeontological context, and the fact that the great majority of known or new fossil sites can be mitigated in the Pre-Construction Phase, these ratings apply equally to all the powerline route options and substation sites under consideration. There is therefore no preference on palaeontological heritage grounds for any particular powerline route option or substation site alternative among those under consideration.

The proposed EGI developments are not fatally flawed. On condition that the recommended mitigation measures outlined in Section 9 of this report and the Chance Fossil Finds Protocol tabulated in Appendix 2 are included within the EMPr and implemented in full during the Construction Phase, there are no objections on palaeontological heritage grounds to the authorization of any of the seven proposed WEF EGI developments. This is on condition that the following recommended mitigation measures and the Chance Fossil Finds Protocol tabulated in Appendix 2 are included within the respective EMPrs and implemented in full during the Construction Phase of each project:

1. Pre-construction survey of potentially sensitive, unsurveyed sectors of selected EGI corridor (including substation sites) by qualified palaeontologist.
2. Pre-construction recording and judicious sampling of new and previously recorded scientifically valuable fossil remains within EGI corridor (including substation sites) by qualified palaeontologist.

3. Monitoring for fossil remains on an on-going basis by ECO / ESO during the construction phase.
4. Application of Chance Fossil Finds Procedure.

The palaeontologist commissioned to carry out mitigation work will need to submit beforehand a Work Plan for approval by the responsible Provincial Heritage Resources Agency, Heritage Western Cape. The fossil material collected must be curated in an approved repository (museum / university collection). Standards for palaeontological reporting and mitigation have been established by Heritage Western Cape (2021) and SAHRA (2013).

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amsl	above mean sea level
DFFE	Department of Forestry, Fisheries and the Environment
ECO	Environmental Control Officer
EGI	Electrical Grid Infrastructure
EMPr	Environmental Management Programme
ESO	Environmental Site Officer
HWC	Heritage Western Cape
Ma	millions of years ago
PIA	palaeontological heritage impact assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
TOR	Terms of Reference
WEF	Wind Energy Facility

1 Introduction and project outline

ABO Wind renewable energies (Pty) Ltd is proposing the construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022. The Kwagga WEF EGI combined project area is spans the N12 trunk road and is located some 65km south of Beaufort West in the Central Karoo District (Prince Albert and Beaufort West Local Municipalities), Western Cape Province (Figure 1).

The seven proposed 132 kV overhead transmission powerlines (Table 2 and Figure 1) will facilitate the connection of the proposed Kwagga WEF 1-3 to the national grid *via* the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1). It is understood that the proposed stations will be constructed by South Africa Mainstream Renewable Power Developments (Pty) Ltd ("Mainstream") in support of their Beaufort West WEF (DFFE Ref: 12-12-20-1784-1-AM2) and the Trakas WEF (DFFE Ref: 12-12-20-1784-2-AM2) that are to be located on land directly adjacent to the proposed Kwagga WEF 1-3. ABO Wind has signed a servitude agreement and relevant powers of attorney with the landowner of the relevant Beaufort West and Trakas WEF affected land portions and obtained agreement with Mainstream to facilitate the connection of the proposed Kwagga WEF 1-3 - *via* 132 kV overhead powerlines and *via* the aforementioned Eskom Switching Substation and the Beaufort West 132 kV-400 kV Linking Station - to the existing Droërivier–Proteus 400 kV overhead powerline that runs parallel to and to the west of the N12 trunk road in a north-south direction (Figure 1). ABO Wind will be the Project Applicant for each of the seven proposed 132 kV overhead transmission powerlines and its associated EGI. The seven proposed 132 kV overhead transmission powerlines will be constructed on the farm portions listed below in Table 1.

The proposed EGI projects will consist of the components listed below. It is important to note at the outset that the exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction (subsequent to the issuing of an EA, should such an authorisation be granted for the proposed projects), but that the information provided below is seen as the worst-case scenario for the projects.

(1) Overhead Transmission Powerlines

- Line capacity: Up to 132 kV \
- Line/pylon height: Up to 30 m
- Pylon type: Monopole
- The registered servitude for each of the seven proposed 132 kV overhead transmission powerlines will be up to 50 m wide, or where multiple adjacent powerlines occur, in line with the Eskom guidelines as described in Table 2 below. Note that the entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant standards and specifications (Table 2 - Eskom Distribution Guide Part 19: Building Line Restrictions, Servitude Widths, Line Separations and Clearances from Power Lines).

Table 1. Guideline and requirements for 132 kV powerlines (Extracted from Eskom Distribution Guide Part 19, 2011)

Voltage	Building restriction on each side of centre line	Separation distance between parallel lines
132 kV	18 metres (15.5 - 20)	15 metres (21 - 24)

(2) Associated electrical infrastructure (including but not limited to feeder bays, busbars, new transformer bays (up to 500 MVA) and possible extension to the existing footprint at the proposed Eskom 132 kV Switching Substation).

(3) The following substations are relevant to these BA projects:
Proposed Eskom 132 kV substation (Footprint: approximately 17 ha)
Proposed Beaufort West 132 kV- 400 kV Linking Station (Footprint: approximately 35 ha)
Proposed Kwagga WEF 1
- Preferred substation (Footprint: approximately 5.21 ha)
- Alternative substation (Footprint: approximately 7.59 ha)

Proposed Kwagga WEF 2
- Preferred substation (Footprint: approximately 18.5 ha)
- Alternative substation (Footprint: approximately 11.7 ha)

Proposed Kwagga WEF 3
- Preferred substation (Footprint: approximately 17 ha)
- Alternative substation (Footprint: approximately 17.7 ha)

1.1 Scope, Purpose and Objectives of this Specialist Report

This report serves as the desktop level Palaeontological Heritage Specialist Assessment that has been prepared as part of the Basic Assessment for the Proposed Development of seven 132 kV Overhead Transmission Powerlines and associated electrical grid infrastructure in support of the proposed Kwagga WEF 1-3 near Beaufort West, Central Karoo District, Western Cape Province.

The assessments include an approximately 300 m wide corridor for the Kwagga EGI route that traverses the proposed Kwagga WEF 1-3 project sites and an approximately 500 m wide corridor for the Kwagga EGI route that traverses the neighbouring Mainstream Beaufort West and Trakas Wind Farm project sites.

In all, seven 132 kV overhead transmission powerlines will be assessed and seven separate applications for Environmental Authorisation (EA) will be submitted to the Department of Forestry, Fisheries and the Environment (DFFE). Therefore, if successful, seven separate EAs will be issued at the end of the BA Processes. The seven separate EGI projects are listed in Table 3 below:

In order to support efficient and responsible implementation of large-scale wind and solar PV projects, the CSIR was appointed by the National Department of Environmental Affairs (DEA) (now operating as the DFFE) in 2014 to identify Renewable Energy Development Zones (REDZs). This led to the identification of eight REDZs being gazetted by the Minister of Environmental Affairs in Government Gazette 41445, Government Notice (GN) 114 on 16 February 2018. In these REDZs, a BA process can be followed instead of a full Scoping and EIA process and the authority decision-making period has been reduced from 107 days to 57 days. Note that the seven proposed 132 kV Overhead Transmission Powerline projects are not located within any of the REDZs or Strategic Transmission Corridors. As a result, the proposed EGI projects will be subjected to a decision-making timeframe of 107 days in terms of the 2014 NEMA EIA Regulations (as amended).

Table 2: The seven separate assessments that form part of the Kwagga WEF 1-3 applications

Project 1	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 1 to the proposed Eskom 132 kV Switching Substation, near Beaufort West in the Western Cape Province
Project 2	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 2 to the proposed Eskom 132 kV Switching Substation, near Beaufort West in the Western Cape Province
Project 3	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 to the proposed Eskom 132 kV Switching Substation, near Beaufort West in the Western Cape Province
Project 4	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 2 to the proposed Kwagga Wind Energy Facility 1, near Beaufort West in the Western Cape Province
Project 5	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 to the proposed Kwagga Wind Energy Facility 1, near Beaufort West in the Western Cape Province
Project 6	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 to the proposed Kwagga Wind Energy Facility 2, near Beaufort West in the Western Cape Province
Project 7	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Eskom 132 kV Switching Substation to the proposed Beaufort West 132kV-400kV Linking Station, near Beaufort West in the Western Cape Province

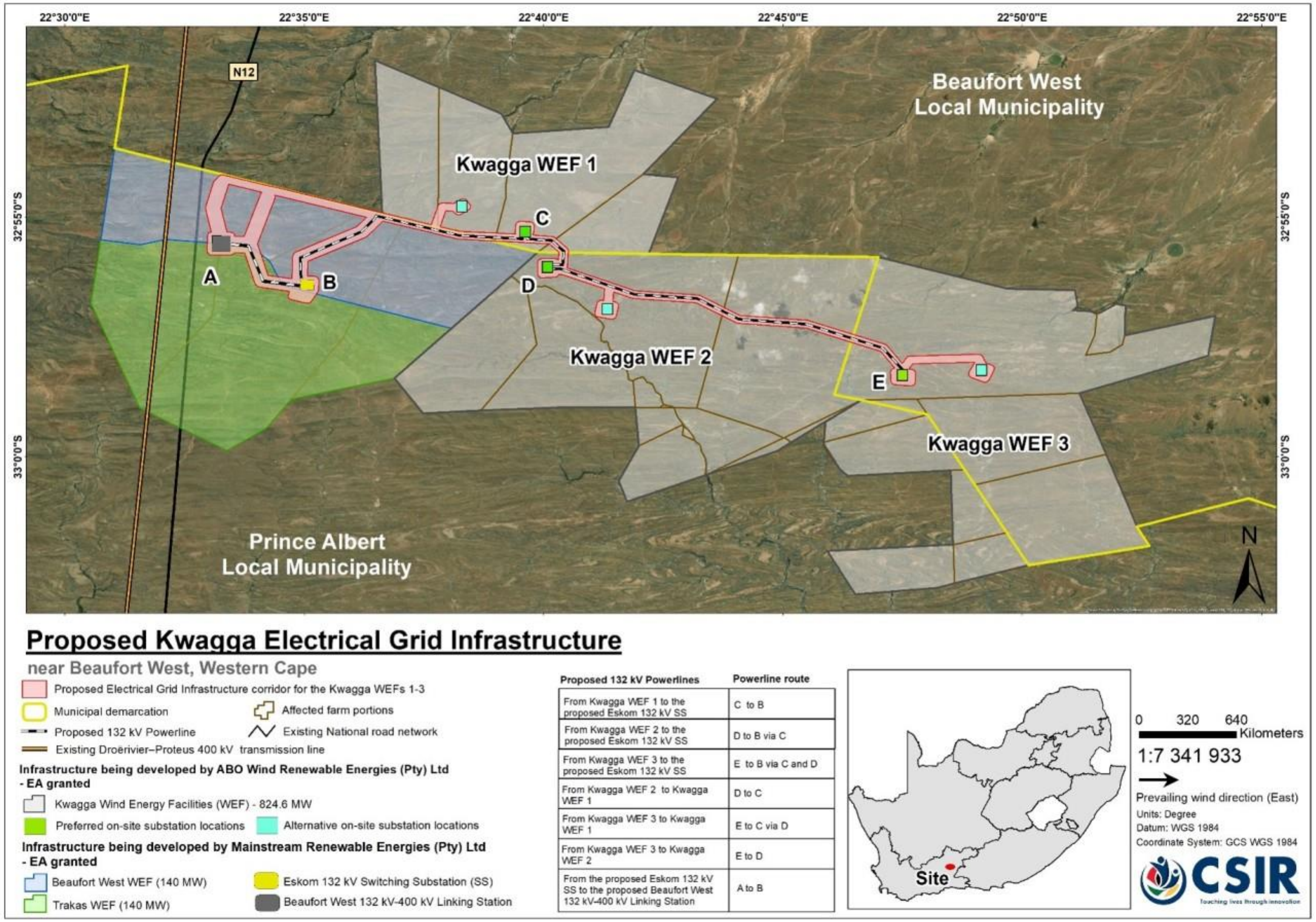

Figure 1: Map showing the proposed EGI corridor (pink) for the Kwagga WEF 1-3 overhead powerlines assessed in this desktop PIA report in the context of the project areas of the Mainstream Beaufort West Cluster WEF and ABO Kwagga WEF 1-3, all of which have been recently subject to previous desktop and field-based palaeontological studies by the present author.

Table 3: Location and servitude specifications for the seven proposed 132 kV overhead transmission lines for the Kwagga WEF 1-3 projects

		Proposed 132 kV Overhead Transmission Powerline Routes							
Land owner contact details	**Affected farm portion**	**From Kwagga WEF 1 to the proposed Eskom 132 kV Substation (SS)** **[Figure 2: C to D]**	**From Kwagga WEF 2 to the proposed Eskom 132 kV SS** **[Figure 2: C to B via C]**	**From Kwagga WEF 3 to the proposed Eskom 132 kV SS** **[Figure 2: E to B via C and D]**	**From Kwagga WEF 2 to Kwagga WEF 1** **[Figure 2: D to C]**	**From Kwagga WEF 3 to Kwagga WEF 1** **[Figure 2: E to C via D]**	**From Kwagga WEF 3 to Kwagga WEF 2** **[Figure 2: E to D]**	**From the proposed Eskom 132 kV SS to the proposed Beaufort West 132 kV-400 kV Linking Station** **[Figure 2: B to A]**	**Specialists are requested to assess an approximately 300 m wide corridor for the Kwagga EGI route that traverses the proposed Kwagga WEFs 1-3 project sites, and an approximately 500 m wide corridor for the Kwagga EGI route that traverses the neighbouring Mainstream Beaufort West and Trakas WEF projects**
		Farm portions which are traversed by each proposed powerline							**Width of corridor to be assessed**
Lotini Trust [Contact: HJ van Daalen, hj@vandaalen.co.za, 0828794094]	Remainder of the Farm Dwaalfontein Wes No. 377 [SG Code: C00900000000037700000]	✓	✓	✓	✓ (applicable if connected to Kwagga 1 SS alternative)	✓ (applicable if connected to Kwagga 1 SS alternative)			300 m corridor to be assessed for routes that traverse these farm portions which form part of the Kwagga WEFs 1-3 project sites.
Johannes Bernardus Nigrini [Contact: Johan.Nigrini@gmail.com, 0825507387]	Portion 3 of the Farm Tyger Poort No. 376 [SG: C00900000000037600003]		✓	✓	✓	✓			
	Portion 1 of the Farm Dwaalfontein Wes No. 377 [SG code: C00900000000037700001]	✓	✓	✓	✓ (applicable if connected to Kwagga 1 SS alternative)	✓ (applicable if connected to Kwagga 1 SS alternative)			
PSP Timber Ind (PTY) Ltd [Contact: Constant de Waal, constantpsp@gmail.com 0827791708]	Remainder of the Farm Dwaalfontein No. 379 [SG code: C00900000000037900000]	✓	✓	✓	✓	✓			
Millennium Trust [Contact: Dirk Lamprecht, dirk.link@kznatal.co.za, 0825535310]	Remainder of the Farm Wolve Kraal No. 17 [SG: C06100000000001700009]		✓	✓	✓	✓	✓		
	Portion 9 of the Farm Wolve Kraal No.17 [SG: C06100000000001700009]			✓		✓	✓		
Ghaties Snyman Familietrust [Contact: Ghaties Snyman, prutkraal@gmail.com, 0662520189]	Portion 7 of the Farm Muis Kraal No. 373 [SG: C00900000000037300007]			✓		✓	✓		
Kevin van Wyk [Contact: 0833755274]	Portion 1 of the Farm Witpoortje No. 16 [SG code:]	✓	✓	✓	✓ (connection to alternative K1 SS)	✓ (connection to alternative K1 SS)		✓	500 m corridor to be assessed for routes that traverse these farm portions which form part of the Trakas and Beaufort West WEFs project sites.
	Portion 1 of the Farm Trakas Kuilen No. 15 [SG code:]	✓	✓	✓					
	Remainder of the Farm Trakas Kuilen No. 15 [SG code:]							✓	
Length of the servitude									
		9 km	12 km	25 km	3 km	16 km	13 km	3 km	
Local municipalities within the Central Karoo District Municipality									
		Beaufort West Local Municipality and Prince Albert Local Municipality						Price Albert Local Municipality	

1.2 Terms of Reference

The Terms of Reference for this Palaeontological Heritage desktop study, as specified by the CSIR, are as follows:

1. Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN R320.
2. Compile a Palaeontological Impact Assessment in compliance with Appendix 6 of the 2014 NEMA EIA Regulations (as amended). The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.
3. Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues that were addressed and detailed assessment of impacts.
4. Determination, description and mapping of the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations.
5. Provide sensitivities in KMZ or similar GIS format.
6. Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
7. Prepare and undertake a study on the palaeontology and fossil heritage within the proposed project area, based on:
   - a review of all relevant palaeontological and geological literature, including geological maps and previous reports,
   - data on the proposed development (*e.g.* location of footprint, depth and volume of bedrock excavation envisaged).
8. Describe the type and location of known palaeontology and fossil heritage sites in the study area, and characterize all items that may be affected by the proposed project.
9. Note fossils and associated sedimentological features of palaeontological relevance (photos, maps, aerial or satellite images, and stratigraphic columns).
10. Evaluate the potential for occurrence of palaeontology and fossil heritage features within the study area.
11. Identify and rate potential direct, indirect and cumulative impacts of the proposed project on the palaeontology and fossil heritage during the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of existing renewable energy plants within the area (as well as those proposed), together with the impact of the proposed project. Impact significance must be rated both without and with mitigation. The Impact Assessment Methodology must follow that provided by the CSIR.
12. Identify any protocols, legal and permit requirements that relevant to this project and the implications thereof.
13. Provide recommendations and suggestions regarding fossil heritage management on site, including conservation measures, as well as promotion of local fossil heritage (*e.g.* for public education, schools) to ensure that the impacts are limited.
14. Provide recommendations with regards to potential monitoring programmes.
15. Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This data must be included in the EMPr.
16. Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.

17. Incorporate and address all issues and concerns raised by Stakeholders (*i.e.* Heritage Western Cape), Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
18. Review the Generic EMPr for 1) Powerlines2) Substations (GN R435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the preapproved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

2 Approach and Methodology

The present palaeontological heritage (PIA) report provides a short outline of the geology and known fossil resources within the combined Kwagga 1-3 WEF Overhead Transmission Powerline project area, based on desktop analysis of previous combined desktop and field-based PIA reports by the author for the Kwagga WEF 1-3, Beaufort West WEF and Trakas WEF project areas (see References). Anticipated impacts on local palaeontological heritage resources during the construction phase of the grid connection development are assessed as well as cumulative impacts in the context of other renewable energy projects in the wider region. Finally, recommendations are made regarding the monitoring and mitigation of impacts during the construction phase of the proposed electrical infrastructure for inclusion in the EMPrs for the powerline developments.

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations, members *etc.*) represented within the study area are determined from geological maps and satellite images. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience (consultation with professional colleagues as well as examination of institutional fossil collections may play a role here, or later following scoping during the compilation of the final report). This data is then used to assess the palaeontological sensitivity of each rock unit to development (provisional tabulations of palaeontological sensitivity of all formations in the Western Cape have already been compiled by J. Almond and colleagues; *e.g.* Almond & Pether 2008) and are shown on the palaeosensitivity map on the SAHRIS (South African Heritage Resources Information System) website. The likely impact of the development on local fossil heritage is then determined on the basis of (1) the palaeontological sensitivity of the rock units concerned and (2) the nature and scale of the development itself, most notably the extent of fresh bedrock excavation and ground clearance envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field assessment study by a professional palaeontologist is usually warranted.

2.1 Information Sources

This palaeontological heritage assessment report is based on:

- A project description, maps, kmz files and other relevant background documentation provided by CSIR - Environmental Management Services;

- A review of (a) 1:50 000 scale topographic maps as well as the 1:250 000 scale topographic map sheets 3222 Beaufort West and 3322 Oudtshoorn; (b) Google Earth© satellite imagery; (c) published geological and palaeontological literature, including 1:250 000 geological map sheet explanations by Johnson & Keyser (1979) and Toerien (1979) as well as (d) several previous desktop and field-based fossil heritage (PIA) assessments for the Beaufort West Cluster WEF projects (Almond 2010, 2015, 2018, 2021f, 2022), for the Kwagga 1-3 WEF (Almond 2021a-c) and for other WEF projects in the wider region (e.g. Almond 2021d-e for the Koup 1 and Koup 2 WEFs, reports in preparation for the Heuweltjies and Kraaltjies WEFs);

- The author's extensive field experience with the formations concerned and their palaeontological heritage (*cf* Almond & Pether 2008 and PIA reports listed in the References).

2.2 Assumptions, Knowledge Gaps and Limitations

The accuracy and reliability of palaeontological specialist studies as components of heritage impact assessments are generally limited by the following constraints:

1. Inadequate database for fossil heritage for much of the RSA, given the large size of the country and the small number of professional palaeontologists carrying out fieldwork here. Most development study areas have never been surveyed by a palaeontologist.

2. Variable accuracy of geological maps which underpin these desktop studies. For large areas of terrain these maps are largely based on aerial photographs alone, without ground-truthing. The maps generally depict only significant ("mappable") bedrock units as well as major areas of superficial "drift" deposits (alluvium, colluvium) but for most regions give little or no idea of the level of bedrock outcrop, depth of superficial cover (soil etc), degree of bedrock weathering or levels of small-scale tectonic deformation, such as cleavage. All of these factors may have a major influence on the impact significance of a given development on fossil heritage and can only be reliably assessed in the field.

3. Inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information.

4. The extensive relevant palaeontological "grey literature" - in the form of unpublished university theses, impact studies and other reports (*e.g.* of commercial mining companies) - that is not readily available for desktop studies.

5. Absence of a comprehensive computerised database of fossil collections in major RSA institutions which can be consulted for impact studies.

   In the case of palaeontological desktop studies without supporting Phase 1 field assessments these limitations may variously lead to either:

   a) underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or

   b) overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of largely unfossiliferous superficial deposits (soil, alluvium etc).

Since most areas of the RSA have not been studied palaeontologically, a palaeontological desktop study usually entails inferring the presence of buried fossil heritage within the study area from relevant fossil data collected from similar or the same rock units elsewhere, sometimes at localities far away. Where substantial exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a palaeontological impact assessment may be significantly enhanced through field assessment by a professional palaeontologist, as in the case of the present study.

In the case of the combined Kwagga WEF 1-3 grid connection project area bedrock exposure is often highly constrained by extensive superficial deposits, especially in areas of low relief but also on rocky hillslopes mantled by colluvium, as well as, to a lesser extent, by shrubby vegetation. The project area is very extensive (*c*. 30 km long and up to 4 km wide) and with comparatively few access roads. Unavoidably, only a small fraction of the entire project area has been surveyed on foot during previous palaeontological site visits for the Kwagga WEF 1-3 and Beaufort West Cluster WEFs. Nevertheless, sufficient bedrock exposures – including several of excellent quality - have been examined during the course of these field studies to assess the palaeontological heritage sensitivity of the main rock units represented within the combined WEF grid connection study area. These studies all conclude that the distribution of fossil sites at surface of scientific and conservation value here is both sparse and unpredictable. Confidence levels for this desktop impact assessment are therefore rated as Medium.

2.3 Consultation Processes Undertaken

Several fossil sites recorded during earlier palaeontological studies for the Beaufort West Cluster WEFs and the Kwagga WEF 1-3 were revisited, evaluated and, in part, sampled in collaboration with Professor Bruce Rubidge and Dr Marc Van den Brandt of the Evolutionary Studies Institute (ESI), Wits University in March 2021. These two experienced Karoo palaeontologists have subsequently provided valuable additional input into the evaluation of fossil material from the Lower Beaufort Group in the region south of Beaufort West.

3 Legislative and Permit Requirements

The present combined desktop palaeontological heritage report falls under Sections 35 and 38 (Heritage Resources Management) of the South African Heritage Resources Act (Act No. 25 of 1999), and it will also inform the EMPr for this development.

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the National Heritage Resources Act include, among others:

- geological sites of scientific or cultural importance;
- palaeontological sites;
- palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the National Heritage Resources Act, dealing with archaeology, palaeontology and meteorites:
(1) The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
(2) All archaeological objects, palaeontological material and meteorites are the property of the State.
(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
(4) No person may, without a permit issued by the responsible heritage resources authority—

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
(d) bring onto or use at an arch.aeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—

(a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
(b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
(c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph *(a)* to apply for a permit as required in subsection (4); and
(d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Minimum standards for the palaeontological component of heritage impact assessment reports (PIAs) have been published by SAHRA (2013) and by Heritage Western Cape (2016, 2021).

4 Description of Project Aspects relevant to the Palaeontological Heritage study

Project aspects of most relevant to palaeontological heritage include the construction of pylon footings, new access roads and new substations during the Construction Phase (*N.B.* Sites for new substations to be constructed by Mainstream have already been assessed by Almond (2021)).

5 Issues, Risks and Impacts

5.1 Identification of Potential Impacts/Risks

Existing impacts on local palaeontological heritage resources within the EGI project area include (1) background low-level loss of fossils exposed at the ground surface due to small-stock farming (*e.g.* vehicle activity, irrigation infrastructure, small-scale agriculture) as well as (2) on-going natural weathering and erosion processes that both destroy fossil material as well as expose and prepare-out previously-buried fossils. Loss of fossils though illegal collection is unlikely to be a major factor at present.

Aspects of the EGI projects that might entail significant impacts on local, legally-protected palaeontological heritage resources of scientific and / or conservation value include surface clearance and excavations into potentially fossiliferous sedimentary bedrocks associated with electrical pylon footings, new access roads as well new substations during the Construction Phase. These activities may adversely affect potential fossil heritage within the development footprint by damaging, destroying, disturbing or permanently sealing-in fossils preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good.

No significant further impacts are anticipated in the Planning, Operational and Decommissioning Phases of the EGI developments. These phase are therefore not separately assessed in this report.

- ***Cumulative impacts***

The cumulative impact assessment evaluates the potential loss of a significant fraction of unique irreplaceable, scientifically important fossil heritage – especially fossil vertebrates - preserved within the Abrahamskraal and Teekloof Formations cropping out in the southern Great Karoo to the south of Beaufort West through the construction of multiple renewable energy developments in the region.

6 Geological and palaeontological context of the Kwagga WEF 1-3 EGI project area

The Kwagga WEF 1-3 EGI project area is situated within gently hilly, semi-arid terrain towards the southern margins of the Great Karoo region in the Western Cape. Extensive illustrated accounts of the geology and palaeontology of this region have been provided in previous desktop and field-based PIA reports for the Beaufort West Cluster WEFs (Almond 2010, 2015, 2018, 2021, 2022) and the Kwagga 1-3 WEFs (Almond 2021a-c).

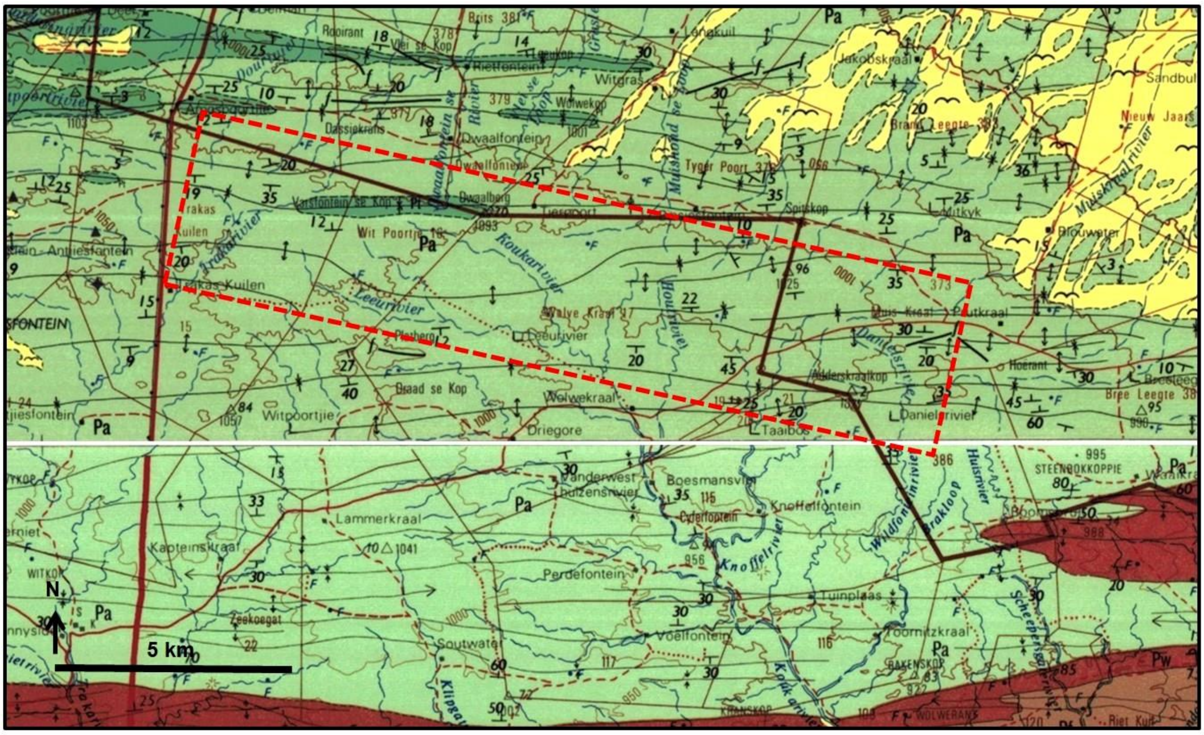

Figure 2: Extracts from adjoining 1: 250 000 geology sheets 3222 Beaufort West and 3322 Oudtshoorn (Council for Geoscience, Pretoria) showing the *approximate* location of the Kwagga WEF 1-3 grid connection project area some 65 km south of Beaufort West, Western Cape (dashed red rectangle). Note numerous W-E trending fold axes in the region which falls within the northern margins of the Cape Fold Belt. Pa (pale green) = Abrahamskraal Formation (Adelaide Subgroup, Lower Beaufort Group). Pt (dark green) = Poortjie member or basal Teekloof Formation (Adelaide Subgroup, Lower Beaufort Group). Yellow = Late Caenozoic / Quaternary superficial sediments, including alluvium, sheet wash, colluvium, soils, locally

cemented by pedocretes such as calcrete. To the west of the N12 and *outside* the WEF project area diamond symbols indicate fossil localities within the *Tapinocephalus* Assemblage Zone (AZ). Triangles indicate fossils within the *Pristerognathus* Assemblage Zone which has since been largely incorporated into the *Endothiodon* AZ (*N.B.* This fossil biozone data is now outdated).

6.1 General Description

The geology of the southern Karoo region to the south of Beaufort West is outlined on the 1: 250 000 scale geology sheets 3222 Beaufort West and 3322 Oudtshoorn with short accompanying sheet explanations by Johnson and Keyser (1979) and Toerien respectively (Figure 2). The majority of the EGI project area is underlain by continental (fluvial / lacustrine) sediments provisionally assigned to the middle and upper parts of the **Abrahamskraal Formation** (Lower Beaufort Group, Karoo Supergroup) of Middle Permian age (Johnson & Keyser 1979, Johnson *et al.* 2006, Day & Rubidge 2014, Cole *et al.* 2016) (Figure 3). Low W-E trending topographic ridges in the north-western sector of the WEF project area (*e.g.* the Vaarsfontein se Kop – Dwaalberg Ridge) are built by sandstone-packages of the Middle Permian **Poortjie Member** at the base of the **Teekloof Formation**. Further detailed field mapping, outside the scope of the present study, would be required to confirm the local stratigraphy (The Ecca – Beaufort boundary along this sector of the Great Karoo margin is incorrectly mapped, for example). On satellite images, the purported Moordenaars Member outcrop area appears dark and markedly striped while the purported Karelskraal Member outcrop area is characterised by lower relief with dark, weakly striped terrain. The Poortjie Member appears paler and brownish with occasional orange-hued tuffite horizons.

A series of W-E trending anticlines and synclines fold the Lower Beaufort Group bedrocks in this region which lies within the northern margins of the Cape Fold Belt, as clearly shown on satellite images and the geological map (Figs. 2 & 7 to 10). Folding is accompanied by cleavage development within finer-grained mudrocks (sometimes including pencil cleavage) and jointing in sandstone facies. No Karoo dolerite intrusions are mapped here. The Beaufort Group bedrocks within the study area are extensively overlain by unconsolidated **Late Caenozoic superficial deposits** such as colluvial and eluvial gravels, gravelly to silty stream alluvium as well as various sandy to gravelly skeletal soils and pedocretes (*e.g.* calcrete).

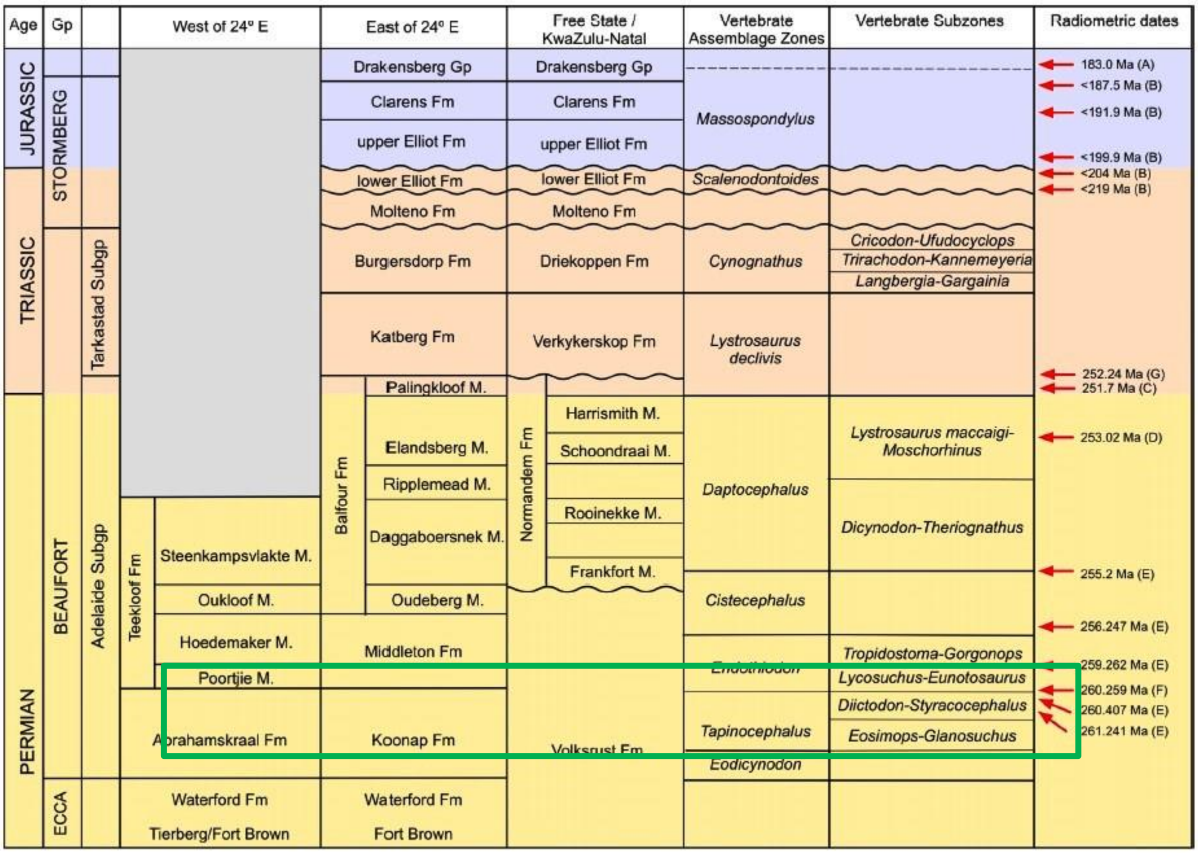

Figure 3: Stratigraphic subdivision of the upper portion of the Karoo Supergroup with the rock units and fossil biozones most relevant to the Kwagga WEF 1-3 EGI project area outlined in green (Modified from Smith *et al.* 2020). Fossil assemblages within the middle portion of the Abrahamskraal Formation belong to the *Eosimops – Glanosuchus* Subzone of the *Tapinocephalus* AZ, while those within the upper Abrahamskraal Formation and lower part of the Poortjie Member of the Teekloof Formation are now assigned to the *Diictodon-Styracocephalus* Assemblage Subzone (Previously part of the *Pristerognathus* AZ).

Fossil biotas represented within the combined EGI project area are referred to the late Middle Permian (Capitanian) ***Tapinocephalus* Assemblage Zone** (AZ) (Rubidge 1995, Smith *et al.* 2012, Day & Rubidge 2020) (Figure 3). More specifically, the middle and upper parts of the Abrahamskraal succession provisionally considered to be represented here are characterised respectively by fossil biotas of the recently defined ***Eosimops* – *Glanosuchus* Subzone** and ***Diictodon* – *Styracocephalus* Subzone**, the latler of which extends into the lower part of the Poortjie Member and has an estimated age of 262-260 Ma, *i.e.* late Capitanian (Day & Rubidge 2020). Marked impoverishment of fossil assemblages, notably with very few dinocephalians, within the upper part of the subzone - largely above the Moordenaars Member - is associated with the catastrophic, global end-Capitanian ecological crisis and Mass Extinction Event (*cf* Day *et al.* 2015).

Tapinocephalus AZ biotas recorded within the project areas of the Beaufort West Cluster and Kwaggas WEF 1-3 include cranial and post-cranial remains of bradysaurian pareiasaur reptiles, large-bodied dinocephalian therapsids (possible tapinocephalids, titanosuchids) (Figure 4), medium to large therocephalians as well as numerous skulls and rarer postcranial skeletal remains of small-bodied dicynodonts. These last are generally preserved within pedogenic calcrete concretions, some of which may have formed within burrows. They include not only *Diictodon*, the commonest form, but also examples of other, as yet unidentified, genera. Most of the better preserved fossil specimens are associated with small exposures of overbank mudrock facies, often preserved within pedocrete concretions marking ancient soils. As usual, most of the sporadic, usually weathered, larger chunks of fossil bone found as surface float are unidentifiable in terms of anatomy or taxonomic affinity; they are attributable to either pareiasaurs or dinocephalians. Local accumulations of ferruginised dinocephalian bones containing abundant secondary pyrite may be associated with partially articulated bony scales of palaeoniscoid fishes and probably accumulated on the margins of lakes and ponds.

Trace fossil records from the Abrahamskraal Formation beds in the wider study region include (1) the small tetrapod burrows (probably mostly dicynodont), (2) rare, poorly preserved trackways of a large tetrapod - probably undertracks of pareiasaur reptiles, (3) local concentrations of subcylindrical lungfish burrow casts (*Dipnoichnus*) , (4) rare phosphatic coprolites and (5) low diversity invertebrate burrow assemblages from lacustrine, river channel / bank and floodplain pond settings. Apart from rare, small blocks of silicified wood, the only plant fossils recorded comprise mats of sphenophyte fern stems ("horsetails") preserved as compressions or impressions.

Despite locally good levels of bedrock exposure, fossil records within the Poortjie Member outcrop area are usually very sparse, as is typical for the impoverished, post-extinction phase of the *Diictodon* – *Styracocephalus* Subzone (Day & Rubidge 2020). Occasional large, unidentifiable chunks of weathered bone found in surface float are tantalizing since they probably represent relict populations of dinocephalians, or even bradysaurine pareiasaurs (Figure 4). Other Poortjie Member tetrapods include cranial and postcranial material of medium to large therocephalian carnivores and locally common skulls of small-bodied dicynodonts such as *Diictodon*. Laterally extensive assemblages of sandstone lungfish burrow casts are associated with lacustrine mudrocks containing abundant gypsum pseudomorphs and occasional *equivocal* tetrapod burrows. Poorly-preserved silicified wood may be locally abundant and is usually encountered as reworked blocks within surface gravels.

No animal body fossil remains have been recorded so far from within the Late Caenozoic superficial sediments within the combined EGI project area. Dense assemblages of calcretized rhioliths (plant root casts) may be seen within consolidated older alluvium along major drainage lines; these trace fossils occur widely across the Great Karoo and are of limited scientific or conservation interest.

6.2 Fossil heritage resources within the Kwagga WEF 1-3 EGI corridor

Fossil sites recorded from the Beaufort West Cluster WEF and the Kwagga WEF 1-3 project areas are detailed in previous PIA reports by Almond (2021a-c, 2022). Very few (*c*. 10) of these recorded sites lie within or very close to the Kwagga WEF 1-3 EGI corridor project area, most of which has not yet been palaeontologically surveyed on foot. The recorded fossil material mainly comprises postcranial skeletal remains of large bodied tetrapods - pareiasaur reptiles / dinocephalian therapsids - *plus* a few skulls of small dicynodonts. These sites are mapped on satellite images Figures 7 to 10 and tabulated in Table 4 together with any recommended mitigation measures.

Several of the recorded sites are of low scientific or conservation interest (*e.g.* fragmentary, weathered postcranial chunks of bone in surface float which are difficult or impossible to identify) while others have already been collected since they were recorded (*cf* Almond 2022). Important exceptions include two partial postcranial skeletons of large pareiasaur reptiles on Farm Trakaskuilen 1/15 (Figs. 5, 6 & 9). Most – indeed, probably all - recorded fossil sites could be mitigated in the Pre-Construction Phase if directly threatened by the proposed EGI development.

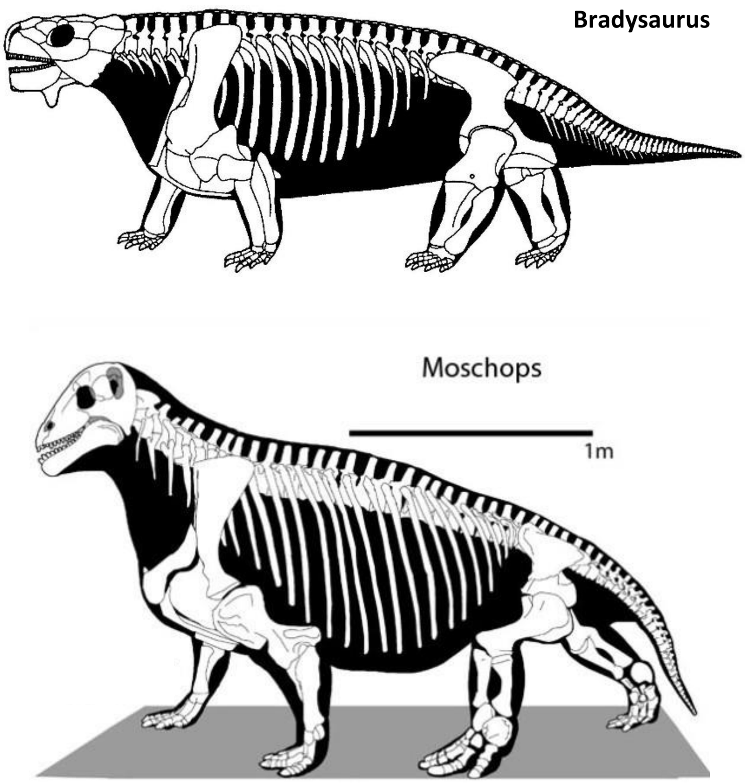

Figure 4: Two unrelated subgroups of rhino-sized, herbivorous tetrapods from the Middle Permian *Tapinocephalus* Assemblage Zone that are represented within EGI project area: bradysaurine pareiasaur reptiles (above) and dinocephalian therapsids (below). Fragmentary postcranial remains of these large-bodied tetrapods are often difficult to assign to one or other subgroup, especially when exposed and weathered at surface.

Figure 5: Partial postcranial skeleton of a large bradysaurian pareiasaur, including two elongate blocks with articulated vertebrae (bottom), Abrahamskraal Formation on Farm 1/15 (Loc. 249) (hammer = 30 cm). This specimen lies within an alternative sector of the EGI corridor (see satellite map Figure 9). Image abstracted from Almond (2022).

Figure 6: Partially *in situ* postcranial skeleton of a bradysaurian pareiasaur weathering out of Abrahamskraal Formation overbank mudrocks on Farm Trakaskuilen 1/15 (Loc. 248). Hammer = 30 cm. This specimen lies within an alternative sector of the EGI corridor (see satellite map Figure 9). Image abstracted from Almond (2022).

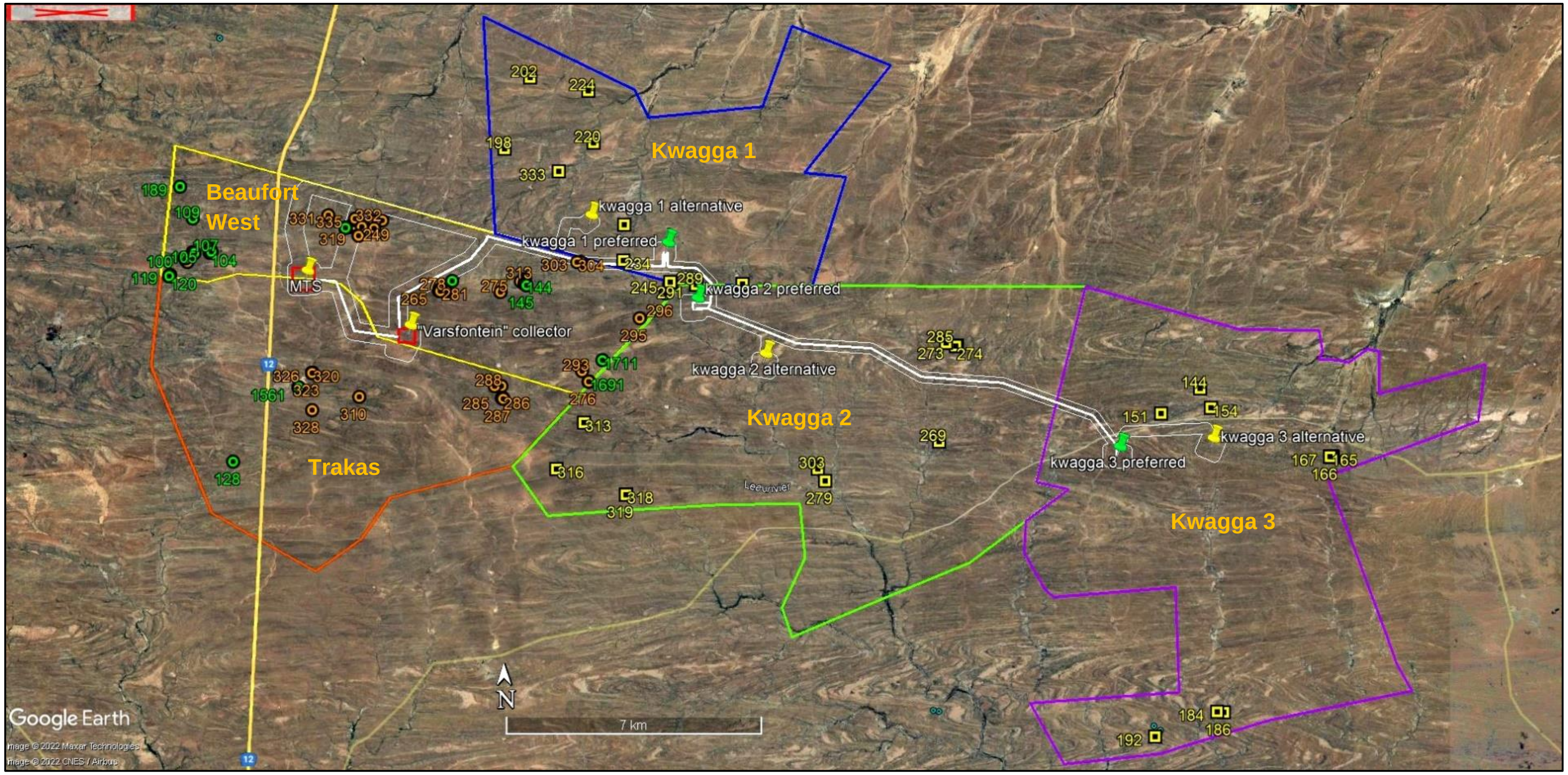

Figure 7: Google Earth© satellite image of the southern Great Karoo study region spanning the N12 *c*. 65 km south of Beaufort West showing the five component WEF project areas labelled in orange. The combined Kwagga WEF 1-3 EGI corridor is outlined by thin white line. The preferred grid connection is shown by the thick white line. See Figure 1 for a key to the substation options and the following three satellite maps for more detail.

Numbered small squares and circles map recorded fossil sites, abstracted from previous PIAs by Almond (2021a-c, 2022). Only 10 of these sites fall within or very close to the EGI corridor. See Table 4 below for details of these fossil sites and any recommended palaeontological mitigation. *N.B.* Most of the EGI corridor has not been surveyed in detail, so a specialist palaeontological heritage walk down is recommended in the Pre-Construction Phase of the EGI development.

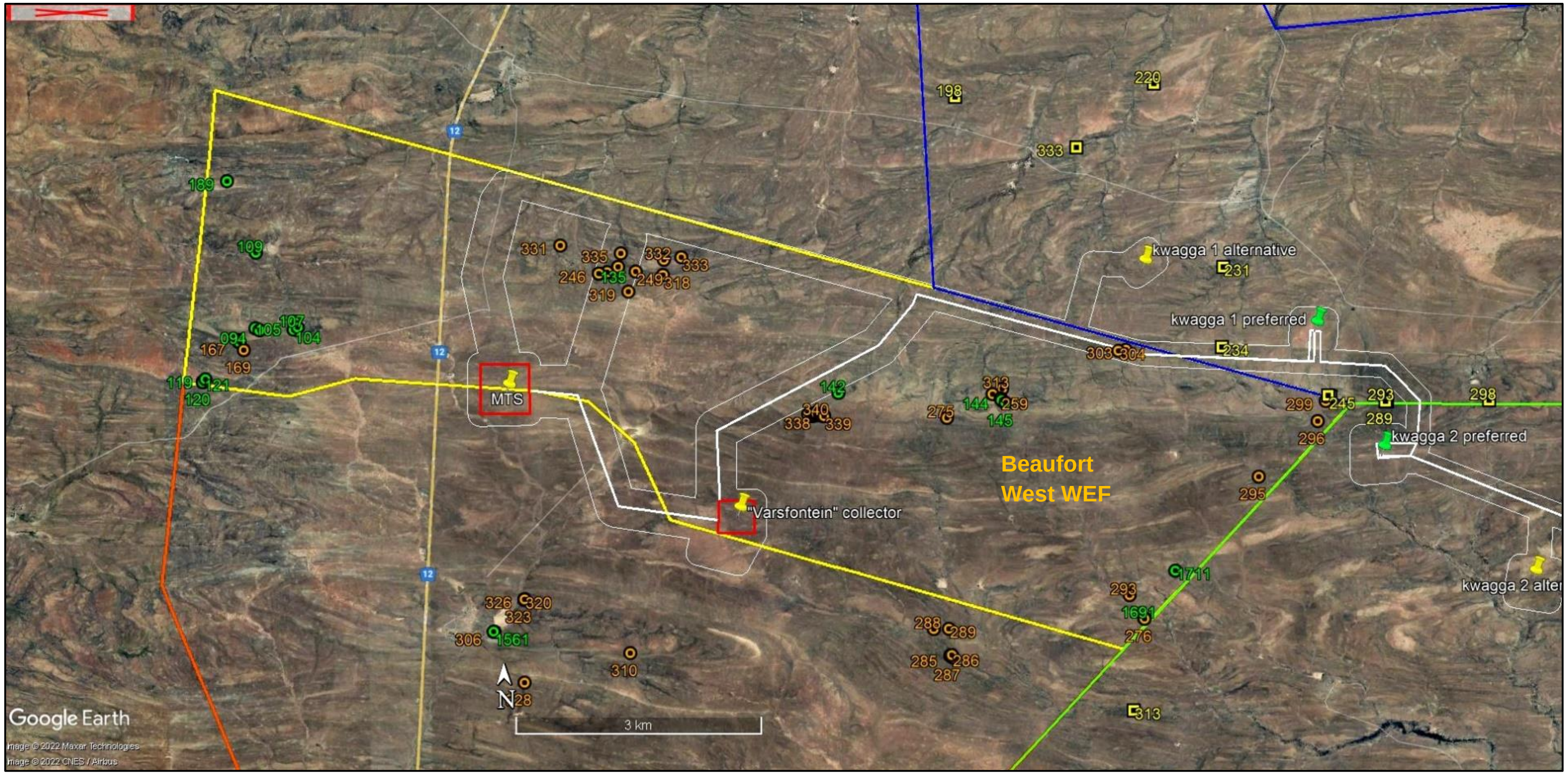

Figure 8: Google Earth© satellite image of the western sector of the combined EGI corridor (white polygons) and relevant substation sites. See Table 4 for details of numbered fossil sites and following figure for more detail of the central sector within the Beaufort West WEF project area.

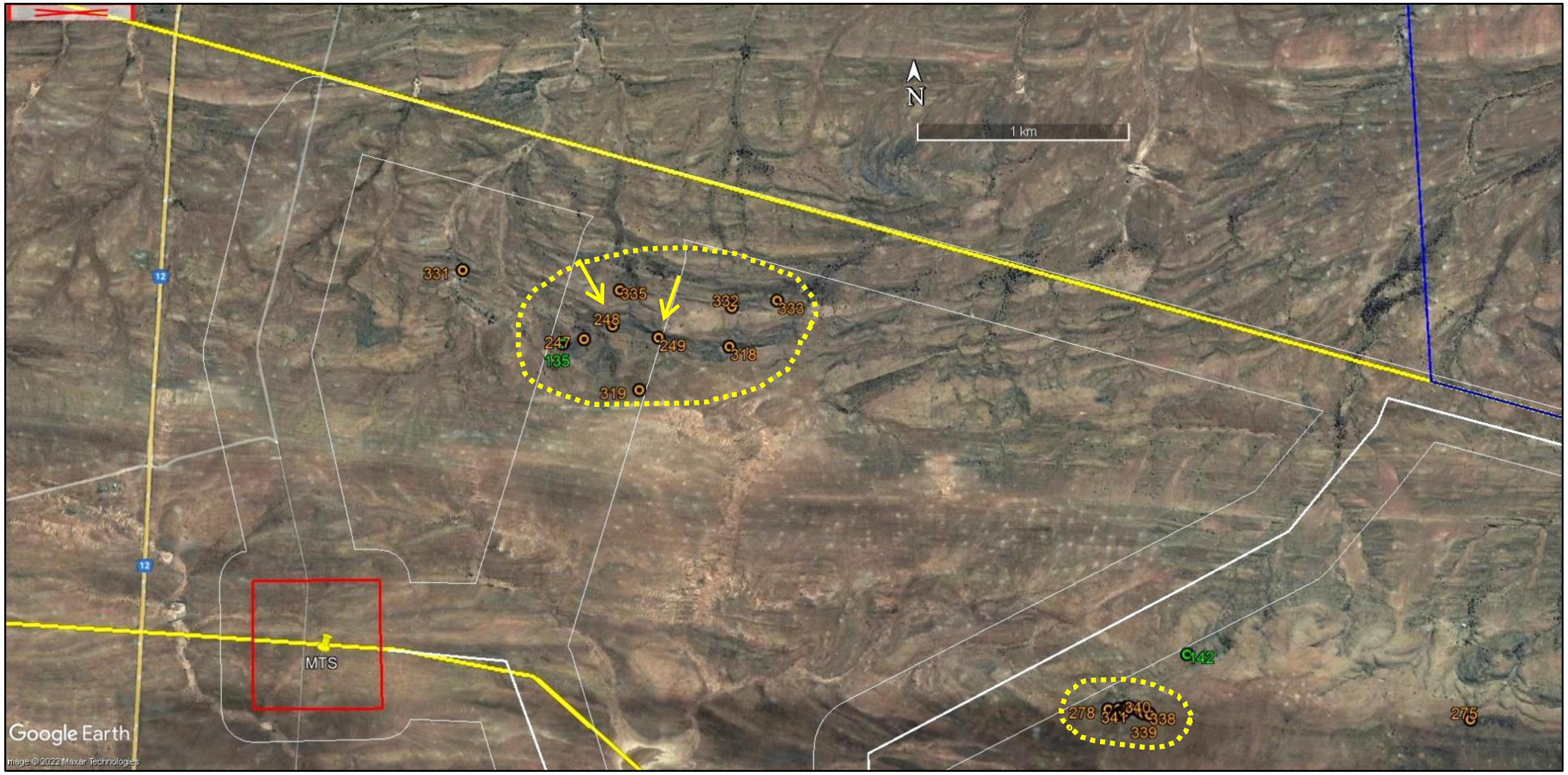

Figure 9: Google Earth© satellite image of part of the Beaufort West WEF project area. See Table 4 for data on numbered fossil sites. Two partial postcranial skeletons of pareiasaur reptiles (Locs. 248, 249 – arrowed) (Figs. 5 & 6) should be collected in the pre-construction phase should this alternative sector of the EGI corridor be chosen. Most of the fossil specimens recorded at surface within the two dotted ellipses have already been collected or are of limited scientific value (Almond 2022).

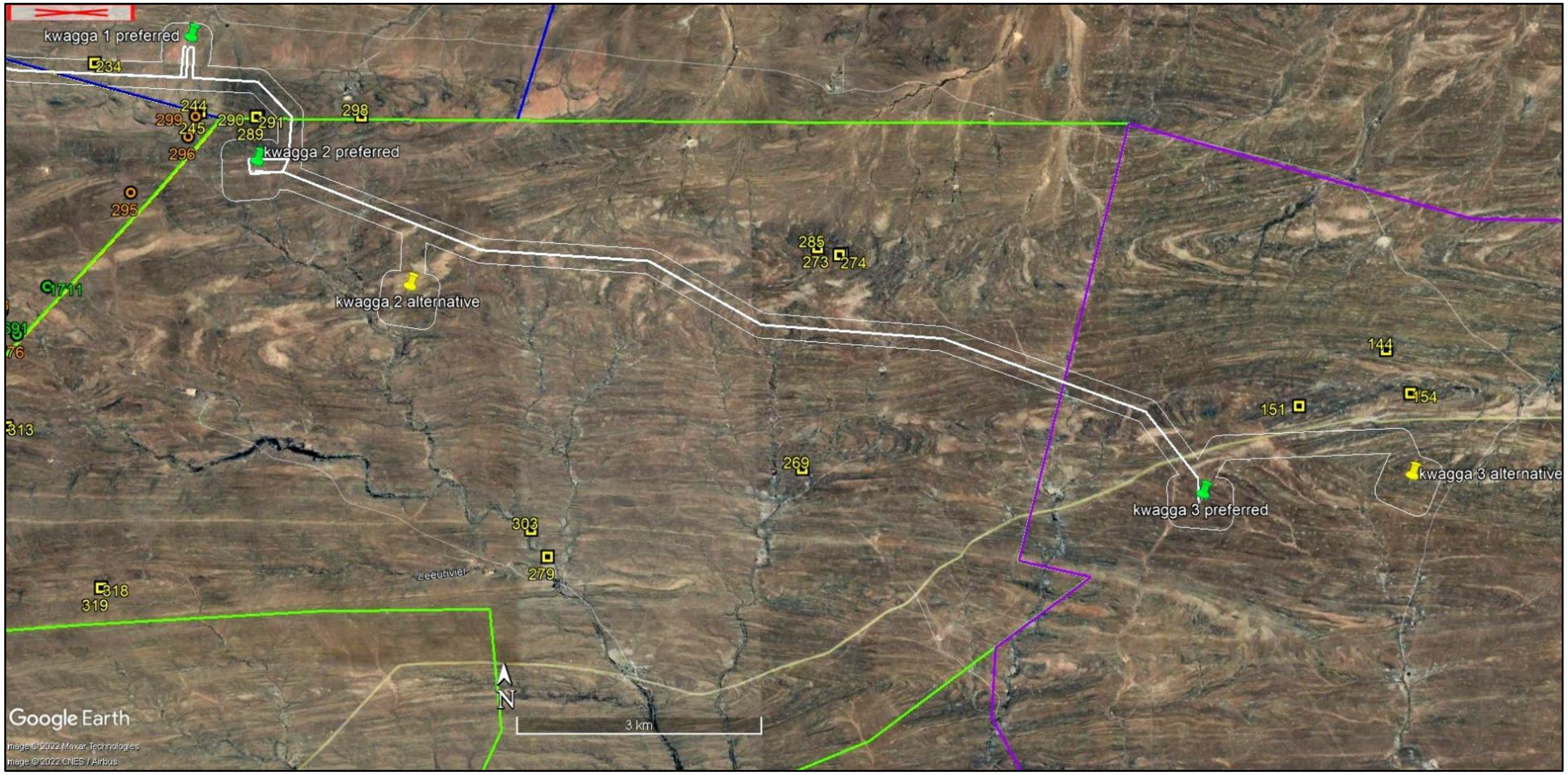

Figure 10: Google Earth© satellite image of the eastern sector of the combined EGI corridor (white polygons) and relevant substation sites. See Table 4 for data on numbered fossil sites. Note that hardly any recorded fossil sites lie within this sector of the EGI corridor, most of which has not been surveyed in detail, so a specialist palaeontological heritage walkdown is recommended in the Pre-Construction Phase of the EGI development.

Table 4: Recorded vertebrate fossil sites within the Kwagga WEF 1-3 EGI project area (data abstracted from Almond 2021a-c, 2022)

135	S32° 54' 47.8" E22° 34' 01.4"	Extensive hillslope exposures of grey-green mudrocks and abundant pedogenic calcrete nodules. Weathered **spongy bone of substantial-sized tetrapod**, possibly with teeth (*i.e.* Possible skull fragment), associated with pedogenic calcrete horizon. Upper Abrahamskraal Fm. Proposed Field Rating IIIB. Material to be collected / sampled in pre-construction phase if directly threatened by EGI development.
142	S32° 55' 36.1" E22° 35' 52.9"	Extensive Poortjie Member gulley exposures on N-facing slopes of low range of hills. Grey-green mudrocks with abundant gypsum pseudomorphs. Pedogenic calcrete float concretion enclosing **medium-sized tetrapod skull** (*c.* 10 cm long) – probably a large *Diictodon*. Scattered disarticulated post-cranial bone fragments in area. Proposed Field Rating IIIB. Collected March 2021 (Bruce Rubidge, ESI, Wits University)
234	S32° 55' 20.4" E22° 38' 53.4"	Dwaalfontein Wes R/377. Pedogenic palaecalcrete concretion in float containing a **small tetrapod skull** (probably small-bodied dicynodont), lower Poortjie Member. Proposed Field Rating IIIB. Material to be collected / sampled in pre-construction phase if directly threatened by EGI development.
247	S32.91312° E22.56813°	Farm Trakaskuilen 1/15. Abrahamskraal Formation. Ex-situ nodule housing a **small dicynodont skull**. Nodule, containing a small dicynodont skull with canines, wide intertemporal region (not *Diictodon*), ex-situ, within pedocrete concretion on grey mudstone. Proposed Field Rating IIIC Local Resource. Not collected. No mitigation necessary.
248	S32.91254° E22.56956°	Farm Trakaskuilen 1/15. Abrahamskraal Formation. **Partial in-situ pareiasaur postcrania**. Partially preserved, large bradysaurian pareiasaur postcranial skeleton, in part in situ within grey mudstone. Ex-situ scapula blade in two pieces, preserving the dorsal surface and the acromion process, distal humerus, and other postcrania. Vertebral column in-situ with dorsal osteoderms, smooth, unornamented and covered in lichen. Tentatively identified as *Bradysaurus*, based on the morphology of the osteoderms. Proposed Field Rating IIIB Local Resource. Material to be collected / sampled in pre-construction phase if directly threatened by EGI development.
249	S32.91311° E22.57189°	Farm Trakaskuilen 1/15. Abrahamskraal Formation. **Partial ex-situ pareiasaur postcrania**. Partially preserved, large bradysaurian pareiasaur, ex-situ in shallow stream bed, comprising two large blocks of articulated vertebrae with dorsal osteoderms, glenoid cavity of scapula with articulated dorsal humerus, partial left and right clavicles and other postcranial fragments. Proposed Field Rating IIIB Local Resource. Material to be collected / sampled in pre-construction phase if directly threatened by EGI development.
303	S32.92245° E22.63557°	Farm Witpoortjie. Abrahamskraal Formation. **In-situ large iliac blade or scapula blade**. In-situ large iliac blade or scapula blade, with bluish preservation, from either a dinocephalian or a bradysaurian pareiasaur, in green-grey mudstone. Proposed Field Rating IIIB Local Resource. Material to be collected / sampled in pre-construction phase if directly threatened by EGI development.
304	S32.92257° E22.63466°	Farm Witpoortjie. Abrahamskraal Formation. **Two ex-situ postcranial bone fragments**. Two weathered, postcranial fragments, with thick cortical bone, from either a dinocephalian or a bradysaurian pareiasaur, ex-situ in float. Proposed Field Rating IIIB Local Resource. Material to be collected / sampled in pre-construction phase if directly threatened by EGI development.
319	S32.915288° E 22.570859°	Farm Trakaskuilen 1/15.Abrahsmkraal Formation. Concentration of **7 weathered postcranial (and possibly cranial) bones of large-bodied tetrapod** (dinocephalian or pareiasaur) in surface float. Proposed Field Rating IIIB Local Resource. Specimen sampled.
335	S32.91109° E22.56995°	Farm Trakaskuilen 1/15. Abrahamskraal Formation. **Four poorly-preserved chunks of weathered large tetrapod** (probably postcranial). Proposed Field Rating IIIC Local Resource. Not collected.

7 Identification of Palaeontological Heritage Sensitivities and Site Sensitivity Verification

7.1 Sensitivities identified by the National Web-Based Environmental Screening Tool

The Lower Beaufort Group outcrop area in the Main Karoo Basin as a whole is provisionally designated as Very High Sensitivity in palaeontological heritage terms on the basis of its rich fossil record of continental (fluvial / lacustrine / terrestrial) vertebrates of Middle to Late Permian age. A Very High Palaeosensitivity rating for almost the entire combined Kwagga 1-3 WEF and Beaufort West Cluster WEF project area is indicated on the SAHRIS palaeosensitivity map (based on 1: 250 000 geological mapping), with the exception of small riverine areas with thick alluvial deposits (Almond 2021a-c, Almond 2022). Likewise a **Very High Sensitivity** is indicated for the entire Kwagga WEF 1-3 EGI corridor project area, based on the DFFE Screening Tool (Figure 11). Paradoxically, the draft Phase 2 Heritage Scoping Report for the Aberdeen and Beaufort West REDZ5 area located just to the north by Van der Walt (2019) asserts that "Small sections in the focus area are of medium palaeontological sensitivity" and assigns an overall Medium Sensitivity to this REDZ (This assessment is currently being challenged, however).

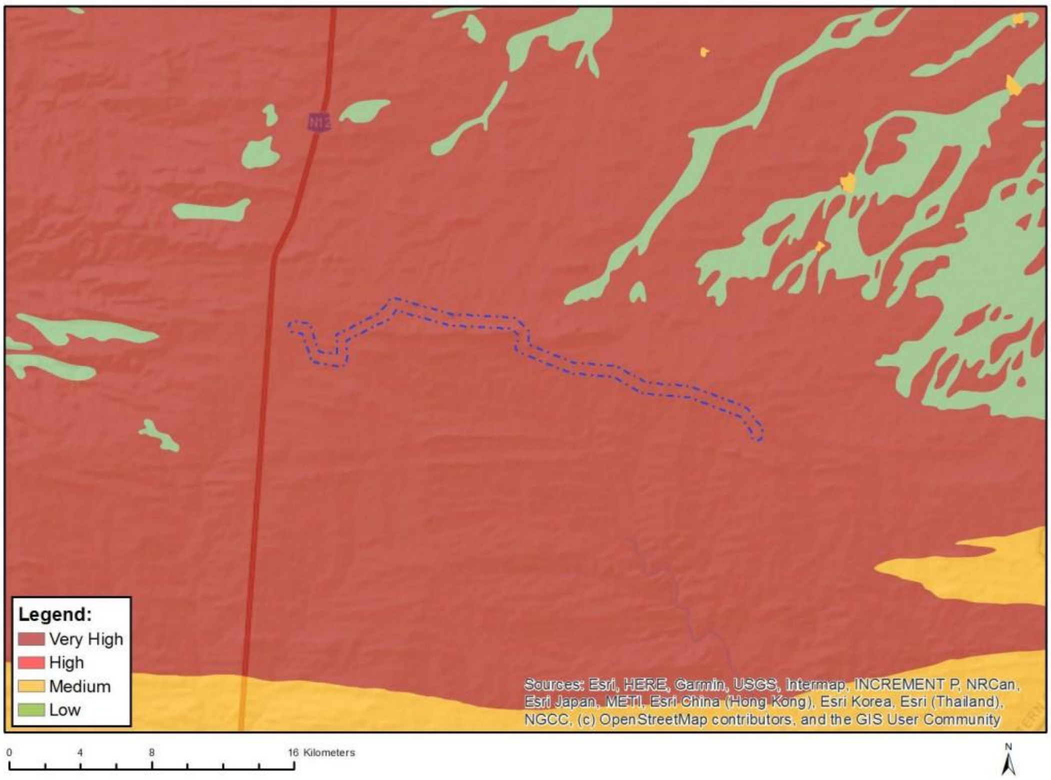

Figure 11: Provisional palaeosensitivity map of the Kwagga WEF 1-3 EGO corridor south of Beaufort West (blue dashed polygon) generated by the DFFE Screening Tool (CSIR, March 2022). The entire project area is designated Very High Palaesensitivity due to underlying sedimentary bedrocks of the Lower Beaufort Group. This sensitivity mapping is contested in this PIA report.

7.2 Specialist Palaeosensitivity Analysis and Site Sensitivity Verification

On the basis of several recent field surveys of the Kwagga WEF 1-3 and Beaufort West Cluster project areas (Almond 2018, 2021a-c, 2021f, 2022), in the context of additional palaeontological fieldwork in adjoining WEF project areas, the Very High Sensitivity assigned to the EGI corridor project area by the DFFE Screening Tool (Figure 11) is *contested* in this report. Since comparatively few fossils of scientific and conservation value are recorded over a large area here, even in areas of good bedrock exposure*, it is concluded that, in practice, the palaeosensitivity of the site is generally LOW but with sparse, small and largely unpredictable sites of HIGH to VERY HIGH sensitivity.* No areas (as opposed to individual sites) of High Palaeosensitivity or No-Go Areas have been identified here. Most – indeed probably all – known fossil sites could be mitigated in the pre-construction phase, should they be threatened by the proposed development, while several have already been mitigated.

7.3 Sensitivity Analysis Summary Statement

Provisional palaeosensitivity mapping of the Kwagga WEF 1-3 EGI corridor project area by the DFFE Screening Tool suggests a Very High Palaeosensitivity for the entire corridor, based on the underlying bedrocks of the Lower Beaufort Group (Karoo Supergroup). However, extensive recent palaeontological field surveys indicate that, in practice, the site is of Low Palaeosensitivity overall, with rare, sporadic and largely unpredictable fossil sites present at surface.

8 Impact Assessment

Existing impacts on local palaeontological heritage resources within the EGI project area include (1) background low-level loss of fossils exposed at the ground surface due to small-stock farming (*e.g.* vehicle activity, irrigation infrastructure, small-scale agriculture) as well as (2) on-going natural weathering and erosion processes that both destroy fossil material as well as expose and prepare-out previously-buried fossils. Loss of fossils though illegal collection is unlikely to be a major factor at present.

Potential impacts on local, legally-protected palaeontological heritage resources resulting from the proposed EGI projects are assessed in this section of the report. As explained below, this assessment applies only to the Construction Phase of the projects and applies equally to all seven overhead transmission powerline projects under consideration (as listed in Table 2 and Figure 1).

8.1 Potential Impacts during the Construction Phase

The construction phase of the proposed EGI will entail limited surface clearance as well as excavations into the superficial sediment cover and underlying, potentially fossilfierous bedrock (*e.g.* for widened or new access roads, pylon footings, substations). Construction of the electrical infrastructure may adversely affect potential fossil heritage within the development footprint by damaging, destroying, disturbing or permanently sealing-in legally-protected fossil heritage preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good.

Potential impact during the Construction Phase of the proposed Kwagga 1-3 WEF grid connection on local fossil heritage resources, before and after mitigation, are assessed below and summarized in Table 5, applying the Environmental Impact Assessment (EIA) Methodology developed by the CSIR. The planning, operational and de-commissioning phases of the project are unlikely to involve further adverse impacts on local palaeontological heritage and are therefore not separately assessed in this report.

Given (1) the very similar geological context - and hence anticipated palaeontological heritage resources - throughout the entire EGI project area, (2) the paucity of fossil sites recorded here as well as (3) the potential for effective mitigation of all recorded fossil sites in the Pre-Construction Phase, this impact assessment *applies equally to all seven overhead transmission powerline projects under consideration* (as listed in Table 2 and Figure 1). *Furthermore, there is therefore no preference on palaeontological heritage groups for any particular powerline route option of substation site alternative among those under consideration*.

The destruction, damage or disturbance out of context of legally-protected, scientifically-important fossils preserved at the ground surface or below ground that may occur during construction of the EGI entail *direct negative* impacts to palaeontological heritage resources that are confined to the development footprint (*site specific*). These impacts can often be mitigated but cannot be fully rectified (*i.e.* they are *non-reversible*). All the sedimentary formations represented within the study area contain fossils of *some* sort, so impacts at some level on fossil heritage are *definite*. However, this analysis focuses primarily on fossil heritage *of significant scientific or conservation value*, in which case the probability of impacts is rated somewhat lower as *likely*. While most (but *not* all) of the fossils concerned are probably of widespread occurrence elsewhere within the large outcrop areas of the formations concerned*, some* unique, well-preserved, scientifically-important fossils are known to occur in this region of the Great Karoo. The potential losses of irreplaceable fossil resources without mitigation are therefore conservatively rated as *moderate*. Such impacts are of *permanent* duration (*non-reversible*). Their intensity / magnitude or consequence during the construction phase is rated as *medium* before mitigation as a precautionary measure since most of the EGI project footprint has not been surveyed on foot. Before mitigation, a NEGATIVE LOW impact significance is accordingly inferred for each EGI project.

These ratings apply equally to all the powerline route options and substation sites under consideration. *There is therefore no preference on palaeontological heritage groups for any particular powerline route option of substation site alternative among those under consideration*.

Potential negative impacts can be substantially reduced through implementation of the proposed mitigation measures, *viz*. a pre-construction palaeontological specialist survey of potentially sensitive sectors (if any) of the finally chosen EGI corridor (including substation sites), with recording and judicious collection / sampling of fossil material of scientific / conservation within the corridor. This should be backed up by a Chance Fossil Finds Procedure during the construction phase (See Appendix 2 and the EMPr). Mitigation through micro-siting of EGI infrastructure / substations would only be necessary in the case of the discovery of extensive fossil sites of very high scientific / conservation value within the finally chosen EGI corridor; this eventuality cannot be entirely excluded but is considered highly unlikely. After mitigation, the residual impact significance of the proposed grid connection project falls to NEGATIVE VERY LOW.

Due to the unavoidably reconnaissance level of the field surveys of the extensive combined WEF study area, including the EGI corridor (See satellite map Figure 7), confidence levels for this palaeontological heritage assessment are only moderate (*medium*). These conclusions and recommendations are supported, however, by several previous palaeontological field assessments undertaken in the broader southern Karoo region by the author (See References and discussion on cumulative impacts below).

In the case of the **No-Go Option** (*i.e.* no EGI development), the possible loss of local heritage resources through construction of the proposed electrical infrastructure (negative impact) would be avoided while potential improvements in palaeontological understanding through professional mitigation - *i.e.* recording and collection of palaeontological material and data (positive impacts) -

would be lost. The slow background destruction of fossils exposed at the surface through natural weathering and erosion would continue, but at the same time new fossils are revealed for scientific study. On balance, it is concluded that in all cases the No-Go alternative would probably have a *neutral* impact on palaeontological heritage.

Table 5: Palaeontological heritage impact assessment summary table for the Construction Phase of the Kwagga WEF 1-3 EGI development near Beaufort West

- *N.B.* Refers to legally-protected fossil heritage of significant scientific and / or conservation value
- No significant further impacts anticipated during operational and decommissioning phases

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Disturbance, damage or destruction of fossils preserved at or beneath ground surface within EGI development footprint due to excavations and surface clearance	***Status***	**Negative**	**Low risk / impact (4)**	**1. Pre-construction survey of potentially sensitive, unsurveyed sectors of selected EGI corridor (including substation sites) by qualified palaeontologist. 2. Pre-construction recording and judicious sampling of new and previously recorded scientifically valuable fossil remains within EGI corridor (including substation sites) by qualified palaeontologist. 3. Monitoring for fossil remains on an on-going basis by ECO / ESO during the construction phase. 4. Application of Chance Fossil Finds Procedure.**	**Very low impact (5)**	**Medium**
	Spatial Extent	**Site specific**				
	Duration	**Permanent**				
	Consequence	**Moderate**				
	Probability	**Very likely**				
	Reversibility	**Non-reversible**				
	Irreplaceability	**Moderate**				

Table 6: Palaeontological heritage cumulative impact assessment summary table for the Kwagga WEF 1-3 EGI in the context of the other authorized or proposed renewable energy projects in the region (~ 50 km radius)

- *N.B.* Assumes that all the proposed monitoring and mitigation recommendations made for all the relevant projects are consistently and fully implemented.

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Disturbance, damage or destruction of fossils preserved at or beneath ground surface within the development footprint due to excavations and surface clearance	***Status***	Negative	**Moderate (3)**	**1. Pre-construction survey of potentially sensitive, unsurveyed sectors of authorised footprints by qualified palaeontologist. 2. Pre-construction recording and judicious sampling of scientifically valuable fossil remains inside, or within 10 m radius of, authorised project footprint by qualified palaeontologist. 3. Monitoring for fossil remains on an on-going basis by ECO / ESO during the construction phase. 4. Application of Chance Fossil Finds Procedure**	**Low impact (4)**	**Medium**
	Spatial Extent	**Regional**				
	Duration	**Permanent**				
	Consequence	**Substantial**				
	Probability	**Very likely**				
	Reversibility	**Non-reversible**				
	Irreplaceability	**Moderate**				

8.2 Cumulative Impacts

This cumulative impact assessment - summarized in Table 6 above - considers potential losses of a significant fraction of scientifically important, conservation-worthy fossil heritage resources– especially fossil vertebrates - preserved within the Abrahamskraal and Teekloof Formations of the southern Great Karoo south of Beaufort West as a consequence of the construction of multiple renewable energy developments and their associated EGIs in the region.

Anticipated cumulative impacts on palaeontological heritage within a radius of approximately 50 km around the EGI project area have already been extensively analyzed in previous reports for the Kwagga WEF 1-3 projects by Almond (2021a-c) and will not be repeated at length. It is noted that a number of additional WEF and (especially) developments have since been proposed for the Beaufort West region since the gazetting of the Aberdeen and Beaufort West REDZ5 but these so far unauthorized projects are less advanced than the Kwagga WEF 1-3 projects, while associated EGI corridors may not have been determined. These more recent projects are therefore not considered here.

In all the strictly *relevant* field-based Karoo palaeontological studies under consideration (*i.e.* those involving geological and fossil heritage comparable to those within the Kwagga EGI project area) the palaeontological sensitivity of the project area and the palaeontological heritage impact significance for the developments concerned has been rated as *low*. In all cases it was concluded by the author that, despite the undoubted occurrence of scientifically-important fossil remains (notably fossil vertebrates, petrified wood), the overall impact significance of the proposed developments was low because the probability of significant impacts on *scientifically important, unique or rare fossils* was slight. While fossils do indeed occur within most of the formations present, they tend to be sparse – especially as far as fossil vertebrates are concerned - while the majority are poorly-preserved and / or represent common forms that occur widely within the outcrop areas of the rock units concerned. Important exceptions include rare, semi-articulated skeletal remains of therapsids and pareiasaur reptiles as well as well-preserved dicynodont skulls of biostratigraphic significance from the *Tapinocephalus* Assemblage Zone.

Anticipated cumulative impacts of the known renewable energy projects proposed or authorised for the margins of the Great Karoo region to the south of Beaufort West – *including* the seven proposed Kwagga WEF 1-3 grid connection projects - are assessed as NEGATIVE MODERATE without mitigation. Overall impact significance may fall to NEGATIVE LOW with full mitigation since impacts will then occur at a lower intensity and will be partially offset by valuable new scientific data. The analysis only applies *provided that* all the proposed monitoring and mitigation recommendations made for all these various projects are followed through. Since this is inherently unpredictable and (sadly) unlikely, these cumulative impact assessments are necessarily *provisional*. Unavoidable residual negative impacts may be partially offset by the improved understanding of Karoo palaeontology resulting from appropriate professional mitigation. This is regarded as a *positive* impact for Karoo palaeontological heritage.

In conclusion, the cumulative impacts on local fossil heritage anticipated for the various renewable energy projects in the southern Great Karoo margins region due south of Beaufort West – including the seven proposed Kwagga WEF 1-3 grid connection projects – are expected to lie within acceptable limits, *provided that* all recommended mitigation recommendations for these projects are fully implemented.

8.3 Impact Assessment Summary

In terms of palaeontological heritage resources, the each of the seven proposed EGI developments for the Kwagga WEF 1-3 are assigned an overall impact significance rating (Construction Phase) of NEGATIVE LOW before mitigation and NEGATIVE VERY LOW after mitigation. No significant further impacts on fossil heritage resources are anticipated in the planning, operational and decommissioning phases. The No-Go Option might have a NEUTRAL impact significance. Anticipated cumulative impacts in the context of several planned or authorized renewable energy projects in the region are assessed as NEGATIVE MEDIUM before mitigation and NEGATIVE LOW after mitigation, falling within acceptable limits. The No-Go Option for each EGI project will probably have a NEUTRAL impact significance.

Anticipated cumulative palaeontological heritage impacts of the known renewable energy projects proposed or authorised for the margins of the Great Karoo region to the south of Beaufort West – *including* the seven proposed Kwagga WEF 1-3 grid connection projects - are assessed as NEGATIVE MODERATE without mitigation. Overall impact significance may fall to NEGATIVE LOW with full mitigation. These anticipated cumulative impacts fall within acceptable limits.

These ratings (Table 7) apply equally to all the powerline route options and substation sites under consideration. *There is therefore no preference on palaeontological heritage grounds for any particular powerline route option of substation site alternative among those under consideration*.

Table 7: Overall Impact Significance (Post Mitigation) – refers equally to all seven EGI projects

Phase	**Overall Impact Significance**
Construction	LOW (negative)
Operational	No significant impacts
Decommissioning	No significant impacts
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	MEDIUM (negative)
Cumulative - Operational	No significant impacts
Cumulative - Decommissioning	No significant impacts

9 Environmental Management Programme Inputs

The following palaeontological mitigation and monitoring is recommended in the case of each of the seven Kwagga WEF 1-3 EGI projects under consideration here:

- Once the final EGI corridor is determined, a specialist palaeontological survey or “walk down” of the corridor (including substation footprints) should be undertaken by a qualified palaeontologist in the Pre-Construction Phase. The walk down would focus on potentially-sensitive, previously unsurveyed sectors of the footprint, such as areas of extensive mudrock exposure along drainage lines, erosion gullies and bedrock ridges, Previously recorded (see sites listed in Table 4) as well as any new fossil sites of scientific or conservation value within the corridor should be mitigated through recording and collection / sampling of fossil material and associated geological data. The palaeontologist responsible will need to submit beforehand a Work Plan for approval by Heritage Western Cape. The ensuing mitigation report should make recommendations for any further palaeontological input (if any) in the Pre-construction and Construction Phases. The fossil material collected must be curated in an approved repository (museum / university collection). Standards for palaeontological reporting and mitigation have been established by Heritage Western Cape (2016, 2021) and SAHRA (2013).

- During the Construction Phase of the EGI a standard Chance Fossil Finds Protocol will apply, to be implemented by the ECO / ESO and, where necessary, a palaeontological specialist (See Appendix 2). The Environmental Control Officer (ECO) / Environmental Site Officer (ESO) responsible for the development should be made aware of the possibility of important fossil remains (vertebrate bones, teeth, petrified wood, plant-rich horizons *etc.*) being found or unearthed during the construction phase of the development. Monitoring for fossil material of all major surface clearance and deeper (>1m) excavations by the Environmental Site Officer on an on-going basis during the construction phase is therefore recommended. Significant fossil finds should be safeguarded and reported at the earliest opportunity to Heritage Western Cape for recording and sampling by a professional palaeontologist (Contact details: Heritage Western Cape. 3rd Floor Protea Assurance Building, 142 Longmarket Street, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 021 483 5959. Email:ceoheritage@westerncape.gov.za).

- These recommendations should be included within the EMPr for each of the Kwagga WEF 1-3 grid connection developments.

10 Final Specialist Statement and Authorisation Recommendation

10.1 Statement and Reasoned Opinion

The combined EGI corridor for the Kwaggas WEF 1-3 developments is underlain by Middle Permian continental sediments of the Lower Beaufort Group that are characterized by sparse, largely unpredictable fossil remains – notably those of various vertebrate subgroups – that may be of high scientific and conservation value. The project area is of overall Low Palaeosensitiviy, however. Only a few (*c*. 10) fossil sites, some of which have since been collected (Table 4), and no palaeontological heritage No-Go areas have been identified within the EGI corridor.

Each of the seven proposed EGI developments for the Kwagga WEF 1-3 are assigned an overall impact significance rating (Construction Phase) of NEGATIVE LOW before mitigation and NEGATIVE VERY LOW after mitigation. No significant further impacts on fossil heritage resources are anticipated in the planning, operational and decommissioning phases. The No-Go Option might have a NEUTRAL impact significance. Anticipated cumulative impacts in the context of several planned or authorized renewable energy projects in the region are assessed as NEGATIVE MEDIUM before mitigation and NEGATIVE LOW after mitigation, falling within acceptable limits.

Given their very similar geological and palaeontological context, and the fact that the great majority of known or new fossil sites can be mitigated in the Pre-Construction Phase, these ratings apply equally to all the powerline route options and substation sites under consideration. There is therefore no preference on palaeontological heritage grounds for any particular powerline route option or substation site alternative among those under consideration.

The proposed EGI developments are not fatally flawed. On condition that the recommended mitigation measures outlined in Section 9 of this report and the Chance Fossil Finds Protocol tabulated in Appendix 2 are included within the EMPr and implemented in full during the Construction

Phase, there are no objections on palaeontological heritage grounds to the authorization of any of the seven proposed WEF EGI developments.

10.2 EA Condition Recommendations regarding Palaeontological Heritage

There are no objections on palaeontological heritage grounds to the authorization of any of the seven proposed WEF EGI developments on condition that:

- the recommended mitigation measures outlined in Section 9 of this report and the Chance Fossil Finds Protocol tabulated in Appendix 2 are included within the EMPr and implemented in full during the Construction Phase

11 References

Extensive additional references relevant to the Kwagga WEF 1-3 EGI project area are provided in the reports by Almond (2021a-c, 2021, 2022) cited below.

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12 Details of Specialist

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and the University of Tübingen in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa and Madagascar. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out numerous palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Northwest Province, Mpumalanga, Gauteng, KwaZulu-Natal and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as a member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA (Palaeontological Society of Southern Africa) and APHP (Association of Professional Heritage Practitioners – Western Cape).

Appendix 1 - Specialist Statement of Independence

I, **Dr John Edward Almond**, 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.

John E. Almond

Signature of the Specialist:

Name of Company: ***Natura Viva* cc, Cape Town, RSA**

Date: **20 June 2022**

<table>
<tr><th colspan="3">Appendix 2: KWAGGA WEF 1-3 grid connection projects south of Beaufort West</th></tr>
<tr><td>Province & region:</td><td colspan="2">Western Cape (Central Karoo District): Beaufort West and Prince Albert Local Municipalities</td></tr>
<tr><td>Responsible Heritage Resources Agency</td><td colspan="2">Heritage Western Cape (Contact details: Heritage Western Cape. 3rd Floor Protea Assurance Building, 142 Longmarket Street, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 021 483 5959 Email: ceoheritage@westerncape.gov.za)</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Abrahamskraal & Teekloof Formations (Lower Beaufort Group), Late Caenozoic alluvium and other superficial deposits</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Fossil vertebrate bones, teeth, trace fossils, trackways, petrified wood, plant-rich beds in the Lower Beaufort Group bedrocks.
Fossil mammal bones, teeth, horn cores, freshwater molluscs, plant material in Late Caenozoic alluvium.</td></tr>
<tr><td rowspan="5">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
• Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
• Context – describe position of fossils within stratigraphy (rock layering), depth below surface
• Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
Photograph fossils against a plain, level background, with scale
Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">Submit a Paleontological Heritage Work Plan for approval by Heritage Western Cape. Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.</td></tr>
</table>

Appendix 3: Compliance with the Appendix 6 of the 2014 EIA Regulations (as amended)

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
1. (1) A specialist report prepared in terms of these Regulations must contain - *a) details of -* *i. the specialist who prepared the report; and* *ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;*	**12**
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	**Appendix 1**
c) an indication of the scope of, and the purpose for which, the report was prepared;	**1.1**
(cA) an indication of the quality and age of base data used for the specialist report;	**2.1**
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**8**
d) the duration, 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 inclusive of equipment and modelling used;	**2**
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	**8**
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;	**Figures 7 to 10**
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	**2.2**
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	**6, 8, 10**
k) any mitigation measures for inclusion in the EMPr;	**9** **Table 6**
l) any conditions for inclusion in the environmental authorisation;	**8, 10.2**
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**9**
n) a reasoned opinion- *i. 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, and where applicable, the closure plan;*	**10.1**
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	**2.3**
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	**n/a**
q) any other information requested by the competent authority.	
(2) Where a government notice by the Minister provides for any protocol or minimum	**Part A of the**

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	**Assessment Protocols published in GN 320 on 20 March 2020 are applicable (i.e. Site sensitivity verification requirements where a specialist assessment is required but no specific assessment protocol has been prescribed).**

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.4

Terrestrial Biodiversity and Species Impact Assessment

BASIC ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF A 132 kV OVERHEAD TRANSMISSION POWERLINE AND ASSOCIATED GRID INFRASTRUCTURE IN SUPPORT OF THE PROPOSED KWAGGA WEF 1-3, SOUTH OF BEAUFORT WEST, WESTERN CAPE
SEGMENT C – E

TERRESTRIAL BIODIVERSITY AND SPECIES: SPECIALIST ASSESSMENT

Ekotrust cc
CK 90/10465/23

Report prepared for:	*Report prepared by:*
ABO Wind Renewable Energies (Pty) Ltd Unit B1, Mayfair Square Century Way, Century City Cape Town, 7441 South Africa	Ekotrust cc 7 St George Street Lionviham, Somerset West, 7130 South Africa

23 June 2022

Contents

EXECUTIVE SUMMARY

Section 1: Generic description of the entire route of the Kwagga Overhead Transmission Powerline and associated grid infrastructure

ABO Wind Renewable Energies (Pty) Ltd ("the Developer") is proposing seven options for the construction of a 132 kV overhead transmission powerline in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022. The seven proposed 132 kV overhead transmission powerline options will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Varsfontein Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

This report provides an assessment of the Terrestrial Biodiversity and Species of the Kwagga OTP. The approach, methodology and legislative framework is explained in Chapters 2 and 3 in the report.

Location, topography, climate, geology and soils

The site is situated in the Western Cape province about 70 km south of Beaufort West and east of the N12 road to Oudtshoorn. The site is drained by a number of ephemeral watercourses.

The mean annual rainfall in the region ranges from 236 mm at Beaufort West to 253 mm at Willowmore. October to April is the main rainy season at Beaufort West when about 77% of the annual rainfall occurs. Mean annual temperature for Beaufort West is 17.7°C with extreme maximum and minimum temperatures 41.4°C and -5.6°C respectively.

The dominant geology consists of mudstone with siltstone and sandstone and thin greenish cherty beds and thin pink tuff beds in places. Alluvium occurs along the drainage lines. The site falls in the Fc Land Type that consists of Glenrosa and/or Mispah soil forms where lime is generally present in the entire landscape.

Vegetation and flora

The site falls in the Nama-Karoo Biome and more specifically in the Lower Karoo Bioregion (NKl) between Beaufort West and Klaarstroom and in the Gamka Karoo (NKl 1) vegetation type.

Overall, the vegetation on the Kwagga OTP site is structurally fairly homogeneous with dwarf shrubs (Karoo bushes) being dominant. The data of all vegetation surveys on Kwagga WEFs 1, 2 and 3, as well as the current surveys for the Kwagga OTP route, were combined to improve the identification of habitat types in the area. Overall, eight broad habitat types/plant communities were distinguished within the combined area. However, only plant communities 1, 2, 3, 4, 6 & 8 were distinguished on the Kwagga OTP route (thus communities 5 and 7 were not present on the powerline route).

The study area has been poorly collected botanically. A list of 242 plant species that could be found in the region was downloaded from the South African Biodiversity Institute's website. During the field surveys, 291 species were recorded on Kwagga WEFs 1, 2 and 3 as well as on the Kwagga OTP route combined. Combined the NewPosa list and the list for the current study yielded 437 species which could potentially occur at the site.

Two IUCN red-listed species occur in the region according to the NewPosa (SANBI) list (see Appendix B). Ninety-three (93) plant species are listed as provincially protected (Schedule 4). Most of the protected species belong to the Aizoaceae. No threatened or protected species under the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) is listed for the study area and none were found at the site. Fifteen species listed by CITES were recorded during the site survey. No nationally protected tree species is listed for the site and none were recorded during the site visit. Seven plant species are listed as endemic to the Gamka Karoo Vegetation Type, but none of these species were encountered during the site visits. In total 19 alien plant species are listed for the study area of which 10 are categorised as invasive and nine as naturalised. Only five of these alien invasive species were observed on site.

Fauna

The site falls within the distribution range of 20 terrestrial mammal species. However, no IUCN threatened mammal species were listed for the environs of the Kwagga OTP site.

Thirty-two reptiles are listed for the region. The Karoo dwarf tortoise (*Chersobius boulengeri)* is listed as IUCN Endangered and is also in CITES Appendix II together with two other tortoise species. The Karoo dwarf tortoise is an endemic species occurring in the region and is associated with dolerite ridges and rocky outcrops. No dolerite ridges are present on the site and rocky outcrops cover only a small portion of the site. Thus, with proper mitigation measures such as avoiding rocky outcrops, negative impacts on the Karoo dwarf tortoise will be avoided. Furthermore, a herpetological investigation on Trakaskuilen and surrounds could also find no evidence of live specimens or shell fragments and concluded that the habitat was not suitable for the species.

Conservation

The Kwagga OTP site is located in the Gamka Karoo (NKl 1) vegetation type which is classified as Least Concern. The site is not located in a statutorily protected area and does not form part of the NPAES. The site does not fall within any Centre of Endemism. The Critical Biodiversity Map indicates the presence of CBAs along small sections of the Kwagga OTP route. Development within CBAs is not encouraged. Since a powerline can maintain the natural vegetation cover of CBAs in a healthy ecological state, it can be regarded as a permissible land use. Nevertheless, CBAs should be avoided wherever possible. Overall the impact of the development within the identified CBAs and ESAs is believed to be small.

The Ecological Support Areas (ESAs) follow the smaller watercourses on site. However, ESAs are not essential for meeting biodiversity targets, although they play an important role in supporting the ecological functioning in a CBA. ESAs need to be maintained in at least a functional and often natural state, but some limited habitat loss may be acceptable. Other Natural Areas (ONAs) represent the largest area in the region and form a matrix within which the CBAs and ESAs occur.

The areas classified as Freshwater Ecosystem Priority Areas (FEPA) intersect a large section of the powerline route between Substations B and D. However, the area mapped as FEPA did not emerge as being highly sensitive in the current assessment and the sensitivity model that was applied, classified only the drainage lines in the FEPA as being of medium sensitivity.

Ecological processes, functioning and drivers

The clearing of the vegetation at the footprints of the infrastructure is expected to be small in relation to the adjacent landscape where no change to the ecological processes is anticipated. The relatively small footprint of the infrastructure will not hinder pollination by airborne pollinators. Migration of ground-dwelling organisms will temporarily be hindered at the construction sites, but ecological connectivity should not be disrupted during the operational phase. Overall, it is unlikely that the project will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions.

The infrastructure will not cause any additional impediment to ecological corridors and habitat fragmentation should not be an issue. The level of alien infestation at the site was low. Nevertheless, an alien invasive plant species monitoring and control programme needs to be initiated to control invasions.

Sensitivity

A sensitivity model was applied to the data for each habitat (plant community) on site. Overall, the mountainous parts (Habitats 1 & 2), quartz patches (Habitat 3), shrubveld on deep sandy loam soils (Habitat 6) and drainage lines (Habitat 8) were of medium sensitivity in the area. There were a number of protected and CITES listed species found on the rocky ridges (Habitats 1 & 2) and the quartzitic rocky plains (Habitat 3) which should be taken into account when selecting the sites for the Kwagga OTP infrastructure.

Buffers are applicable to the development along the watercourses. The buffer zones as delineated by the bat and aquatic specialists should be observed when planning powerline infrastructure.

Section 2: Kwagga OTP – Segment C – E

Screening Report

The screening tool rated the sensitivity of the Plant Species Theme as Medium. Three sensitive plant species were highlighted by the screening tool of which none were found along the powerline. However, many provincially protected/specially protected and CITES II listed species were recorded on site. These species are mostly associated with cliffs, scarps, rocky ridges (outcrops) and quart patches and pylons should not be positioned on these habitats.

The screening tool rated the sensitivity of the Animal Species Theme **(birds excluded)** as Medium. Animal species highlighted by the screening tool for the region was the Karoo dwarf tortoise (*Chersobius boulengeri*). A herpetological investigation on Trakaskuilen could find no evidence of live specimens or shell fragments of the Karoo dwarf tortoise. Furthermore, the habitat was not regarded as suitable for the species.

The screening tool rated the sensitivity of the Relative Terrestrial Biodiversity Theme as Very High based on the presence of CBAs, ESAs and FEPAs.

Issues, risks and impacts

The key issue is that part of the site has been identified as CBA and/or FEPA.

The following direct, indirect and cumulative impacts of the proposed development on the Terrestrial Biodiversity and Species were assessed based on the knowledge gained during the site visit and literature review.

- The clearing of natural vegetation
- The loss of threatened, protected, CITES listed and/or endemic plants/animals
- Loss of faunal habitat
- Direct faunal mortalities due to construction and increased traffic
- Increased dust deposition
- Increased human activity and associated increased noise levels
- Establishment of alien vegetation
- Increased water run-off and erosion

Cumulative impacts

- Vegetation loss and habitat destruction
- Compromising integrity of CBAs, ESAs and NPAES
- Reduced ability to meet conservation obligations & targets
- Loss of landscape connectivity and disruption of broad-scale ecological processes

Significance of environmental impacts

Each of the impacts on Segment C – E is briefly described in Chapter 11 in terms of the nature; proposed mitigation measures; and the significance of the impact without and with the mitigation measures applied. The impact assessment is summarized in Section 11.5 of the report.

Overall Impact Significance (Post Mitigation) was as follows:

Phase	Overall Impact Significance
Construction	Very low to Low
Operational	Very low
Decommissioning	Very low
Cumulative	Low

Preferred infrastructure locations

Servitude road:

- Powerline servitude should follow existing farm roads where possible.
- Avoid cliffs, rocky ridges, rocky sheets and quartz patches and minimise impact at drainage lines.

Powerline and pylons:

- Placing of pylons should avoid sensitive habitats such as cliffs, rocky ridges, rocky sheets, quartz patches and drainage lines.

On-site substation:

- The footprint of Substation C should avoid Habitat 3; and in Substation D avoid Habitat 1 (Figure 21).

Legislative and permit requirements

The most important permit requirement is the permit that needs to be obtained for the removal of plant species protected in the Western Cape. Legislative requirements also relate to the combatting of alien invasive species. Other aspects are summarised in Chapter 12.

Environmental management programme input

The impacts, mitigation measures, management objectives and actions as well as monitoring for the EMPr are summarised in the Environmental Management Programme (see Chapter 13).

Final specialist statement and authorisation recommendation

The low impact significance and low sensitivity rating for many of the habitats means the project could go ahead without major constraints, provided the mitigation measures and management actions proposed to conserve protected fauna and flora on the site are taken into consideration. **We thus recommend authorisation of the project provided all mitigation measures are implemented.**

A brief summary of the most important considerations is provided below:

Vegetation:

- **Vegetation types:** The Gamka Karoo is listed as Least Concern.
- **Threatened plant species:** No IUCN red-list threatened plant species were encountered during the field survey.
- **Species listed by the Screening Tool:** None of the species listed by the screening tool were found on site.
- **Habitats:** None of the habitats had a high or very high sensitivity.
- **Overall sensitivity of plant theme:** This is rated as medium. However, if the suggested mitigation measures are followed it could be rated as low.

Fauna:

- **Threatened animal species:** The Karoo dwarf tortoise was not encountered during the site survey and suitable habitat for this species does not appear to be available according to a herpetological study on the farm Trakaskuilen. Furthermore, the herpetological study could find no live specimens or shell fragments on Trakaskuilen and surrounds.
- **Overall sensitivity of animal theme (birds excluded):** This is rated as medium. However, if the suggested mitigation measures are followed the threatened animal species should not be negatively affected although it is unlikely that it does occur on site.

Conservation:

- **Protected Areas:** The study area is not located in a protected area.
- **National Protected Areas Expansion Strategy (NPAES):** The development will not interfere with the protected areas expansion strategy.
- **Critical Biodiversity Areas (CBAs):** A CBA marginally intersect the Kwagga OTP in Segment C – E, north of Substation E. Since a powerline can maintain the natural vegetation cover of CBAs in a healthy ecological state, it can be regarded as a permissible land use. Nevertheless, CBAs should be avoided wherever possible.
- **Ecological Support Areas (ESAs):** The ESAs on site follow the smaller watercourses with a number of ESAs along the OTP route in Segment C – E. However, the extent of the development is relatively small and ecological processes that operate within or across ESAs will not be altered by the development. Thus, no additional loss of ecological connectivity in relation to the broader landscape is likely.
- **Freshwater Ecosystem Priority Area (FEPA):** FEPAs intersect some sections of the powerline route in Segment C – E.

Ecological processes, function and drivers:

- Overall, it is unlikely that the development will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate.
- The disturbance caused by the construction of the Kwagga OTP will create conditions favourable for invasion by alien species. Alien invasive species are currently not common in the area, although a few declared invasive species were noted on site.

Significance of environmental impacts:

Overall the significance of the environmental impacts was rated as low to very low. In summary:

- Since the development footprint is small, the loss of habitat or species will be limited.
- The extent of clearing activities in the Gamka Karoo vegetation type is small in relation to the remaining extent of the vegetation types and ecosystem threat status will not be affected.
- None of the habitats identified were rated as highly sensitive, and the overall impact per habitat type will be small.
- The impact on overall species and ecosystem diversity of the adjacent land will not be affected and the impact will be small.
- The impact on populations of threatened or protected species will be negligible.
- Depending on the type of fencing to be erected at some of the infrastructure, the powerline and associated infrastructure will contribute minimally to obstruction of animal movement.
- A list of key environmental mitigation and management actions is provided.

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

AIS	Alien Invasive species
BA	Basic Assessment
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
CBD	Convention on Biodiversity
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora
CSIR	Council for Scientific and Industrial Research
DFFE	Department of Forestry, Fisheries and the Environment
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EGI	Electrical Grid Infrastructure
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Plan Report
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
IUCN	International Union for the Conservation of Nature
I&APs	Interested and Affected Parties
GIS	Geographical Information System
NC	Northern Cape province
NEMA	National Environmental Management Act
NEM:BA	National Environmental Management: Biodiversity Act
NPAES	National Protected Area Expansion Strategy
ONA	Other Natural Areas
OTP	Overhead Transmission Powerline
PA	Protected Area
REDZ	Renewable Energy Development Zone
SEA	Strategic Environmental Assessment
SANBI	South African National Biodiversity Institute
SSV	Site Sensitivity Verification
ToPS	Threatened and Protected Species
ToR	Terms of Reference
WC	Western Cape province
WCNECO	Western Cape Nature and Environmental Conservation Ordinance
WEF	Wind Energy Facility
WESSA	Wildlife and Environmental Society of South Africa

GLOSSARY

Alien invasive species	Any species whose establishment and spread outside of its natural distribution range (i) threatens ecosystems, habitats or other species or has a demonstrable potential to threaten ecosystems, habitats or other species; and (ii) may result in economic or environmental harm or harm to human health.
Alternative	A possible course of action, in place of another, that would meet the same purpose and need (of the proposal). Alternatives can refer to any of the following, but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.
Alluvium	Unconsolidated material deposited by flowing water
Biodiversity	The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. It includes diversity within species, between species and of ecosystems.
Category 1a Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as a species that must be combatted or eradicated. Landowners are obliged to take immediate steps to control Category 1a species in compliance with sections 75(1), (2) and (3) of the Act. If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme.
Category 1b Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as species that must be controlled. If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
Category 2 Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity specified in the Notice or an area specified in the permit, as the case may be. Permit-holders must ensure that specimens of the species do not spread outside of land or area specified in the Notice or permit.
Category 3 Listed Invasive Species	A species listed by notice in terms of section 70(1)(a) of the act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice. However, Category 3 Listed Invasive Species that occurs in riparian areas must be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.
Critical Biodiversity Areas	Areas required to meet biodiversity targets for ecosystems, species or ecological processes. CBAs are regarded as areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species.
Development	The building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity.
Development footprint	Any evidence of physical alteration as a result of the undertaking of any activity.
Ecological Support Areas	These are not essential for meeting biodiversity targets, but play an important role in supporting the functioning of Protected Areas or CBAs and are often vital for delivering ecosystem services. ESAs must be maintained in at least a functional and often natural state, but some limited habitat loss may be acceptable.
Endangered flora	Any species that is in danger of extinction and is specified in Schedule 3 or Appendix I of the CITES (WCNECO 1974 as amended 2000).
Endangered wild animal’	A wild animal of any species that is in danger of extinction and is specified in Schedule I or Appendix I of the CITES (WCNECO 1974 as amended 2000).
Habitat	A place where a species or ecological community naturally occurs.
Indigenous vegetation	Vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Indigenous	A species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic, but excludes a species that has been introduced in the Republic as a result of human activity.
Introduced	In relation to a species, means the introduction by humans, whether deliberately or accidentally, of a species to a place outside the natural range or natural dispersal potential of that species;
Linear activity	An activity that is arranged in or extending along one or more properties and which affects the environment or any aspect of the environment along the course of the activity, and includes railways, roads, canals, channels, funiculars, pipelines, conveyor belts, cableways, power lines, fences, runways, aircraft landing strips, firebreaks and telecommunication lines.
Mitigate	The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.
"No-Go" option	The “no-go” development alternative option assumes the site remains in its current state, i.e. there is no development in the proposed project area.
Protected flora	Any species of flora specified in Schedule 4 or Appendix II of the CITES (WCNECO 1974 as amended 2000).
Protected wild animal	Any species of wild animal specified in Schedule 2 or Appendix II of the CITES (WCNECO 1974 as amended 2000).
Watercourse	Includes (a) a river or spring; (b) a natural channel in which water flows regularly or intermittently; (c) a wetland, pan, lake or dam into which, or from which, water flows; and a reference to a watercourse includes, where relevant, its bed and banks.
Wetland	Land that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

TERRESTRIAL BIODIVERSITY AND SPECIES: SPECIALIST ASSESSMENT

SECTION 1:

GENERIC DESCRIPTION OF ENTIRE ROUTE OF OVERHEAD TRANSMISSION POWERLINE AND ASSOCIATED GRID INFRASTRUCTURE

1. INTRODUCTION

1.1 Scope, purpose and objectives of this specialist report

ABO Wind Renewable Energies (Pty) Ltd ("the Developer") is proposing seven options for the construction of a 132 kV overhead transmission powerline in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022.

The seven proposed 132 kV overhead transmission powerline options will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Varsfontein Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

Basic Assessment Processes are required for the proposed seven options and their associated electrical infrastructure. The BA report will be in accordance with the requirements of the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended), and the National Environmental Management Act (Act No. 107 of 1998, as amended), as well as the gazetted Environmental Assessment Protocols of the NEMA EIA Regulations (2014, as amended), where applicable (GG 43855/GNR 1150, 30 October 2020 and GG 43110/GNR 320, 20 March 2020) (NEMA 2020a, 2020b).

As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification needs to be undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area.

This report presents the Specialist Terrestrial Biodiversity and Species Impact Assessment Report for the BA of the proposed Overhead Transmission Powerline project.

1.2 Details of specialists

This specialist assessment has been undertaken by Dr Noel van Rooyen and Prof Gretel van Rooyen of Ekotrust cc (Registration number: CK90/05465/23). The specialists are registered with the South African Council for Natural Scientific Professions (SACNASP).

Dr Noel van Rooyen Pr.Sci.Nat; Reg. no. 401430/83 - Botanical Sciences
Prof. Gretel van Rooyen Pr.Sci.Nat., Reg. no. 400509/14 – Ecological Sciences

A signed specialist statement of independence is included in Appendix G of this specialist assessment. In addition, the *Curriculum Vitae* of the specialists are included in Appendix H of this assessment.

1.3 Terms of Reference

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN R320 (NEMA 2020a). This specifically includes the Site Sensitivity Verification requirements and protocol for the specialist assessment and minimum report content requirements for environmental impacts on Terrestrial Biodiversity. *This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).*

- Comply with the Assessment Protocols that were published on 30 October 2020, in Government Gazette 43855, GN R1150 (NEMA 2020b). This specifically includes the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species and terrestrial plant species. *This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).*
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN R320, and 30 October 2020, in Government Gazette 43855, GN R1150 (NEMA 2020b).
- Provide a Terrestrial Biodiversity and Species Specialist Report and Compliance Statement based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN R320, and 30 October 2020, in Government Gazette 43855, GN R1150 (NEMA 2020b).
- The Specialist Assessment and/or Compliance Statement must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. In addition, it must comply with the 2014 NEMA EIA Regulations (as amended), where applicable.
- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues that were addressed and the detailed assessment of impacts.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool (DFFE), and to verify and confirm this sensitivity and land-use and either compile a Terrestrial Biodiversity and Species Specialist Report or Compliance Statement, as documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN R320, and 30 October 2020, in Government Gazette 43855, GN R1150 (NEMA 2020a & b).
- Determination, description and mapping of the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations.
- Provide sensitivities in .kmz or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- The report must also describe the terrestrial ecology features of the project area, with focus on features that are potentially impacted by the proposed project. The description should include the major habitat types within the study site, giving due consideration to terrestrial flora and fauna.
- Consider seasonal changes and long-term trends, such as due to climate change.
- Identify any species of special concern or protected species on site (e.g. protected tree species).
- The assessment is to be based on existing information, national and provincial databases, and professional experience and field work conducted by the specialist, as considered necessary and in accordance with relevant legislated requirements. The assessment must also consider the maps generated by the National Screening Tool (DFFE).
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on terrestrial biodiversity and species. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow the format as provided by the CSIR.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders (e.g. DFFE Biodiversity and Conservation, WESSA and EWT), Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).

2. APPROACH AND METHODOLOGY

2.1 Approach

The study commenced as a desktop study, followed by field-based surveys in November 2020 and June 2022. October to April is the main rainy season at Beaufort West when about 77% of the annual rainfall occurs. Field work for the powerline was conducted after the area had received good rains in the rainy season.

The focus of the site visit was:

- to undertake a site sensitivity verification in order to assess the current land use and environmental sensitivity as identified in the screening tool; and
- to conduct surveys (fauna and flora) of the Kwagga OTP and associated grid infrastructure project to identify sensitive habitats; to classify the vegetation along the gridline route according to the vegetation map produced by Van Rooyen & Van Rooyen (2021) for the Kwagga WEFs 1-3; compile species lists and to search for Species of Conservation Concern (SCC). According to SANBI's (SANBI 2020) definition of SCC, these are species that have a high conservation importance in terms of preserving South Africa's high floristic and faunal diversity and include not only threatened species, but also those classified as Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD)(www.redlist.SANBI.org).

Hard copy and digital information from **spatial databases**, such as BGIS of the South African Biodiversity Institute (bgis.sanbi.org) for maps of Critical Biodiversity Areas (CBAs), Protected Areas, Protected Area Expansion Strategy (PAES), Freshwater Ecosystem Priority Areas (FEPA); the geological survey maps (3222 Beaufort West); land type maps (3222 Beaufort West); topocadastral maps (1:50 000 maps); vegetation types of Mucina & Rutherford (2006) and SANBI (2006-2018); NewPosa database of SANBI; and databases of the Animal Demography Unit, University of Cape Town, were sourced to provide information on the environment and biodiversity of the study area.

Satellite images (Google Earth) were used to stratify the area into relatively homogeneous terrain/vegetation units. The vegetation survey consisted of visiting the mapped units and systematically recording plant species on site and estimating their cover. A total of 125 sites were surveyed in 2020 and a total of 44 additional sites were surveyed along the Kwagga OTP route in 2022. Physical habitat features were also noted. During the site visit, digital photographs were taken and representative photographs of the different habitats are included in the report. The site was also surveyed for rare, threatened and/or endemic plant species during the site visit.

The animal site survey was limited to day-time visual assessments on site. Animal species presence on site was mainly attained by means of direct or indirect sighting methods (animals, spoor, burrows, scats, sounds), whilst traversing the site by vehicle or on foot. Red-listed species are generally uncommon and/or localised and the survey may have been insufficient to record their presence at or near the proposed development.

2.2 Vegetation and flora

The plant species data were summarised in a synoptic phytosociological table (Appendix A) and plant communities or habitats were identified, described and mapped. The term species is used here in a general sense to denote species, subspecies and varieties. The checklist of plant species in Appendix B was compiled from own surveys and from the NewPosa database of the South African National Biodiversity Institute (newposa.sanbi.org, accessed June 2022). The IUCN status, conservation and protected status of all plant species provided in Appendix B were determined from available literature and acts, e.g. NewPosa database (newposa.sanbi.org), and Red list database (redlist.sanbi.org) of the South African National Biodiversity Institute; NEM:BA (2007c) (ToPS list); WCNECO (1974, as amended 2000) and CITES (2021).

2.3 Fauna

Species lists (the term species is used here in a general sense to denote species, subspecies and varieties) of the faunal component were sourced from the Animal Demography Unit, University of Cape Town website (www.adu.uct.ac.za) and consulting of available databases and/or relevant literature, e.g. Leeming (2003), Skinner and Chimimba (2005), Alexander and Marais (2007), Mecenero *et al.* (2013), Bates *et al.* (2014) and Child *et al.* (2016) to determine the diversity, conservation status and distribution of relevant faunal species (Appendix C). These species lists were supplemented by own observations.

2.4 Sensitivity assessment

Based on the environmental features and the species encountered in the on-site survey, a sensitivity assessment of each habitat was done (Chapter 7). Sensitive features are presented spatially in GIS format (provided as a separate .kmz file).

2.5 Sources of information

The sources of information are listed under **References and Bibliography.**

Vegetation:

- Vegetation types occurring in the area were obtained from Mucina & Rutherford (2006) and SANBI (2006-2018).
- Conservation status of the vegetation types was obtained from Mucina & Rutherford (2006), the National List of Threatened Ecosystems (NEMA 2011) and the National Biodiversity Assessment 2018 (Skowno *et al.* 2019).
- Information on endemic species per national vegetation type was obtained from Mucina & Rutherford (2006).
- Inclusion in a centre of endemism was determined according to Van Wyk & Smith (2001).
- A plant species checklist of the immediate region around the site was obtained from the NewPosa database of the South African National Biodiversity Institute (SANBI) (Appendix B) (website accessed June 2022).
- The IUCN Red List Category for the plant species was extracted from the Threatened Species Programme (Red List of South African plants; website accessed June 2022) as well as the NewPosa database of the South African National Biodiversity Institute (SANBI) (website accessed June 2022).
- WCNECO (1974 as amended in 2000) was consulted to establish provincially specially protected and protected status of plant species.
- The National Protected tree list (NFA 2021) was consulted.

Fauna

- Lists of mammals, reptiles, birds, frogs, scorpions, (Scorpiones), spiders (Arachnida), butterflies (Lepidoptera), lacewings (Neuroptera), dung beetles (Scarabinae) and dragonflies (Odonata) were extracted from the Animal Demography Unit, University of Cape Town website (vmus.adu.org.za) and supplemented by information gathered in The red list of mammals of South Africa, Swaziland and Lesotho (Child *et al.,* 2016), Bates *et al*. (2014) and Alexander and Marais (2007) for reptiles; Skinner and Chimimba (2005) for mammals; Mecenero *et al.* (2013) for butterflies; and Leeming (2003 for scorpions (Appendix C).

- The IUCN Red List Category for the animal species was extracted from the Animal Demography Unit, University of Cape Town website (vmus.adu.org.za); Child *et al.* (2016), Bates *et al*. (2014), and Mecenero *et al.* (2013).
- WCNECO (1974, as amended 2000) was consulted to establish provincially specially protected and protected status of animal species.

Other

- The National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (biodiversityadvisor.sanbi.org; accessed June 2022).
- The Western Cape Biodiversity Area Maps were consulted for inclusion of the site into a Critical Biodiversity Area or Ecological Support Area (biodiversityadvisor.sanbi.org; accessed June 2022).

Regulatory framework

- Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA 1998, when applying for Environmental Authorisation were published in the Government Gazette 43110, No. 320, 20 March 2020 (NEMA 2020a) and in Government Gazette 43855, No. 1150, 30 October 2020 (NEMA 2020b).

2.6 Assumptions, knowledge gaps and limitations

The following assumptions, limitations or uncertainties are listed regarding the evaluation of the impacts of the proposed Kwagga OTP project on the terrestrial biodiversity and ecology:

- Botanically, the area has been poorly collected and the list of plant species that could potentially occur on site as obtained from the NewPosa database, was therefore taken from a broader area than the study site.
- Rare and threatened plant and animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species.
- Furthermore, rare plant species usually occur in specialised and localised habitats and positive identifications of rare plant species are best done when the plants are in flower.
- No trapping (either camera trapping or by way of Sherman traps) was conducted for fauna, since these methods generally provide an underrepresentation of the full faunal diversity within the limited timeframe available.
- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts are listed in Section 11 of this report.

2.7 Impact assessment methodology

The impact assessment methodology follows the guidelines and format provided by the CSIR and are provided in appendix M.

2.8 Consultation processes

Landowners were asked to supply information on animal species sighted on their land.

3. LEGISLATIVE FRAMEWORK

3.1 Introduction

The White Paper on the conservation and sustainable use of South Africa's biodiversity and the National Environmental Management Act (Act No. 107 of 1998) specify that due care must be taken to conserve and avoid negative impacts on biodiversity and that the sustainable, equitable and efficient use of biological resources must be promoted. Various acts provide control over natural resources in terms of their conservation, the use of biological resources and avoidance of negative impacts on biodiversity. Some international conventions are also relevant to sustainable development.

3.2 Natural resources

Terrestrial and other ecosystems and their associated species are widely used for commercial, semi-commercial and subsistence purposes through both formal and informal markets. While some of this use is well managed and/or sustainable, much is thought to be unsustainable. "Use" in this case refers to direct use, such as collecting, harvesting, hunting and fishing for human consumption and production, as well as more indirect use such as ecotourism and wildlife ranching.

3.3 Convention on Biodiversity (CBD)

South Africa is a signatory to the United Nations Convention on Biological Diversity (CBD), which was ratified in 1995. The CBD requires signatory states to implement the objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources; and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14 (a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimise these effects and, where appropriate, to allow for public participation in such procedures.

3.4 National Environmental Management Act (Act No. 107 of 1998) (NEMA)

NEMA is the framework environmental management legislation, enacted as part of the government's mandate to ensure every person's constitutional right to an environment that is not harmful to his or her health or well-being. It is administered by DFFE, but several functions have been delegated to the provincial environmental departments. One of the purposes of NEMA is to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment. The act further aims to provide for institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for the administration and enforcement of other environmental management laws.

The EIA Regulations Listing Notices of 2010 were repealed in 2014 and amended regulations and listings were published in 2014 and 2017 under the National Environmental Management Act (NEMA 2014, 2017). Listing Notice 1 (GN No. 327), Listing Notice 2 (GN No 325) and Listing Notice 3 (GN No 324) of the 2017 Regulations list activities that may require Environmental Authorisation prior to commencement of an activity and identify competent authorities in terms of sections 24(2) and 24D of the Act.

Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA 1998, when applying for Environmental Authorisation were published in the Government Gazette 43110, No. 320, 20 March 2020 (NEMA 2020a) and in Government Gazette 43855, No. 1150, 30 October 2020 (NEMA 2020b).

3.5 National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)

As the principal national act regulating biodiversity protection, NEM:BA, which is administered by DFFE, is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. The term 'biodiversity', according to the Convention on Biodiversity (CBD), refers to the variability among living organisms from all sources including, *inter alia* terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity in genes, species and ecosystems.

Threatened ecosystems
Section 53 of NEM:BA lists the threatened status of ecosystems, i.e. critically endangered ecosystems, endangered ecosystems, and vulnerable ecosystems. The list of threatened ecosystems was published in 2011 (NEM:BA 2011). The recent National Biodiversity Assessment 2018 (Skowno *et al.* 2019) includes the updated extent and status of threatened ecosystems, although not yet formally adopted under the NEM:BA.

Threatened or Protected Species (ToPS) Regulations
Section 56 of NEM:BA makes provision for the declaration of species which are of such high conservation value, national importance or are considered threatened that they need protection, i.e. critically endangered species, endangered species and vulnerable species. Lists of species that are threatened or protected and associated activities that are prohibited and/or exempted from restriction were published in 2007 (NEM:BA 2007c). Any proposed development involving one or more threatened or protected species and/or prohibited/restricted activities will require a permit in term of these Threatened or Protected Species (ToPS) Regulations.

Alien and Invasive Species (AIS) Regulations
Chapter 5 of NEM:BA provides for the protection of biodiversity from alien and invasive species. The act defines alien species and provides lists of invasive species in regulations. The Alien and Invasive Species (AIS) lists were published in Government Gazette No. 43726 of 18 September 2020 (NEM:BA 2020a). The Alien and Invasive Species (AIS) Regulations, in terms of Section 97(1) of NEM:BA, was subsequently published in Government Gazette No. 43735 of 25 September 2020 (NEM:BA 2020b).

In terms of the aforementioned legislation, the following categories of declared alien and invasive plants are recognised in South Africa (see Glossary for explanations):

1. Category 1a Listed Invasive Species
2. Category 1b Listed Invasive Species
3. Category 2 Listed Invasive Species
4. Category 3 Listed Invasive Species

3.6 The National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEM:PAA)

NEM:PAA provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.

3.7 National Forests Act (Act No. 84 of 1998) (NFA)

The National Forest Act makes provision for the declaration of for example specially protected areas, forest nature reserves, forest wilderness areas and protected woodlands. The latest list of declared protected tree species in terms of the NFA was published in 2021 (NFA, 2021). In terms of section 15(1) of this act, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. The competent authority responsible for considering and issuing the license will be the national Department of Forestry, Fisheries and the Environment (DFFE).

3.8 Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA)

The objectives of the Conservation of Agricultural Resources Act are to provide for the conservation of the natural agricultural resources by the maintenance of the production potential of the land, by combating and preventing erosion and weakening or destruction of the water resources, and by protecting natural vegetation and combating weeds and invader plants. In order to achieve the objectives, certain control measures are prescribed to which land users must comply. The activities mentioned relate to:

- the cultivation of virgin soil;
- the irrigation of land;
- the prevention or control of waterlogging or salinisation of land;
- the utilisation and protection of vleis, marshes and water courses;
- the regulation of the flow pattern of run-off water;
- the utilisation and protection of vegetation; and
- the restoration or reclamation of eroded land.

3.9 Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is an international agreement to which countries adhere voluntarily. The aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The species covered by CITES are listed in three appendices reflecting the degree of protection that the species needs. Appendix I includes species that are threatened with extinction and trade in these species is permitted only in exceptional circumstances. Appendix II lists species that are not necessarily now threatened with extinction, but that may become so unless trade is closely controlled. Appendix III lists species that are protected in at least one country that has asked other CITES parties for assistance in controlling the trade (Website: www.cites.org, appendices valid from June 2021).

3.9 Western Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974) (WCNECO) as amended in the Western Cape Nature Conservation Laws Amendment Act (No. 3 of 2000)

According to the legislation, no person may pick any flora on a public road or on the land on either side of such road within a distance of 90 m from the centre of such road in the Western Cape, without a permit. Furthermore, many of the species are protected/specially protected and separate permits may have to be issued for the destruction of individuals of these species.

A permit is required if any of the following activities are involved:
Section 63. (1) No person shall:

- a) uproot the plant in the process of picking the flower of any flora;
- b) without a permit—
    - i. pick any endangered or protected flora, or
    - ii. pick any flora on a public road or on the land on either side of such road within a distance of ninety metres from the centre of such road, or
- c) pick any protected or indigenous unprotected flora on land of which he or she is not the owner, without the permission of the owner of such land or of any person authorised by such owner to grant such permission.

CapeNature is the regulatory authority in the Western Cape for the issuing of permits for fauna, flora, hunting and CITES. Under the Act, the majority of mammals, reptiles and amphibians are listed as protected species.

4. STUDY AREA

4.1 Location

The Kwagga OTP site is situated in the Western Cape province about 70 km south of Beaufort West and east of the N12 road to Oudtshoorn (Figure 1). The altitude of the region ranges from 940 m in the southeast to 1093 m at Dwaalberg in the north. The site is drained by a number of ephemeral watercourses.

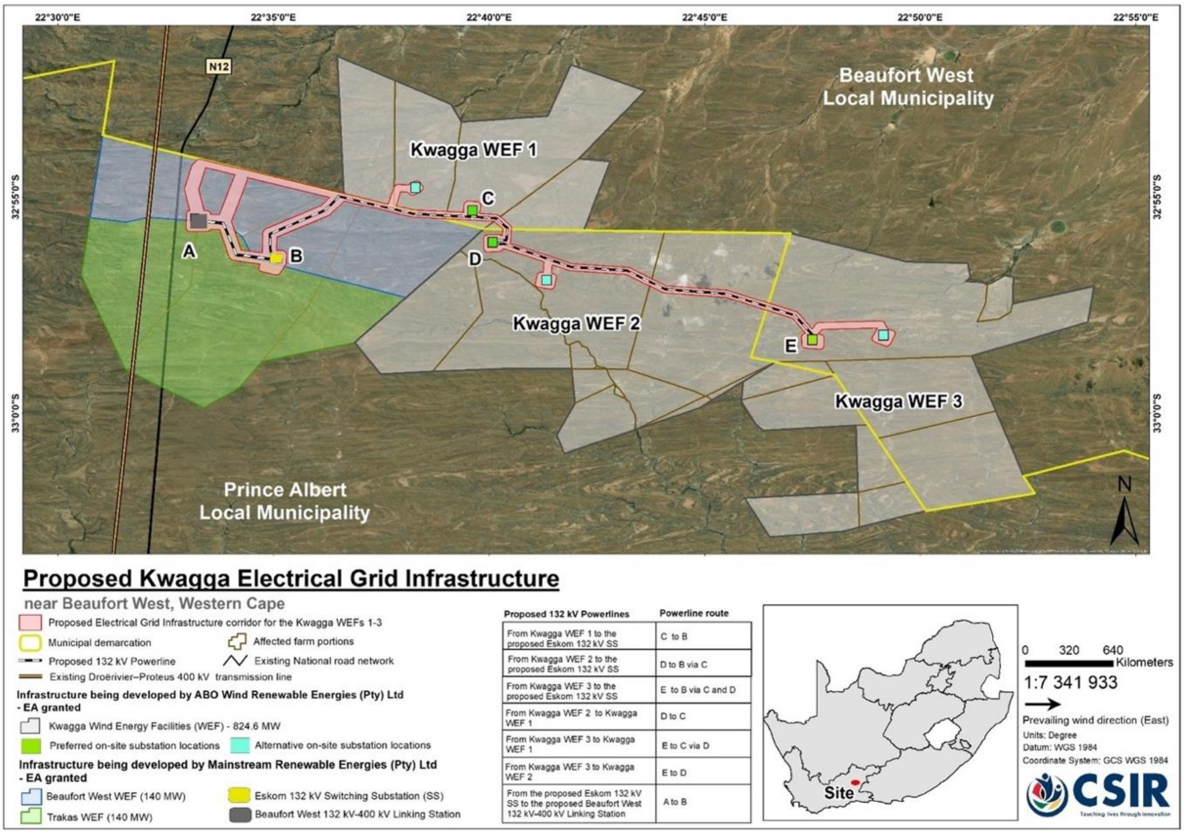

Figure 1: Map indicating the location of the Kwagga OTP route.

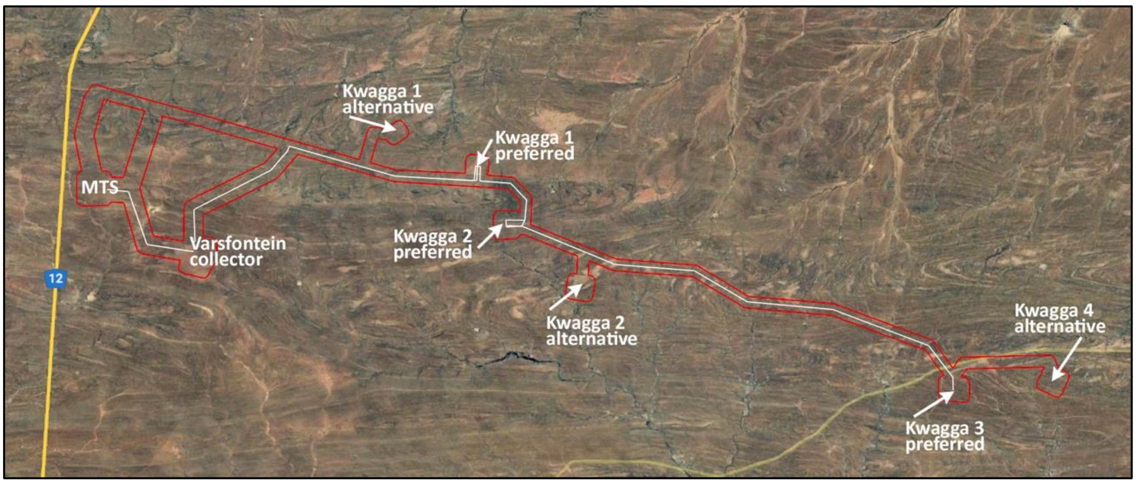

Figure 2: Google satellite image of the Kwagga OTP route.

4.2 Climate

4.2.1 Regional climate (Mucina & Rutherford, 2006)

Mean annual precipitation in the Gamka Karoo, covering the plains south of the Great Escarpment around Beaufort West) is 165 mm (range from about 100 mm in some areas between the Dwyka and Gamka Rivers to about 240 mm against the Great Escarpment) with a peak in March (Mucina & Rutherford 2006). The annual precipitation coefficient of variation is 38%; mean annual potential evaporation is 2483 mm, while the mean annual soil moisture stress is 84%. The mean annual temperature is 16.3°C and frost is frequent in winter with a mean of 27 days per annum.

4.2.2 Rainfall

The mean annual rainfall in the region ranges from 236 mm at Beaufort West to 253 mm at Willowmore (Weather Bureau (1988, 1998). The total annual rainfall at Beaufort West during dry and wet years respectively may range from 129 mm to 472 mm, indicating the unpredictable nature of the rainfall (Table 1, Figure 3). October to April is the main rainy season at Beaufort West when about 77% of the annual rainfall occurs. January to March are the wettest months and the driest period is from June to July, when less than 10 mm of rain per month is recorded. The maximum rainfall measured over a 24-hour period at Beaufort West was 83 mm in March. The highest monthly rainfall recorded was 164 mm, measured in January.

According to the worldweatheronline.com models rainfall at Rietbron, approximately 40 km to the east of the site is far more evenly spread throughout the year and October is the month with the highest rainfall.

Table 1: Mean, maximum and minimum monthly rainfall (mm) and maximum rainfall (mm) in 24 hours at Beaufort West: 32° 18’ S; 22° 14’ E; 893 m (Weather Bureau 1998)

Month	Mean (month)	24 h max	Max per month	Min per month
Jan	35	50	164	0
Feb	30	67	133	0
Mar	30	83	83	2
Apr	20	30	65	2
May	11	70	78	0
June	8	18	26	0
July	9	34	42	0
Aug	14	55	73	0
Sep	12	41	58	0
Oct	21	48	68	0
Nov	27	47	70	2
Dec	19	38	106	0
Year	236	83	472	129

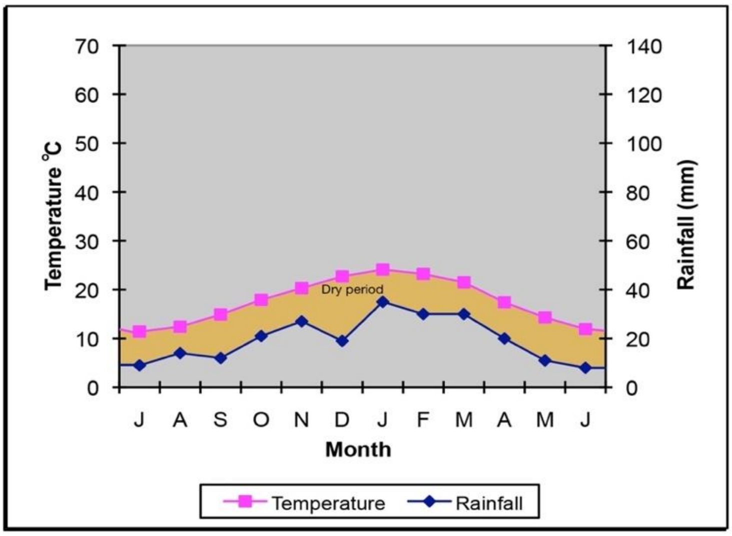

Figure 3: Climate diagram for Beaufort West. Months on X-axis are from July to June. When the rainfall curve is below the temperature curve it indicates a dry period.

4.2.3 Temperature

The mean annual temperature for Beaufort West is 17.7°C (Table 2) with the extreme maximum and minimum temperatures 41.4°C and -5.6°C respectively. The mean daily maximum for January is 32.3°C and for July it is 18.4°C, whereas the mean daily minimum for January is 15.8°C and for July it is 4.3°C. Frost may occur from April to October.

Table 2: Temperature data (°C) for Beaufort West: 32° 18’ S; 22° 14’ E; 893 m (Weather Bureau 1998)

	Temperature (°C)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Max	32.3	31.2	28.9	24.4	21.1	18.5	18.4	19.8	22.8	25.7	28.4	31.0	25.2
*Ext. Max	41.4	40.7	38.8	36.0	32.2	28.8	28.5	33.8	36.2	38.8	40.5	40.3	41.4
Min	15.8	15.3	14.0	10.4	7.5	5.1	4.3	4.9	7.0	10.1	12.3	14.4	10.1
*Ext. Min	8.2	4.9	3.5	-0.3	-2.5	-4.9	-5.6	-5.4	-3.5	-0.5	3.0	4.3	-5.6
Mean	24.1	23.2	21.5	17.4	14.3	11.9	11.4	12.4	14.9	17.9	20.3	22.7	17.7

Max = mean daily maximum temperature for the month
*Ext. Max = extreme maximum temperature recorded per month
Min = mean daily minimum temperature for the month
*Ext. Min = extreme minimum temperature recorded per month
Mean = mean monthly temperature for each month and for the year

4.3.4 Cloudiness and relative air humidity

At Beaufort West, the cloud cover at 14:00 is the highest in October (3.7 eights) and the lowest from December to March (2.4 - 2.8 eights) and May to August (2.7 - 2.9 eights) (Table 3). The highest mean relative air humidity (%) at 08:00 occurs during the autumn months (March and April; 70 – 74%) and the lowest relative air humidity at 14:00 (26%) occurs in summer (December and January) (Weather Bureau 1988, 1998).

Table 3: Cloud cover at 14:00 and percentage relative air humidity at 08:00 and 14:00 at Beaufort West: 32° 18’ S; 22° 14’ E; 893 m (Weather Bureau 1988, 1998)

	Cloud (0-8)	Relative air humidity %	
	14:00	**08:00**	**14:00**
Jan	2.7	67	26
Feb	2.4	69	29
Mar	2.8	74	33
Apr	3.3	70	32
May	2.7	65	29
June	2.9	65	33
July	2.8	65	32
Aug	2.7	65	31
Sept	3.2	68	29
Oct	3.7	68	31
Nov	3.2	66	29
Dec	2.8	64	26
Year	2.9	68	30

4.3 Geology

The geology of the Kwagga OTP site is depicted in the geological map 3222 Beaufort West (Figure 3). The dominant geology consists of mudstone (red in places) with sandstone and thin greenish cherty beds (Pa) of the Abrahamskraal Formation, Beaufort Group. The other relevant geology consists of mudstone (red in places), sandstone, thin greenish cherty beds near the base and thin pink tuff beds in places (Pt, Teekloof Formation, Beaufort Group). Alluvium occurs along the drainage lines.

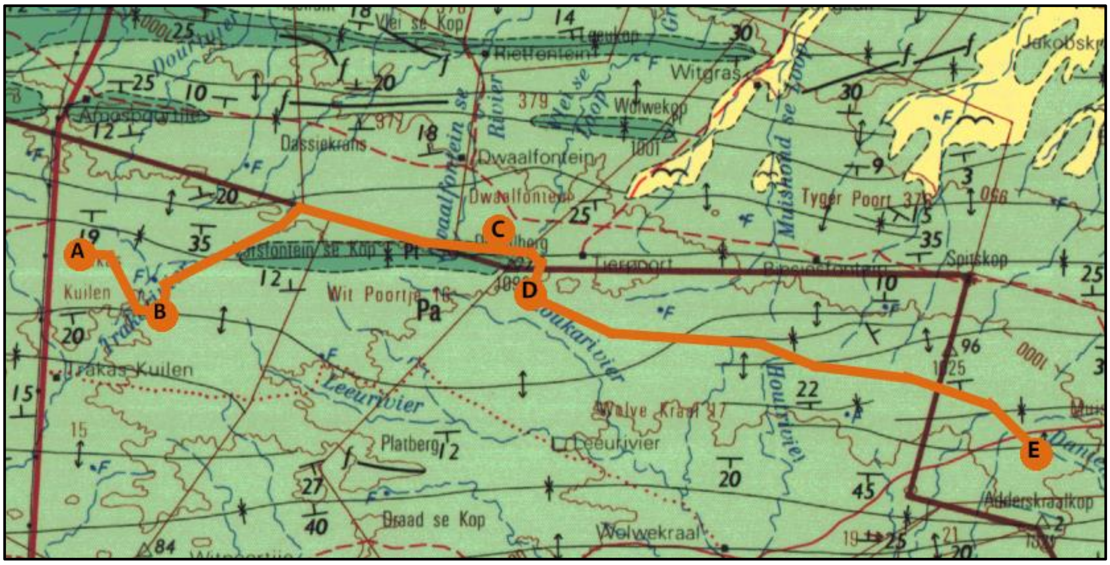

Figure 4: Geology of the OTP Kwagga powerline and associated infrastructure (Geological Survey 1979) (see text for explanation of codes Pa and Pt).

4.4 Land Types

The land types of the site are depicted in the land type maps of Beaufort West 3222 and Oudtshoorn 3322. Land types denote areas that display a marked degree of uniformity with respect to terrain form, soil pattern and climate. A terrain unit within a land type is any part of the land surface with homogeneous form and slope. The Kwagga OTP site falls in the Fc163b and Fc164b units (Figure 5). The Fc Land Type consists of Glenrosa and/or Mispah soil forms where lime is generally present in the entire landscape.

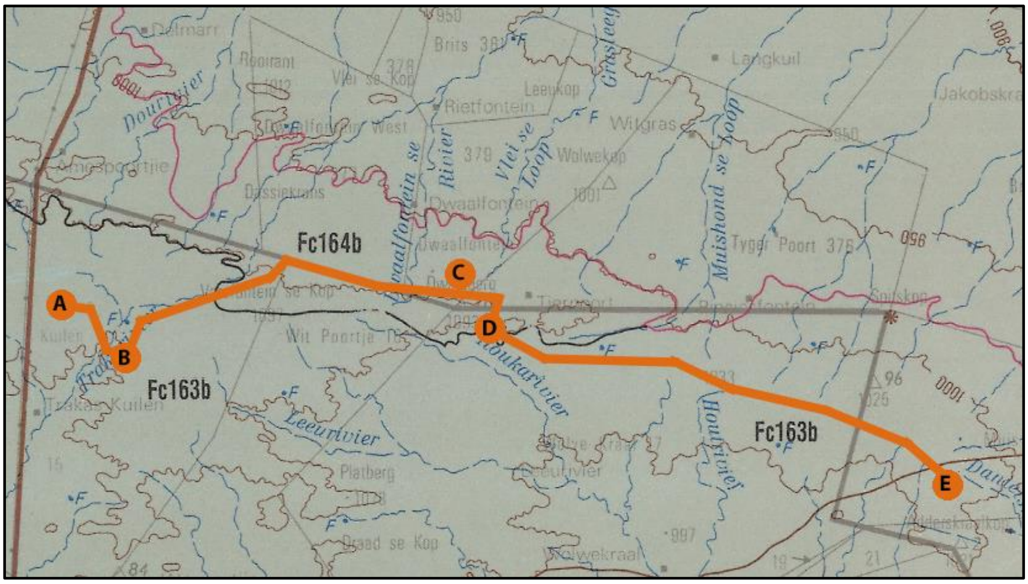

Figure 5: Land types of the OTP Kwagga powerline and associated infrastructure (Land Type Survey 1987).

4.5 Vegetation

4.5.1 Broad-scale vegetation types

The site falls in the Nama-Karoo Biome and more specifically in the Lower Karoo Bioregion (NKl) between Beaufort West and Klaarstroom. The site does not fall within any Centre of Endemism according to Van Wyk and Smith (2001).

The site is located in the Gamka Karoo (NKl 1) vegetation type (Mucina & Rutherford 2006) which covers 20 325 km^2 in South Africa and occurs between the Great Escarpment (Nuweveld Mountains) in the north and Cape Fold Belt Mountains (Swartberg Mountains) in the south. It occurs on irregular to slightly undulating plains covered with dwarf spiny shrubland, dominated by Karoo dwarf shrubs. Mudrock and sandstones of the Beaufort Group and shales of the Ecca Group cover the area. The dominant shrub and dwarf shrub species are *Lycium* spp., *Rhigozum obovatum, Vachellia karroo, Searsia burchellii, Chrysocoma ciliata, Eriocephalus* spp.*, Felicia muricata* and *Pentzia incana*. The most prominent grass species include *Aristida adscensionis*, *Aristida congesta, Aristida diffusa, Fingerhuthia africana, Stipagrostis ciliata, Stipagrostis obtusa* and *Eragrostis* spp.

The vegetation type is classified as Least Concern with about 2.6% statutorily conserved in the Karoo National Park and some private nature reserves (Mucina & Rutherford 2006, NEMA 2011, SANBI 2006-2018). Only a small part has undergone transformation. Endemic plant species include *Chasmatophyllum stanleyi, Hereroa incurva, Hoodia dregei, Ruschia beaufortensis, Jamesbrittenia tenuifolia, Manulea karrooica* and *Piaranthus comptus*.

4.5.2 Description of habitats (plant communities)

The data of all vegetation surveys on Kwagga WEFs 1, 2 and 3, as well as the current surveys for the Kwagga OTP route, were combined to improve the identification of habitat types in the area. Overall, eight broad habitat types were distinguished within the combined area. Based on species composition eight plant communities were thus distinguished, described and mapped on the combined Kwagga WEF 1-3 sites and the Kwagga OTP route (Figure 6). However, only plant communities 1, 2, 3, 4, 6 & 8 were distinguished on the Kwagga OTP route (thus communities 5 and 7 were not present on the powerline route).

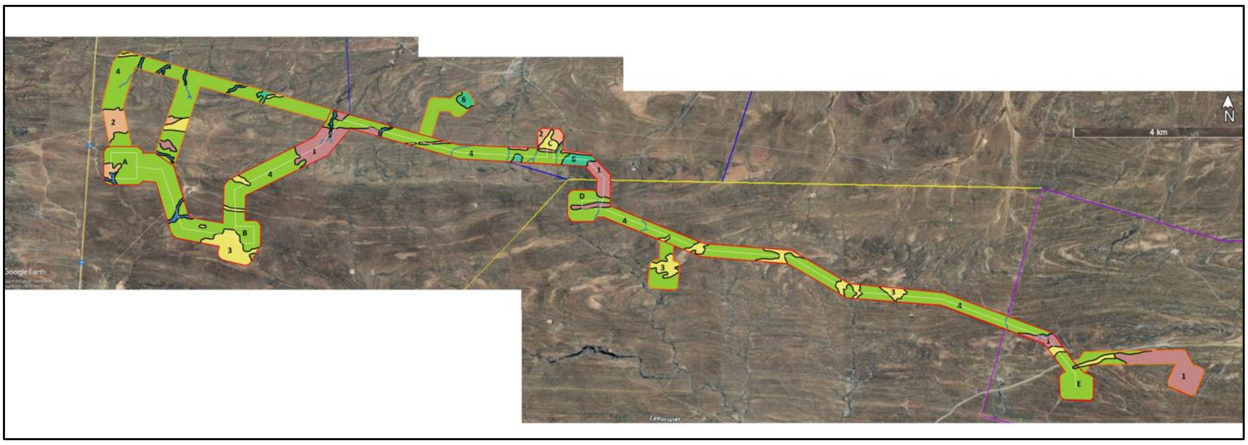

Figure 6: Vegetation map of the Kwagga overhead transmission powerline and associated infrastructure.

Legend to Figure 6:

1 *Rhigozum obovatum - Trichodiadema decorum* dwarf shrubveld
2 *Rhigozum obovatum - Sericocoma avolans* dwarf shrubveld
3 *Ruschia cradockensis - Crassula deltoidea* dwarf shrubveld
4 *Lycium cinereum - Anacampseros ustulata* dwarf shrubveld
5 *Ruschia spinosa - Monsonia camdeboensis* dwarf shrubveld
6 *Rhigozum obovatum - Pteronia viscosa* dwarf shrubveld
7 *Pentzia incana - Stipagrostis obtusa* dwarf shrubveld
8 *Vachellia karroo - Lycium oxycarpum* bushveld of watercourses
Infrastructure

Habitat 1. *Rhigozum obovatum – Trichodiadema decorum* dwarf shrubveld

This shrubveld covers small areas along the route and occurs on crests and scarps of hills, ridges and mountains (Figures 6 & 7). Surface rocks cover from 10% to >75% of the area, with a mean of 52%. Gravel covers from 10–30% of the soil surface with a mean of 16% cover. The shallow, well-drained, yellow-brown, red-brown to brown, sandy loam soils are derived from mudrock.

The diagnostic species of this habitat (community) include *Bulbine triebneri*, *Trichodiadema decorum, Melica decumbens, Felicia muricata, Helichrysum zeyheri, Pelargonium carnosum* and *Adromischus* cf. *triflorus* (species group 1, Appendix A).

- Small **trees** (>3–6 m) have a mean canopy cover of less than 1% and are characterised by *Searsia pallens* and *Diospyros lycioides*.
- **Shrubs** cover on average 3% of the area and the most prominent species are *Rhigozum obovatum, Grewia robusta* and *Gymnosporia szyszylowiczii.*
- **Dwarf shrubs** cover 11% of the habitat and include *Lycium cinereum, Pentzia incana, Hermannia linearifolia, Nenax microphylla, Gorteria alienata, Lasiosiphon deserticola, Pentzia quinquefida, Lacomucinaea lineata, Pteronia glauca, Pteronia adenocarpa, Anacampseros albidiflora* and *Ruschia intricata.*
- The dominant **grass** species include *Aristida adscensionis, Aristida congesta, Aristida diffusa, Digitaria argyrograpta* and *Tragus koelerioides*.
- **Succulent** species that are prominent in this habitat include *Euphorbia stellispina, Adromischus* cf. *triflorus, Trichodiadema pomeridianum* and *Drosanthemum* spp.

- **Forb** (herbaceous non-graminoid) species have a mean canopy cover of less than 2%. The most common species include *Dianthus micropetalus, Chaenostoma* sp.*, Gazania heterochaeta, Cuspidia cernua* and *Curio radicans*.

Figure 7: The *Rhigozum obovatum – Trichodiadema decorum* dwarf shrubveld on crests and scarps of hills.

Rare and/or protected species in Habitat 1:

SA Red data list:	Sensitive species 1039
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	26 species of the Aizoaceae including *Conophytum truncatum*; 3 species in the Apocynaceae; 1 species in the Iridaceae; 3 species of *Anacampseros;*
CITES:	*Anacampseros albidiflora, A. telephiastrum, A. ustulata,* Sensitive species 1039, *Euphorbia stellispina, E. mauritanica*
Endemic species:	None

Habitat 2. *Rhigozum obovatum – Sericocoma avolans* dwarf shrubveld

This shrubveld occurs on crest of hills and ridges and is found primarily in the west along the alternative route to Substation A as well as in the site for Substation C (Figures 6 & 8). Surface rocks cover from 10% to >75% of the area, with a mean of 52%. Gravel covers from 10–30% of the soil surface with a mean of 25%. The shallow, well-drained, orange-brown, yellow-brown to red-brown, sandy loam soils are derived from mudrock.

There are no diagnostic species in this habitat, but the following species are common to Habitats 1 & 2 (species group 2, Appendix A): *Eriocephalus brevifolius, Sericocoma avolans, Helichrysum pumilio, Hermannia linearifolia, Dianthus micropetalus, Osteospermum scariosum* and *Anacampseros telephiastrum.*

Figure 8: The *Rhigozum obovatum – Sericocoma avolans* dwarf shrubveld on ridges and rocky outcrops.

- Small **trees** (>3–6 m) have a mean canopy cover of less than 1% and are represented by *Diospyros lycioides* and *Searsia pallens*.
- **Shrubs** cover on average 1% of the area and are characterised by *Rhigozum obovatum, Grewia robusta, Searsia burchellii* and *Gymnosporia szyszylowiczii.*
- **Dwarf shrubs** cover 13% of the habitat and include *Ruschia intricata* (d), *Eriocephalus ericoides* (d), *Chrysocoma ciliata* (d), *Lycium cinereum, Asparagus aethiopicus, Pteronia empetrifolia, Pteronia adenocarpa, Eriocephalus brevifolius, Helichrysum pumilio, Hermannia linearifolia, Monsonia camdeboensis, Amphiglossa* sp., *Lacomucinaea lineata, Pteronia glauca* and *Nenax microphylla.*
- Prominent **succulent** species in this habitat include *Euphorbia stellispina, Euphorbia mauritanica, Antimima* sp*., Mesembryanthemum (Phyllobolus)* sp., *Mesembryanthemum (Psilocaulon)* sp*., Trichodiadema pomeridianum, Anacampseros albidiflora* and *Drosanthemum lique.*
- The dominant **grass** species include *Aristida adscensionis, Aristida diffusa, Enneapogon desvauxii, Oropetium capense* and *Tragus koelerioides*.
- **Forb** species have a mean canopy cover of less than 2%. The most common species include *Galenia sarcophylla, Sericocoma avolans, Dianthus micropetalus, Gazania heterochaeta* and *Curio radicans*.

Rare and/or protected species in Habitat 2:

SA Red data list:	Sensitive species 1039
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	22 species of the Aizoaceae including *Conophytum truncatum*; 3 species in the Apocynaceae; 1 species in the Iridaceae; 3 species of *Anacampseros; Haworthiopsis nigra*
CITES:	*Anacampseros albidiflora, A. telephiastrum, A. ustulata, Euphorbia stellispina, E. mauritanica,* Sensitive species 1039*, Pachypodium succulentum*
Endemic species:	None

Habitat 3. ***Ruschia cradockensis*** **–** ***Crassula deltoidea*** **dwarf shrubveld**

This dwarf shrubveld occurs on the rocky plains and low hills and is found in small bands across the powerline route. It is also found on the sites for Substations A, C and the alternative to D (Figures 6 & 9). Surface rocks cover from <10% to >75% of the site, with a mean of 37%. Quartzitic gravel covers from <10 to >50% of the soil surface with a mean of 23%. The shallow, well-drained, orange-brown to yellow-brown, sandy loam soils are derived from mudrock.

The diagnostic species of this community include *Crassula deltoidea, Chasmatophyllum musculinum, Anacampseros papyracea, Antimima* sp. 2 and a *Justicia* sp. (species group 3, Appendix A).

- Small **trees** (>3–6 m) have a mean canopy cover less than 1% and are characterised by *Diospyros lycioides*.
- **Shrubs** cover on average 1% of the area and are represented by *Rhigozum obovatum* and *Grewia robusta.*
- **Dwarf shrubs** cover 13% of the habitat and include *Ruschia cradockensis* (d), *Eriocephalus ericoides* (d), *Ruschia intricata* (d), *Nenax microphylla, Lycium cinereum, Pteronia empetrifolia, Felicia filifolia, Monsonia camdeboensis, Salsola* spp., *Lacomucinaea lineata, Asparagus aethiopicus, Lasiosiphon deserticola, Pteronia glauca* and *Chrysocoma ciliata.*
- Prominent **succulent** species include *Anacampseros papyracea, Anacampseros ustulata, Euphorbia stellispina, Crassula deltoidea, Trichodiadema pomeridianum, Drosanthemum lique* and *Mesembryanthemum (Psilocaulon)* sp.
- The dominant **grass** species include *Aristida adscensionis, Aristida congesta, Aristida diffusa, Tragus koelerioides, Oropetium capense* and *Enneapogon desvauxii*.
- **Forb** species cover less than 2%. The most common species include *Gazania heterochaeta* and *Curio radicans*.

Figure 9: The *Ruschia cradockensis – Crassula deltoidea* dwarf shrubveld on quartzitic rocky plains.

Rare and/or protected species in Habitat 3:

SA Red data list:	None
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	23 species of the Aizoaceae including *Conophytum truncatum;* 1 species in the Iridaceae; 3 species of *Anacampseros;*
CITES:	*Anacampseros albidiflora, A. ustulata, A. papyracea, Euphorbia stellispina, Euphorbia mauritanica*
Endemic species:	None

Habitat 4: ***Lycium cinereum – Anacampseros ustulata* dwarf shrubveld**

This shrubveld occurs on the rocky plains and covers most of the route for the powerline (Figures 6 & 10). Surface rocks cover from <10% to >50% of the site, with a mean of 22%. Gravel covers from <10% to 50% of the soil surface with a mean of 18%. The shallow, well-drained orange-brown, yellow-brown to red-brown, sandy loam soils are derived from mudrock.

The absence of species of species groups 1 – 4 characterise this habitat. There are no diagnostic species in this habitat, but the following species are shared with communities 1, 2 & 3 (species group 5, Appendix A): *Nenax microphylla, Gorteria alienata, Lasiosiphon deserticola, Cuspidea cernua, Gazania heterochaeta* and *Anacampseros ustulata.*

- Small **trees** (>3–6 m) have a mean canopy cover of less than 1% and are characterised by *Searsia pallens* and *Diospyros lycioides.*
- **Shrubs** cover on average 1% of the area and are represented by *Rhigozum obovatum (d), Grewia robusta* and *Searsia burchellii.*
- **Dwarf shrubs** cover 12% of the habitat and include *Lycium cinereum (d), Eriocephalus ericoides (d), Ruschia intricata, Chrysocoma ciliata, Pentzia incana, Asparagus aethiopicus, Asparagus mucronatus, Lacomucinaea lineata, Hermannia grandiflora, Nenax microphylla, Gorteria alienata, Lasiosiphon deserticola* and *Pteronia glauca.*
- Prominent **succulent** species include *Euphorbia stellispina, Anacampseros ustulata, Drosanthemum lique, Mesembryanthemum noctiflorum, Mesembryanthemum (Psilocaulon)* sp., *Trichodiadema pomeridianum* and *Crassula capitella.*
- The dominant **grass** species include *Aristida adscensionis, Aristida congesta* and *Aristida diffusa*.
- **Forb** species have a mean canopy cover of less than 1%. The most common species include *Gazania heterochaeta* and *Cuspidea cernua.*

Figure 10: The *Lycium cinereum – Anacampseros ustulata* dwarf shrubveld on rocky plains.

Rare and/or protected species in Habitat 4 include:

SA Red data list: None
NEM:BA (ToPS): None

NFA: None
WCNECO: 21 species of the Aizoaceae, 1 species in the Apocynaceae; 2 species of *Anacampseros;*
CITES: *Euphorbia decepta*, *E. stellispina, E. mauritanica, Anacampseros albidiflora, A. ustulata*
Endemic species: None

Habitat 5. *Ruschia intricata* – *Monsonia camdeboensis* dwarf shrubveld

This dwarf shrubveld did not occur along the Kwagga overhead powerline route.

Habitat 6. *Rhigozum obovatum – Pteronia viscosa* dwarf shrubveld

This shrubveld occurs locally on somewhat deeper soils on the plains mainly around Substation C (Figures 6 & 11). Surface rock and gravel generally cover <10% of the soil surface. The grey-brown, orange-brown to red-brown, sandy loam soils are derived from mudrock.

The absence of species of species groups 1–6 characterise this habitat. There are no diagnostic species in this habitat, but the following species are common to Habitats 1–6 (species groups 7, Appendix A): *Searsia pallens, Rhigozum obovatum, Pteronia viscosa, Euphorbia stellispina, Trichodiadema pomeridianum* and *Pteronia adenocarpa.*

Figure 11: The *Rhigozum obovatum – Pteronia viscosa* dwarf shrubveld on the sandy loam plains.

- Small **trees** (>3–6 m) have a mean canopy cover of 1% and are characterised by *Vachellia karroo* and *Diospyros lycioides*.
- **Shrubs** cover approximately 4% of the area and are represented by *Rhigozum obovatum* (d), *Searsia burchellii, Gymnosporia szyszylowiczii, Grewia robusta, Lycium oxycarpum* and *Cadaba aphylla.*
- **Dwarf shrubs** cover 13% of the habitat and include *Ruschia intricata* (d), *Lycium cinereum* (d), *Eriocephalus ericoides* (d), *Tetraena chrysopteron, Pentzia incana, Asparagus aethiopicus, Lacomucinaea lineata, Chrysocoma ciliata* and *Pteronia adenocarpa.*
- Prominent **succulent** species include *Euphorbia stellispina, Trichodiadema pomeridianum, Drosanthemum lique* and *Drosanthemum hispidum*.
- The dominant **grass** species include *Aristida adscensionis, Aristida congesta, Aristida diffusa, Enneapogon desvauxii, Stipagrostis obtusa, Tragus berteronianus* and *Oropetium capense*.
- **Forb** species have a mean canopy cover of less than 1%. The most common species include *Sesamum*

capense, Kewa salsoloides and *Galenia sarcophylla*.

Rare and/or protected species in Habitat 6:

SA Red data list:	Sensitive species 1039
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	17 species of the Aizoaceae; 1 species of *Anacampseros;* 1 species of Apocynaceae
CITES:	*Anacampseros albidiflora,* Sensitive species 1039*, Euphorbia stellispina, E. mauritanica*
Endemic species:	None

Habitat 7. *Pentzia incana* – *Stipagrostis obtusa* dwarf shrubveld

This dwarf shrubveld did not occur along the Kwagga overhead powerline route.

Habitat 8. *Vachellia karroo* – *Lycium oxycarpum* bushveld of watercourses

This habitat is associated with the watercourses on site (Figures 6 & 12). The shallow to deep, grey to grey-brown sandy soils are alluvial in origin.

The diagnostic species of this community include *Setaria verticillata, Cenchrus ciliaris, Melianthus comosus, Searsia lancea, Stipagrostis namaquensis, Oedera humilis* and *Chloris virgata* (species group 10, Appendix A).

Figure 12: The *Vachellia karroo – Lycium oxycarpum* bushveld of ephemeral watercourses.

- **Tall trees** (>6 m) cover on average 2% of the area and the prominent species include *Vachellia karroo* and *Searsia lancea*.
- **Small trees** (>3–6 m) have a mean canopy cover of 12% and are characterised by *Diospyros lycioides* and *Searsia pallens.*
- **Shrubs** cover on average 23% of the area and are characterised by *Lycium oxycarpum, Searsia burchellii, Gymnosporia szyszylowiczii, Carissa haematocarpa* and *Grewia robusta.*
- **Dwarf shrubs** cover 10% of the habitat and include *Lycium cinereum, Melianthus comosa, Oedera humilis, Tetraena lichtensteiniana, Salsola* spp. and *Pentzia incana.*
- **Succulent** species in this habitat include *Mesembryanthemum guerichianum*, *Mesembryanthemum*

noctiflorum, Malephora sp., *Aptenia* sp., and *Mesembryanthemum (Psilocaulon)* sp.

- The dominant **grass** species include *Setaria verticillata, Cenchrus ciliaris, Stipagrostis namaquensis, Stipagrostis ciliata, Chloris virgata* and *Cynodon incompletus*.
- **Forb** species have a mean canopy cover of less than 2%. The most common species include *Leysera tenella, Galenia papulosa, Aptosimum indivisum, Arctotis leiocarpa* and *Kewa salsoloides.*

Rare and/or protected species in Habitat 8:

SA Red data list:	None
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	11 species of the Aizoaceae; 1 species of Apocynaceae; 1 species of Iridaceae
CITES:	None
Endemic species:	None

4.6 National Environmental Management: Protected Areas Act (Act No. 10 of 2003)

The study site is not located in a statutorily protected area.

4.7 National Protected Areas Expansion Strategy (NPAES)

The study site does not form part of the NPAES (NPAES 2010).

4.8 National list of ecosystems that are threatened and in need of protection

The site is located in the Gamka Karoo (NKl 1) vegetation type (Mucina & Rutherford 2006) which is classified as Least Concern with about 2.6% statutorily conserved in the Karoo National Park and some private nature reserves (Mucina & Rutherford 2006, NEMA 2011, Skowno *et al.* 2019). Only a small part has undergone transformation.

4.9 Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs)

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species or ecological processes. CBAs are regarded as areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. The definitions for CBAs are (SANBI 2018):

- CBA 1: Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species or ecological processes in these areas (SANBI 2018).
- CBA 2: Areas that are the best option for meeting biodiversity targets, in the smallest area, while avoiding conflict with other land uses.

The CBA map in Figure 13 indicates the presence of a CBA along the powerline route. The main reasons provided for the mapping of the CBAs were: (1) very high terrestrial sensitivity indicated in the shale gas SEA (without an indication of what caused the high sensitivity); (2) very high dry river sensitivity indicated in the shale gas SEA; (3) water resource protection (FEPAs); and (4) presence of the Cape mountain zebra.

Development within Critical Biodiversity Areas is not encouraged. According to the Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet *et al*., 2017) permissible land uses are those that are compatible with maintaining the natural vegetation cover of CBAs in a healthy ecological state, and that do not result in loss or degradation of natural habitat. Undesirable land uses in terrestrial CBAs are those that cause loss of natural habitat or ecosystem functionality, such as: (i) mining or prospecting; (ii) intensive agriculture (cultivation) or plantation forestry; (iii) residential, commercial or industrial developments; (iv) game-proof fences in CBA corridors; (v) linear infrastructure that disrupts the connectivity of CBA corridors; and (vi) extensive or intensive grazing that results in species diversity being lost through selective or over-grazing (Pool-Stanvliet *et al*., 2017).

Since a powerline can maintain the natural vegetation cover of CBAs in a healthy ecological state, it can be regarded as a permissible land use. Nevertheless, CBAs should be avoided wherever possible. The preferred powerline route has avoided most CBAs with the exception of the section between Substations A and B and to the north of Substation E where the CBA borders on the powerline route. The alternative options have more instances of CBAs intersecting the powerline route.

An Ecological Support Areas (ESA) is not essential for meeting biodiversity targets but plays an important role in supporting the ecological functioning in a CBA. ESAs need to be maintained in at least a functional and often natural state, but some limited habitat loss may be acceptable. It is important that the project should not compromise the functional (natural) state of the ESAs as required by the conservation plan of the Western Cape (Pool-Stanvliet et al. 2017). The ESAs in Figure 13 follow the smaller watercourses. The smaller drainage lines were included in the ESA mapping and cross the powerline route at multiple places. Pylon placing for the powerline should avoid these drainage lines.

Other Natural Areas (ONAs) have not been identified as a priority but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Land use guidelines for Terrestrial Other Natural Areas (ONAs) are not required to meet biodiversity targets. ONAs represent the largest area in the region and form a matrix within which the CBAs and ESAs occur (Figure 13).

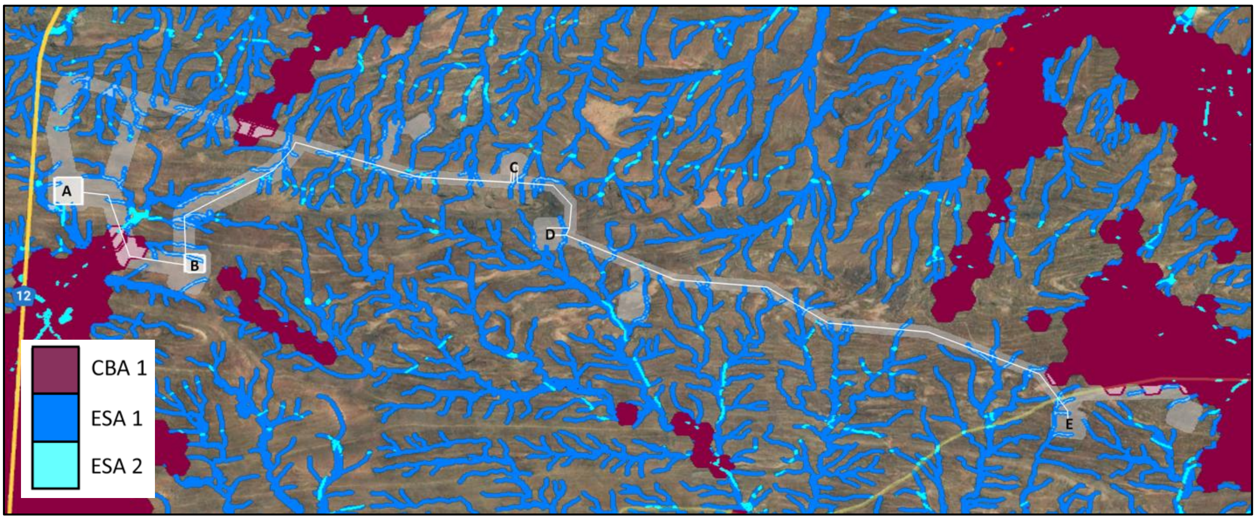

Figure 13: Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs, not coloured matrix) of the Kwagga OTP site and environs (biodiversityadvisor.sanbi.org).

4.10 Freshwater Ecosystem Priority Areas (FEPAs)

Freshwater Ecosystem Priority Areas (FEPA) are priority areas for conserving freshwater ecosystems and supporting sustainable use of water resources and upstream management areas (Driver *et al*. 2011) (Figure 14). The areas classified as Freshwater Ecosystem Priority Areas (FEPA) intersect the powerline route between Substation B and D and the alternative route at Substation E. However, the area mapped as FEPA did not emerge as being highly sensitive in the current assessment and the sensitivity model that was applied, classified only the drainage lines in the FEPA as being of medium sensitivity.

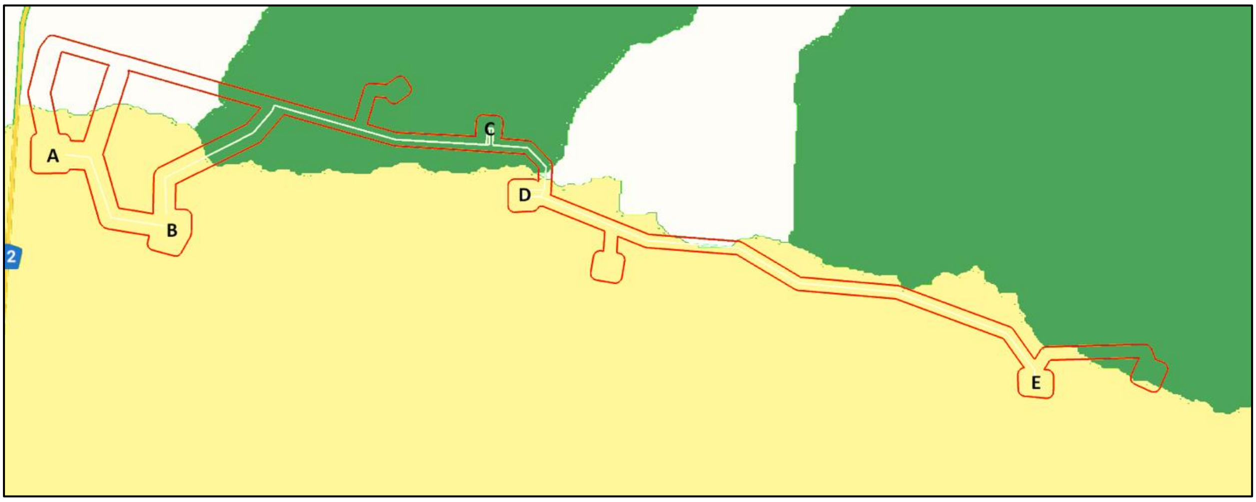

Figure 14: Freshwater priority areas (FEPA) along the Kwagga OTP route. Dark green indicates FEPA and associated sub-quaternary catchment (or quinary catchment) and yellow the upstream catchment.

4.11 Ecological processes, functioning and drivers

Ecological processes include primary production, decomposition, nutrient cycling and fluxes of nutrients and energy. These processes will be altered by the clearing of the vegetation at the footprints of the infrastructure. The impact is expected to be fairly small in relation to the adjacent landscape where no change to the ecological processes is anticipated. The relatively small footprint of the infrastructure will not hinder pollination by airborne pollinators. Migration of ground-dwelling organisms will temporarily be hindered at the construction sites, but ecological connectivity should not be disrupted during the operational phase. Overall, it is unlikely that the project will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. The infrastructure will not cause any additional impediment to ecological corridors and habitat fragmentation should not be an issue

The disturbance caused during construction will inevitably create conditions favourable for invasion by alien species. However, the level of alien infestation at the site was fairly low. Nevertheless, an alien invasive plant species monitoring and control programme needs to be initiated to control invasions.

Fire in this arid part of the Nama-Karoo is rare as a result of the high grazing pressure and variable rainfall and not considered as an important driver of vegetation dynamics.

4.12 Indigenous forests

No indigenous forests occur at the site.

5. FLORA: CHECKLISTS AND RED-LISTED AND/OR PROTECTED SPECIES

The study area has been very poorly collected botanically. A list of 242 plant species (the term species is used here in a general sense to denote species, subspecies and varieties) that could be found in the region (quarter degree grids: 3222 DA, DB, DC, DD, plus 3322BA, BB) was downloaded from the South African Biodiversity Institute's website (SANBI: newposa.sanbi.org – accessed June 2022) (Appendix B). During the field surveys, 291 species were recorded on Kwagga WEFs 1, 2 and 3 combined as well as on the overhead powerline route (Appendix B). Combined the NewPosa list and the list for the current study yielded 437 species which could potentially occur at the site.

The South African Threatened Species Programme website (redlist.sanbi.org) of SANBI; the National Forests Act (Act No. 84 of 1998) (NFA 2021); the National Environmental Management: Biodiversity Act (NEMBA, 2007c) (ToPS list); CITES (2021) appendices and the lists of protected plant species of the Western Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974, as amended 2000) were consulted to classify the species in the study area into the relevant IUCN or protected categories (Appendix B).

5.1 IUCN Red-listed species

For the IUCN Categories, the following definitions were applied (see Figure 15). **The colours in Figure 15 were applied to the checklist of plants and animals in this section as well as in Appendices B and C.**

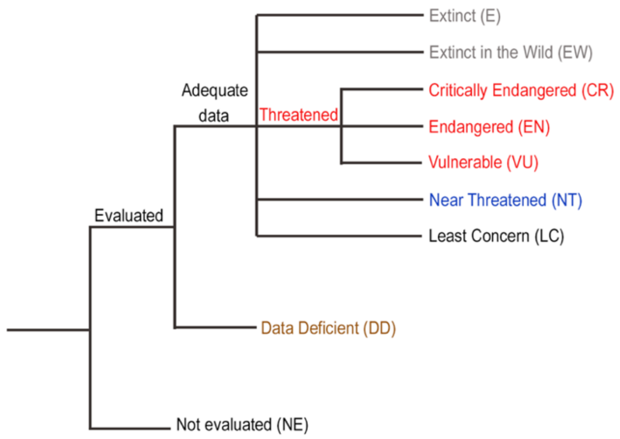

Figure 15: Schematic representation of the relationship between the various IUCN Red List Categories.

Threatened Species and Species of Conservation Concern (SCC)

Extinct Categories:

- **Extinct (E):** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
- **Extinct in the Wild (EW):** A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.

Threatened Categories:

- **Critically Endangered (CR):** A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **Endangered (EN):** A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that it is facing a very high risk of extinction.
- **Vulnerable (VU):** A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that it is facing a high risk of extinction.

Not Threatened Categories, but of conservation concern:

- **Near Threatened (NT):** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
- **Data Deficient (DD):** A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. In this case the species would be classified as DDD. If however, taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible, the species is classified as DDT. The latter category cannot be considered as SCC.
- **Additional categories recognised by SANBI:** Although not threatened categories, SANBI have added the species classified as Critically Rare, Rare and Declining to their SCC.

Not Threatened Categories:

- **Least Concern (LC):** A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
- **Not Evaluated (NE):** A taxon is Not Evaluated when it is has not yet been evaluated against the five IUCN criteria. This category often applies to alien species.

Two IUCN red-listed species occur in the region according to the NewPosa list (Appendix B). Data Deficient (DD) and Near Threatened (NT) species are not classified as threatened according to the IUCN classification. No Near Threatened species are listed for the region and only *Stapelia engleriana*, *Curio rowleyanus, Ceropegia fimbriata* (no subspecies identified in NewPosa) and *Cyphia* cf. *dentariifolia* are classified as DDT indicating that they are taxonomically unresolved. Only *Curio rowleyanus* and *Cyphia* cf. *dentariifolia* were identified on site, but because of their unresolved taxonomy cannot be evaluated further.

5.2 Protected species

5.2.1 Western Cape

Ninety-three (93) plant species in Appendix B are listed as protected (Schedule 4) according to the WCNECO (1974, as amended in 2000). Most of these Schedule 4 species are members of the Aizoaceae (61 species), Apocynaceae (10 species), Anacampserotaceae (6 species) and Iridaceae (7 species). Of these 93 species, 56 protected species were recorded during the site surveys in October/November 2020 and June 2022 (see Appendix B). Once again most of the protected species belonged to the Aizoaceae.

5.3 ToPS list (NEM:BA 2007c)

No species, classified as protected within the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA, 2007c) is listed for the study area and none were found at the site.

5.4 CITES appendices

Appendix II of CITES lists species that are not necessarily now threatened with extinction, but that may become so unless trade is closely controlled. Fifteen Appendix II species are listed for the region including mostly *Anacampseros* species and *Euphorbia* species. Ten species listed by CITES were recorded during the site survey (Appendix B).

5.5 National Forests Act (Act No. 84 of 1998) - Protected Tree Species

No nationally protected tree species is listed for the site (NFA 2021) and none were recorded during the site visit.

5.6 Endemic species

Endemic plant species of the Gamka Karoo Vegetation Type include *Chasmatophyllum stanleyi, Hereroa incurva, Hoodia dregei, Ruschia beaufortensis, Jamesbrittenia tenuifolia, Manulea karrooica* and *Piaranthus comptus* (Mucina & Rutherford 2006). None of these species were encountered during the site visits.

5.7 Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA 2020a, 2020b)

In total 19 alien species are listed for the study area (Appendix B) of which 10 are categorised as invasive and nine as naturalised. Alien species with an invasive categorisation will have to be controlled during the construction and operational stages of the project. Alien invasive species listed for the study area include the following (species recorded during the site survey are marked with an asterisk):

Acacia podalyriifolia	1b
*Argemone ochroleuca**	1b
Atriplex lindleyi subsp. *inflata*	1b
Atriplex nummularia	2
Cylindropuntia pallida	1a
*Datura ferox**	1b
*Opuntia aurantiaca**	1b
*Opuntia ficus-indica**	1b
Prosopis glandulosa	1b
*Salsola kali**	1b

6. FAUNA: CHECKLISTS AND RED-LISTED AND/OR PROTECTED SPECIES

6.1 Mammals

The site falls within the distribution range of 20 terrestrial mammal species (http://vmus.adu.org.za) (Appendix C).

6.1.1 IUCN threatened mammal species

Among the rodents, Littledale's whistling rat (*Parotomys littledalei*) is listed as Near Threatened (a category that is not a threatened category in the IUCN classification). This species has a patchy habitat distribution, reflecting forage availability and the need for deep soils. The plant communities on rocky terrain along the powerline route would thus not provide favourable habitat for this species. It could potentially occur in the sandy dry river systems which will be avoided by the powerline pylons. The species does not do well during extended drought. For example, they became locally extinct in Goegap Nature Reserve after a severe drought in 2003 (returning only in low numbers in 2014). The extended drought that occurred in the region prior to 2021 would have resulted in a similar effect in the study area.

6.3 Reptiles

Thirty-two reptiles are listed for the region. The Karoo dwarf tortoise (*Chersobius boulengeri)* is listed as IUCN **Endangered** and is also in CITES Appendix II. The Karoo dwarf tortoise is an endemic species occurring in the region and is associated with dolerite ridges and rocky outcrops. No dolerite ridges are present on the site and rocky outcrops cover only a small portion of the site. The rocky outcrops will all be avoided in the layout of the powerline, thus with proper mitigation measures, negative impacts to the Karoo dwarf tortoise will be avoided. A herpetological investigation on Trakaskuilen could also find no evidence of live specimens or shell fragments of the Karoo dwarf tortoise. Furthermore, the habitat was not regarded suitable for the species.

The most common tortoise on site is the leopard tortoise or bergskilpad *Stigmochelys pardalis.*

Other CITES II listed Chelonians are:

Chersina angulata	Angulate tortoise
Psammobates tentorius tentorius	Karoo tent tortoise
Psammobates tentorius verroxii	Verrox's tent tortoise

Comment:

The following additional mammals were either sighted or confirmed by two landowners on site:

Mammals:
Artiodactyla:

Sylvicapra grimmia	Grey (bush) duiker	(WC protected species)
Tragelaphus sylvaticus	Greater Kudu	(WC protected species)
Oryx gazella	Gemsbok	(WC protected species)

Carnivores:

Canis mesomelas	Black-backed jackal	
Caracal caracal	Caracal	
Otocyon megalotis	Bat-eared fox	(WC protected species)
Cynictis penicillata	Yellow mongoose	

Primates:

Chlorocebus pygerythrus	Vervet monkey

Lagomorpha (Hares and rabbits):

Lepus capensis	Cape hare

7. ECOLOGICAL SENSITIVITY ANALYSIS: VEGETATION

7.1 Introduction

Sensitivity is the vulnerability of a habitat to an impact, for example a wetland or ridge system would be more vulnerable to development than would a sandy plain. Several features of a site can be assessed to derive a sensitivity score, such as:

1. Threatened status of the regional vegetation type wherein the proposed site is situated:
2. Percentage of red-listed plant species per habitat or site:
3. Number of protected tree species per habitat or site:
4. Percentage of provincially protected plant species per habitat:
5. Presence of endemic plant species per habitat or site (endemic to vegetation type):
6. Conservation value of association (habitat) or site - overall the watercourses, rocky ridges and mountainous habitats (with scarps/cliffs) were considered as having a high conservation value.
7. Species richness per habitat or per sample plot (number of plant species):
8. Degree of connectivity and/or fragmentation of the habitat, i.e. high connectivity and low fragmentation infers a low rating - the only naturally fragmented habitats were the rocky ridges (Habitats 1 & 2), which could occur within almost any of the broader habitat types.
9. Soil erosion potential: in general, the banks and floodplains along watercourses, as well as the mountainous areas and slopes are more prone to soil erosion.
10. Resilience (this is a measure of the ability of a particular habitat to recover after an impact, i.e. high resilience infers low rating).

7.2 Sensitivity model

In total, 125 sample sites were surveyed for Kwagga WEFs 1, 2 & 3 and an additional 45 were surveyed for the Kwagga OTP. All identifiable plant species were noted and specific attention was given to protected species or species of conservation concern (SCC).

The following **sensitivity model** (Table 4, Figure 16) was applied to the data for each habitat on site. This was achieved by weighting each criterion and calculating the sum for the habitat, which reflects the sensitivity and sensitivity ranking. A brief description of the sensitivity rating of the parameters is provided below:

1. **Threatened status of the ecosystem** (depends on the percentage area intact, or degree of transformation) (Mucina & Rutherford 2006, NEM:BA 2011, SANBI 2006-2018, Skowno *et al.* 2019). The ecosystems are classified into the following categories:
   - Low sensitivity: If Least Concern, the vegetation type has most of its habitat intact, i.e. more than 80%; or the vegetation type is adequately statutory or formally conserved in parks and reserves.
   - Moderate sensitivity: If “Vulnerable”, the vegetation type has from 60% to 80% of the ecosystem intact; less than 40% has been transformed which could result in some ecosystem functioning being altered, and/or the ecosystem is statutory poorly conserved. For example, the vegetation type is rich in plant species but is not a pristine example of a vegetation type, therefore some transformation or disturbance occurred, such as human structures and degraded veld due to overgrazing and/or bush encroachment.
   - High sensitivity: If “Endangered”, the vegetation type has from 40% to 60% of the ecosystem intact; or 40%

to 60% transformed due to disturbance, cultivation or alien species; or the ecosystem is statutory poorly conserved e.g. less than about 3% conserved.

- Very high sensitivity: If "Critically Endangered", the vegetation type has only 16% to 36% of the ecosystem intact. The richer the ecosystem is in terms of species, the higher the percentage threshold.

Category rating:

Low	(LT)	= 1
Moderate	(VU)	= 2
High	(EN)	= 3
Very high	(CE)	= 4

2. **Percentage of red-listed plant species** (listed as threatened following IUCN threatened status): The rating is determined by the presence of red-listed flora in a habitat (calculated as percentage of the total number of species per habitat).

Category rating:

None	(0%)	= 0
Low	(>0 – 2%)	= 1
Moderate	(>2 – 5%)	= 2
High	(>5%)	= 3

3. **Presence of protected tree species** (NFA 2021): The presence protected tree species in a habitat is rated as follows:

Category rating:

None	(0 species)	= 0
Low	(1 - 2 species)	= 1
Moderate	(3 – 4 species)	= 2
High	(>4 species)	= 3

4. **Percentage of Western Cape protected plant species**: Western Cape Nature and Environmental Conservation Ordinance, 1974 (No. 19 of 1974, as amended in 2000) (WCNECO 1974). The rating depends on the percentage of protected species in relation to the total plant species per habitat.

Category rating:

None	(0%)	= 0
Low	(>0 - 10%)	= 1
Moderate	(>10 – 20%)	= 2
High	(>20%)	= 3

5. **Percentage of plant species endemic to the particular vegetation type of Mucina & Rutherford** (2006): Refers to the number of species expressed as a percentage of the total number of species per habitat.

Category rating:

None	(0%)	= 0
Low	(>0 - 2%)	= 1
Moderate	(2–5%)	= 2
High	(>5%)	= 3

6. **Species richness per habitat:** Expressed as mean number of species per plot in a habitat.

Category rating:

Low	(<15)	= 1
Moderate	(15 – 30)	= 2
High	(>30)	= 3

7. **Conservation value of the habitat:** The assessment is made for the habitat in the broader region.

Category rating:

Low	= 1
Moderate	= 2
High	= 3

8. **Degree of connectivity and/or fragmentation of the ecosystem:** The degree of connectivity with surrounding or adjacent natural areas and/or fragmentation of habitats, thus high degree of connectivity and low degree of fragmentation infer a high rating.

Category rating (note reverse order)*:*

Low	= 3
Moderate	= 2
High	= 1

9. **Erosion potential of the soil:** The erosion potential of the soil is indicated as low, moderate or high, e.g. coarse sandy soils on plains have a low erosion potential.

Category rating:

Low	= 1
Moderate	= 2
High	= 3

10. **Resilience:** Is a measure of the ability of a particular habitat to recover to its current state after an impact, i.e. high resilience infers low rating.

Category rating (note reverse order):

Low	= 3
Moderate	= 2
High	= 1

Each criterium is weighted as follows in the model:

Threatened status of the vegetation type	x5
Percentage of red list plant species	x4
Presence of protected tree species	x3
Percentage of Northern Cape or Western Cape protected species	x4
Percentage of endemic species to vegetation type	x2
Species richness	x2
Conservation value (habitat)	x4
Degree of connectivity/fragmentation of habitat	x2
Erosion potential	x2
Resilience	x3

7.2.2 Sensitivity rating

The sum of all criteria is obtained per habitat and interpreted as follows:

≤ 39	= low	(L)	(rating scale = 1)
40 – 54	= moderate	(M)	(rating scale = 2)
55 – 69	= high	(H)	(rating scale = 3)
> 70	= very high	(VH)	(rating scale = 4)

In general, these sensitivity ratings are interpreted as follows:

- **Low** sensitivity means the sensitivity should not have an influence on the decision about the project. It is usually applicable to habitats that have been transformed, especially by human activities. However, no protected species may be removed/destroyed without a permit.
- **Moderate** means a sensitivity rating that is real and sufficiently important to require management, e.g. mitigation measures, management or protection of the rare/threatened fauna and flora, protection of a specific habitat on the property and/or rehabilitation.
- **High** means a sensitivity rating where the habitat should be excluded from any development.
- **Very high** means a sensitivity rating that should influence the decision whether or not to proceed with the project.

Table 4: Sensitivity of the different plant communities (habitats) identified on site (see Figure 16)

Community/Habitat	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Threatened status (x5)	5	5	5	5	5	5	5	5
% Red list species (x4)	4	4	4	4	8	8	0	0
Number of protected trees (x3)	0	0	0	0	0	0	0	0
WCNECO/CITES species (x4)	8	12	12	12	12	12	12	8
Endemic species (x2)	0	0	0	0	0	0	0	0
Species richness (x2)	6	4	4	4	4	4	4	4
Conservation value (x4)	8	8	8	4	4	4	4	12
Connectivity (x2)	4	4	4	2	2	2	2	4
Erosion (x2)	4	2	2	2	2	2	2	6
Resilience (x3)	6	6	6	6	6	6	6	6
Sum:	45	45	45	39	43	43	35	45
Sensitivity rating:	**M**	**M**	**M**	L	**M**	**M**	L	**M**

None of the habitats were rated as having a high or very high sensitivity. Overall, the mountainous parts (Habitats 1 & 2), quartz patches (Habitat 3), shrubveld on deep sandy loam soils (Habitat 6) and drainage lines (Habitat 8) were of medium sensitivity. There were a number of protected and CITES listed species found on the rocky ridges (Habitats 1 & 2) and the quartzitic rocky plains (Habitat 3) which should be taken into account when selecting the sites for the powerline infrastructure.

Buffers are applicable to the development along the watercourses. The buffer zones as delineated by the bat and aquatic specialists should be observed when planning powerline infrastructure.

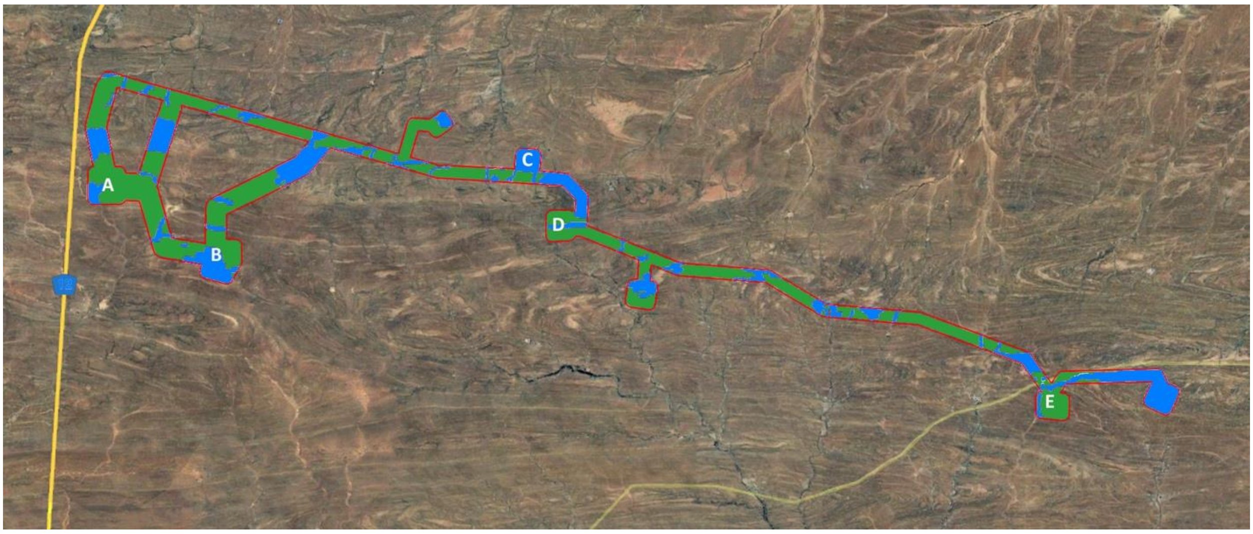

Figure 16: Sensitivity map of the Kwagga OTP route. Blue indicates a moderate sensitivity and green a low sensitivity. The sensitivity map is additionally provided as a .kmz file.

Although none of the habitats were rated as highly sensitive from a vegetation point of view, this does not exclude the presence of threatened, protected and CITES listed species in the habitats. Only one threatened species was encountered in the larger area investigated, but none occurred within the powerline route. Apart from the species listed by the screening tool, protected and CITES listed species were not considered as being of conservation concern for the following reasons: (1) Most of them do not qualify as SCC according to the SANBI definition (SANBI 2020); and (2) in WCNECO (1974, as amended 2000), a number of families and genera, for example the family Aizoaceae, (formerly Mesembryanthemaceae) and genera such as *Mesembryanthemum, Drosanthemum, Galenia, Ruschia* and *Tetragonia* are listed as either Specially Protected Species/Flora or Protected Species/Flora. This blanket classification may be because of the presence of one or two species of vulnerable or higher conservation (IUCN) status in the genus. Unfortunately, this then includes many species that are either common, or even weedy, e.g. *Drosanthemum hispidum*, *Galenia namaensis, Mesembryanthemum guerichianum* or *Ruschia* species that do not need to be awarded special conservation status. To a large extent, Appendix II of CITES has the same weakness as WCNECO, because it often also simply lists all species within a genus, e.g. *Anacampseros* spp. Several species noted on site are provincially protected as well as CITES listed (see Appendix B). Permits will have to be obtained for the removal of the protected species.

8. ISSUES, RISKS AND IMPACTS

8.1 Introduction

In this section the issues, risks and impacts associated with the project from a terrestrial biodiversity and species viewpoint is presented.

8.2 Key issues

- The key issue is that part of the site has been identified as CBA.
- Furthermore, a portion of the site falls within a FEPA. The sensitivity analysis did, however, not highlight this FEPA section as having a high sensitivity.
- Three sensitive plant species were highlighted by the screening tool of which none were found along the powerline although one was recorded on the larger Kwagga WEF sites.
- The screening tool highlighted the possible presence of the Karoo dwarf tortoise (*Chersobius boulengeri*) in the area. A herpetological investigation on Trakaskuilen could find no evidence of live specimens or shell fragments. Furthermore, the habitat was not regarded as suitable for the species.

8.3 Impacts during the construction phase

8.3.1 Direct impacts during the construction phase

- Potential impact 1: The clearing of natural vegetation
- Potential impact 2: The loss of threatened, protected and endemic plants/animals
- Potential impact 3: Loss of faunal habitat
- Potential impact 3: Direct faunal mortalities due to construction and increased traffic
- Potential impact 4: Increased dust deposition
- Potential impact 5: Increased human activity and associated increased noise levels.

8.3.2 Indirect impacts during the construction phase

- Potential impact 1: Establishment of alien vegetation
- Potential impact 2: Increased water run-off and erosion.

8.4 Impacts during the operational phase

8.4.1 Direct impacts during the operational phase

- Potential impact 1: Direct faunal mortalities

8.4.2 Indirect impacts during the operational phase

- Potential impact 1: Establishment of alien vegetation
- Potential impact 2: Increased erosion and water run-off.

8.5 Impacts during the decommissioning phase

8.5.1 Direct impacts during the decommissioning phase

- Potential impact 1: Direct faunal mortalities
- Potential impact 2: Increased dust deposition.

8.5.2 Indirect impacts during the decommissioning phase

- Potential impact 1: Establishment of alien vegetation
- Potential impact 2: Increased water run-off and erosion.

8.6 Cumulative impacts

- Cumulative impact 1: Vegetation loss and habitat destruction
- Cumulative impact 2: Compromising integrity of CBA, ESA and NPAES
- Cumulative impact 3: Reduced ability to meet conservation obligations & targets
- Cumulative impact 4: Loss of landscape connectivity and disruption of broad-scale ecological processes.

8.7 Summary of Issues identified during the Public Consultation Phase [if relevant]

To be done once the Public Consultation Phase has been completed.

SECTION 2:

OVERHEAD TRANSMISSION POWERLINE: SEGMENT C – E

9. BASELINE ENVIRONMENTAL DESCRIPTION

9.1 Location

This section of the report concerns only Segment C – E of the Kwagga OTP route as indicated by the blue and yellow lines in Figure 17. The segment of the 132kV OTP runs from Substation C tot Substation E via Substation D.

Figure 17: Location of Segment C – E (via D) (blue and yellow lines) along the Kwagga overhead transmission powerline route.

9.2 Geology and Land type

Geologically, this segment is underlain by mudstones with sandstone and green cherty beds (Pa) of the Abrahamskraal Formation, Beaufort Group) and the land type is classified as Fc where lime occurs regularly in both upland and valley bottom soils.

9.3 Vegetation

Six habitat types (plant communities) were distinguished along this segment (Figure 18). For a description of the general area the reader is referred to Chapter 5 of the generic section (Section 1), whereas the discussion here will focus on the powerline route.

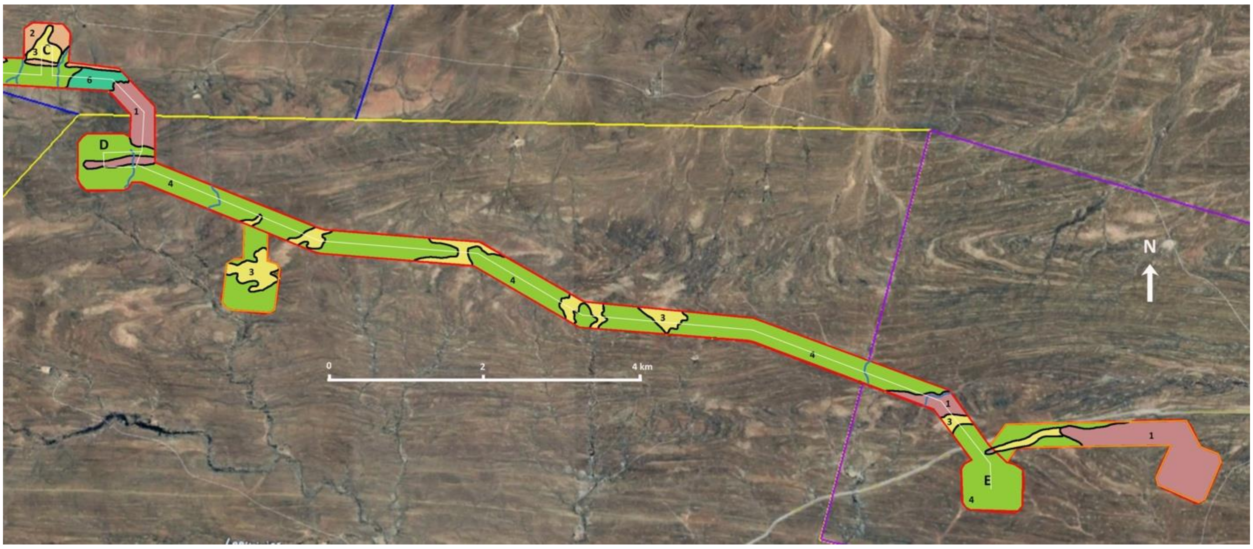

Figure 18: Vegetation of Segment C – E (via D) of the Kwagga overhead transmission powerline route.

Habitat 1: This shrubveld occurs on crests and scarps of hills, ridges and mountains and covered a substantial portion of the route in Segment C - D. As small section of Habitat 1 was also found to the north of Substation E. Surface rocks cover from 10% to >75% of the area and gravel covers from 10–30% of the soil surface.

- Small **trees** (>3–6 m) are characterised by *Searsia pallens* and *Diospyros lycioides*.
- The most prominent **shrub** species are *Rhigozum obovatum, Grewia robusta* and *Gymnosporia szyszylowiczii.*
- **Dwarf shrubs** include *Lycium cinereum, Pentzia incana, Hermannia linearifolia, Nenax microphylla, Gorteria alienata, Lasiosiphon deserticola, Pentzia quinquefida, Lacomucinaea lineata, Pteronia glauca, Pteronia adenocarpa, Anacampseros albidiflora* and *Ruschia intricata.*
- The dominant **grass** species include *Aristida adscensionis, Aristida congesta, Aristida diffusa, Digitaria argyrograpta* and *Tragus koelerioides*.
- **Succulent** species that are prominent in this habitat include *Euphorbia stellispina, Trichodiadema pomeridianum* and *Drosanthemum* spp.
- The most common **forb** (herbaceous non-graminoid) species include *Dianthus micropetalus, Chaenostoma* sp.*, Gazania heterochaeta, Cuspidia cernua* and *Curio radicans*.

Rare and/or protected species along the powerline route in Habitat 1:

SA Red data list:	None (Sensitive species 1039 was not found in Segment C – E)
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	Several species of Aizoaceae; 1 species of Apocynaceae; 1 species of Iridaceae; 1 species of *Anacampseros*
CITES:	*Anacampseros ustulata, Euphorbia stellispina, E. mauritanica; E. mauritanica* var*. minor*
Endemic species:	None

Habitat 2: This shrubveld occurs on crest of hills and ridges and covers a portion of Substation C. Surface rocks cover from 10% to >75% of the area and gravel covers from 10–30% of the soil surface.

- Small **trees** (>3–6 m) are represented by *Diospyros lycioides* and *Searsia pallens*.
- **Shrubs** are characterised by *Rhigozum obovatum, Grewia robusta, Searsia burchellii* and *Gymnosporia szyszylowiczii.*
- **Dwarf shrubs** include *Ruschia intricata* (d), *Eriocephalus ericoides* (d), *Chrysocoma ciliata* (d), *Lycium cinereum, Asparagus aethiopicus, Pteronia empetrifolia, Pteronia adenocarpa, Eriocephalus brevifolius, Helichrysum pumilio, Hermannia linearifolia, Monsonia camdeboensis, Amphiglossa* sp., *Lacomucinaea*

lineata, Pteronia glauca and *Nenax microphylla.*
- Prominent **succulent** species in this habitat include *Euphorbia stellispina, Euphorbia mauritanica, Antimima* sp.*, Mesembryanthemum (Phyllobolus)* sp., *Mesembryanthemum (Psilocaulon)* sp.*, Trichodiadema pomeridianum, Anacampseros albidiflora* and *Drosanthemum lique.*
- The dominant **grass** species include *Aristida adscensionis, Aristida diffusa, Enneapogon desvauxii, Oropetium capense* and *Tragus koelerioides*.
- The most common **forb** (herbaceous non-graminoid) species include *Galenia sarcophylla, Sericocoma avolans, Dianthus micropetalus, Gazania heterochaeta* and *Curio radicans*.

Rare and/or protected species along the powerline route in Habitat 2:

SA Red data list:	None (Sensitive species 1039 was not found in Segment C – E)
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	Several species of the Aizoaceae; *Haworthiopsis nigra*
CITES:	*Euphorbia mauritanica* var*. minor*
Endemic species:	None

Habitat 3: This dwarf shrubveld occurs on the rocky plains and low hills and covers portions of Substations C and D and some small sections between Substations D and E. The habitat is characterised by quartzitic gravel, which covers from <10 to >50% of the soil surface.
- Small **trees** (>3–6 m) are characterised by *Diospyros lycioides*.
- **Shrubs** are represented by *Rhigozum obovatum* and *Grewia robusta.*
- **Dwarf shrubs** include *Ruschia cradockensis* (d), *Eriocephalus ericoides* (d), *Ruschia intricata* (d), *Nenax microphylla, Lycium cinereum, Pteronia empetrifolia, Felicia filifolia, Monsonia camdeboensis, Salsola* spp., *Lacomucinaea lineata, Asparagus burchellii, Lasiosiphon deserticola, Pteronia glauca* and *Chrysocoma ciliata.*
- Prominent **succulent** species include *Anacampseros papyracea, Anacampseros ustulata, Euphorbia stellispina, Euphorbia mauritanica, Crassula deltoidea, Trichodiadema pomeridianum, Drosanthemum lique* and *Mesembryanthemum (Psilocaulon)* sp.
- The dominant grass species include *Aristida adscensionis, Aristida congesta, Aristida diffusa, Tragus koelerioides, Oropetium capense* and *Enneapogon desvauxii*.
- The most common **forb** species include *Gazania heterochaeta* and *Curio radicans*.

Rare and/or protected species along the powerline route in Habitat 3:

SA Red data list:	None
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	Several species of the Aizoaceae*;* 1 species in the Iridaceae; 2 species of *Anacampseros;*
CITES:	*Anacampseros ustulata, A. papyracea, Euphorbia stellispina, Euphorbia mauritanica*
Endemic species:	None

Habitat 4: This shrubveld occurs on the rocky plains and covers the largest part of Segment C – E.
- Small **trees** are characterised by *Searsia pallens* and *Diospyros lycioides.*
- **Shrubs** are represented by *Rhigozum obovatum (d), Grewia robusta* and *Searsia burchellii.*
- **Dwarf shrubs** include *Lycium cinereum (d), Eriocephalus ericoides (d), Ruschia intricata, Chrysocoma ciliata, Pentzia incana, Asparagus burchellii, Asparagus mucronatus, Lacomucinaea lineata, Hermannia grandiflora, Nenax microphylla, Gorteria alienata, Lasiosiphon deserticola* and *Pteronia glauca.*

- Prominent **succulent** species include *Euphorbia stellispina, Euphorbia mauritanica, Anacampseros ustulata, Drosanthemum lique, Mesembryanthemum noctiflorum, Mesembryanthemum (Psilocaulon)* sp., *Trichodiadema pomeridianum* and *Crassula capitella.*
- The dominant **grass** species include *Aristida adscensionis, Aristida congesta* and *Aristida diffusa*.
- The most common **forb** species include *Gazania heterochaeta* and *Cuspidea cernua.*

Rare and/or protected species along the powerline route in Habitat 4 include:

SA Red data list:	None
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	Several species of the Aizoaceae, 1 species in the Apocynaceae; 1 species of Asphodelaceae
CITES:	*Euphorbia stellispina, E. mauritanica*
Endemic species:	None

Habitat 6: This shrubveld occurs in small spots on somewhat deeper soils on the plains mainly to the east of Substation C. Surface rock and gravel generally cover <10% of the soil surface.

- Small **trees** are characterised by *Vachellia karroo* and *Diospyros lycioides*.
- **Shrubs** are represented by *Rhigozum obovatum* (d), *Searsia burchellii, Gymnosporia szyszylowiczii, Grewia robusta, Lycium oxycarpum* and *Cadaba aphylla.*
- **Dwarf shrubs** include *Ruschia intricata* (d), *Lycium cinereum* (d), *Eriocephalus ericoides* (d), *Tetraena chrysopteron, Pentzia incana, Asparagus aethiopicus, Lacomucinaea lineata, Chrysocoma ciliata* and *Pteronia adenocarpa.*
- Prominent **succulent** species include *Euphorbia stellispina, Trichodiadema pomeridianum, Drosanthemum lique* and *Drosanthemum hispidum*.
- The dominant **grass** species include *Aristida adscensionis, Aristida congesta, Aristida diffusa, Enneapogon desvauxii, Stipagrostis obtusa, Tragus berteronianus* and *Oropetium capense*.
- The most common **forb** species species include *Sesamum capense, Kewa salsoloides* and *Galenia sarcophylla*.

Rare and/or protected species in Habitat 6:

SA Red data list:	None (Sensitive species 1039 was not found in Segment C – E)
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	Several species of the Aizoaceae;
CITES:	None
Endemic species:	None

Habitat 8: This habitat is found on the alluvial soils associated with the watercourses on site.

- Prominent **tall trees** (>6 m) prominent species include *Vachellia karroo* and *Searsia lancea*.
- **Small trees** (>3–6 m) are characterised by *Diospyros lycioides* and *Searsia pallens.*
- **Shrubs** are characterised by *Lycium oxycarpum, Searsia burchellii, Gymnosporia szyszylowiczii, Carissa haematocarpa* and *Grewia robusta.*
- **Dwarf shrubs** include *Lycium cinereum, Melianthus comosa, Oedera humilis, Roepera lichtensteiniana, Salsola* spp. and *Pentzia incana.*
- **Succulent** species in this habitat include *Mesembryanthemum guerichianum*, *Mesembryanthemum noctiflorum, Malephora* sp., *Aptenia* sp., and *Mesembryanthemum (Psilocaulon)* sp.
- The dominant **grass** species include *Setaria verticillata, Cenchrus ciliaris, Stipagrostis namaquensis, Stipagrostis ciliata, Chloris virgata* and *Cynodon incompletus*.

- The most common **forb** species include *Leysera tenella, Galenia papulosa, Aptosimum indivisum, Arctotis leiocarpa* and *Kewa salsoloides.*

Rare and/or protected species in Habitat 8:

SA Red data list:	None
NEM:BA (ToPS):	None
NFA:	None
WCNECO:	Several species of the Aizoaceae; 1 species of Apocynaceae;
CITES:	None
Endemic species:	None

9.4 National Environmental Management: Protected Areas Act (Act No. 10 of 2003) and National Protected Areas Expansion Strategy (NPAES)

The study site is not located in a statutorily protected area nor does it form part of the NPAES (NPAES 2010).

9.5 National list of ecosystems that are threatened and in need of protection

The site is located in the Gamka Karoo (NKl 1) vegetation type (Mucina & Rutherford 2006) which is classified as Least Concern with about 2.6% statutorily conserved in the Karoo National Park and some private nature reserves (Mucina & Rutherford 2006, NEMA 2011, Skowno *et al*. 2019). Only a small part has undergone transformation.

9.6 Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs)

The CBA map in Figure 19 indicates a CBA marginally intersecting the powerline route north of Substation E.

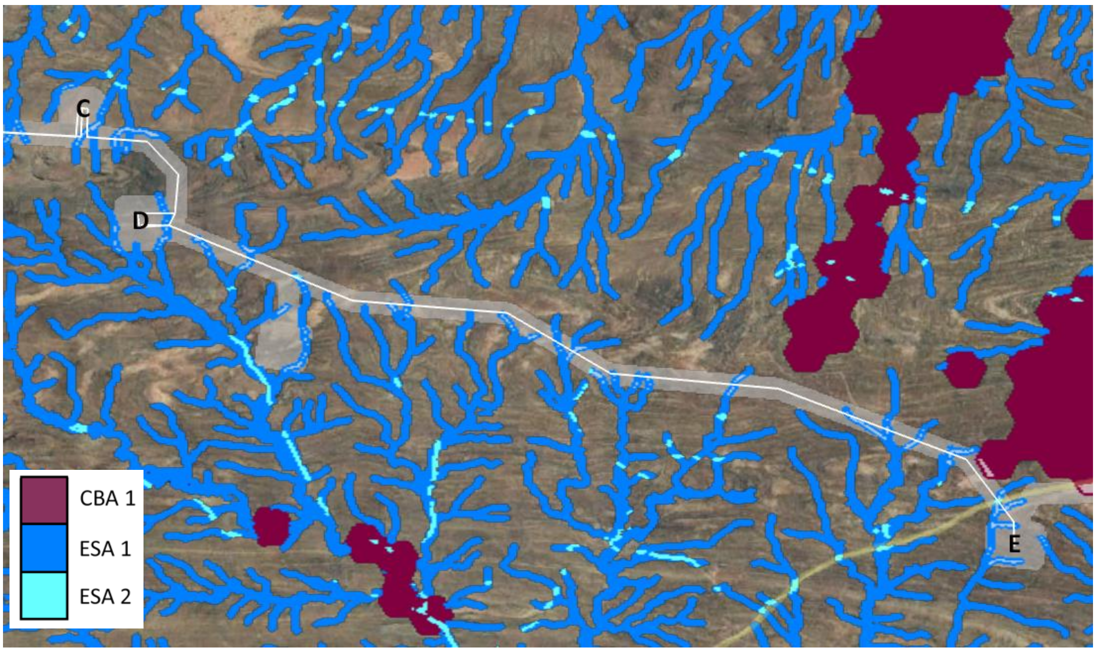

Figure 19: Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs - uncoloured) along Segment C – E of the Kwagga OTP site and environs (biodiversityadvisor.sanbi.org).

Development within Critical Biodiversity Areas is not encouraged. According to the Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet *et al*. 2017) permissible land uses are those that are compatible with maintaining the natural vegetation cover of CBAs in a healthy ecological state, and that do not result in loss or degradation of natural habitat. Undesirable land uses in terrestrial CBAs are those that cause loss of natural habitat or ecosystem functionality, such as: (i) mining or prospecting; (ii) intensive agriculture (cultivation) or plantation forestry; (iii) residential, commercial or industrial developments; (iv) game-proof fences in CBA corridors; (v) linear infrastructure that disrupts the connectivity of CBA corridors; and (vi) extensive or intensive grazing that results in species diversity being lost through selective or over-grazing (Pool-Stanvliet *et al*. 2017). Since a powerline can maintain the natural vegetation cover of CBAs in a healthy ecological state, it can be regarded as a permissible land use. Nevertheless, CBAs should be avoided wherever possible.

An Ecological Support Area (ESA) is not essential for meeting biodiversity targets but plays an important role in supporting the ecological functioning in a CBA. ESAs need to be maintained in at least a functional and often natural state, but some limited habitat loss may be acceptable. It is important that the project should not compromise the functional (natural) state of the ESAs as required by the conservation plan of the Western Cape (Pool-Stanvliet et al. 2017). The ESAs in Figure 19 follow the smaller watercourses with a number of ESAs in Section C – E.

9.7 Freshwater Ecosystem Priority Areas (FEPAs)

Freshwater Ecosystem Priority Areas (FEPA) are priority areas for conserving freshwater ecosystems and supporting sustainable use of water resources and upstream management areas (Driver *et al*. 2011) (Figure 20). The areas classified as Freshwater Ecosystem Priority Areas (FEPA) intersect the powerline route in Segment C – D as well as towards the alternative for Substation E.

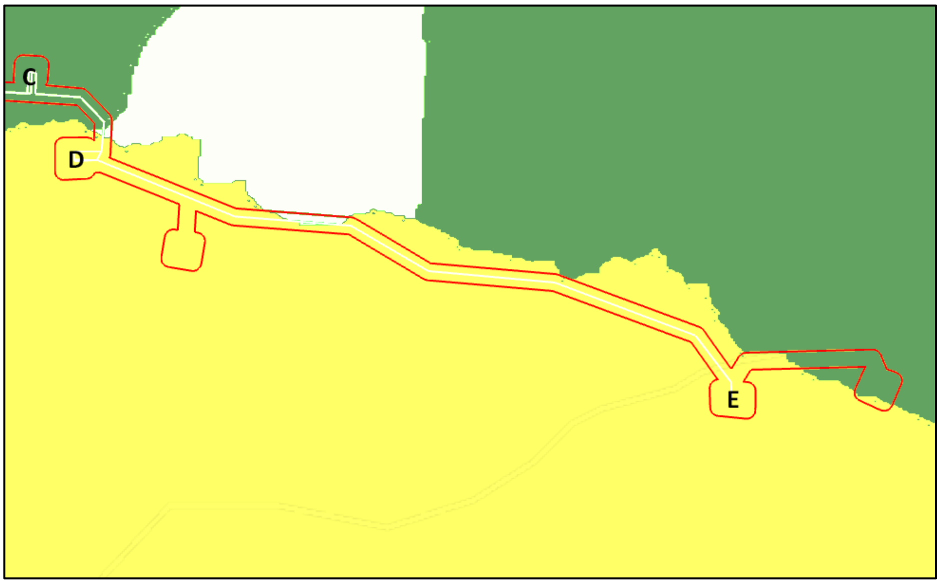

Figure 20: FEPAs along Segment C – E of the Kwagga overhead transmission powerline route.

9.7 Sensitivity map

Overall, the mountainous parts (Habitats 1 & 2), quartz patches (Habitat 3) and drainage lines (Habitat 8) were more sensitive than the plains. None of the habitats were rated as having a high or very high sensitivity.

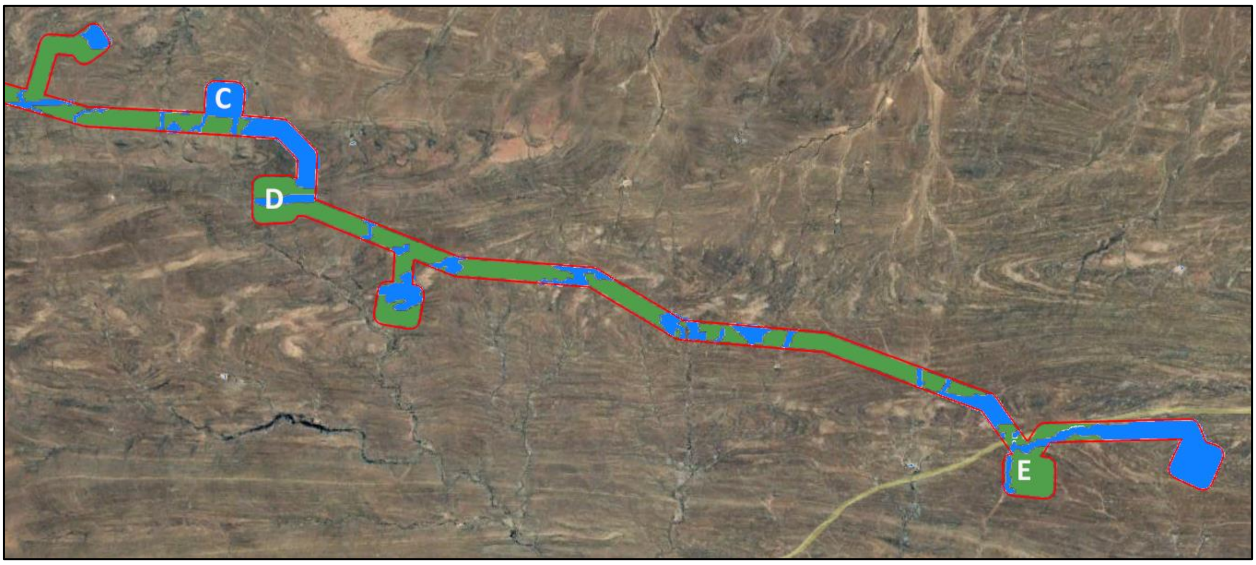

Figure 21: Sensitivity map of the Kwagga OTP route Segment C – E. Blue indicates a moderate sensitivity and green a low sensitivity.

10. SCREENING REPORT

10.1 Summary of screening tool results

10.1.1 Plant Species Theme

The screening tool rated the sensitivity of the Plant Species Theme as **Medium** (Figure 22) and three species were highlighted as being of concern.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 383
Medium	*Peersia frithii*
Medium	Sensitive species 1039

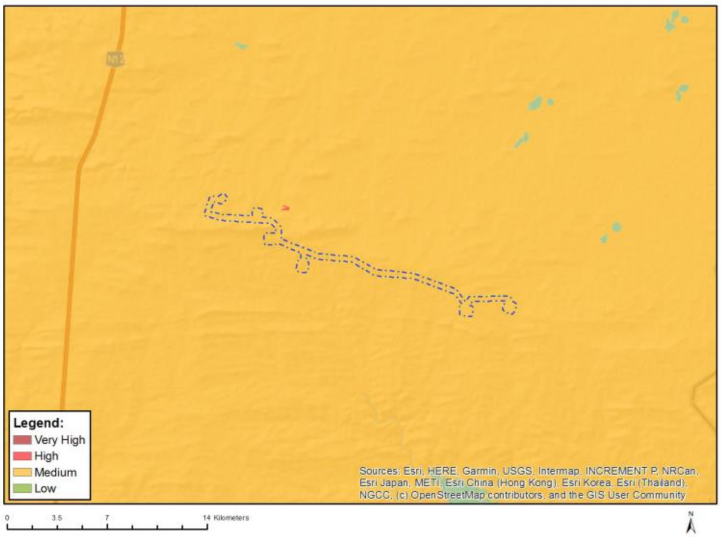

Figure 22: Map and outcome of the Plant Species Theme sensitivity generated by the screening tool.

10.1.2 Animal Species Theme (birds excluded)

The screening tool rated the sensitivity of the overall Animal Species Theme as **High** (Figure 23), **however if the birds are excluded the rating changes to Medium**. Animal species highlighted by the screening tool for the region included the Karoo dwarf tortoise (*Chersobius boulengeri*). The other species mentioned (*Afrotus afra, Polemaetus bellicosus, Neotis ludwigii and Circus maurus*) will be discussed in the report by the avifaunal specialist.

Very high sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	x		

Sensitivity	Feature(s)
High	Aves-Neotis ludwigii
High	Aves-Polemaetus bellicosus
Medium	Aves-Afrotis afra
Medium	Aves-Neotis ludwigii
Medium	Reptilia-Chersobius boulengeri

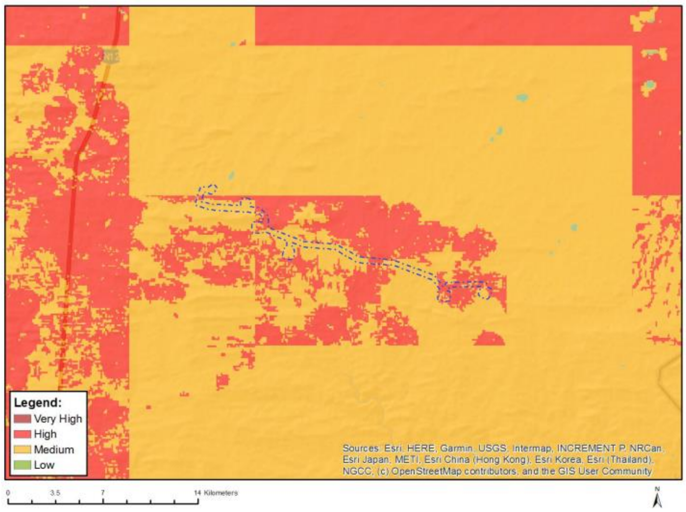

Figure 23: Map and outcome of Animal Species Theme sensitivity generated by the screening tool.

10.1.3 Relative Terrestrial Biodiversity Theme

The screening tool rated the sensitivity of the Relative Terrestrial Biodiversity theme as **Very High** (Figure 24). The following features were highlighted:

Very high sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
x			

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiversity area 1
Very High	Ecological support area 2
Very High	FEPA Subcatchments

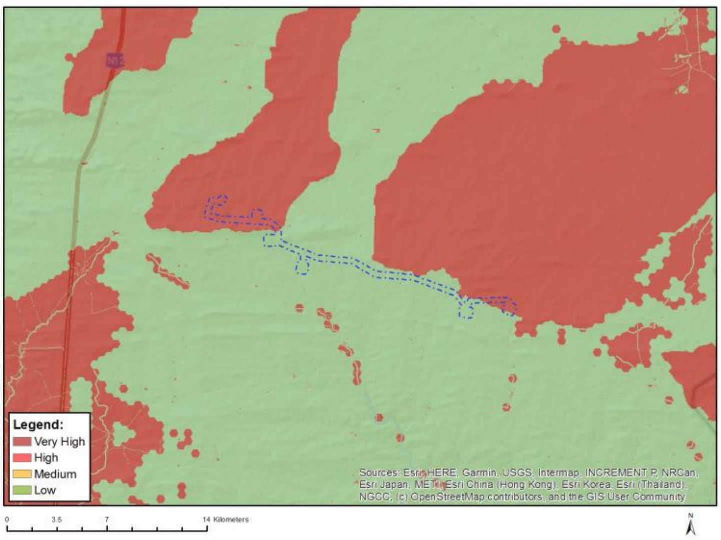

Figure 24: Map and outcome of Relative Terrestrial Biodiversity sensitivity generated by the screening tool.

10.2 Screening tool in relation to background study and site assessment

10.2.1 Plant Species Theme

None of the mentioned species were encountered along Segment C – E of the Kwagga OTP route. However, several provincially protected/specially protected and CITES II listed species were recorded on site. These species are mostly associated with cliffs, scarps, quartz patches and rocky ridges (outcrops) and pylons should avoid these habitats. Our background study and site assessment would therefore downgrade the Plant Species Theme to a **Low** sensitivity.

10.2.2 Animal Species Theme

Our background study indicated that the Kwagga overhead powerline could indeed fall within the distribution range of the Karoo dwarf tortoise (Animal Demography Unit reptile map) although it was not recorded during the site visit. The closest records of the species are approximately 20 – 40 km from the Kwagga OTP site. A site visit (September 2021) by a specialist herpetologist on the farm Trakaskuilen yielded no evidence of live specimens or shell fragments of Karoo Dwarf Tortoise. This tortoise has a strong affinity with dolerite ridges and other types of rocky outcrops in the Nama Karoo biome. It utilises holes or cavities under rocks as shelter, which are considered the most important components of essential habitat that determines the likelihood of presence or absence in an area. The conclusion by the specialist was that the species was indeed absent from this particular area judging by the general lack of suitable habitat on Trakaskuilen. We would thus suggest a downgrading of the Animal Species Theme to a **Low** sensitivity.

10.2.3 Relative Terrestrial Biodiversity Theme

This theme considers the presence of protected areas, National Protected Area Expansion Strategy (NPAES), CBA, ESA and National Freshwater Ecosystem Priority Area (NFEPA). The study area is not located in a protected area and the vegetation type on site is listed as Least Concern.

Our background study indicated that the development will have no impact on existing protected areas nor affect the NPAES. There is only a very small section of the Kwagga OTP route (north of Substation E) where a CBA marginally intersects the route and pylons should preferably not be located within the areas demarcated as CBA. Overall, the impact of the development within the identified CBAs and ESAs can be limited by good planning. Freshwater Ecosystem Priority Areas (FEPAs) intersect a section of Segment C – E of the powerline route. However, the area mapped as FEPA did not emerge as being highly sensitive in the current botanical assessment and the sensitivity model that was applied, classified only the drainage lines in the FEPA as being of medium sensitivity.

Considering the fact that none of the habitats had a high sensitivity, we would downgrade the Relative Terrestrial Biodiversity Theme to a Medium sensitivity.

11. ASSESSMENT OF SIGNIFICANCE OF ENVIRONMENTAL IMPACT

11.1 Impacts during the construction phase and their significance

11.1.1 Direct impacts during the construction phase

The clearing of natural vegetation

Nature: Natural vegetation will be cleared for the powerline servitude, upgrading of existing tracks and pylon sites. The removal of indigenous vegetation may cause a loss of individuals of threatened, protected and/or endemic species and will also be accompanied by a loss of faunal habitat. Overall, this may lead to an impoverished biodiversity at those sites. Vegetation loss is generally also associated with increased water run-off and erosion (see indirect impacts).

Where vegetation clearance is required for roads and permanent infrastructure, thus in areas that will not be rehabilitated, the impact on the vegetation would be long-term. The direct footprint of the powerline should however be small. Beyond the footprint, environmental functions and processes should not be altered.

Proposed mitigation measures:

- Micrositing of Substation C to avoid Habitat 3 and Substation D to avoid Habitat 1 is proposed (see Figures 18 & 21).
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions.
- Ensure that temporary use areas are located in areas of low sensitivity.
- Footprints of the substation locations and pylons should be clearly demarcated.
- Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided.
- Any cliffs and rocky sheets should be avoided.
- All vehicles are to remain on demarcated roads and no driving in the veld should be allowed.
- No collection of fuelwood should be allowed on site.
- The ECO is to provide supervision on vegetation clearing activities and other activities which may cause damage to the environment, especially when construction commences and most vegetation clearing is taking place.
- Pylons should not be located within or near watercourses or on rocky ridges where small ‘cliffs’ are present, on rocky sheets or on the rocky crest of ridges (Figure 25).
- Patches of quartzitic gravel should also be avoided (part of Habitat 3).
- River/stream crossings should follow the specific guidelines of the aquatic specialist.
- River/stream crossings should be specifically designed not to impede or disrupt the direction and flow of the water. Specific guidelines of the aquatic specialist should be followed.
- No plants may be translocated or otherwise uprooted or disturbed without express permission from the ECO.

Figure 25: Example of a cliff that should be avoided in the placement of pylons.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Moderate
Probability	Very likely	Very likely
Reversibility	Low	Low
Irreplaceability	Moderate	Moderate
Significance	**Low**	**Low**
Confidence level of assessment	Medium	Medium

The loss of threatened, protected & endemic plant species

Nature: The loss of the vegetation for the powerline servitude, upgrading of existing tracks, pylon sites and substation may cause a loss of individuals of protected plant species. However, none of the screening tool listed species were encountered along the Kwagga OTP route Segment C – E. Many provincially protected plant species were present, most of them are quite common and some even weedy. As the protected species at the site are not threatened species, the loss of individuals and habitat of these species is not likely to threaten the local or regional populations of these species. The loss of some individuals of protected species is unlikely to alter the patterns or processes of the natural system, in the sense that environmental functions and processes will temporarily or permanently cease. The rare protected species are often habitat specialists (e.g. found on rocky sheets or quartzitic gravel) and in those cases the habitat should be avoided. Permits need to be obtained for the destruction of provincially specially protected or protected species.

A herpetological investigation on Trakaskuilen could find no evidence of live specimens or shell fragments of the Karoo dwarf tortoise. Furthermore, the habitat was not regarded suitable for the species.

Proposed mitigation measures:

- Construction crew, in particular the drivers, should undergo environmental training (induction) to make them aware of the importance of protected species.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative

Spatial extent	Site specific	Site specific
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Moderate
Probability	Likely	Likely
Reversibility	Low	Low
Irreplaceability	Moderate	Moderate
Significance	**Low**	**Low**
Confidence level of assessment	Medium	Medium

Loss of faunal habitat

Nature: The loss of the vegetation due to the powerline servitude, upgrading of existing tracks, pylon sites and substation will be accompanied by a loss of faunal habitat.

Proposed mitigation measures:

- Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns.
- Speed limits should be set on all roads and strictly adhered to.
- Development should avoid drainage lines and rocky outcrops. The outcrops may be favoured habitat for reptiles and other species (e.g. hyrax or dassie) since they offer protection from predators.
- Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the sites.
- Observe buffer zones along drainage lines as prescribed by the aquatic specialist.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	Low	Low
Irreplaceability	Moderate	Moderate
Significance	**Low**	**Very low**
Confidence level of assessment	Moderate	Moderate

Direct faunal mortalities due to construction and increased traffic

Nature: Faunal mortalities may be caused by construction at the footprint of the infrastructure, construction vehicles or other operational activities. In particular slow-moving species such as tortoises, might be prone to these mortalities. When animals ingest waste material or become ensnared in wires fatalities might also occur.

Larger more mobile fauna such as antelope and larger predators will most likely move away from areas of high activity during the construction phase. Smaller and less-mobile animals are not as capable of moving away and may seek shelter down burrows and other shelter sites. The risk of poaching as well as persecution of fauna such as snakes, might increase due to the increased number of personnel on-site during construction and the improved access roads. The red-listed fauna which may occur at the site are however usually shy species which occur at a low density and it is unlikely that any of the red-listed fauna would be directly encountered by people at the site.

Proposed mitigation measures:

- Construction crew, in particular the drivers, should undergo environmental training to increase their awareness of environmental concerns. The crew should also be made aware of not harming or collecting species such as snakes, tortoises and owls which are often persecuted.
- Proper waste management procedures should be in place to avoid litter, food or other foreign material from lying around and all waste material should be removed from the site.
- No night driving should be allowed at the site.
- Speed limits should be set on all roads on site.
- Personnel should not be allowed to roam into the veld.
- Ensure that cabling and electrical infrastructure at the site is buried sufficiently deeply to avoid being excavated by fauna and that where such infrastructure emerges above-ground that it is sufficiently protected from gnawing animals.
- Any dangerous fauna (e.g. snakes, scorpions) that are encountered during construction should not be handled or molested by construction staff and the ECO or other suitably qualified persons should be contacted to remove the animals to safety.
- Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have an escape ramp to allow any fauna that fall in to escape.
- If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals.
- Should electrical fences be erected it must be done according to the norms and standards of the Nature Conservation Authorities in the Western Cape.
- Access to the site should be strictly regulated to reduce the opportunities for poaching.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Short-term	Short-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	Low	Low
Irreplaceability	Moderate	Moderate
Significance	**Low**	**Very low**
Confidence level of assessment	Medium	Low

Increased dust deposition

Nature: Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing. The increased dust levels will be temporary.

Proposed mitigation measures:

- Excessive dust can be reduced by spraying water onto the roads or other disturbed areas during construction activities.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Short-term	Short-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	High	High
Irreplaceability	-	-
Significance	**Low**	**Very low**
Confidence level of assessment	High	High

Increased human activity and noise levels

Nature: Construction activities will increase human presence and noise levels on site. These activities may affect animal behaviour. Increased noise associated with the construction phase are temporary.

Proposed mitigation measures:

- The SANS standards should be adhered to in terms of noise levels.
- No construction should be done at night.
- If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Short-term	Short-term
Consequence (Severity)	Substantial	Slight
Probability	Likely	Likely
Reversibility	High	High
Irreplaceability	-	-
Significance	**Moderate**	**Very low**
Confidence level of assessment	High	High

11.1.2 Indirect impacts during the construction phase

Establishment of alien vegetation

Nature: As a result of the clearance of indigenous vegetation and resulting degradation, alien species might invade the area. Alien invasive species are currently not common in the area, although a few declared invasive species were noted on site. Increased vehicle traffic may further facilitate the introduction of seeds of alien species. Infestation by invasive alien species may cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation. Bare areas that are not actively rehabilitated and areas receiving runoff are particularly vulnerable to alien infestation.

Proposed mitigation measures:

- Implement a monitoring program for the early detection of alien invasive plant species.
- A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts.

- Herbicides for the control of alien species should be applied according to the instructions and by appropriately trained personnel.
- No alien species should be used in rehabilitation or landscaping.
- Use only plants and seed collected on-site for revegetation.
- Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife.
- Material brought onto site e.g. building sand should be regularly checked for the germination of alien species.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Local	Local
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Low**	**Very low**
Confidence level of assessment	Medium	Medium

Increased water run-off and erosion

Nature: Increased erosion (water and wind) and water run-off will be caused by the clearing of the indigenous vegetation and compaction of soil. Servitude roads traversing hill slopes will be the main source of erosion if not properly constructed and provided with water run-off structures. In addition, the hardened surfaces created by the roads and other infrastructure elements will increase runoff, which will pose an erosion risk in the areas receiving the water. The potential for erosion is further increased because the site lies within the summer rainfall region and receives a large proportion of rainfall as intense thundershowers. Increased run-off and erosion could change water and silt discharge into the streams. Terrain in Segment C – E of the powerline is relatively flat and with proper mitigation measures run-off and erosion can be contained.

Proposed mitigation measures:

- Clearing of vegetation, compaction and levelling should be restricted to the footprint of the proposed development.
- All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area.
- A rehabilitation and revegetation plan should be developed as part of the EMP.
- Regularly monitor the site during construction for erosion problems.
- Silt traps should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- If applicable, topsoil should be removed and stored separately and reapplied as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- Where applicable, construct gabions and other stabilization features on steep slopes to prevent erosion.
- Reduce activity on site after large rainfall events when the soils are wet. No driving off hardened roads should be allowed until soils have dried out and the risk of bogging down has decreased.
- A suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site-specific to regional	Local
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	Low	Low
Irreplaceability	Moderate	Moderate
Significance	**Low**	**Very low**
Confidence level of assessment	Medium	Medium

11.2 Impacts during the operational phase and their significance

11.2.1 Direct impacts during the operational phase

Direct faunal mortalities

Nature: Faunal mortalities may be caused by maintenance vehicles or other maintenance activities, electric fences and ingestion of waste material. In particular slow-moving species such as tortoises, might be prone to road mortalities. Fatalities might also arise when animals become ensnared in wires or in electric fences.

Although activity at the site is likely to be relatively low during operation, some impact on fauna may still occur as a result of personnel present on site as well as the operation of maintenance vehicles. Major risk factors during operation are likely to be from vehicle collisions with fauna.

Proposed mitigation measures:

- Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns.
- Access to the site should be strictly controlled.
- All excess wires, cables and waste material should be removed from the site.
- All vehicles at the site should adhere to a low speed limit and slow-moving fauna such as tortoises on roads should be moved off the road.
- No activity should be allowed at the site between sunset and sunrise.
- Electrical fences should be erected according to the norms and standards of the Nature Conservation Authorities in the Western Cape.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Long-term	Long-term
Consequence (Severity)	Slight	Slight
Probability	Likely	Unlikely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Very low**	**Very low**
Confidence level of assessment	Medium	Medium

11.2.2 Indirect impacts during the operational phase

Establishment of alien vegetation

Nature: As a result of the loss of indigenous vegetation and resulting degradation, primarily during the construction phase, alien species might invade the area. Alien invasive species are generally more common in road reserves than the adjacent undisturbed farmland. The invasion by alien species will continue unless controlled. Increased vehicle traffic may further facilitate the introduction of seeds of alien species. Infestation by invasive alien species may eventually cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation.

Proposed mitigation measures:

- Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species.
- No alien species should be used for landscaping, rehabilitation or any other purpose.
- Clearing of alien species should be done on a regular basis.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Local	Local
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Low**	**Very Low**
Confidence level of assessment	Medium	Medium

Increased water run-off and erosion

Nature: Disturbance created during construction will take several years to fully stabilise and the increase in compacted areas as a result of roads may increase runoff which will pose an erosion risk. Particular areas of concern would be roads traversing steep slopes as well as any infrastructure on steep or gentle slopes with erodible soils. Consequently, erosion risk during operation is likely to be centred on areas disturbed during construction and on areas receiving runoff from roads and similar hardened surfaces. Increased run-off and erosion could affect hydrological processes in the area and may change water discharge into the streams and increase silt load.

Proposed mitigation measures:

- Proper road maintenance procedures should be in place.
- Regular monitoring of the site during operation for erosion problems.
- Should new sections of the road be needed, a suitably qualified person should plan, design and supervise the proper construction of roads.
- Reduce activity at the site after large rainfall events when the soils are wet.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Local	Local

Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Likely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Low**	**Very low**
Confidence level of assessment	Medium	Medium

11.3 Impacts during the decommissioning phase and their significance

11.3.1 Direct impacts during the decommissioning phase

Faunal mortalities

Nature: Faunal mortalities may be caused by vehicles or other decommissioning activities and waste. In particular slow-moving species such as tortoises, might be prone to road mortalities. When animals ingest waste material or become ensnared in it fatalities might also occur.

Proposed mitigation measures:

- Decommissioning crew should undergo environmental training to increase their awareness of environmental concerns.
- Speed limits should be adhered to.
- Proper waste management procedures should be in place and no material should be left on site in order to prevent instances of ensnarement or ingestion of foreign material.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Short-term	Short-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Low**	**Very low**
Confidence level of assessment	Medium	Medium

Increased dust deposition

Nature: Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing the dust covered vegetation. The increased dust levels will be temporary.

Proposed mitigation measures:

- Excessive dust can be reduced by spraying water on roads and other disturbed areas.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Site specific	Site specific
Duration	Short-term	Short-term

Consequence (Severity)	Moderate	Slight
Probability	Likely	Unlikely
Reversibility	High	High
Irreplaceability	-	-
Significance	**Low**	**Very low**
Confidence level of assessment	High	High

11.3.2 Indirect impacts during the decommissioning phase

Establishment of alien vegetation

Nature: As a result of the decommissioning activities, areas will be disturbed and alien species might invade. Increased vehicle traffic may facilitate the introduction of seeds of alien species.

Proposed mitigation measures:

- Implement a monitoring program for at least three years after decommissioning to document vegetation recovery and alien infestation across the site.
- A control program to combat declared alien invasive plant species should be employed.
- Areas where infrastructure is removed, must be revegetated with indigenous plant species.
- No alien species should be used for rehabilitation/revegetation or any other purpose.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Local	Local
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Likely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Low**	**Very low**
Confidence level of assessment	Medium	Medium

Increased water run-off and erosion

Nature: Some of the existing roads might have to be upgraded and increased erosion and water run-off will thus be caused by the clearing of the indigenous vegetation and soil disturbance. Decommissioning would involve the removal of all infrastructure and the rehabilitation of the area. If the rehabilitation is not successful, this would leave the site vulnerable to erosion. Without management, increased run-off and erosion could affect hydrological processes in the area and may change water discharge into the streams and increase silt load.

Proposed mitigation measures:

- No new roads should be built.
- Proper road maintenance procedures should be in place.
- Removal of all infrastructure components from the site.
- Rehabilitation of all cleared and disturbed areas with local species.
- Off-site disposal of all facility components.
- Monitoring programme for at least three years after decommissioning to document vegetation recovery on site.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Local	Local
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Slight
Probability	Likely	Likely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Low**	**Very low**
Confidence level of assessment	Medium	Medium

11.4 Cumulative impacts

The existing and proposed developments within 50 km from the site that were taken into consideration for cumulative impacts include:

- Renewable energy projects:
    - Beaufort West WEF
    - Trakas WEF

These developments fall predominantly in the Gamka Karoo Vegetation Type with some sections in the Southern Karoo Riviere.

Vegetation loss and habitat destruction

Nature: Vegetation loss, habitat destruction and possibly loss of SCC, will occur. The habitat destruction will lead to changes in the physical features of the habitat, with concomitant changes in ecological processes. Secondary vegetation will develop at sites where the vegetation was cleared or the soil compacted. The species composition may change and alien species might invade. Vegetation loss will also constitute the loss of animal habitat. **It should however be noted that the contribution by Segment C – E of the Kwagga OTP to the cumulative impact will be negligible.**

Proposed mitigation measures:

- All projects should adhere to the site-specific recommendations of the ecologists to ensure that impacts are mitigated where possible.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Regional	Regional
Duration	Long-term	Long-term
Consequence (Severity)	Substantial	Moderate
Probability	Likely	Likely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Moderate**	**Low**
Confidence level of assessment	Medium	Medium

Compromising integrity of CBA, ESA and NPAES

Nature: According to the mapping of CBAs in the Western Cape, several of the proposed developments are located/partially located within CBAs. Development within CBAs is not encouraged as such development may result in biodiversity loss and therefore compromise the integrity of the CBA. Development is only permitted in a CBA on condition approval is granted by the relevant competent authority. Considering all developments in the Gamka Karoo, the CBAs in this vegetation type could be compromised and consequently the biodiversity target for the ecosystem could be affected. It should however, be taken into consideration that the transmission line could largely avoid encroaching the CBA by appropriate positioning of pylons. It is assumed that authorisation would only be granted to projects that have similarly tried avoiding CBAs.

The site does not fall in a protected area and is not earmarked for NPAES.

Proposed mitigation measures:

- Align roads and other infrastructure so that transformation within the CBAs and ESAs is minimised.
- River/stream crossings should follow the be specific guidelines of the aquatic specialist.
- Minimise the development footprint as far as possible.
- Stringent construction-phase monitoring of activities at the site to ensure that mitigation measures are adhered to and that the overall ecological impact of the development is maintained at a low level.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Regional	Regional
Duration	Long-term	Long-term
Consequence (Severity)	Substantial	Moderate
Probability	Likely	Unlikely
Reversibility	Low to moderate	Moderate
Irreplaceability	Low	Low
Significance	**Moderate**	**Low**
Confidence level of assessment	Medium	Medium

Reduced ability to meet conservation obligations & targets

Nature: The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets. Although the Gamka Karoo vegetation type is classified as Least Concern, it is poorly protected and certain habitats or communities may be disproportionately affected. Nevertheless, the proposed development of Segment C – E of the Kwagga OTP is small (901 ha) in relation to the 2032500 ha of the Gamka Karoo vegetation type (0.04%).

The site does not fall in a protected area and is not earmarked for NPAES.

Proposed mitigation measures:

- Sensitive habitats should be avoided.
- Minimise the development footprint as far as possible.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative

Spatial extent	Regional	Regional
Duration	Long-term	Long-term
Consequence (Severity)	Substantial	Moderate
Probability	Likely	Likely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Moderate**	**Low**
Confidence level of assessment	Medium	Medium

Loss of landscape connectivity and disruption of broad-scale ecological processes

Nature: Cumulatively, the developments and the associated transformation of intact vegetation, could pose a threat to the connectivity of the landscape. For fauna, the disruption is largely due to the hardened surfaces which also create open areas. However, Segment C – E of the Kwagga overhead transmission powerline lies in an arid area with a sparse vegetation cover and most species present are adapted to open spaces and the servitude road would not prevent most species from moving about the landscape. Subterranean species that have to emerge from the soil to cross the servitude will be most affected. The site is however already fairly fragmented for such species due to the presence of rocky outcrops and ridges across the site. The severity of any these impacts for faunal species is likely to be relatively low as the servitude road required for operation will still be of a natural surface and would experience low traffic volumes.

In the case of the vegetation, the small area that is denuded for the substation is unlikely to disrupt pollination and dispersal processes that could cause spatial fragmentation of populations. In the long-term the facility is not likely to create significant local or regional population-level impact on fauna or vegetation.

Proposed mitigation measures:

- Sensitive areas should be avoided and least-impact locations should be identified for river/stream crossings.
- Minimising the development footprint wherever possible.
- Revegetation of all cleared and bare areas created by the development with local species.
- Fences and other structures which impede faunal movement should be avoided where possible.

Significance without and with mitigation measures:

Parameter	Without mitigation	With mitigation
Status	Negative	Negative
Spatial extent	Regional	Regional
Duration	Long-term	Long-term
Consequence (Severity)	Moderate	Moderate
Probability	Likely	Unlikely
Reversibility	Moderate	Moderate
Irreplaceability	Low	Low
Significance	**Low**	**Low**
Confidence level of assessment	Medium	Medium

11.5 Impact assessment summary

Tables 5-8 summarise the impact assessment across all phases of the development and the integrated assessment post-mitigation per phase is provided in Table 9.

Table 5: Summary assessment of (a) direct and (b) indirect impacts and their mitigation measures during the construction phase

(a) Direct impacts

Impact	*Impact Criteria (after mitigation)*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE: DIRECT IMPACTS						
The clearing of natural vegetation	Status	Negative	Low	Micrositing of Substation C to avoid Habitat 3 and Substation D to avoid Habitat 1 is proposed (see Figures 18 & 21). Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions. Ensure that temporary use areas are located in areas of low sensitivity. Footprints of the substation locations and pylons should be clearly demarcated. Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided. Any cliffs, ridges and rocky sheets should be avoided. All vehicles are to remain on demarcated roads and no driving in the veld should be allowed. No collection of fuelwood should be allowed on site. The ECO is to provide supervision on vegetation clearing activities and other activities which may cause damage to the environment, especially when construction commences and most vegetation clearing is taking place. River/stream crossings should follow the specific guidelines of the aquatic specialist. River/stream crossings should be specifically designed not to impede or disrupt the direction and flow of the water. Specific guidelines of the aquatic specialist should be followed. No plants may be translocated or otherwise uprooted or disturbed without express permission from the ECO.	Low - 4	Medium
	Spatial Extent	Site specific				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Very likely				
	Reversibility	Low				
	Irreplaceability	Moderate				
The loss of threatened, protected & endemic plant and animal species	Status	Negative	Low	Construction crew, in particular the drivers, should undergo environmental training (induction) to make them aware of the importance of protected species.	Low - 4	Medium
	Spatial Extent	Site specific				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Unlikely				
	Reversibility	Low				
	Irreplaceability	Moderate				
Loss of faunal habitat	Status	Negative	Low	Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided. Construction crew, in particular the drivers, should undergo environmental training	Very low - 5	Medium
	Spatial Extent	Site-specific				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Unlikely				

	Reversibility	Low		(induction) to increase their awareness of environmental concerns. Speed limits should be set on all roads and strictly adhered to. Development should avoid drainage lines and rocky outcrops. The outcrops may be favoured habitat for reptiles and other species since they offer protection from predators. Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the sites.		
	Irreplaceability	Moderate				
Direct faunal mortalities	Status	Negative	Low	Construction crew, in particular the drivers, should undergo environmental training to increase their awareness of environmental concerns. The crew should also be made aware of not harming or collecting species such as snakes, tortoises and owls which are often persecuted. Proper waste management procedures should be in place to avoid litter, food or other foreign material from lying around and all waste material should be removed from the site. No night driving should be allowed on site. Speed limits should be set on all roads on site. Personnel should not be allowed to roam into the veld. Ensure that cabling and electrical infrastructure at the site is buried sufficiently deeply to avoid being excavated by fauna and that where such infrastructure emerges above-ground that it is sufficiently protected from gnawing animals. Any dangerous fauna (e.g. snakes, scorpions) that are encountered during construction should not be handled or molested by construction staff and the ECO or other suitably qualified persons should be contacted to remove the animals to safety. Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have an escape ramp to allow any fauna that fall in to escape. If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Should electrical fences be erected it must be done according to the norms and standards of the Nature Conservation Authorities in the Western Cape. Access to the site should be strictly regulated to reduce the opportunities for poaching.	Very low - 5	Medium
	Spatial Extent	Site specific				
	Duration	Short-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Low				
	Irreplaceability	Moderate				
Increased dust deposition	Status	Negative	Low	Excessive dust can be reduced by spraying water onto the roads or other disturbed areas during construction activities.	Very low - 5	High
	Spatial Extent	Site specific				
	Duration	Short-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	-				
Increased human activity and noise levels	Status	Negative	Moderate	The SANS standards should be adhered to in terms of noise levels. No construction should be done at night.	Very low - 5	High
	Spatial Extent	Site specific				
	Duration	Short-term				

	Consequence	Slight		Appropriate lighting should be installed to minimise negative effects on nocturnal animals.		
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	-				

(b) Indirect impacts

Impact	***Impact Criteria (after mitigation)***		***Significance and Ranking (Pre-Mitigation)***	***Potential mitigation measures***	***Significance and Ranking (Post-Mitigation)***	***Confidence Level***
CONSTRUCTION PHASE: INDIRECT IMPACTS						
Establishment of alien vegetation	Status	Negative	Low	Implement a monitoring program for the early detection of alien invasive plant species. A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts. Herbicides for the control of alien species should be applied according to the instructions and by appropriately trained personnel. No alien species should be used in rehabilitation or landscaping. Use only plants and seed collected on-site for revegetation. Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife. Material brought onto site e.g. building sand should be regularly checked for the germination of alien species.	Very low - 5	Medium
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Moderate				
	Irreplaceability	Low				
Increased erosion and water run-off	Status	Negative	Low	Clearing of vegetation, compaction and levelling should be restricted to the footprint of the proposed development. All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. A rehabilitation and revegetation plan should be developed as part of the EMP. Regularly monitor the site during construction for erosion problems. Silt traps should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas. If applicable, topsoil should be removed and stored separately and reapplied as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas. Where applicable, construct gabions and other stabilization features on steep slopes to prevent erosion. Reduced activity on site after large rainfall events when the soils are wet. No driving off hardened roads until soils have dried out and the risk of bogging down has decreased. A suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.	Very low - 5	Medium
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Unlikely				
	Reversibility	Low				
	Irreplaceability	Moderate				

Table 6: Summary assessment of (a) direct and (b) indirect impacts and their mitigation measures during the operational phase

(a) Direct impacts

Impact	***Impact Criteria (after mitigation)***	***Significance and Ranking (Pre-Mitigation)***	***Potential mitigation measures***	***Significance and Ranking (Post-Mitigation)***	***Confidence Level***

OPERATIONAL PHASE: DIRECT IMPACTS						
Direct faunal mortalities	Status	Negative	Very low	Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns. Access to the site should be strictly controlled. All excess wires, cables and waste material should be removed from the site. All vehicles at the site should adhere to a low speed limit and slow-moving fauna such as tortoises on roads should be moved off the road. No activity should be allowed at the site between sunset and sunrise.	Very low - 5	Medium
	Spatial Extent	Site specific				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Moderate				
	Irreplaceability	Low				

(b) Indirect impacts

Impact	***Impact Criteria (after mitigation)***		***Significance and Ranking (Pre-Mitigation)***	***Potential mitigation measures***	***Significance and Ranking (Post-Mitigation)***	***Confidence Level***
OPERATIONAL PHASE: INDIRECT IMPACTS						
Establishment of alien vegetation	Status	Negative	Low	Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species. No alien species should be used for landscaping and rehabilitation. Clearing of alien species should be done on a regular basis.	Very low - 5	Medium
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Moderate				
	Irreplaceability	Low				
Increased erosion and water run-off	Status	Negative	Low	Proper road maintenance procedures should be in place. Regular monitoring of the site during operation for erosion problems. Should new sections of the road be needed, a suitably qualified person should plan, design and supervise the proper construction of roads. Reduced activity at the site after large rainfall events when the soils are wet.	Very low - 5	Medium
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Likely				
	Reversibility	Moderate				
	Irreplaceability	Low				

Table 7: Summary assessment of (a) direct and (b) indirect impacts and their mitigation measures during the decommissioning phase

(a) Direct impacts

Impact	***Impact Criteria (after mitigation)***		***Significance and Ranking (Pre-Mitigation)***	***Potential mitigation measures***	***Significance and Ranking (Post-Mitigation)***	***Confidence Level***
DECOMMISSIONING PHASE: DIRECT IMPACTS						
Increased dust deposition	Status	Negative	Low	Excessive dust can be reduced by spraying water onto the roads or other disturbed areas during construction activities.	Very low - 5	High
	Spatial Extent	Site specific				
	Duration	Short-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High				
	Irreplaceability	-				
Direct faunal mortalities	Status	Negative	Low	Decommissioning crew should undergo environmental training to increase their awareness of environmental concerns. Speed limits should be adhered to. Proper waste management procedures should be in place and no material should be left on site in order to prevent instances of ensnarement or ingestion of foreign material.	Very low - 5	Medium
	Spatial Extent	Site specific				
	Duration	Short-term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Moderate				
	Irreplaceability	Low				

(b) indirect impacts

Impact	***Impact Criteria (after mitigation)***		***Significance and Ranking***	***Potential mitigation measures***	***Significance and Ranking***	***Confidence Level***

			(Pre-Mitigation)		(Post-Mitigation)	
DECOMMISSIONING PHASE: INDIRECT IMPACTS						
Establishment of alien vegetation	Status	Negative	Low	Implement a monitoring program for at least three years after decommissioning to document vegetation recovery and alien infestation across the site. A control program to combat declared alien invasive plant species should be employed. Areas where infrastructure is removed, must be revegetated with indigenous plant species. No alien species should be used for rehabilitation/revegetation or any other purpose.	Very low - 5	Medium
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Likely				
	Reversibility	Moderate				
	Irreplaceability	Low				
Increased erosion and water run-off	Status	Negative	Low	No new roads should be built. Proper road maintenance procedures should be in place. Removal of all infrastructure components from the site. Rehabilitation of all cleared and disturbed areas with local species. Off-site disposal of all facility components. Monitoring programme for at least three years after decommissioning to document vegetation recovery on site.	Very low - 5	Medium
	Spatial Extent	Local				
	Duration	Long-term				
	Consequence	Slight				
	Probability	Likely				
	Reversibility	Moderate				
	Irreplaceability	Low				

Table 8: Summary assessment of cumulative impacts

Impact	***Impact Criteria (after mitigation)***		***Significance and Ranking (Pre-Mitigation)***	***Potential mitigation measures***	***Significance and Ranking (Post-Mitigation)***	***Confidence Level***
Loss of vegetation, habitat and threatened species	Status	Negative	Moderate	All projects should adhere to the site-specific recommendations of the ecologists to ensure that impacts are mitigated where possible.	Low - 4	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Substantial				
	Probability	Likely				
	Reversibility	Moderate				
	Irreplaceability	Low				
Compromising integrity of CBA, ESA and NPAES	Status	Negative	Moderate	Align roads and other infrastructure so that transformation within the CBAs and ESAs is minimised. River/stream crossings should follow the be specific guidelines of the aquatic specialist. Minimise the development footprint as far as possible. Stringent construction-phase monitoring of activities at the site to ensure that mitigation measures are adhered to and that the overall ecological impact of the development is maintained at a low level.	Low - 4	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Unlikely				
	Reversibility	Moderate				
	Irreplaceability	Low				
Reduced ability to meet conservation obligations & targets	Status	Negative	Moderate	Sensitive habitats should be avoided. Minimise the development footprint as far as possible.	Low - 4	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	Moderate				
	Irreplaceability	Low				
Loss of landscape connectivity and disruption of broad-scale	Status	Negative	Low	Sensitive areas should be avoided and least-impact locations are identified for river/stream crossings. Minimising the development footprint wherever possible.	Low - 4	Medium
	Spatial Extent	Regional				
	Duration	Long-term				
	Consequence	Moderate				
	Probability	Unlikely				
	Reversibility	Moderate				

ecological processes	Irreplaceability	Low		Revegetation of all cleared and bare areas created by the development with local species. Fences and other structures which impede faunal movement should be avoided where possible.		

Preferred infrastructure locations

Access routes:

- Powerline servitude should follow existing farm roads where possible.
- Avoid cliffs, rocky ridges, rocky sheets and quartz patches and minimise impact at drainage lines.

Powerline and pylons:

- Placing of pylons should avoid sensitive habitats such as cliffs, rocky ridges, rocky sheets, quartz patches and drainage lines.

On-site substations:

- The footprint of Substation C should avoid Habitat 3 and the footprint of Substation D should avoid Habitat 1 (Figures 18 & 21). Both of these habitats are difficult to rehabilitate.
- The alternative to Substation C would be the preferred option vegetation wise.
- The alternative of Substation D should avoid Habitat 3 and could thus be moved within the broader site delineated. Alternatively Substation D could be moved north of the powerline route.
- ‘Preferred’ Substation E is the better option than the alternative site.

Table 9: Overall Impact Significance (Post Mitigation)

Phase	**Overall Impact Significance**
Construction	Very low to Low
Operational	Very low
Decommissioning	Very low
Cumulative	Low

12. LEGISLATIVE AND PERMIT REQUIREMENTS

The following legislation is relevant to the development and may require permits from the relevant authority.

12.1 National Forest Act (Act No. 84 of 1998)(NFA 2021)

The National Forest Act provides for the protection of forests, as well as for specific tree species. In the case where a protected tree would have to be destroyed by the development an application for a license would have to be made. However, no protected trees, according to the protected tree list (NFA 2021), were observed and it is unlikely that any such species would occur within the development footprint.

12.2 National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (ToPS list) (NEMBA 2007c)

NEMBA also deals with endangered, threatened and otherwise controlled species, under the ToPS Regulations (Threatened or Protected Species Regulations). A ToPS permit is required for any activities involving a ToPS listed species.

No threatened or protected **plant species** (following ToPS legislation) were recorded during the Kwagga OTP site survey. None of the mammals or carnivores are expected to be negatively affected by the development. The following protected **faunal species** (ToPS) are listed for the general region:

Mammals:

Cape fox	*Vulpes chama*	Protected
Riverine rabbit	*Bunolagus monticularis*	CR

Amphibians

Giant bull frog	*Pyxicephalus adspersus*	Protected

12.3 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species.

Currently, abundance of alien plants at the site is relatively low, however disturbance associated with the construction phase would encourage alien invasion and woody species, in particular species such as *Prosopis glandulosa* would need to be cleared on a regular basis. No permitting would be required for such activities, but an alien invasive species control programme should be initiated. Invasive alien species (and their category) likely to occur on site include:

Argemone ochroleuca	1b
Atriplex nummularia	2
Cylindropuntia pallida	1a
Datura ferox	1b

Opuntia aurantiaca	1b
Opuntia ficus-indica	1b
Prosopis glandulosa	1b
Salsola kali	1b

12.4 Western Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974) as amended in the Western Cape Nature Conservation Laws Amendment Act (No. 3 of 2000)

12.4.1 Flora (see Appendix B):

A permit is required if any of the following activities are involved:
Section 63. (1) No person shall:

a) uproot the plant in the process of picking the flower of any flora;
b) without a permit—
   i. pick any endangered or protected flora, or
   ii. pick any flora on a public road or on the land on either side of such road within a distance of ninety metres from the centre of such road, or
c) pick any protected or indigenous unprotected flora on land of which he or she is not the owner, without the permission of the owner of such land or of any person authorised by such owner to grant such permission.

Schedule 3: Endangered flora

No Schedule 3 plant species were recorded on site.

Schedule 4: Protected flora

A number of plant genera and families are listed in their entirety as protected and of particular relevance to the larger Kwagga WEF site are species within the following genera and families:

- Amaryllidaceae — all species
- Apocynaceae — all species (except those specified in Schedule 3)
- Iridaceae — all species
- Asphodelaceae (Liliaceae) — all species of *Aloe* except those in Schedule 3 and *Aloe ferox*.
- Aizoaceae (Mesembryanthemaceae) — all species
- Anacampserotaceae — all *Anacampseros* spp.

Protected species encountered in Segment C – E of the Kwagga OTP included a number of species of the Mesembryanthemaceae (most common *Ruschia* spp., *Mesembryanthemum* spp., *Trichodiadema pomeridianum* and *Drosanthemum lique*); 1 species of the Apocynaceae (*Fockea comaru*); one species of the Asphodelaceae (*Haworthiopsis nigra*); two species of the Anacampserotaceae (*Anacampseros ustulata, A. papyraceae*); and one species of the Iridaceae (*Moraea polystachya*).

12.4.2 Fauna permit requirements

CapeNature is the regulatory authority in the Western Cape for the issuing of permits for fauna, flora, hunting and CITES. Under the Act, the majority of mammals, reptiles and amphibians are listed as protected species (see Appendix C). However, no permits are required for animal species since none should be harmed by the development.

12.5 CITES (Convention on the International Trade in Endangered Species of Wild Fauna and Flora)

South Africa is a signatory to CITES and as such must comply with the import, export and re-export procedure as stipulated by CITES. CapeNature is the CITES Management and Scientific Authority for exports out of and imports into the respective provinces from or to other countries. The following species occurring in the study area are CITES listed. However, no permits are required for animal species since none should be harmed by the development. The following are CITES listed plant species:

Plant species:

Anacampseros	all species
Aloe	all species (thus would include current genera such as *Gonialoe)*
Euphorbia	all succulent species
Hoodia	all species
Pachypodium	all species

12.6 Species with a red-listed (threatened) IUCN status

No threatened species were encountered in Segment C – E of the Kwagga OTP.

13. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUT

Impact	Mitigation / Management Objectives	Mitigation / Management actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
A. IMPACTS ON TERRESTRIAL BIODIVERSITY AND SPECIES					
A. DESIGN PHASE					
Potential impact on terrestrial biodiversity and species as a result of the proposed powerline and associated grid infrastructure.	Avoid or minimise impacts on terrestrial biodiversity and species on site regarding the placement of the infrastructure. Avoiding ridges, cliffs, quartz patches and rocky sheets will reduce the chances of loss of protected species.	Ensure that the placing of infrastructure takes the sensitivity mapping of the ecological assessment into account to avoid and reduce impacts on sensitive habitats and protected species.	Ensure that the impact is taken into consideration during the planning and design phase.	During design cycle and before construction commences.	Project Developer and Appointed Ecological Specialist.
B. CONSTRUCTION PHASE					
Clearance of vegetation	Confine vegetation clearance to footprint and minimise disturbance to adjacent areas.	Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation. Permits have to be obtained for the removal of WCNECO protected species within the footprint of the development.	Ensure that mitigation measures are enforced.	Daily	The Environmental Control Officer (ECO) should monitor and report any incidents to the Holder of the EA
Impact on animal species	Avoid or minimise impacts that could potentially affect animal behaviour.	Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. Holes and trenches should not be left open for long periods of time. These should be regularly inspected for the presence of trapped animals before filling. Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site. Speed limits should be strictly adhered to. No activity should be allowed on site at night.	Ensure compliance with these mitigation measures.	Daily	The ECO should monitor and report to the Holder of the EA.
Increased dust levels	Avoid or minimise increased dust levels.	Dust control measures should be implemented.	Ensure that dust control measures are in place.	Daily	The ECO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species.	Ensure implementation of a programme to detect	Daily	The ECO should monitor and report to the Holder of the EA.

Impact	Mitigation / Management Objectives	Mitigation / Management actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		Employ a control program to combat declared alien invasive plant species.	and combat alien invasive plants.		
C. OPERATIONAL PHASE					
Impact on animal species	Avoid or minimise impacts that could potentially affect animal behaviour.	Proper waste management procedures should be put in place.	Ensure compliance with these mitigation measures.	Monthly	The ECO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species.	Ensure implementation of a programme to detect and combat alien invasive plants.	Every three months	The ECO should monitor and report to the Holder of the EA.
C. DECOMMISSIONING PHASE					
Clearance of vegetation	Minimise disturbance and clearance of vegetation.	Unnecessary clearance of natural vegetation should be avoided.	Ensure that mitigation measures are enforced.	Every three months	The ECO should monitor and report to the Holder of the EA.
Impact on animal behaviour	Avoid or minimise impacts that could potentially affect animal behaviour.	Proper waste management procedures should be put in place.	Ensure compliance with these mitigation measures.	Monthly	The ECO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species.	Ensure implementation of a programme to detect and combat alien invasive plants.	Every three months	The ECO should monitor and report to the Holder of the EA.

14. FINAL SPECIALIST STATEMENT AND AUTHORISATION RECOMMENDATION

The low impact significance and low sensitivity rating for many of the habitats means the project could go ahead without major constraints, provided the mitigation measures and management actions proposed to conserve protected fauna and flora on the site are taken into consideration. **We thus recommend authorisation of the project provided all mitigation measures are implemented.**

A brief summary of the most important considerations is provided below:

Vegetation:

- **Vegetation types:** The Gamka Karoo is listed as "Least Concern".
- **Threatened plant species:** No IUCN red-list threatened plant species were encountered during the field survey on Segment C – E of the powerline route.
- **Species listed by the Screening Tool:** None of the species listed by the screening tool were found on Segment C – E of the powerline route.
- **Habitats:** None of the habitats had a high or very high sensitivity.
- **Overall sensitivity of plant theme:** This is rated as Low. Nevertheless, all suggested mitigation measures need to be complied with.

Fauna:

- **Threatened animal species:** The Karoo dwarf tortoise was not encountered during the site survey and suitable habitat for this species does not appear to be available according to a herpetological study on the farm Trakaskuilen.
- **Overall sensitivity of animal theme:** This is rated as low **if the bird component is excluded**. Suggested mitigation measures should be followed to avoid possible negative impacts.

Conservation:

- **Protected Areas:** The study area is not located in a protected area.
- **National Protected Areas Expansion Strategy (NPAES):** The development will not interfere with the protected areas expansion strategy.
- **Critical Biodiversity Areas (CBAs):**
  There is only a very small section of the Kwagga OTP route (north of Substation E) where a CBA marginally intersects the route and pylons should preferably not be located within the areas demarcated as CBA. Since a powerline can maintain the natural vegetation cover of CBAs in a healthy ecological state, it can be regarded as a permissible land use in a CBA. Nevertheless, CBAs should be avoided wherever possible.
- **Ecological Support Areas (ESAs):** The ESAs on site follow the smaller watercourses with a number of ESAs along the Kwagga OTP route in Segment C – E. However, ecological processes that operate within or across ESAs will not be altered by the development. The extent of the development is small and will not have a negative impact on the functionality of the broader ESA. Thus, no additional loss of ecological connectivity in relation to the broader landscape is likely.
- **Freshwater Ecosystem Priority Area (FEPA):** The areas classified as Freshwater Ecosystem Priority Areas (FEPA) intersect a section of the powerline route in Segment C – E.

Ecological processes, function and drivers:

- Overall, it is unlikely that the development will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions.

- The disturbance caused by the construction of the Kwagga OTP will create conditions favourable for invasion by alien species. Alien invasive species are currently not common in the area, although a few declared invasive species were noted on site.

Significance of environmental impacts:
Overall the significance of the environmental impacts was rated as low to very low. In summary:
- Since the development footprint is small, the loss of habitat or species will be limited.
- The extent of the project's clearing activities in the Gamka Karoo vegetation type is small in relation to the remaining extent of the vegetation type and ecosystem threat status will not be affected.
- None of the habitats identified were rated as highly sensitive, and the overall impact per habitat type will be small.
- The impact on overall species and ecosystem diversity of the adjacent land will not be affected and the impact will be small.
- The impact on populations of threatened or protected species will be negligible.
- Depending on the type of fencing to be erected at some of the infrastructure, the project may contribute minimally to obstruction of animal movement.

Key environmental mitigation and management actions proposed

- Ensure that the placing of infrastructure takes the sensitivity mapping of the ecological assessment into account to avoid and reduce impacts on species and habitats of conservation concern.
- Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation.
- Sensitive habitats such as cliffs, rocky ridges, rocky sheets, quartzitic gravel patches and drainage lines should be avoided where possible.
- Observe buffer zones along drainage lines as prescribed by the aquatic specialist.
- Avoid or minimise impacts that could potentially affect animal behaviour.
- All excess wires, cables and waste material should be removed from the site.
- Holes and trenches should not be left open for long periods of time. Trenches should be inspected for the presence of trapped animals before being filled.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns.
- All vehicles are to remain on demarcated roads and no driving in the veld should be allowed.
- If applicable, a suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.
- If applicable, proper road maintenance procedures should be in place.
- All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area.
- Regularly monitor the site during construction for erosion problems.
- Should electrical fences be erected it must be done according to the norms and standards of the Nature Conservation Authorities in the Western Cape.
- Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site.
- Speed limits should be strictly adhered to.
- Dust control measures should be implemented.
- Permits have to be obtained for the removal of WCNECO protected species.
- Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species.
- No alien plant species should be used in rehabilitation or landscaping.

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APPENDIX A

SYNOPTIC TABLE OF PLANT COMMUNITIES

Codes used in Table: 1 = species present in 1-20% of sites in a particular habitat;
2 = species present in 21-40% of sites in a particular habitat;
3 = species present in 41-60% of sites in a particular habitat;
4 = species present in 61-80% of sites in a particular habitat;
5 = species present in 81-100% of sites in a particular habitat

Community number	1	2	3	4	5	6	7	8
Species group 1								
Chaenostoma sp.	**3**	1	1	1				
Felicia muricata	**2**		1	1				1
Helichrysum zeyheri	**1**		1					
Pelargonium carnosum	**2**	1						
Bulbine triebneri	**2**		1				**1**	1
Trichodiadema decorum	**2**	1		1				
Melica decumbens	**2**							1
Adromischus triflorus	**1**							
Manulea gariepina	**1**	1						
Zaluzianskya venusta	**1**			1				
Osteospermum microphyllum	**1**		1					
Enneapogon scaber	**1**					**1**		
Pelargonium alternans	**1**							
Heliophila deserticola	**1**							
Pteronia tricephala	**1**							
Species group 2								
Eriocephalus brevifolius	**3**	**1**	1		1			
Sericocoma avolans	**1**	**2**						
Helichrysum pumilio	**1**	**1**			1	**1**		
Hermannia linearifolia	**2**	**2**		1				
Dianthus micropetalus	**2**	**1**	1					
Osteospermum scariosum	**1**	**1**	1		1			
Pteronia ciliata	**1**	**1**						
Anacampseros telephiastrum	1	1						
Species group 3								
Crassula deltoidea	1	1	**3**		1			
Antimima sp. 2		1	**2**					
Anacampseros papyracea			**2**					
Trichodiadema barbatum			**1**					
Chasmatophyllum musculinum	1		**1**					
Justicia sp.			**1**	1				
Species group 4								
Tragus koelerioides	**3**	**3**	**2**	1				
Amphiglossa sp.	**2**	**2**	**2**		1			
Digitaria argyrograpta	**4**	**1**	**2**	1		**1**	**1**	2
Eragrostis obtusa	**1**	**1**	**1**	1		**1**	**1**	1
Mesembryanthemum geniculiflorum	**1**	**2**	**1**	1				1
Eriocephalus spinescens	**1**	**1**	**1**	1			**1**	
Crassula muscosa	**1**	**1**	**2**		1			
Species group 5								
Gazania heterochaeta	**3**	**2**	**3**	**3**	1		**1**	
Cuspidia cernua	**1**	**1**	**2**	**2**		**1**		1
Nenax microphylla	**4**	**2**	**3**	**2**	1	**1**	**1**	
Hermannia desertorum	**3**	**1**	**1**	**2**		**1**		
Anacampseros ustulata	**1**	**1**	**2**	**2**				
Pteronia empetrifolia	**3**	**3**	**2**	**1**	1			
Gorteria alienata	**4**	**2**	**1**	**1**		**1**		1
Lasiosiphon deserticola	**4**	**2**	**2**	**1**				
Helichrysum lucilioides	**3**	**2**	**3**	**1**				
Crassothonna protecta	**1**	**1**	**2**	**1**				

Asparagus capensis	1	1	1	1				
Lycium horridum	1			1				
Oxalis depressa	1	1	2	2		1		
Eriospermum cf. porphyrium	1	1	1	1				
Lessertia annularis	1	1	1	1				
Monsonia salmoniflora	1			1				
Senecio acutifolius	1	1	1	1				
Cynanchum viminale	1			1				
Eriospermum cf. paradoxum	1	1	2	1				
Lampranthus sp.	1	1	1	1		1		
Aptosimum indivisum	1	1	1	2				1
Species group 6								
Tetragonia sp.	2	1	2	1	1			
Euphorbia suffulta	1	2	2	1	2	1		
Galenia fruticosa	1	1	1	1	2	1		
Antimima sp. 1	1	2	2	1	1			
Felicia filifolia	1	1	2	1	1	1		
Pteronia paniculata	1	1	2	1	1			
Euphorbia mauritanica	1	1	1	1	1			
Species group 7								
Rhigozum obovatum	5	5	4	3	5	5		1
Euphorbia stellispina	3	3	2	2	3	2		
Searsia pallens	1	1		1		3		1
Pteronia viscosa	2	1	1	2	1	3		1
Trichodiadema pomeridianum	3	2	3	3	2	2	1	
Monsonia camdeboensis	2	2	3	1	3	1		
Oropetium capense	2	2	3	2	1	1		
Pteronia adenocarpa	3	3	1	1	2	2		
Asparagus striatus	2	2	1	1	1	1		
Curio radicans	2	2	2	2	2	1		
Pentzia quinquefida	2	1	1	1	1	1		
Trachyandra sp.	1	1	1	2	1	1		
Anacampseros albidiflora	1	1	1	1	1	1		
Mesembryanthemum tortuosum	1	1		1	1	1		
Species group 8								
Stipagrostis obtusa		1	1	1	1	3	3	
Tragus berteronianus	1	1	1	1	1	2	1	1
Sesamum capense				1		3	2	1
Ruschia sp.	1	1	1	1			3	
Species group 9								
Eriocephalus ericoides	5	5	5	5	5	5	3	
Aristida congesta	3	2	5	5	5	5	5	1
Aristida diffusa	5	5	3	2	3	3	1	1
Ruschia intricata	5	5	5	4	4	3	2	1
Drosanthemum lique	2	3	2	2	4	3	5	1
Enneapogon desvauxii	1	3	3	3	4	4	2	1
Asparagus mucronatus	3	2	2	2	2		1	1
Ruschia cradockensis	1	1	5	2	3	1	2	
Pteronia sordida	1	1	2	1	1	1	2	
Pteronia glauca	4	3	3	2	2	1	1	
Species group 10								
Setaria verticillata	1					1		5
Cenchrus ciliaris								4
Melianthus comosus								3
Searsia lancea								2
Stipagrostis namaquensis								3
Chloris virgata			1				1	3
Oedera humilis	1	1		1			1	3
Leysera tenella		1						2
Eragrostis sp.								2
Amaranthus sp.				1				2
Roepera lichtensteiniana						1	1	1
Argemone ochroleuca								1
Malephora sp.								1
Galenia papulosa		1	1			1		1
Tetragonia acanthocarpa	1	1		1				1
Stipagrostis ciliata				1		1	1	1
Mesembryanthemum articulatum				1	1	1		1
Gazania krebsiana			1	1	1			1
Viscum rotundifolium	1	1		1		1		1
Cynodon incompletus								1

Solanum tomentosum								1
Cotula sp.								1
Selago geniculata								1
Diospyros austro-africana								1
Tagetes minuta								1
Aptenia sp.								1
Polypogon monspeliensis								1
Arctotis leiocarpa								1
Eragrostis rotifer								1
Bassia salsoloides								1
Species group 11								
Lycium oxycarpum	1	1	1	1		3	3	5
Vachellia karroo	1	1	1	1		1	1	5
Fingerhuthia africana	1			1		1	1	1
Tetraena chrysopteron		1	1	1	1	3	3	1
Kewa salsoloides		1	1	1	1	1	2	2
Species group 12								
Aristida adscensionis	4	3	5	5	5	5	5	3
Chrysocoma ciliata	5	4	4	4	3	3	1	3
Lacomucinaea lineatum	4	3	3	3	3	4	2	2
Lycium cinereum	3	3	5	5	4	5	5	5
Asparagus burchellii	3	4	4	4	4	4	4	3
Asparagus cf. suaveolens	1	1	1	1	1	2	2	1
Pentzia incana	4	2	3	4	2	4	4	4
Diospyros lycioides	2	2	3	2	1	3	2	4
Searsia burchellii	4	3	1	2	2	3	1	3
Mesembryanthemum (Psilocaulon) sp.	2	1	2	1	5	1	1	1
Grewia robusta	4	2	2	2	1	4	1	2
Gymnosporia szyszylowiczii	3	2	1	1	3	3	2	4
Drosanthemum hispidum	2	1	2	2	1	2	3	2
Hermannia grandiflora	2	1	2	2	1	1	1	1
Osteospermum sinuata	1	1	2	1	1		1	1
Mesembryanthemum guerichianum	1	1	1	1	2	1	2	3
Galenia sarcophylla	1	2	1	2	1	2	1	2
Salsola spp.	1		2	1	1	1	1	2
Mesembryanthemum noctiflorum	1	1	2	1	1	1	1	2
Cadaba aphylla	1	1	1		1	2	2	1
Sporobolus fimbriatus	2	1	1				1	3
Species group 13								
Drimia intricata	1	1	1					
Conophytum truncatum	1	1	1					
Astroloba foliolosa	1	1		1				
Pteronia glomerata	1	1		1				
Hereroa sp.	1		1	1				
Selago albida	1	1	2	1				1
Limeum aethiopicum	1	1		1				
Felicia sp.	1	1	1	1		1		
Hoodia pilifera	1	1			1	1		
Crassula hemisphaerica	1		1			1		
Hermannia cuneifolia	1	1			1	1		
Dipcadi sp.	1	1		1				
Crassula subaphylla	1		1	1	1		1	
Crassula corallina	1	1	1	1			1	
Plinthus karooicus	1		1	1	1		1	
Albuca sp.	1			1		1	1	
Asparagus retrofractus	1	1						1
Hermannia comosa	1		1	1				1
Melolobium candicans	1		1	1			1	1
Carissa haematocarpa	1		1					1
Lepidium africanum	1		1	1				1
Moraea sp.		1			1			1
Ursinia nana		1	1				1	1
Senecio acaulis		1	1	1				
Kleinia longiflora			1	1	1			
Curio rowleyanus			1	1	1			
Osteospermum calendulaceum			1	1				
Cyphia dentariifolia			1	1				
Crassula capitella				1	1			
Opuntia ficus-indica				1			1	1
Species group 14								
Indigofera sessilifolia	1			1				

Helichrysum asperum	1		1					
Asparagus setaceus	1	1						1
Osteospermum sp.	1							
Mesembryanthemum tetragonum	1				1			
Ledebouria sp.	1			1				
Barleria rigida	1							
Pteronia staehelinoides	1							
Pegolettia retrofracta	1				1			
Digitaria eriantha	1							1
Solanum giftbergense	1							
Albuca maxima	1							
Jamesbrittenia sp.	1							1
Bulbine frutescens	1							
Adromischus sp.	1							
Galenia namaensis	1							
Hermannia spinosa	1							1
Atriplex vestita	1					**1**		
Melolobium microphyllum	1							
Mesembryanthemum (Prenia) sp.	1					**1**		
Nemesia sp.	1							
Lessertia frutescens	1							
Blepharis capensis	1			1	1	**1**		1
Moraea polystachya	1		1					
Microloma sp.	1							
Euclea undulata	1			1				
Garuleum bipinnatum	1							
Monsonia crassicaule	1	1						
Ehrharta calycina	1			1				
Ifloga glomerata	1							
Lycium schizocalyx		1						
Mesembryanthemum junceum		1						
Pentameris cf airoides		1						
Lotononis sp.		1	1					
Fockea comaru		1						1
Pentzia sphaerocephala		1						
Mesembryanthemum sp. 3		1					**1**	
Haworthiopsis nigra		1		1				
Pharnaceum sp.		1	1					
Eriocephalus decussatus		1	1	1				1
Drimia sp.		1						
Enneapogon cenchroides		1						
Hermannia vestita		1			1			
Crassula pyramidalis		1						
Pachypodium succulentum		1						
Hermannia coccocarpa		1		1			**1**	1
Ruschia abbreviata			1					
Jamesbrittenia atropurpurea			1					
Lessertia sp.			1					
Mesembryanthemum sp. 2			1				**1**	
Atriplex semibaccata			1					1
Thesium hystrix			1	1				
Blepharis mitrata			1				**1**	
Tetragonia microptera			1	1		**1**		
Berkheya sp.			1			**1**		
Pelargonium minimum			1					1
Euphorbia decepta				1	1			
Ornithogalum sp.				1	1			
Athanasia minuta				1				1
Oedera oppositifolia				1			**1**	
Salsola kali				1				1
Osteospermum spinescens				1				
Hermannia erodioides				1				
Wahlenbergia nodosa				1				
Oxalis sp.				1				
Mesembryanthemum nodiflorum				1				
Gazania lichtensteinii				1				
Cucumis myriocarpus				1				
Lotononis sp.				1				
Trianthema parvifolia				1		**1**		
Hermannia sp.				1				1
Gonialoe variegata					1			

Crassothonna sedifolia	1			
Aizoon canariense	1		**1**	
Tetraena rigida		**1**		
Opuntia aurantiaca		**1**	**1**	
Dicoma capensis		**1**		
Phymaspermum sp.		**1**		
Pteronia incana		**1**		
Peliostomum leucorrhizum			**1**	
Malephora crassa			**1**	
Nemesia sp.			**1**	
Stipagrostis uniplumis			**1**	
Mesembryanthemum sp. 1			**1**	1
Solanum sp.				1
Chenopodium sp.				1
Datura ferox				1
Ehrharta sp.				1
Senecio sp.				1
Mesembryanthemum nitidum				1
Fuirena sp.				1
Osteospermum acanthospermum				1
Pseudoschoenus inanis				1
Afroscirpoides dioeca				1
Emex australis				1
Erodium cicutarium				1
Helichrysum leontonyx				1
Malva parviflora				1
Sebaea sp.				1
Sporobolus sp.				1
Sonchus sp.				1
Cyperus sp.				1
Leptochloa fusca				1
Lasiopogon glomerulatus				1
Sporobolus ioclados				1
Arctotis argentea				1
Arctotheca sp.				1
Amphiglossa triflora			**1**	1
Bromus cf. catharticus				1
Radyera urens				1
Tricholaena capensis				1
Amaranthus praetermissus				1
Osteospermum leptolobum				1
Eragrostis lehmanniana				1

APPENDIX B:

PLANT SPECIES CHECKLIST

[1]IUCN category
[2]Western Cape Nature and Environmental Conservation Ordinance (WCNECO as amended 2000)
[3]CITES = Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES 2021)
[4]ALIEN = ALIEN AND INVASIVE SPECIES
[5]NAT = NATURALISED
[6]Plants observed during October/November 2020 site visit and/or June 2022 visit
[7]Newposa list (SANBI)

FAMILY	SPECIES	IUCN[1]	WC[2]	CITES[3]	ALIEN[4]	NAT[5]	CURRENT[6]	NEWPOS[7]
Acanthaceae	*Barleria rigida*						x	
Acanthaceae	*Blepharis capensis*	LC					x	x
Acanthaceae	*Blepharis mitrata*	LC					x	x
Acanthaceae	*Blepharis* sp.	-					x	
Acanthaceae	*Justicia* sp.	-					x	
Aizoaceae	*Aizoon canariense*	LC	x				x	
Aizoaceae	*Antimima* sp. 1	-	x				x	
Aizoaceae	*Aptenia* sp.	-	x				x	
Aizoaceae	*Chasmatophyllum musculinum*	LC	x				x	
Aizoaceae	*Hereroa sp. 1*	-	x				x	
Aizoaceae	*Antimima sp. 2*	-	x				x	
Aizoaceae	*Conophytum truncatum*	LC	x				x	
Aizoaceae	*Delosperma* sp.	-	x					x
Aizoaceae	*Drosanthemum hispidum*	LC	x				x	x
Aizoaceae	*Drosanthemum lique*	LC	x				x	x
Aizoaceae	*Drosanthemum* sp.	-	x					x
Aizoaceae	*Galenia acutifolia*	LC	x					x
Aizoaceae	*Galenia fruticosa*	LC	x				x	x
Aizoaceae	*Galenia glandulifera*	LC	x					x
Aizoaceae	*Galenia namaensis*	LC	x				x	
Aizoaceae	*Galenia papulosa*	LC	x				x	x
Aizoaceae	*Galenia sarcophylla*	LC	x				x	
Aizoaceae	*Galenia secunda*	LC	x					x
Aizoaceae	*Lampranthus sp.*	-	x				x	
Aizoaceae	*Leipoldtia* sp.	-	x					x
Aizoaceae	*Malephora crassa*	LC	x				x	
Aizoaceae	*Malephora latipetala*	LC	x					x
Aizoaceae	*Malephora* sp.	-	x				x	x
Aizoaceae	*Mesembryanthemum articulatum*	LC	x				x	x
Aizoaceae	*Mesembryanthemum crystallinum*	LC	x					x
Aizoaceae	*Mesembryanthemum geniculiflorum*	LC	x				x	x
Aizoaceae	*Mesembryanthemum guerichianum*	LC	x				x	
Aizoaceae	*Mesembryanthemum junceum*	LC	x				x	
Aizoaceae	*Mesembryanthemum nitidum*	LC	x				x	x
Aizoaceae	*Mesembryanthemum noctiflorum* subsp. *stramineum*	LC	x				x	x
Aizoaceae	*Mesembryanthemum nodiflorum*	LC	x				x	x
Aizoaceae	*Mesembryanthemum sp. 1*	-	x				x	
Aizoaceae	*Mesembryanthemum sp. 2*	-	x				x	
Aizoaceae	*Mesembryanthemum sp. 3*	-	x				x	
Aizoaceae	*Mesembryanthemum splendens*	LC	x					x
Aizoaceae	*Mesembryanthemum splendens* subsp. *pentagonum*	LC	x					x
Aizoaceae	*Mesembryanthemum splendens* subsp. *splendens*	LC	x					x
Aizoaceae	*Mesembryanthemum tetragonum*	LC	x				x	x
Aizoaceae	*Mesembryanthemum tortuosum*	LC	x				x	

Aizoaceae	*Mesembryanthemum vaginatum*	LC	x					x
Aizoaceae	*Mesembryanthemum (Phyllobolus)* sp.	-	x				x	
Aizoaceae	*Mesembryanthemum (Prenia) sp.*	-	x				x	
Aizoaceae	*Plinthus karooicus*	LC	x				x	
Aizoaceae	*Mesembryanthemum (Psilocaulon)* sp.	-	x				x	
Aizoaceae	*Rhinephyllum graniforme*	LC	x					x
Aizoaceae	*Ruschia cf. abbreviata*	-	x				x	
Aizoaceae	*Ruschia centrocapsula*	LC	x					x
Aizoaceae	*Ruschia cradockensis*	LC	x				x	
Aizoaceae	*Ruschia* sp.	-	x				x	x
Aizoaceae	*Ruschia intricata*	LC	x				x	
Aizoaceae	*Mesembryanthemum tortuosum*	LC	x				x	
Aizoaceae	*Tetragonia acanthocarpa*	LC	x				x	
Aizoaceae	*Tetragonia fruticosa*	LC	x					x
Aizoaceae	*Tetragonia haworthii*	LC	x					x
Aizoaceae	*Tetragonia microptera*	LC	x				x	x
Aizoaceae	*Tetragonia* sp.	-	x				x	
Aizoaceae	*Trianthema parvifolia*	LC	x				x	
Aizoaceae	*Trichodiadema barbatum*	LC	x				x	x
Aizoaceae	*Trichodiadema decorum*	LC	x				x	x
Aizoaceae	*Trichodiadema pomeridianum*	LC	x				x	x
Amaranthaceae	*Amaranthus* sp.	-				x	x	
Amaranthaceae	*Amaranthus praetermissus*	LC					x	
Amaranthaceae	*Atriplex lindleyi* subsp. *inflata*	NE			1b			x
Amaranthaceae	*Atriplex nummularia* subsp. *nummularia*	NE			2			x
Amaranthaceae	*Atriplex semibaccata*	NE				x	x	x
Amaranthaceae	*Atriplex suberecta*	NE				x		x
Amaranthaceae	*Atriplex vestita*	LC					x	
Amaranthaceae	*Bassia salsoloides*	LC					x	
Amaranthaceae	*Chenopodium mucronatum*	LC						x
Amaranthaceae	*Chenopodium* sp.	-					x	
Amaranthaceae	*Salsola adisca*	LC						x
Amaranthaceae	*Salsola kali*	NE			1b		x	x
Amaranthaceae	*Salsola* spp.	-					x	
Amaranthaceae	*Sericocoma avolans*	LC					x	
Amaryllidaceae	*Ammocharis coranica*	LC	x					x
Anacampserotaceae	*Anacampseros albidiflora*	LC	x	x			x	
Anacampserotaceae	*Anacampseros arachnoides*	LC	x	x				x
Anacampserotaceae	*Anacampseros filamentosa* subsp. *filamentosa*	LC	x	x				x
Anacampserotaceae	*Anacampseros papyracea*	LC	x	x			x	
Anacampserotaceae	*Anacampseros telephiastrum*	LC	x	x			x	
Anacampserotaceae	*Anacampseros ustulata*	LC	x	x			x	x
Anacardiaceae	*Schinus molle*	NE				x		x
Anacardiaceae	*Searsia burchellii*	LC					x	
Anacardiaceae	*Searsia lancea*	LC					x	
Anacardiaceae	*Searsia pallens*	LC					x	
Apiaceae	*Berula thunbergii*	LC						x
Apiaceae	*Sanicula elata*	LC						x
Apocynaceae	*Carissa haematocarpa*	LC					x	
Apocynaceae	*Ceropegia fimbriata*	DDT						x
Apocynaceae	*Cynanchum viminale*	LC						x
Apocynaceae	*Fockea comaru*	LC	x				x	
Apocynaceae	*Gomphocarpus filiformis*	LC	x					x
Apocynaceae	*Hoodia pilifera* subsp. *annulata*	VU	x	x			x	x
Apocynaceae	*Huernia barbata* subsp. *barbata*	LC	x					x
Apocynaceae	*Microloma sp.*	-	x				x	
Apocynaceae	*Pachypodium succulentum*	LC	x	x			x	
Apocynaceae	*Piaranthus comptus*	LC	x					x
Apocynaceae	*Piaranthus geminatus* subsp. *geminatus*	LC	x					x
Apocynaceae	*Stapelia engleriana*	DDT	x					x
Apocynaceae	*Stapeliopsis pillansii*	LC	x					x
Asparagaceae	*Asparagus aethiopicus*	LC					x	x
Asparagaceae	*Asparagus burchellii*	LC					x	
Asparagaceae	*Asparagus capensis* var. *capensis*	LC					x	x
Asparagaceae	*Asparagus exuvialis* forma *exuvialis*	NE						x
Asparagaceae	*Asparagus mucronatus*	LC					x	
Asparagaceae	*Asparagus recurvispinus*	LC						x
Asparagaceae	*Asparagus retrofractus*	LC					x	
Asparagaceae	*Asparagus setaceus*	LC					x	

Asparagaceae	*Asparagus striatus*	LC		x	
Asparagaceae	*Asparagus suaveolens*	LC			x
Asphodelaceae	*Aloe claviflora*	LC		x	
Asphodelaceae	*Astroloba foliolosa*	LC		x	
Asphodelaceae	*Bulbine frutescens*	LC		x	x
Asphodelaceae	*Bulbine triebneri*	LC		x	
Asphodelaceae	*Gonialoe variegata*	LC	x	x	x
Asphodelaceae	*Haworthiopsis nigra* var. *nigra*	NE	x	x	x
Asphodelaceae	*Trachyandra karrooica*	LC			x
Asphodelaceae	*Trachyandra* sp.	-		x	
Asteraceae	*Amellus strigosus* subsp. *strigosus*	LC			x
Asteraceae	*Amphiglossa* sp.	-		x	
Asteraceae	*Amphiglossa triflora*	LC		x	x
Asteraceae	*Arctotheca sp.*	-		x	
Asteraceae	*Arctotis argentea*	LC		x	
Asteraceae	*Arctotis dregei*	LC			x
Asteraceae	*Arctotis leiocarpa*	LC		x	
Asteraceae	*Arctotis venusta*	LC			x
Asteraceae	*Athanasia minuta*	LC		x	
Asteraceae	*Berkheya spinosa*	LC		x	x
Asteraceae	*Chrysocoma ciliata*	LC		x	x
Asteraceae	*Cotula coronopifolia*	LC		x	x
Asteraceae	*Crassothonna cacalioides*	LC		x	
Asteraceae	*Crassothonna protecta*	LC		x	x
Asteraceae	*Crassothonna sedifolia*	LC		x	
Asteraceae	*Curio radicans*	LC		x	x
Asteraceae	*Curio rowleyanus*	DDT		x	x
Asteraceae	*Cuspidia cernua* subsp. *annua*	LC		x	x
Asteraceae	*Dicoma capensis*	LC		x	
Asteraceae	*Eriocephalus brevifolius*	LC		x	
Asteraceae	*Eriocephalus ericoides*	LC		x	
Asteraceae	*Eriocephalus decussatus*	LC		x	
Asteraceae	*Eriocephalus spinescens*	LC		x	x
Asteraceae	*Euryops imbricatus*	LC			x
Asteraceae	*Euryops pinnatipartitus*	LC			x
Asteraceae	*Felicia fascicularis*	LC			x
Asteraceae	*Felicia filifolia*	LC		x	
Asteraceae	*Felicia muricata* subsp. *muricata*	LC		x	x
Asteraceae	*Felicia* sp.	-		x	
Asteraceae	*Garuleum bipinnatum*	LC		x	
Asteraceae	*Gazania heterochaeta*	LC		x	
Asteraceae	*Gazania krebsiana* subsp. *arctotoides*	LC			x
Asteraceae	*Gazania krebsiana* subsp. *krebsiana*	LC		x	x
Asteraceae	*Gazania lichtensteinii*	LC		x	
Asteraceae	*Geigeria filifolia*	LC			x
Asteraceae	*Gorteria alienata*	LC		x	x
Asteraceae	*Helichrysum asperum* var. *albidulum*	LC		x	x
Asteraceae	*Helichrysum leontonyx*	LC		x	
Asteraceae	*Helichrysum lucilioides*	LC		x	
Asteraceae	*Helichrysum pumilio*	LC		x	
Asteraceae	*Helichrysum rutilans*	LC			x
Asteraceae	*Helichrysum simulans*	LC			x
Asteraceae	*Helichrysum zeyheri*	LC		x	
Asteraceae	*Ifloga glomerata*	LC			x
Asteraceae	*Kleinia longiflora*	LC		x	
Asteraceae	*Lasiopogon glomerulatus*	LC		x	x
Asteraceae	*Leysera tenella*	LC		x	x
Asteraceae	*Macledium spinosum*	LC			x
Asteraceae	*Oedera humilis*	LC		x	x
Asteraceae	*Oedera oppositifolia*	LC		x	
Asteraceae	*Oncosiphon piluliferus*	LC			x
Asteraceae	*Osteospermum acanthospermum*	LC		x	
Asteraceae	*Osteospermum calendulaceum*	LC		x	x
Asteraceae	*Osteospermum leptolobum*	LC		x	
Asteraceae	*Osteospermum microphyllum*	LC		x	x
Asteraceae	*Osteospermum scabrum*	LC			x
Asteraceae	*Osteospermum scariosum* var. *scariosum*	NE		x	x
Asteraceae	*Osteospermum sinuatum* var. *sinuatum*	LC		x	x
Asteraceae	*Osteospermum* sp.	-		x	

Asteraceae	*Osteospermum spinescens*	LC					x	
Asteraceae	*Pegolettia retrofracta*	LC					x	
Asteraceae	*Pentzia incana*	LC					x	x
Asteraceae	*Pentzia quinquefida*	LC					x	
Asteraceae	*Pentzia sphaerocephala*	LC					x	
Asteraceae	*Phymaspermum parvifolium*	LC						x
Asteraceae	*Pteronia adenocarpa*	LC					x	x
Asteraceae	*Pteronia ciliata*	LC					x	
Asteraceae	*Pteronia empetrifolia*	LC					x	x
Asteraceae	*Pteronia glauca*	LC					x	x
Asteraceae	*Pteronia glomerata*	LC						x
Asteraceae	*Pteronia cf. incana*	-					x	
Asteraceae	*Pteronia paniculata*	LC					x	
Asteraceae	*Pteronia sordida*	LC					x	
Asteraceae	*Pteronia staehelinoides*	LC					x	
Asteraceae	*Pteronia tricephala*	LC					x	
Asteraceae	*Pteronia viscosa*	LC					x	x
Asteraceae	*Senecio acaulis*	LC					x	
Asteraceae	*Senecio acutifolius*	LC					x	x
Asteraceae	*Senecio angustifolius*	LC						x
Asteraceae	*Senecio* sp.	-					x	
Asteraceae	*Seriphium plumosum*	-						x
Asteraceae	*Sonchus* sp.	-					x	
Asteraceae	*Tagetes minuta*	NE				X	x	
Asteraceae	*Ursinia nana* subsp. *nana*	LC					x	x
Bignoniaceae	*Rhigozum obovatum*	LC					x	
Brassicaceae	*Cardamine africana*	LC						x
Brassicaceae	*Heliophila crithmifolia*	LC						x
Brassicacee	*Heliophila cf. deserticola*	-					x	
Brassicaceae	*Lepidium africanum* subsp. *africanum*	LC					x	x
Brassicaceae	*Lepidium africanum* subsp. *divaricatum*	LC						x
Brassicaceae	*Lepidium desertorum*	LC						x
Brassicaceae	*Lepidium englerianum*	LC						x
Brassicaceae	*Sisymbrium capense*	LC						x
Cactaceae	*Cylindropuntia pallida*	NE			1a			x
Cactaceae	*Opuntia aurantiaca*	NE			1b		x	
Cactaceae	*Opuntia ficus-indica*	NE			1b		x	
Campanulaceae	*Wahlenbergia nodosa*	LC					x	
Capparaceae	*Cadaba aphylla*	LC					x	
Caryophyllaceae	*Dianthus micropetalus*	LC					x	
Celastraceae	*Gymnosporia buxifolia*	LC						x
Celastraceae	*Gymnosporia linearis* subsp. *linearis*	LC						x
Celastraceae	*Gymnosporia szyszylowiczii*	LC					x	
Convolvulaceae	*Convolvulus sagittatus*	LC						x
Crassulaceae	*Adromischus filicaulis*	LC						x
Crassulaceae	*Adromischus filicaulis* subsp. *marlothii*	LC						x
Crassulaceae	*Adromischus liebenbergii*	LC						x
Crassulaceae	*Adromischus* sp.	-					x	
Crassulaceae	*Adromischus triflorus*	LC					x	x
Crassulaceae	*Crassula capitella*	LC					x	
Crassulaceae	*Crassula corallina* subsp. *corallina*	LC					x	x
Crassulaceae	*Crassula deltoidea*	LC					x	
Crassulaceae	*Crassula hemisphaerica*	LC					x	
Crassulaceae	*Crassula muscosa*	LC					x	
Crassulaceae	*Crassula pyramidalis*	LC	x				x	
Crassulaceae	*Crassula subaphylla*	LC					x	
Cucurbitaceae	*Cucumis africanus*	LC						x
Cucurbitaceae	*Cucumis myriocarpus*	LC					x	
Cyperaceae	*Afroscirpoides dioecus*	LC					x	
Cyperaceae	*Cyperus* sp.	-					x	
Cyperaceae	*Fuirena* sp.	-					x	
Cyperaceae	*Pseudoschoenus inanis*	LC					x	
Cyperaceae	*Schoenoplectus decipiens*	LC						x
Ebenaceae	*Diospyros austro-africana*	LC					x	
Ebenaceae	*Diospyros lycioides* subsp. *lycioides*	LC					x	x
Ebenaceae	*Euclea undulata*	LC					x	x
Ericaceae	*Erica bolusanthus*	LC						x
Euphorbiaceae	*Euphorbia decepta*	LC		x			x	
Euphorbiaceae	*Euphorbia ferox*	LC		x				x
Euphorbiaceae	*Euphorbia mauritanica*	LC		x			x	x

Euphorbiaceae	*Euphorbia pillansii*	LC		x				x
Euphorbiaceae	*Euphorbia stellispina*	LC		x			x	
Euphorbiaceae	*Euphorbia suffulta*	VU		x				x
Fabaceae	*Acacia podalyriifolia*	NE			1b			x
Fabaceae	*Indigofera sessilifolia*	LC					x	x
Fabaceae	*Lessertia annularis*	LC					x	x
Fabaceae	*Lessertia frutescens*	LC					x	
Fabaceae	*Lessertia* sp.	-					x	
Fabaceae	*Lotononis pungens*	LC						x
Fabaceae	*Lotononis* sp.	-					x	
Fabaceae	*Medicago laciniata* var. *laciniata*	NE						x
Fabaceae	*Melolobium candicans*	LC					x	
Fabaceae	*Melolobium canescens*	LC						x
Fabaceae	*Melolobium cf. microphyllum*	LC					x	
Fabaceae	*Prosopis glandulosa* var. *glandulosa*	NE			1b			x
Fabaceae	*Psoralea aphylla*	LC						x
Fabaceae	*Vachellia karroo*	LC					x	
Gentianaceae	*Sebaea* sp.	-					x	
Geraniaceae	*Erodium cicutarium*	NE				x	x	x
Geraniaceae	*Monsonia camdeboensis*	LC					x	x
Geraniaceae	*Monsonia crassicaule*	LC					x	
Geraniaceae	*Monsonia salmoniflora*	LC					x	x
Geraniaceae	*Pelargonium alternans*	LC					x	
Geraniaceae	*Pelargonium carnosum* subsp. *carnosum*	LC					x	x
Geraniaceae	*Pelargonium laxum*	LC					x	
Geraniaceae	*Pelargonium malacoides*	LC						x
Geraniaceae	*Pelargonium minimum*	LC					x	
Hyacinthaceae	*Albuca canadensis*	LC						x
Hyacinthaceae	*Albuca exuviata*	LC						x
Hyacinthaceae	*Albuca maxima*	LC					x	
Hyacinthaceae	*Albuca secunda*	LC						x
Hyacinthaceae	*Albuca* sp.	-					x	
Hyacinthaceae	*Albuca unifolia*	LC						x
Hyacinthaceae	*Dipcadi* sp.	-					x	
Hyacinthaceae	*Drimia anomala*	LC						x
Hyacinthaceae	*Drimia intricata*	LC					x	
Hyacinthaceae	*Drimia physodes*	LC						x
Hyacinthaceae	*Drimia* sp.	-					x	
Hyacinthaceae	*Drimia toxicaria*	LC						x
Hyacinthaceae	*Lachenalia aurioliae*	LC						x
Hyacinthaceae	*Lachenalia bowkeri*	LC	x					x
Hyacinthaceae	*Lachenalia* sp.	-	x					x
Hyacinthaceae	*Ledebouria* sp.	-					x	
Hyacinthaceae	*Ornithogalum* sp.	-					x	
Iridaceae	*Babiana sambucina* subsp. *sambucina*	LC	x					x
Iridaceae	*Ixia orientalis*	LC	x					x
Iridaceae	*Moraea polystachya*	LC	x				x	
Iridaceae	*Moraea* sp.	-	x				x	
Iridaceae	*Romulea fibrosa*	LC	x					x
Iridaceae	*Tritonia florentiae*	LC	x					x
Iridaceae	*Tritonia tugwelliae*	LC	x					x
Kewaceae	*Kewa bowkeriana*	LC						x
Kewaceae	*Kewa salsoloides*	LC					x	
Lamiaceae	*Salvia verbenaca*	LC						x
Limeaceae	*Limeum aethiopicum* var. *aethiopicum*	NE					x	x
Lobeliaceae	*Cyphia cf. dentariifolia*	DDT					x	
Loranthaceae	*Moquiniella rubra*	LC						x
Malvaceae	*Grewia robusta*	LC					x	x
Malvaceae	*Hermannia burkei*	LC						x
Malvaceae	*Hermannia coccocarpa*	LC					x	x
Malvaceae	*Hermannia comosa*	LC					x	
Malvaceae	*Hermannia cuneifolia* var. *cuneifolia*	LC					x	x
Malvaceae	*Hermannia cuneifolia* var. *glabrescens*	LC						x
Malvaceae	*Hermannia desertorum*	LC					x	x
Malvaceae	*Hermannia erodioides*	LC					x	
Malvaceae	*Hermannia grandiflora*	LC					x	x
Malvaceae	*Hermannia jacobeifolia*	LC						x
Malvaceae	*Hermannia linearifolia*	LC					x	x
Malvaceae	*Hermannia* sp.	-					x	
Malvaceae	*Hermannia spinosa*	LC					x	

Malvaceae	*Hermannia vestita*	LC					x	
Malvaceae	*Hibiscus pusillus*	LC						x
Malvaceae	*Malva parviflora* var. *parviflora*	NE				x	x	x
Malvaceae	*Radyera urens*	LC						x
Melianthaceae	*Melianthus comosus*	LC					x	x
Molluginaceae	*Pharnaceum* sp.	-					x	
Orchidaceae	*Disa hians*	LC	x	x				x
Oxalidaceae	*Oxalis depressa*	LC					x	
Oxalidaceae	*Oxalis sp.*	-					x	
Papaveraceae	*Argemone ochroleuca*	NE			1b		x	
Pedaliaceae	*Sesamum capense*	LC					x	
Plantaginaceae	*Plantago cafra*	LC						x
Poaceae	*Aristida adscensionis*	LC					x	
Poaceae	*Aristida congesta* subsp. *congesta*	LC					x	x
Poaceae	*Aristida diffusa*	LC					x	
Poaceae	*Bromus pectinatus*	LC					x	x
Poaceae	*Bromus cf. catharticus*	-					x	
Poaceae	*Cenchrus ciliaris*	LC					x	
Poaceae	*Chloris virgata*	LC					x	
Poaceae	*Cynodon incompletus*	LC					x	
Poaceae	*Digitaria argyrograpta*	LC					x	x
Poaceae	*Digitaria eriantha*	LC					x	
Poaceae	*Ehrharta* sp.	-					x	
Poaceae	*Ehrharta calycina*	LC					x	x
Poaceae	*Enneapogon cenchroides*	LC					x	
Poaceae	*Enneapogon desvauxii*	LC					x	x
Poaceae	*Enneapogon scaber*	LC					x	
Poaceae	*Eragrostis curvula*	LC					x	x
Poaceae	*Eragrostis homomalla*	LC						x
Poaceae	*Eragrostis lehmanniana*	LC					x	
Poaceae	*Eragrostis obtusa*	LC					x	
Poaceae	*Eragrostis procumbens*	LC						x
Poaceae	*Eragrostis rotifer*	LC					x	
Poaceae	*Eragrostis* sp.	-					x	
Poaceae	*Fingerhuthia africana*	LC					x	x
Poaceae	*Hordeum murinum* subsp. *leporinum*	NE				x		x
Poaceae	*Leptochloa fusca*	LC					x	
Poaceae	*Lolium multiflorum*	NE						x
Poaceae	*Lolium temulentum*	NE						x
Poaceae	*Melica decumbens*	LC					x	
Poaceae	*Oropetium capense*	LC					x	
Poaceae	*Pentameris* cf *airoides*	LC					x	
Poaceae	*Polypogon monspeliensis*	NE				x	x	
Poaceae	*Schismus barbatus*	LC						x
Poaceae	*Setaria verticillata*	LC					x	
Poaceae	*Sporobolus cf. festivus*	-					x	
Poaceae	*Sporobolus fimbriatus*	LC					x	
Poaceae	*Sporobolus ioclados*	LC					x	x
Poaceae	*Sporobolus* sp.	-					x	
Poaceae	*Stipagrostis ciliata*	LC					x	
Poaceae	*Stipagrostis namaquensis*	LC					x	x
Poaceae	*Stipagrostis obtusa*	LC					x	x
Poaceae	*Stipagrostis uniplumis*	LC					x	
Poaceae	*Tragus berteronianus*	LC					x	x
Poaceae	*Tragus koelerioides*	LC					x	x
Poaceae	*Tragus racemosus*	LC						x
Poaceae	*Tricholaena capensis*	LC					x	
Polygalaceae	*Polygala myrtifolia* var. *myrtifolia*	LC						x
Polygonaceae	*Emex australis*	LC					x	x
Polygonaceae	*Persicaria lapathifolia*	LC						x
Restionaceae	*Elegia filacea*	LC						x
Restionaceae	*Thamnochortus cinereus*	LC						x
Rosaceae	*Cliffortia* sp.	-						x
Rubiaceae	*Kohautia cynanchica*	LC						x
Rubiaceae	*Nenax microphylla*	LC					x	
Ruscaceae	*Eriospermum cf. paradoxum*	-					x	
Ruscaceae	*Eriospermum cf. porphyrium*	-					x	
Rutaceae	*Agathosma ovata*	LC						x
Salicaceae	*Dovyalis caffra*	LC						x
Santalaceae	*Thesium hystrix*	LC					x	

Santalaceae	*Thesium imbricatum*	LC				x
Santalaceae	*Thesium lacinulatum*	LC				x
Santalaceae	*Viscum rotundifolium*	LC			x	x
Scrophulariaceae	*Aptosimum indivisum*	LC			x	x
Scrophulariaceae	*Chaenostoma archeri*	LC				x
Scrophulariaceae	*Chaenostoma halimifolium*	LC				x
Scrophulariaceae	*Diascia decipiens*	LC	x			x
Scrophulariaceae	*Diascia runcinata*	LC	x			x
Scrophulariaceae	*Jamesbrittenia atropurpurea* subsp. *atropurpurea*	LC			x	x
Scrophulariaceae	*Jamesbrittenia* sp.	-			x	
Scrophulariaceae	*Jamesbrittenia tenuifolia*	LC				x
Scrophulariaceae	*Jamesbrittenia tortuosa*	LC				x
Scrophulariaceae	*Limosella africana* var. *africana*	LC				x
Scrophulariaceae	*Lyperia tristis*	LC				x
Scrophulariaceae	*Manulea chrysantha*	LC				x
Scrophulariaceae	*Manulea gariepina*	LC			x	
Scrophulariaceae	*Manulea* sp.	-			x	
Scrophulariaceae	*Nemesia linearis*	LC				x
Scrophulariaceae	*Nemesia* sp.	-			x	
Scrophulariaceae	*Peliostomum leucorrhizum*	LC			x	x
Scrophulariaceae	*Selago albida*	LC			x	
Scrophulariaceae	*Selago centralis*	LC				x
Scrophulariaceae	*Selago divaricata*	LC				x
Scrophulariaceae	*Selago geniculata*	LC			x	
Scrophulariaceae	*Selago myriophylla*	LC				x
Scrophulariaceae	*Selago* sp.	-			x	
Scrophulariaceae	*Zaluzianskya venusta*	LC			x	x
Solanaceae	*Datura ferox*	NE		1b	x	
Solanaceae	*Lycium cinereum*	LC			x	x
Solanaceae	*Lycium horridum*	LC				x
Solanaceae	*Lycium oxycarpum*	LC			x	
Solanaceae	*Lycium pumilum*	LC				x
Solanaceae	*Lycium cf. schizocalyx*	-			x	
Solanaceae	*Solanum giftbergense*	LC			x	
Solanaceae	*Solanum* sp.	-			x	
Solanaceae	*Solanum tomentosum*	LC			x	
Thesiaceae	*Lacomucinaea lineatum*	LC			x	
Thymelaeaceae	*Lasiosiphon deserticola*	LC			x	x
Urticaceae	*Forsskaolea candida*	LC				x
Zygophyllaceae	*Augea capensis*	LC				x
Zygophyllaceae	*Roepera incrustata*	LC				x
Zygophyllaceae	*Roepera lichtensteiniana*	LC			x	x
Zygophyllaceae	*Roepera microphyllum*	LC				x
Zygophyllaceae	*Roepera sessilifolia*	LC				x
Zygophyllaceae	*Tetraena chrysopteron*	LC			x	x
Zygophyllaceae	*Tetraena rigida*	LC			x	

APPENDIX C:

FAUNA SPECIES CHECKLISTS (ADU DATABASE)

Database: 3222 CB, CD, DA, DB, DC, DD; 3322 AB, BA, BB
IUCN red list category
Western Cape Nature and Environmental Conservation Ordinance (WCNECO as amended 2000)
CITES
NEMBA (ToPS) - Threatened or Protected Species

Family	Scientific name	Common name	IUCN RSA	WCNCO Sch2	CITES	NEMBA
MAMMALS						
ORDER: ARTIODACTYLA						
Bovidae	*Antidorcas marsupialis*	Springbok	LC	x		
Bovidae	*Kobus ellipsiprymnus*	Waterbuck	LC	x		
Bovidae	*Oreotragus oreotragus*	Klipspringer	LC	x		
Bovidae	*Raphicerus campestris*	Steenbok	LC	x		
Bovidae	*Raphicerus melanotis*	Cape grysbok	LC	x		
Bovidae	*Taurotragus oryx*	Cape eland	LC	x		
ORDER: CARNIVORA (CARNIVORES)						
Canidae	*Vulpes chama*	Cape fox	LC	X		X
Hyaenidae	*Proteles cristata*	Aardwolf	LC	x		
Viverridae	*Genetta genetta*	Small-spotted genet	LC			
ORDER: PRIMATES						
Cercopithecidae	*Papio ursinus*	Chacma baboon	LC			
ORDER: RODENTIA (RODENTS)						
Hystricidae	*Hystrix africaeaustralis*	Cape porcupine	LC			
Muridae	*Desmodillus auricularis*	Cape short-tailed gerbil	LC			
Muridae	*Otomys unisulcatus*	Karoo bush rat	LC			
Muridae	*Parotomys brantsii*	Brants's whistling rat	LC			
Muridae	*Parotomys littledalei*	Littledale's whistling rat	NT			
ORDER: TUBULIDENTATA						
Orycteropodidae	*Orycteropus afer*	Aardvark	LC	x		
ORDER: HYRACOIDEA (HYRAXES)						
Procaviidae	*Procavia capensis*	Rock hyrax	LC			
ORDER: LAGOMORPHA (HARES AND RABBITS)						
Leporidae	*Lepus saxatilis*	Scrub hare	LC			
ORDER: MACROSCELIDAE (ELEPHANT SHREWS)						
Macroscelididae	*Elephantulus edwardii*	Cape elephant shrew	LC			
ORDER: EULIPOTYPHIA (SHREWS)						
Soricidae	*Myosorex varius*	Forest shrew	LC			
REPTILES						
ORDER: SQUAMATA						
SUB-ORDER: LACERTILIA (LIZARDS)						

Agamidae	*Agama aculeata aculeata*	Common ground agama	LC	x		
Agamidae	*Agama atra*	Southern rock agama	LC	x		
Chamaeleonidae	*Chamaeleo namaquensis*	Namaqua chameleon	LC	X		
Cordylidae	*Cordylus aridus*	Eastern dwarf girdled lizard	LC	X		
Cordylidae	*Karusasaurus polyzonus*	Karoo girdled lizard	LC	x		
Gekkonidae	*Chondrodactylus angulifer angulifer*	Common giant ground gecko	LC	x		
Gekkonidae	*Chondrodactylus bibronii*	Bibron's gecko	LC	x		
Gekkonidae	*Pachydactylus capensis*	Cape gecko	LC	x		
Gekkonidae	*Pachydactylus geitje*	Ocellated gecko	LC	X		
Gekkonidae	*Pachydactylus maculatus*	Spotted gecko	LC	x		
Gekkonidae	*Pachydactylus mariquensis*	Marico gecko	LC	x		
Gekkonidae	*Pachydactylus purcelli*	Purcell's gecko	LC	x		
Gekkonidae	*Ptenopus garrulus maculatus*	Spotted barking gecko	LC	x		
Lacertidae	*Meroles suborbitalis*	Spotted desert lizard	LC	x		
Lacertidae	*Nucras livida*	Karoo sandveld lizard	LC	x		
Lacertidae	*Pedioplanis laticeps*	Karoo sand lizard	LC	x		
Lacertidae	*Pedioplanis lineoocellata pulchella*	Common sand lizard	LC	x		
Lacertidae	*Pedioplanis namaquensis*	Namaqua sand lizard	LC	x		
Scincidae	*Trachylepis capensis*	Cape skink	LC	x		
Scincidae	*Trachylepis occidentalis*	Western three-striped skink	LC	x		
Scincidae	*Trachylepis sulcata sulcata*	Western rock skink	LC	x		
Scincidae	*Trachylepis variegata*	Variegated skink	LC	x		
SUB-ORDER: SERPENTES (SNAKES)						
Elapidae	*Aspidelaps lubricus lubricus*	Coral shield cobra	LC			
Elapidae	*Naja nivea*	Cape cobra	LC			
Lamprophiidae	*Psammophis notostictus*	Karoo sand snake	LC			
Viperidae	*Bitis arietans arietans*	Puff adder	LC			
ORDER: TESTUDINATA (CHELONIANS)						
Testudinidae	*Chersina angulata*	Angulate tortoise	LC	x	App II	
Testudinidae	*Chersobius boulengeri*	Karoo padloper/Karoo dwarf tortoise	EN	x	App II	
Testudinidae	*Psammobates tentorius tentorius*	Karoo tent tortoise	-	x	App II	
Testudinidae	*Psammobates tentorius verroxii*	Verrox's tent tortoise	-	x	App II	
Testudinidae	*Stigmochelys pardalis*	Leopard tortoise	LC	x	App II	
Pelomedusidae	*Pelomedusa galeata*	SA helmeted terrapin	NE			
Frogs						
Bufonidae	*Vandijkophrynus gariepensis*	Karoo toad	LC	x		
Pipidae	*Xenopus laevis*	Common platanna	LC	x		
Pyxicephalidae	*Amietia fuscigula*	Cape river frog	LC	x		
Pyxicephalidae	*Cacosternum boettgeri*	Common caco	LC	x		
Pyxicephalidae	*Pyxicephalus adspersus*	Giant bull frog	NT	x		x
Pyxicephalidae	*Tomopterna delalandii*	Cape sand frog	LC	x		
Dung beetles						
Scarabaeidae	*Digitonthophagus gazella*					
Scarabaeidae	*Epirinus aeneus*					
Scarabaeidae	*Epirinus striatus*					
Scarabaeidae	*Euonthophagus vicarius*					
Scarabaeidae	*Gymnopleurus humanus*					
Scarabaeidae	*Onthophagus albipennis*					
Scarabaeidae	*Onthophagus cameloides*					
Scarabaeidae	*Onthophagus peringueyi*					
Scarabaeidae	*Phalops rufosignatus*					
Scarabaeidae	*Scarabaeus sp.*					
Scarabaeidae	*Scarabaeus (Sceliages) gagates*					
Scarabaeidae	*Scarabaeus bohemani*					
Scarabaeidae	*Scarabaeus kalaharicus*					
Scarabaeidae	*Scarabaeus karrooensis*					
Scarabaeidae	*Scarabaeus megaparvulus*					
Scarabaeidae	*Scarabaeus satyrus*					
Scarabaeidae	*Scarabaeus viator*					
Lepidoptera						
Geometridae	*Acanthovalva focularia*		LC			
Hesperiidae	*Spialia asterodia*	Star sandman	LC			
Hesperiidae	*Spialia nanus*	Dwarf sandman	LC			
Hesperiidae	*Tsitana tulbagha kaplani*	Tulbagh sylph	LC			

Lycaenidae	*Aloeides damarensis damarensis*	Damara russet	LC
Lycaenidae	*Aloeides depicta*	Depicta russet	LC
Lycaenidae	*Aloeides pierus*	Veined russet	LC
Lycaenidae	*Aloeides vansoni*	Roggeveld russet	LC
Lycaenidae	*Anthene definita definita*	Steel-blue-ciliate blue	LC
Lycaenidae	*Argyraspodes argyraspis*	Warrior silver-spotted copper	LC
Lycaenidae	*Azanus ubaldus*	Velvet-spotted babul blue	LC
Lycaenidae	*Brephidium metophis*	Tinktinkie pygmy blue	LC
Lycaenidae	*Cacyreus dicksoni*	Karoo geranium bronze	LC
Lycaenidae	*Chrysoritis chrysaor*	Burnished opal	LC
Lycaenidae	*Chrysoritis midas*	Midas opal	LC
Lycaenidae	*Chrysoritis pan lysander*	Lysander opal	LC
Lycaenidae	*Chrysoritis turneri turneri*	Karoo opal	LC
Lycaenidae	*Crudaria leroma*	Silver-spotted grey	LC
Lycaenidae	*Iolaus mimosae mimosae*	Mimosa sapphire	LC
Lycaenidae	*Lepidochrysops australis*	Southern giant cupid	LC
Lycaenidae	*Lepidochrysops ketsi ketsi*	Ketsi giant cupid	LC
Lycaenidae	*Lepidochrysops ortygia*	Koppie giant cupid	LC
Lycaenidae	*Lepidochrysops robertsoni*	Robertson's giant cupid	LC
Lycaenidae	*Leptomyrina lara*	Cape black-eye	LC
Lycaenidae	*Leptotes brevidentatus*	Short-toothed zebra blue	LC
Lycaenidae	*Phasis clavum clavum*	Namaqua arrowhead	LC
Lycaenidae	*Stugeta bowkeri bowkeri*	Bowker's marbled sapphire	LC
Lycaenidae	*Thestor brachycerus dukei*	Duke's skolly	LC
Lycaenidae	*Trimenia argyroplaga argyroplaga*	Large silver-spotted copper	LC
Lycaenidae	*Tylopaedia sardonyx sardonyx*	King copper	LC
Noctuidae	*Helicoverpa armigera*		
Nympahlidae	*Charaxes pelias*	Protea charaxes	LC
Nympahlidae	*Danaus chrysippus orientis*	African plain tiger	LC
Nympahlidae	*Pseudonympha trimenii trimenii*	White-netted brown	LC
Nympahlidae	*Stygionympha irrorata*	Karoo hillside brown	LC
Nympahlidae	*Tarsocera fulvina*	Karoo spring widow	LC
Nympahlidae	*Vanessa cardui*	Painted lady	LC
Pieridae	*Belenois aurota*	Pioneer caper white	LC
Pieridae	*Pontia helice helice*	Southern meadow white	LC
Saturnidae	*Imbrasia tyrrhea*		
Spingidae	*Agrius convolvuli*		
Odonata			
Libellulidae	*Sympetrum fonscolombii*	Red-veined Darter or Nomad	LC
Scorpions			
Buthidae	*Parabuthus schlechteri*		
Buthidae	*Uroplectes gracilior*		
Hormuridae	*Hadogenes trichiurus*		
Scorpionidae	*Opistophthalmus karrooensis*		
Spiders			
Theraphosidae	*Harpactira namaquensis*	Baboon spider	

APPENDIX D:

SITE SENSITIVITY VERIFICATION

Prior to commencing with the Terrestrial Biodiversity Specialist Assessment in accordance with the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (Government Notice 320, dated 20 March 2020), a site sensitivity verification was undertaken in order to assess the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool)(NEMA 2020a).

The details of the site sensitivity verification are noted below:

Date of site visit	6 – 10 June 2022
Specialist name	N. van Rooyen; M.W van Rooyen
Professional registration number	401430/83 Botanical Science (NvR); 400509/14 Ecological Science (MWvR)
Specialist affiliation / company	Ekotrust cc

The site sensitivity verification was undertaken using the following means:

- desk top analysis using satellite imagery;
- consulting geological, land type and vegetation type maps of the region;
- consulting provincial datasets on the latest versions of the mapping of CBAs, ESAs, ONAs, NPAES and PAs;
- checking distribution ranges of IUCN red-listed species and species highlighted by the screening tool;
- compiling plant and animal species checklist for the region; and
- on-site inspection.

To verify the site sensitivity of the screening tool, Google satellite images were studied beforehand and the site stratified into relatively homogenous physiographic-physionomic units or habitats. Sites were then selected to represent these habitats. During the field survey, 37 sampling sites were surveyed at the proposed Kwagga OTP development.

Animal Theme (note avifauna is excluded)

Screening tool: The screening tool listed the species below and rated the sensitivity of the Animal Species Theme if the avifaunal component is excluded as **Medium.**

Sensitivity	Feature(s)
High	Aves-*Neotis ludwigii*
High	Aves-*Polemaetus bellicosus*
Medium	Aves-*Afrotis afra*
Medium	Aves-*Neotis ludwigii*
Medium	Reptilia-*Chersobius boulengeri*

Site verification:

Reptiles:

- Our background study confirmed the presence of the Karoo dwarf tortoise within the 3222D degree square (Animal Demography Unit reptile map) although it was not recorded during the site visit. The closest records of the species are approximately 20 – 40 km from the Kwagga OTP site. A site visit (September 2021) by a specialist herpetologist on the farm Trakaskuilen yielded no evidence of live specimens or shell fragments of Karoo Dwarf Tortoise. This tortoise has a strong affinity with dolerite ridges and other types of rocky outcrops in the Nama Karoo biome. It utilises holes or cavities under rocks as shelter, which are considered the most important components of essential habitat that determines the likelihood of presence or absence in an area. The conclusion by the specialist was that the species was indeed absent from this particular area judging by the general lack of suitable habitat on Trakaskuilen.

We would thus suggest a downgrading of the Animal Species Theme **(avifaunal component excluded)** to a **Low** sensitivity.

Plant Theme

Screening tool: The screening tool listed the species below and rated the sensitivity of the Plant Species Theme as **Medium.**

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 383
Medium	*Peersia frithii*
Medium	Sensitive species 1039

Site verification:

- None of the species listed by the screening tool were found in Segment C – E of the proposed Kwagga OTP and associated infrastructure. Sensitive species 383 was however, recorded on the larger Kwagga WEF site.
- Our background study and site assessment would therefore downgrade the Plant Species Theme to a **Low** sensitivity. However, several provincially protected/specially protected and CITES II listed species were recorded on site. These species are mostly associated with cliffs, scarps and rocky ridges (outcrops) and permits are needed for the removal of these species.

Relative Terrestrial Biodiversity Theme

Screening tool: The screening tool rated the sensitivity of the Relative Terrestrial Biodiversity theme as **Very High**.

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiveristy area 1
Very High	Ecological support area 2
Very High	FEPA Subcatchments

Site verification:

- This theme considers the presence of protected areas, National Protected Area Expansion Strategy (NPAES), CBAs, ESAs and National Freshwater Ecosystem Priority Area (NFEPAs). Our background study concurred with the findings of the screening tool on the presence of these features.

Outcome of the site sensitivity verification:

- We would suggest that the Plant Theme's site sensitivity to be rated as **Low.**
- We would suggest the Animal Theme's site sensitivity to be rated as **Low**.
- Unfortunately, the screening tool limits the sensitivity of the relative terrestrial biodiversity theme to either Very High or Low. This is an issue which should be revisited by the Department of Forestry, Fisheries and the Environment (DFFE) since it does not give a proper representation of the site conditions. Although we agree with the delineation of the CBA and its categorization as Very High, the entire powerline route cannot be considered as Very High. Thus, if the same 4-tiered scale were to be applied to this theme, as in the case of the other themes, we would rate it as **Medium.**

APPENDIX E:

COMPLIANCE WITH THE TERRESTRIAL BIODIVERSITY PROTOCOL (GN 320, 20 MARCH 2020)

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	***Section where this has been addressed in the Specialist Report***
The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects: *2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these;*	*Chapter 4, Section 4.11*
2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;	*Chapter 4, Sections 4.9 & 4.11*
2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	*Chapter 4, Sections 4.9 & 4.11*
2.3.4. the description of any significant terrestrial landscape features (including rare or important flora- faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;	*Chapters 4, 9 & 10*
2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including: *a) main vegetation types;* *b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;* *c) ecological connectivity, habitat fragmentation, ecological processes and fine-scale habitats; and* *d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;*	*(a) Chapter 4* *(b) Chapters 4, 9 & 10* *(c) Chapters 4, 9 & 10* *(d) Chapters 4, 5, 6, 9 & 10; Appendix B, C & D*
2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	*Chapters 4, 7, 9 & 11*
2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify: *2.3.7.1. terrestrial critical biodiversity areas (CBAs), including:* *a) the reasons why an area has been identified as a CBA;* *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;* *c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* *d) the impact on ecosystem threat status;* *e) the impact on explicit subtypes in the vegetation;* *f) the impact on overall species and ecosystem diversity of the site; and* *g) the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	*(a) Chapters 2, 4 & Appendix D* *(b) Chapter 4; Section 4.9* *(c) Chapter 4* *(d) Chapter 11* *(e) Chapter 11* *(f) Chapter 11* *(g) Chapter 11*
2.3.7.2. terrestrial ecological support areas (ESAs), including: *a) the impact on the ecological processes that operate within or across the site;* *b) the extent the proposed development will impact on the functionality of the ESA; and* *c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	*(a) Chapter 4, 9 & 10* *(b) Chapter 4, 9 & 10* *(c) Chapter 4, 9 & 10*
2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- *a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	*(a) Chapters 4, 10 & Appendix D*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	***Section where this has been addressed in the Specialist Report***
2.3.7.4. priority areas for protected area expansion, including- a) the way in which the proposed development will compromise or contribute to the expansion of the protected area network;	*(a) Chapters 4, 10 & Appendix D*
2.3.7.5. SWSAs including: a) the impact(s) on the terrestrial habitat of a SWSA; and b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);	*n.a.*
2.3.7.6. FEPA subcatchments, including- a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;	*Chapters 4, 9 & 10*
2.3.7.7. indigenous forests, including: a) impact on the ecological integrity of the forest; and b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	*n.a.*
3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	*Appendix G & H*
3.1.2. a signed statement of independence by the specialist;	*Appendix G*
3.1.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	*Chapter 2, Appendix D*
3.1.4. a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	*Chapter 2*
3.1.5. a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	*Chapter 2*
3.1.6. a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	*Chapter 7; Figure 21; Sensitivity.kmz file*
3.1.7. additional environmental impacts expected from the proposed development;	*n.a.*
3.1.8. any direct, indirect and cumulative impacts of the proposed development;	*Chapter 11*
3.1.9. the degree to which impacts and risks can be mitigated;	*Chapter 11*
3.1.10. the degree to which the impacts and risks can be reversed;	*Chapter 11*
3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	*Chapter 11*
3.1.12. proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	*Chapter 13*
3.1.13. a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	*n.a.*
3.1.14. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	*Chapter 14*
3.1.15. any conditions to which this statement is subjected.	*Chapter 14*
3.2. The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr, where relevant.	*For EAP to incorporate*
3.2.1. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	*For EAP to append .*

APPENDIX F

IMPACT ASSESSMENT METHODOLOGY

The impacts of the proposed development on the terrestrial biodiversity and species were assessed based on the knowledge gained during the site visit and literature review. Each of the impacts is briefly described below in terms of the nature; proposed mitigation measures; and the significance of the impact without and with the mitigation measures applied. The methodology follows the guidelines provided by the CSIR and the following methodology is applied to the prediction and assessment of impacts and risks:

Potential impacts and risks have been rated in terms of the direct, indirect and cumulative impacts:

- **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:** are indirect or induced changes that may occur as a result 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 as a result of the activity.
- **Cumulative impacts:** are impacts 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 a period of time and can include both direct and indirect impacts. The cumulative impacts are assessed by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 50 km of the proposed Kwagga OTP site) that have been approved (i.e. positive EA has been issued) or is currently underway.

The impact assessment methodology includes the following aspects:

- **Nature of impact/risk** - The type of effect that a proposed activity will have on the environment.

- **Status** - Whether the impact/risk on the overall environment will be:
    - Positive - environment overall will benefit from the impact/risk;
    - Negative - environment overall will be adversely affected by the impact/risk; or
    - Neutral - environment overall will not be affected.

- **Spatial extent** – The size of the area that will be affected by the impact/risk:
    - Site specific;
    - Local (<10 km from site);
    - Regional (<100 km of site);
    - National; or
    - International (e.g. Greenhouse Gas emissions or migrant birds).

- **Duration** – The timeframe during which the impact/risk will be experienced:
    - Very short term - instantaneous;
    - Short term - less than 1 year;
    - Medium term - 1 to 10 years;
    - Long term - the impact will cease after the operational life of the activity (i.e. the impact or risk will occur for the project duration); or

  - Permanent - mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e. the impact will occur beyond the project decommissioning).

- **Consequence (Severity)** – The anticipated consequence of the risk/impact:
  - Extreme - extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease;
  - Severe - severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease;
  - Substantial - substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease;
  - Moderate - notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner; or
  - Slight - negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected.

- **Reversibility of the Impacts** - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):
  - High reversibility - impact is highly reversible at end of project life i.e. this is the most favourable assessment for the environment;
  - Moderate reversibility of impacts;
  - Low reversibility of impacts; or
  - Impacts are non-reversible - impact is permanent, i.e. this is the least favourable assessment for the environment.

- **Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks** – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):
  - High irreplaceability of resources - project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment;
  - Moderate irreplaceability of resources;
  - Low irreplaceability of resources; or
  - Resources are replaceable - the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment.

Using the criteria above, the impacts are further assessed in terms of the following:

- **Probability** – The probability of the impact/risk occurring:
  - Extremely unlikely (little to no chance of occurring);
  - Very unlikely (<30% chance of occurring);
  - Unlikely (30-50% chance of occurring)
  - Likely (51 – 90% chance of occurring); or
  - Very Likely (>90% chance of occurring regardless of prevention measures).

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 25).

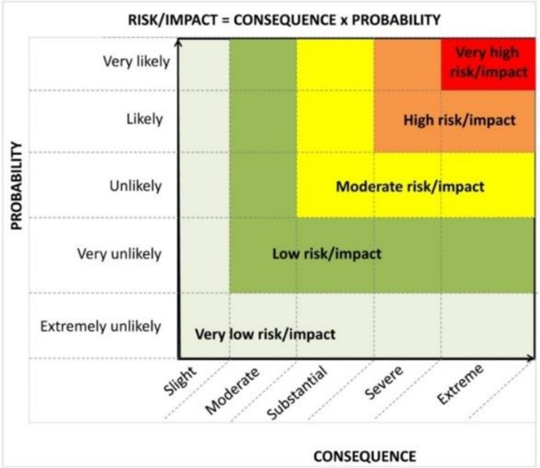

Figure 26: Guide to assessing risk/impact significance as a result of consequence and probability.

- **Significance** – Will the impact cause a notable alteration of the environment?
  - Very low - the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making;
  - Low - the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making;
  - Moderate - the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated;
  - High - the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making; and
  - Very high - the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating).

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- Very low = 5;
- Low = 4;
- Moderate = 3;
- High = 2; and
- Very high = 1.

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:

- Low;
- Medium; or
- High.

APPENDIX G

SPECIALIST STATEMENT OF INDEPENDENCE

Specialist declaration

I, ___Noel van Rooyen_______, 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: _Ekotrust cc_______________

Date: __23 June 2022_______________________

I, ___Gretel van Rooyen______, 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: M. W. van Rooyen

Name of Company: _Ekotrust cc____________________

Date: __23 June 2022______________________

Indemnity and conditions relating to this report:

The observations, findings, recommendations and conclusions provided in the current report are based on the compilers' best scientific and professional knowledge and other available information. If new information should become available Ekotrust cc reserves the right to modify aspects of the report. This report (hard copy and/or electronic) must not be amended or extended without the prior written consent of the author. Furthermore, any recommendations, statements or conclusions drawn from or based on this report must make reference to the report. If these recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety (as an Appendix).

Although Ekotrust cc has exercised due care in preparing this report, it accepts no liability, and by receiving this document, the client indemnifies Ekotrust cc against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

APPENDIX H:

SPECIALIST EXPERTISE

Curriculum vitae: DR NOEL VAN ROOYEN

1. Biographical information

Surname	**Van Rooyen**
First names	**Noel**
ID number	**501225 5034 084**
Citizenship	**South African**
Business address	**Ekotrust CC** **7 St George Street** **Lionviham 7130** **Somerset West** **South Africa**
Mobile	**082 882 0886**
e-mail	**noel@ekotrust.co.za**
Current position	**Member of Ekotrust cc**
Professional registration	**Botanical Scientist: Pr.Sci.Nat; Reg no. 401430/83**

Academic qualifications include BSc (Agric), BSc (Honours), MSc (1978) and DSc degrees (1984) in Plant Ecology at the University of Pretoria, South Africa. Until 1999 I was Professor in Plant Ecology at the University of Pretoria and at present I am a member of Ekotrust cc.

2. Publications

I am the author/co-author of 128 peer reviewed research publications in national and international scientific journals and was supervisor or co-supervisor of 9 PhD and 33 MSc students. More than 400 projects were undertaken by Ekotrust cc as consultant over a period of more than 40 years.

Books:

VAN ROOYEN, N. 2001. *Flowering plants of the Kalahari dunes*. Ekotrust CC, Pretoria. (In collaboration with H. Bezuidenhout & E. de Kock).
VAN ROOYEN, N. & VAN ROOYEN, M.W. 2019. *Flowering plants of the southern Kalahari*. Somerset West.

Author / co-author of various chapters on the Savanna and Grassland Biomes in:

LOW, B. & REBELO, A.R. 1996. *Vegetation types of South Africa, Lesotho and Swaziland***.** Department of Environmental Affairs and Tourism, Pretoria.
KNOBEL, J. (Ed.) 1999, 2006. *The Magnificent Natural Heritage of South Africa***.** (Chapters on the Kalahari and Lowveld).
VAN DER WALT, P.T. 2010. **Bushveld.** Briza, Pretoria. (Chapter on Sour Bushveld).

Contributed to chapters on vegetation, habitat evaluation and veld management in the books:

BOTHMA, J. du P. & DU TOIT, J.G. (Eds). 2016**.** ***Game Ranch Management*.** 5th edition**.** Van Schaik, Pretoria.
BOTHMA, J. du P. & DU TOIT, J.G. (Eds). 2021**. Wildplaasbestuur.** 5e uitgawe**.** Van Schaik, Pretoria.

Co-editor of the book:

BOTHMA, J. du P. & VAN ROOYEN, N**.** (eds). 2005**. *Intensive wildlife production in southern Africa.*** Van Schaik, Pretoria.

3. Ekotrust CC: Core Services

Ekotrust CC specializes in vegetation surveys, classification and mapping, wildlife management, wildlife production and economic assessments, vegetation ecology, veld condition assessment, carrying capacity, biodiversity assessments, rare species assessments, carbon pool assessments and alien plant management.

4. Examples of projects previously undertaken

Numerous vegetation surveys and vegetation impact assessments for Baseline, Scoping and Environmental Impact Assessments (BAs & EIA's) were made both locally and internationally.

Numerous projects have been undertaken in game ranches and conservation areas covering aspects such as vegetation surveys, range condition assessments and wildlife management. Of note is the Kgalagadi Transfrontier Park; iSimangaliso Wetland Park, Ithala Game Reserve, Phinda Private Game Reserve, Mabula Game Reserve, Tswalu Kalahari Desert Reserve, Maremani Nature Reserve and Associate Private Nature Reserve (previously Timbavati, Klaserie & Umbabat Private Game Reserve).

Involvement in various research programmes: vegetation of the northern Kruger National Park, Savanna Ecosystem Project at Nylsvley, Limpopo; Kuiseb River Project (Namibia); Grassland Biome Project; Namaqualand and Kruger Park Rivers Ecosystem research programme.

5. Selected references of other projects done by Ekotrust CC

VAN ROOYEN, N., THERON, G.K., BREDENKAMP, G.J., VAN ROOYEN, M.W., DEUTSCHLäNDER, M. & STEYN, H.M. 1996. *Phytosociology, vegetation dynamics and conservation of the southern Kalahari*. Final report: Department of Environmental Affairs & Tourism, Pretoria.

VAN ROOYEN, N. 1999 & 2017. The vegetation types, veld condition and game of Tswalu Kalahari Desert Reserve.

VAN ROOYEN, N. 2000. Vegetation survey and mapping of the Kgalagadi Transfrontier Park. Peace Parks Foundation, Stellenbosch.

VAN ROOYEN, N, VAN ROOYEN, M.W. & GROBLER, A. 2004. Habitat evaluation and stocking rates for wildlife and livestock - PAN TRUST Ranch, Ghanzi, Botswana.

VAN ROOYEN, N. 2004. Vegetation and wildlife of the Greater St Lucia Wetland Park, KZN.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2008. Vegetation classification, habitat evaluation and wildlife management of the proposed Royal Big Six Nsubane-Pongola Transfrontier Park, Swaziland.

VAN ROOYEN, N., VAN DER MERWE, H. & Van Rooyen, M.W. 2011. The vegetation of the NECSA Vaalputs site. Report to NECSA.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2016. Ecological evaluation of the farm Springbokoog in the Van Wyksvlei region of Northern Cape, including a habitat assessment for the introduction of black rhinoceros. Ekotrust.

VAN ROOYEN, M.W. & VAN ROOYEN, N. & VAN DEN BERG, H. 2016. Kathu Bushveld study: Research offset for first development phase of Adams Solar Energy Facility. Project conducted for Department of Environment and Nature Conservation Northern Cape (DENC) and the Department of Agriculture, Forestry and Fisheries (DAFF).

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2018. Environmental screening study for the proposed essential oils and Moringa oil enterprise on Ferndale farm, Bathurst, Eastern Cape. Ekotrust cc, Somerset West.

VAN ROOYEN, M.W., GAUGRIS, J.Y. & VAN ROOYEN, N. 2018. Dish Mountain gold project, Republic of Ethiopia: Natural resource use evaluation - baseline report. FFMES, Report to SRK Consulting.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2018. Report on the terrestrial ecology (flora & fauna). Basic assessment report for the proposed development of the 325 MW Kudusberg Wind Energy Facility in the Northern and Western Cape. Ekotrust cc, Somerset West.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2019. Proposed amendments to the Ishwati Emoyeni Wind Energy Facility (WEF) of Special Energy Project (PTY) LTD, a subsidiary of Windlab Systems (PTY) LTD. Ekotrust cc, Somerset West.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2021. Basic assessment report for the proposed SKA fibre-optic cable route between Beaufort West and Carnarvon. Terrestrial ecology (flora & fauna). Ekotrust cc, Somerset West.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2022. EIA report for the proposed development of the Kwagga Wind Energy Facilities 1-3 near Beaufort West in the Western Cape. Terrestrial ecology (flora & fauna). Ekotrust cc, Somerset West.

VAN ROOYEN, M.W. & VAN ROOYEN, N. 2022. Conservation Area Management Plan. Black Mountain Mining, Vedanta Resources PLC. Ekotrust cc, Somerset West.

6. Selected peer-reviewed research publications

VAN ROOYEN, N. 1978. A supplementary list of plant species for the Kruger National Park from the Pafuri area. *Koedoe* 21: 37 - 46.

VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1981. A floristic description and structural analysis of the plant communities of the Punda Milia - Pafuri - Wambiya area in the Kruger National Park, Republic of South Africa. 2. The sandveld communities. *Jl S. Afr. Bot.* 47: 405 - 449.

VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1986. The vegetation of the Roodeplaat Dam Nature Reserve. 4. Phenology and climate. *S. Afr. J. Bot*. 52: 159 - 166.

VAN ROOYEN, N. 1989. Phenology and water relations of two savanna tree species. *S. Afr. J. Sci*. 85: 736 - 740.

VAN ROOYEN, N., BREDENKAMP, G.J. & THERON, G.K. 1991. Kalahari vegetation: Veld condition trends and ecological status of species. *Koedoe* 34: 61 - 72.

VAN ROOYEN, M.W., GROBBELAAR, N., THERON, G.K. & VAN ROOYEN, N. 1992. The ephemerals of Namaqualand: effect of germination date on development of three species. *J. Arid. Environ*. 22: 51 - 66.

VAN ROOYEN, N. BREDENKAMP, G.J., THERON, G.K., BOTHMA, J. DU P. & LE RICHE, E.A.N. 1994. Vegetational gradients around artificial watering points in the Kalahari Gemsbok National Park. *J. Arid Environ*. 26: 349-361.

STEYN, H.M., VAN ROOYEN, N., VAN ROOYEN, M.W. & THERON, G.K. 1996. The phenology of Namaqualand ephemeral species: the effect of sowing date. *J. Arid Environ*. 32: 407 - 420.

JELTSCH, F., MILTON, S.J., DEAN, W.R.J. & VAN ROOYEN, N. 1997. Analyzing shrub encroachment in the southern Kalahari: a grid-based modelling approach. *Journal of Applied Ecology* 34 (6): 1497 - 1509.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 1998. Vegetation of the south-western arid Kalahari: an overview. *Trans. Roy. Soc. S. Afr*. 53: 113 -140.

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Curriculum vitae: PROF GRETEL VAN ROOYEN

1. Biographical information

Surname	**Van Rooyen**
First names	**Margaretha Wilhelmine**
ID number	**5004130033084**
Home address	**272 Thatcher's Field** **Lynnwood** **Pretoria** **0081** **South Africa**
Mobile	**072 025 3386**
e-mail	**Gretel@ekotrust.co.za**
Current position	**Honorary Professor in Plant Ecology** **Scientific advisor - Ekotrust**
Academic qualifications	**BSc; BSc (Hons), HNOD, MSc (Botany), PhD (Plant ecology)**

2. Publications

I am author / co-author of more than 100 peer reviewed research publications and have presented / co-presented more than 100 posters or papers at international and national conferences. Five PhD-students and 29 Masters students have completed their studies under my supervision / co-supervision. I have co-authored a book as part of a series on the Adaptations of Desert Organisms by Springer Verlag (Van Rheede van Oudtshoorn, K. & Van Rooyen, M.W. 1999. ***Dispersal biology of desert plants.*** Springer Verlag, Berlin) and two wildflower guides (Van Rooyen, G., Steyn, H. & De Villiers, R. 1999. ***Cederberg, Clanwilliam and Biedouw Valley***. Wild Flower Guide of South Africa no 10. Botanical Society of South Africa, Kirstenbosch, and Van der Merwe, H. & Van Rooyen, G. **Wild flowers of the Roggeveld and Tanqua**). I have also contributed to six chapters in the following books: (i) Dean, W.R.J. & Milton, S.J. (Eds) *The Karoo: Ecological patterns and processes*. Cambridge University Press, Cambridge. pp. 107-122; (ii) Knobel, J. (ed.) *The magnificent heritage of South Africa.* Sunbird Publishing, Llandudno. pp. 94-107; (iii)Hoffman, M.T., Schmiedel, U., Jürgens, N. [Eds]: *Biodiversity in southern Africa. Vol. 3: Implications for landuse and management*: pp. 109–150, Klaus Hess Publishers, Göttingen & Windhoek; (iv) Schmiedel, U., Jürgens, N. [Eds]: *Biodiversity in southern Africa. Vol. 2: Patterns and processes at regional scale: pp.* 222-232, Klaus Hess Publishers, Göttingen & Windhoek; (v) Stoffberg, H., Hindes, C. & Muller, L. South African Landscape Architecture: A Compendium and A Reader. Chapter 10, pp. 129 – 140; and (vi) Stoffberg, H., Hindes, C. & Muller, L. South African Landscape Architecture: A Compendium and A Reader. Chapter 11, pp. 141 – 146.

3. Research interests

My primary research interests lie in population biology and vegetation dynamics. The main aim of the research is to gain an understanding of ecosystem dynamics and to use this understanding to develop strategies to conserve, manage, use sustainably or restore ecosystems. Geographically the focus of the studies has been primarily in Namaqualand (Northern Cape Province, South Africa; classified as Succulent Karoo) and the Kalahari although several studies were conducted in Maputaland (Northern KwaZulu-Natal) and Namibia.

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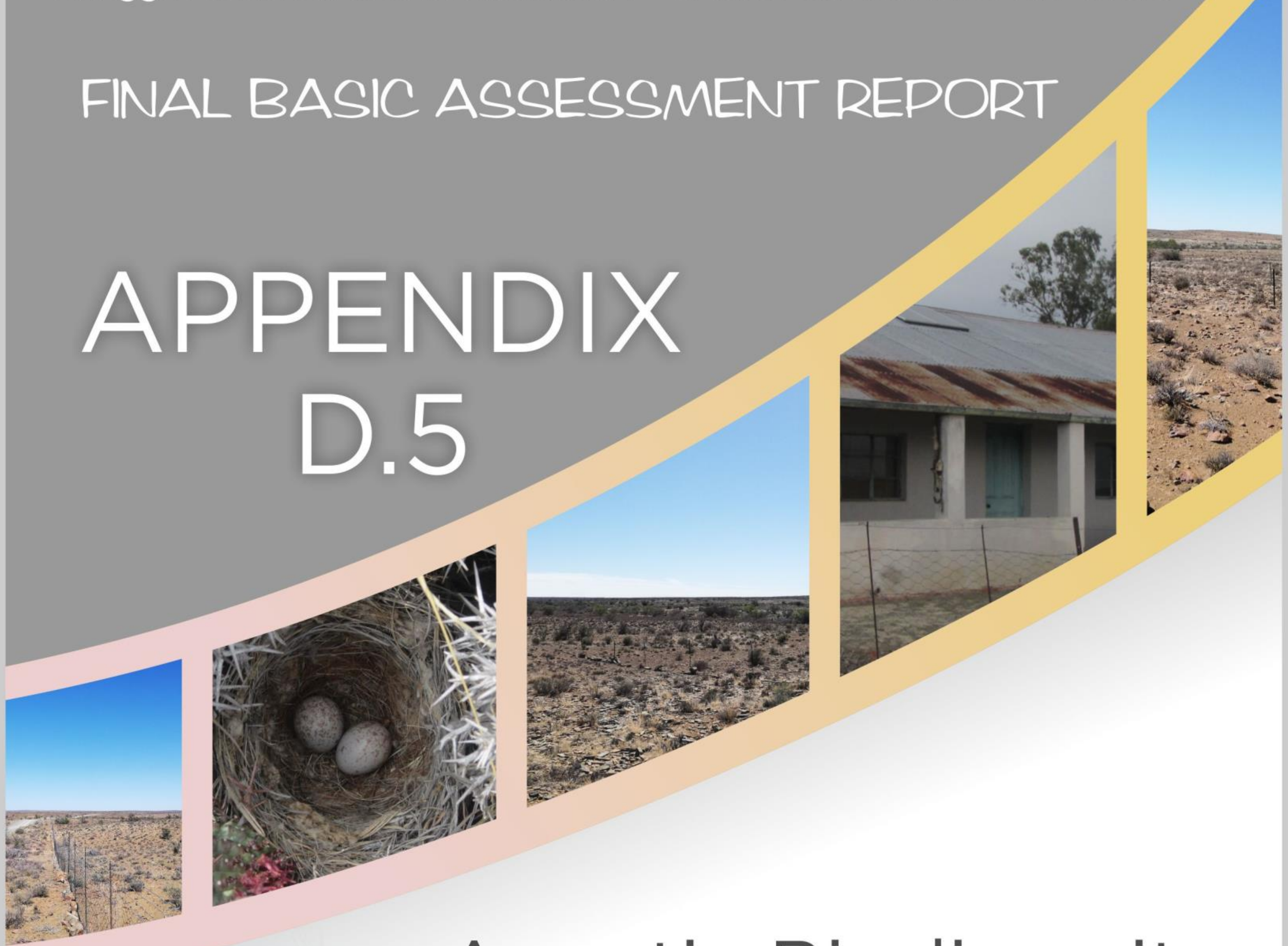
Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.5



Aquatic Biodiversity Impact Assessment

AQUATIC BIODIVERSITY AND SPECIES SPECIALIST ASSESSMENT:

Basic Assessment for the Proposed Development of a 132 kV Overhead Transmission Powerline and its associated electrical grid infrastructure in support of the proposed Kwagga WEF 1-3, near Beaufort West, Western Cape Province

Report prepared for:	Report prepared by:
ABO Wind renewable energies (Pty) Ltd. Unit B1, Mayfair Square, Century Way, Century City, 7441 Phone: +27 (0)21 276 3620 ABO Wind renewable energies (Pty) Ltd.	Toni Belcher 53 Dummer Street Somerset West 7130 South Africa

June 2022

Executive Summary

The study area is located in the upper catchments of the Kouka, a tributary of the Gouritz River System, and the Amos/Sout River, a tributary in the Groot/Gamtoos River System. The proposed OHPL are mostly located in the upper reaches of the Traka/Leeu/Hout and Swartbaken/Grasleegte/Muishond se Loop/Brandleegtre/Muiskraal Tributaries, crossing mostly minor feeder streams of these tributaries. The watercourses are non-perennial rivers tending to only flow for relatively short periods immediately following rainfall events.

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact on the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area, have a high ecological importance and sensitivity while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

The Screening Tool has indicated that the Swartbaken/Grasleegte and Muiskraal River Catchments are of very high sensitivity while the Traka and Leeu/Hout River Catchments are of low Aquatic Biodiversity Combined Sensitivity, this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The catchment of the Swartbaken/Grasleegte Rivers and the Muiskraal River are mapped as a Freshwater Ecosystem Priority Area (FEPA) Sub-catchments. The mainstem of the Swartbaken, Muiskraal and Traka Rivers are mapped as an aquatic Critical Biodiversity Areas. The smaller feeder streams to the rivers are all mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets, but that play an important role in delivering ecosystem services.

The Traka and Leeu/Hout River Sub-catchments are mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species. The only wetlands mapped within the larger site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective, why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem

integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

Recommended mitigation measures are as follows:

- *The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through watercourse should be utilised.*
- *Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regards to the revegetation of disturbed areas.*
- *During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.*
- *Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.*
- *Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.*
- *Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.*
- *During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.*

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List of Abbreviations

BA	Basic Assessment
CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DWA(F)	Department of Water Affairs (and Forestry)
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EI&ES	Ecological Importance and Ecological Sensitivity
EMPr	Environmental Management Program
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
GA	General Authorisation
GG	Government Gazette
GIS	Global Information System
GN	Government Notice
ha	hectare
HI	Habitat Integrity
IUCN	International Union for Conservation of Nature
kW	kilowatt
MMP	Maintenance Management Plan
MW	megawatt
ONA	Other Natural Areas
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
NWA	National Water Act
PA	Protected Area
PES	Present Ecological Status
REC	Recommended Ecological Condition
REDZ	Renewable Energy Development Zone
SANBI	South African National Biodiversity Institute
SEA	Strategic Environmental Assessment
SCC	Species of Conservation Concern
WCBSP	Western Cape Biodiversity Spatial Plan
WEF	Wind Energy Facility
WMA	Water Management Area
WUL	Water Use License
WULA	Water Use License Application

Glossary

Definitions	
Aquifer	A geological formation that has structures or textures that hold water or permit appreciable water movement through them.
Catchment	The area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through a surface flow to a common point or common points
Critical Biodiversity Areas	Areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure.
Drainage feature	A minor channel down which surface water naturally concentrates and flows that is poorly defined and usually does not contain any distinctive riparian and aquatic vegetation or habitat.
Ecological Importance and Sensitivity	The rating of any given wetland or river reaches that provides an indication of the ecological importance of the aquatic system using criteria such as conservation needy habitat or species, protected ecosystems or unique habitat observed. The sensitivity is then derived by assessing the resilience the habitat exhibits under stress as a result of changes in flow or water quality.
Ecological Support Areas	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of Protected Areas or Critical Biodiversity Areas and are often vital for delivering ecosystem services.
Other Natural Areas	Areas that have not been identified as a priority in the biodiversity spatial plans but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for meeting biodiversity targets, they are still an important part of the natural ecosystem.
Perennial / Non-perennial rivers	Perennial rivers are those rivers that exhibit a continuous flow of water throughout the year except during extreme drought conditions. Non-perennial rivers are those rivers that have no flow for at least a part of the year. These rivers are seasonal.
Present Ecological State	The current ecological condition of a watercourse as measured against the deviation from the natural or pre-impacted condition of the system
Protected Areas	Areas that are formally protected by law and recognised in terms of the National Environmental Management: Protected Areas Act. This includes gazetted private Nature Reserves and Protected Environments concluded via a stewardship programme.
Riparian habitat	The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with composition and physical structure distinct from those of adjacent land areas
River FEPA	Rivers currently in a good condition (A or B ecological category) that have been identified to achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species. They should remain in a good condition to contribute to the biodiversity goals of the country.
Watercourse	(a) a river or spring; (b) a natural channel in which water flows regularly or intermittently; (c) a wetland, lake or dam into which, or from which, water flows; and (d) any collection of water which the Minister of DWS may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks;
Water management area	An area established as a management unit in the national water resource strategy within which a catchment management agency will conduct the protection, use, development, conservation, management and control of water resources
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.
Wetland FEPA	Wetlands currently in a good condition (A or B ecological category) that have been identified to achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species. They should remain in a good condition to contribute to the biodiversity goals of the country.

AQUATIC BIODIVERSITY AND SPECIES SPECIALIST ASSESSMENT

This report serves as the Aquatic Biodiversity and Species Specialist Assessment that was prepared as part of the Basic Assessments (BAs) being conducted for the proposed 132 kV overhead transmission powerlines and associated infrastructure in support of the proposed Kwagga Wind Energy Facility (WEF) 1, Kwagga WEF 2 and Kwagga WEF 3, near Beaufort West in the Western Cape. The report comprises a generic assessment for all seven powerline projects under consideration. Each individual powerline project is then considered separately in the appendices.

1. Introduction

1.1. Scope, Purpose and Objectives of this Specialist Report

This Aquatic Ecological (including wetlands) Impact Assessment is intended to inform the Basic Assessment (BA) process for the proposed construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022. The seven proposed 132 kV overhead transmission powerlines will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

1.2. Details of Specialist

This specialist assessment has been undertaken by Toni Belcher. She is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400040/10 in the fields of Ecological Science and Environmental Science. A curriculum vitae is included in Appendix A of this specialist assessment.

In addition, a signed specialist statement of independence is included in Appendix I of this specialist assessment.

1.3. Terms of Reference

The Terms of Reference for this Aquatic Biodiversity and Species specialist study are as follows:

- Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette 43110, GN R320. This specifically includes the Aquatic Biodiversity Protocol that applies to all activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).
- Provide a Site Sensitivity Verification Report based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN R320.
- Provide an Aquatic Biodiversity Specialist Report or Compliance Statement based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN R320.
- The Specialist Assessment and/or Compliance Statement must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply

with the report templates provided by the CSIR. In addition, it must comply with the 2014 NEMA EIA Regulations (as amended), where applicable.

- Provide inputs to the Draft BA Report to include a description of the affected environment and environmental sensitivities, key legislation, key issues that were addressed and the detailed assessment of impacts. A template for such inputs will be provided by the CSIR.
- The specialist must undertake a site visit in order to identify the level of sensitivity assigned to the project area on the Screening Tool, and to verify and confirm this sensitivity and land-use and either compile an Aquatic Biodiversity Specialist Report or Compliance Statement, as documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN R320.
- Determination, description and mapping of the baseline environmental condition and sensitivity of the study area. Specify set-backs or buffers, and provide clear reasons for these recommendations. Also map the extent of disturbance and transformation of the site.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- The report must also describe the aquatic ecology features of the project area, with focus on features that are potentially impacted by the proposed project. The description should include the major habitat forms within the study site, giving due consideration to aquatic ecology (flora), aquatic ecology (fauna), and freshwater ecosystems/wetlands.
- Consider seasonal changes and long-term trends, such as due to climate change.
- Identify any species of special concern or protected species on site.
- The assessment is to be based on existing information, national and provincial databases and professional experience and field work conducted by the specialist, as considered necessary and in accordance with relevant legislated requirements. The assessment must also consider the maps generated by the National Screening Tool.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on aquatic biodiversity and species. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project. The Impact Assessment Methodology must follow the methods provided by the CSIR.
- Identify and delineate wetlands that may occur on the site, using the relevant protocols established.
- Compile a Risk Matrix (Appendix A to GN R509 of 2016) and determine if a Water Use License (WUL) or General Authorisation (GA) is required and if so, determine the requirements thereof.
- Identify any additional protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for 1) Powerlines 2) Substations (GN R435) and confirm if there are any specific environmental sensitivities or attributes present on the site and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions based on the format of the report template provided by the CSIR.

2. Approach and Methodology

Input into this report was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and surrounding catchments, as well as by a more detailed assessment of the freshwater features on the various farm portions that comprise the study area.

The site was visited at the end of the rainy season for a single day on 8 November 2020 to verify the aquatic features occurring on the site. No additional site visits are deemed necessary.

The field visit comprised of delineation, characterisation and integrity assessments of the aquatic habitats within the site. Mapping of the freshwater features was undertaken using a GPS Tracker and mapped in PlanetGIS and Google Earth Professional.

The following techniques and methodologies were utilised to undertake the assessments:

- The guideline document, “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas” document, as published by DWAF (2005), was followed for the delineation of the aquatic habitats;
- The present ecological condition of the watercourses and wetlands was determined using the national River Health Programme and Wet-Health methodologies;
- The ecological importance and ecological sensitivity (EI&ES) assessment of the wetlands and watercourses was conducted according to the guidelines as developed by DWAF (1999); and
- Recommendations made concerning the adoption of buffer zones within the site were based on watercourse and wetland functioning and site characteristics.
- The potential impacts identified in this specialist study have been assessed based on the criteria and methodology outlined in Appendix D of this assessment.

2.1. Information Sources

A summary of the main information sources used in this assessment are provided in Table 1 below:

Table 1. Information Sources for the Aquatic Biodiversity Assessment

Data / Information	Source	Date	Type	Description
Satellite imagery	Google Earth	Nov 2006 to Nov 2020	Spatial	Recent history of aerial imagery for the site
Western Cape Biodiversity Spatial Plan	CapeNature, obtained from CapeFarmMapper	2017	Report and mapping	Systematic biodiversity planning assessment that delineates Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)
National Screening Tool	Department of Forestry, Fisheries and the Environment	2021	Report and spatial	National environmental screening tool
National Biodiversity Assessment	South African National Biodiversity Institute (SANBI), obtained from Biodiversity GIS	2018	Report and Spatial	Latest assessment of South African biodiversity and ecosystems, including wetlands and rivers.
National Vegetation Map	SANBI, obtained from CapeFarmMapper	2018	Report and Spatial	Latest national vegetation type mapping
South African Atlas of Climatology and Agrohydrology	R.E. Schulze, obtained from CapeFarmMapper	2009	Spatial	Climate data
Aquifer classification and Groundwater Resource	Department of Water and Sanitation,	2005, 2012 and 2013	Spatial	Mapping of aquifer class, type, yields, susceptibility and Vulnerability as well

Data / Information	Source	Date	Type	Description
Assessment informati on	obtained from CapeFarmMapper			as depths, recharge and quality
National Soil types	ENPAT, obtained from CapeFarmMapper		Spatial	Mapping of soil types
National Freshwater Ecosystem Priority Areas (FEPA)	CSIR, obtained from CapeFarmMapper and Biodiversity GIS	2011	Report and spatial	Mapping of areas of aquatic ecosystem conservation importance
National River Present Ecological Status, Ecological Importance and Ecological Sensitivity	DWA	2012	Spreadsheets and spatial	River reach assessments of ecological importance, sensitivity and condition
National Wetland Map 5	CSIR and SANBI - South African National Biodiversity Assessment 2018, , obtained from CapeFarmMapper	2018	Spatial	Mapping of wetland habitats
Freshwater Biodiversity Information System	Freshwater Research Centre, SANBI and JRS Biodiversity Foundation	2021	Spatial	Mapping of aquatic biodiversity (fish, invertebrates and algae)
iNaturalist	National Geographic Society and California Academy of Sciences	2021	Spatial	Mapping of aquatic and terrestrial fauna and flora

2.2. Assumptions, Knowledge Gaps and Limitations

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The methodologies and techniques used in this assessment have been developed nationally and are typical of a rapid nature as is required for this freshwater impact assessment.

No baseline long-term monitoring was undertaken as part of this assessment. There is also very little existing information available for the aquatic features within the study area. Data was utilised from adjacent aquatic ecosystems where available. The nature of the proposed activities however also allows them to be placed some distance from any mapped aquatic features such that the likely impacts would be very low. It is usually the associated infrastructure that has the potential to have a greater impact on the aquatic features. The impacts of roads and powerlines on the aquatic features are however well understood and can be effectively mitigated to ensure the impacts remain low. The preferred mitigation measure is to limit the disturbance to aquatic features as far as possible by avoiding and minimising the number of crossings and providing adequate buffer areas. This will also ensure that the cumulative impacts will remain low.

The level of aquatic assessment undertaken was considered to be adequate for this study. No further fieldwork will be required. The ground-truthing of aquatic features was undertaken at the end of the rainy season and when the use of vegetation as an indicator was possible. As it was not possible to cover the entire site in a high level of detail, extrapolation of the areas ground-truthed to those not covered was done using the latest available aerial imagery for the site.

Cumulative impacts of the proposed project were assessed by reviewing all available documentation for the other solar energy facilities within a 30km radius of the site, particularly in terms of the aquatic features occurring in and adjacent to the site; the proposed mitigation measures and the indicated potential impacts to these ecosystems as well as the association of these ecosystems with that within the study area.

2.3. Consultation Processes Undertaken

Limited consultation was undertaken with landowners at the time of the site visit.

3. Legislative and Permit Requirements

The proposed activity needs to take cognizance of the legislative requirements, policies, strategies, guidelines and principles of the relevant regulatory documents of the Central Karoo District, as well as the National Water Act (NWA) and the National Environmental Management Act (NEMA).

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

NEMA is the overarching piece of legislation for environmental management in South Africa and includes provisions that must be considered to give effect to the general objectives of integrated environmental management.

Chapter Seven of the NEMA states that:
"*Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment*".

The Act also clearly states that the landowner, or the person using or controlling the land, is responsible for taking measures to control and rectify any degradation. These may include measures to:
"(a) investigate, assess and evaluate the impact on the environment;
(b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment:
(c) cease, modify or control any act, activity or process causing the pollution or degradation:
(d) contain or prevent the movement of pollutants or degradation: or
(e) eliminate any source of pollution or degradation: or
(f) remedy the effects of the pollution or degradation."

3.2 NEMA Environmental Impact Assessment Regulations, 2014, as amended

NEMA provides for the identification of activities that will impact the environment, in terms of Section 24. These activities were promulgated in terms of Government Notice No. R. 324, 325 and 327, dated 4 December 2014, as amended, and requires environmental authorisation. The impacts of the listed activities must be investigated in April 2017, assessed and reported to the competent authority before authorisation to commence with such listed activities can be granted. The specialist report is intended to inform the environmental authorisation process under NEMA.

3.3 National Water Act, 1998 (Act No. 36 of 1998)

The purpose of the National Water Act, 1998 (NWA) is to provide a framework for the equitable allocation and sustainable management of water resources. Both surface and groundwater sources are redefined by the Act as national resources which cannot be owned by any individual, and rights to which are not automatically coupled to land rights, but for which prospective users must apply for authorisation and register as users. The NWA also provides for measures to prevent, control and remedy the pollution of surface and groundwater sources.

The Act aims to regulate the use of water and activities (as defined in Part 4, Section 21 of the NWA), which may impact water resources through the categorisation of 'listed water uses' encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources, where the DWS is the administering body in this regard. Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or WUL. There are restrictions on the extent and scale of listed activities for which General Authorisations apply.

Section 22(3) of the NWA allows for a responsible authority (DWS) to dispense with the requirement for a WUL if it is satisfied that the purpose of the Act will be met by the grant of a licence, permit or authorisation under any other law.

3.3.1 Regulations requiring that a water user be registered, GN R.1352 (1999)

Regulations requiring the registration of water users were promulgated by the Minister of Water Affairs in terms of provision made in Section 26(1)(c), read together with Section 69 of the National Water Act, 1998. Section 26(1)(c) of the Act allows for registration of all water uses, including existing lawful water use in terms of Section 34(2). Section 29(1)(b)(vi) also states that in the case of a GA, the responsible authority may attach a condition requiring the registration of such water use. The Regulations (Art. 3) oblige any water user as defined under Section 21 of the Act to register such use with the responsible authority and effectively apply for a Registration Certificate as contemplated under Art.7(1) of the Regulations.

3.3.2 General Authorisations in terms of Section. 39 of the NWA

According to the preamble to Part 6 of the NWA, 1998, "*This Part established a procedure to enable a responsible authority, after public consultation, to permit the use of water by publishing general authorisations in the Gazette*…" and further states that "*The use of water under a general authorisation does not require a licence until the general authorisation is revoked, in which case licensing will be necessary*…"

The GAs for Section 21 (c) and (i) water uses (impeding or diverting flow or changing the bed, banks or characteristics of a watercourse) as defined under the NWA have recently been revised (Government Notice R509 of 2016). The proposed works within or adjacent to the wetland areas and river channels are likely to change the characteristics of the associated freshwater ecosystems and may therefore require authorization. Determining if a water use licence is required for these water uses is now associated with the risk of degrading the ecological status of a watercourse. A low risk of impact could be authorised in terms of a GA. A risk assessment has been undertaken for each of the OHPL sections in the appendices.

There are no GAs for groundwater use in Quaternary Catchment L12A, which would imply that if there needs to be an application for groundwater abstraction associated with the project, an integrated water use licence application would be required. Various assessments of the current groundwater use and sustainability of the proposed groundwater use would need to be undertaken in support of such an application.

4. Description of Project Aspects relevant to Aquatic Biodiversity

It is proposed to construct seven 132 kV overhead transmission powerlines to connect Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 to the national grid via the proposed Eskom 132 kV Switching Substation and the proposed Beaufort West 132 kV-400 kV Linking Station, The proposed EGI projects will consist of the following components (the exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction):

- Overhead Transmission 132 kV Powerlines within a servitude of up to 50 m wide
- Pylons will be monopoles with a height of up to 30 m. The size of the pylon footprint area typically can range from 0.6m x 0.6m to 1.5m x 1.5m, with a minimum working area of 20 m x 20 m. The span length tends to range between 200m and 375 m

- Service Road is usually required that typically composes a jeep track of up to 4m wide, placed within servitude of the line where possible
- Associated electrical infrastructure including feeder bays, busbars, new transformer bays and possible extension to the existing footprint at the proposed Eskom 132 kV Switching Substation.

There will be limited water requirements during the Construction Phase for concrete production and curing, road compaction/dust control and drinking water for staff. Water requirements during the Operational Phase are envisaged to be negligible and will mainly be for human consumption and sanitation purposes. It is anticipated that municipal water is trucked to the site or made available for collection at the local municipal water treatment plant via a metered standpipe during the Construction and Operational Phases. These specific waters use arrangements will be agreed upon with the relevant Local Municipality in a Service Level Agreement.

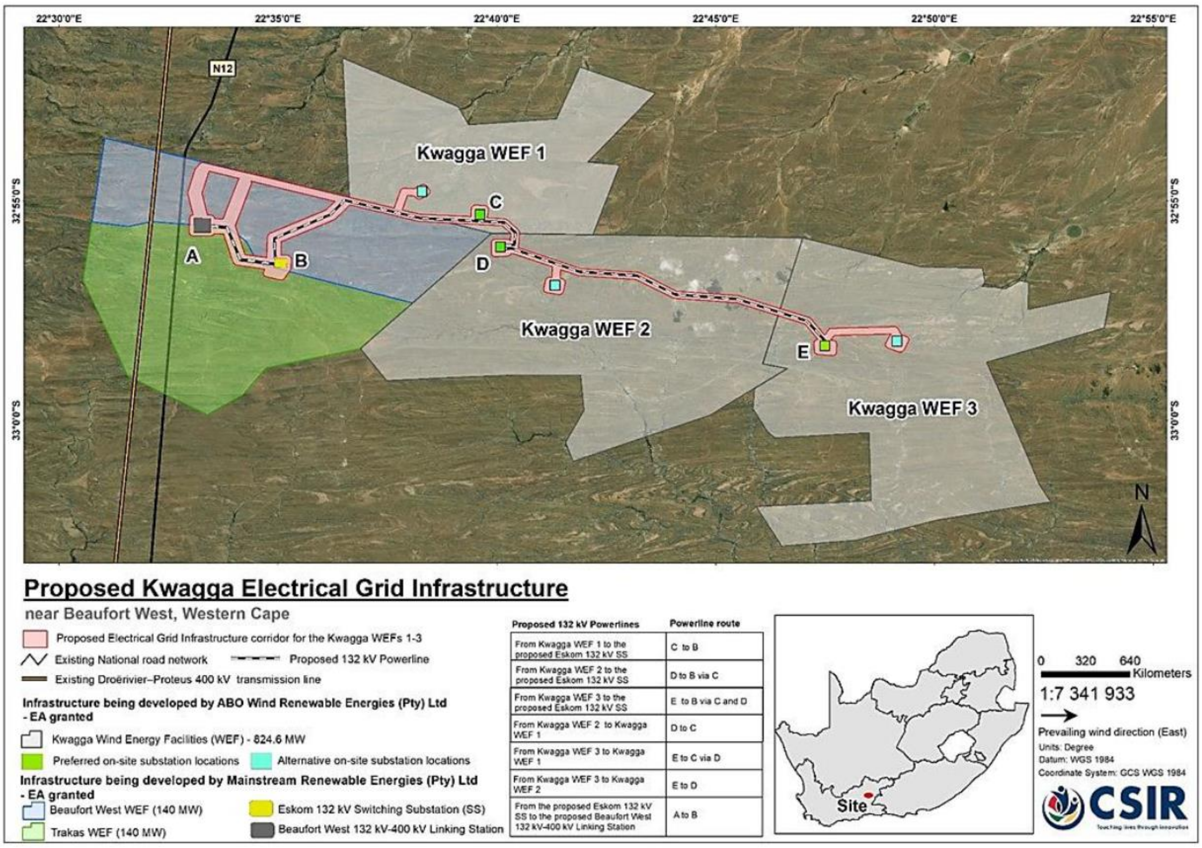

Figure 1. The entire proposed grid corridor(red area) with the separate 132 kV overhead transmission lines indicated (A to E). These separate lines are shown and discussed in more detail in the appendices.

In terms of the potential aquatic ecosystem impacts of the proposed development, it is typically the footprint of the proposed infrastructure that may be placed in or adjacent to aquatic features that may alter the aquatic habitat, have water quality impacts or modify the runoff in the aquatic ecosystems within the area. Overhead powerlines can easily span most aquatic features and avoid any aquatic ecosystem impacts.

5. Baseline Environmental Description

5.1. General Description

The seven proposed 132 kV overhead powerlines (OHPL) will be constructed on the Remainder and Portion 1 of Farm Dwaalfontein Wes No. 377; Remainder of Farm Dwaalfontein No. 379; Portion 3 of Farm Tyger Poort No. 376, Remainder of and Portion 9 of Farm Wolve Kraal No. 17; Portion 7 of Farm Muis Kraal No. 373, Portion 1 of Farm Witpoortjie No. 16 and Remainder of and Portion 1 of Farm Trakas Kuilen No. 15, near Beaufort West in the Central Karoo Municipal area of the Western Cape.

The study area is located in the upper catchments of the Kouka, a tributary of the Gouritz River System, and the Amos/Sout River, a tributary of the Groot/Gamtoos River System. Table 2 provides an overview and summary of the water resource information for the farm on which the development is proposed.

Table 2: Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Traka, Leeu, Hout, Daniel, Huis and Brakloop, tributaries of the Kouka; Swartbaken, Brandleegte and Muiskraaal Rivers, tributaries of the Amos/Sout	Upper portion of the Olifants River in the Gouritz River; Upper portion of the Amos/Sout River, Groot/Gamtoos River
Quaternary Catchment	J32C (Kouka) L12A (Swartbaken) L12A (Muishond se Loop)	
Present Ecological state	Kouka: B (largely natural) Swartbaken: C (moderately modified) Muishond se Loop: (largely natural)	DWS (2012) assessment for the Kouka, Swartbaken and Muishond se Loop Rivers (See Appendices)
Ecological Importance and Ecological Sensitivity	Kouka: High/High Swartbaken: Moderate/Moderate Muishond se Loop: High/High	
Location of the centre of the entire study area	32°56'55"S	Latitude
	22°41'18"E	Longitude

Topography

The proposed grid corridor is to be placed on the hilltops, south and north of the access road into the area that is orientated in an east-west direction with the valleys drained by the tributaries of the Kouka that drain in a southerly direction and the Brandleegte and Muiskraal Rivers, tributaries of the Amos/Sout that drain in a north-easterly direction. The site is in the very upper reaches of the tributaries, where the watercourses are relatively small. The altitude in the area ranges from about 950 to about 1090 m at Dwaalberg in the south.

The underlying geology comprises largely mudstone, siltstone and sandstone of the Abrahamskraal Formation and bands of Middleton Formation of the Beaufort Group in the Karoo Sequence. The soils consist of Glenrosa and Misqah forms, with lime generally being present in the landscape. These soils have minimal development and are usually shallow on hard or weathering rock. Their erosion potential is deemed to be moderate. Alluvium occurs within the valleys and in particular along the larger watercourses.

Climate, Hydrology and Geohydrology

The study area experiences a low rainfall of 155 mm on average per annum. Rainfall falls mostly in late summer/autumn, with March being the highest rainfall month on average. Winters (June – August) are typically colder than summers which experience average daily temperatures of 22°C (December – February) (Figure 2).

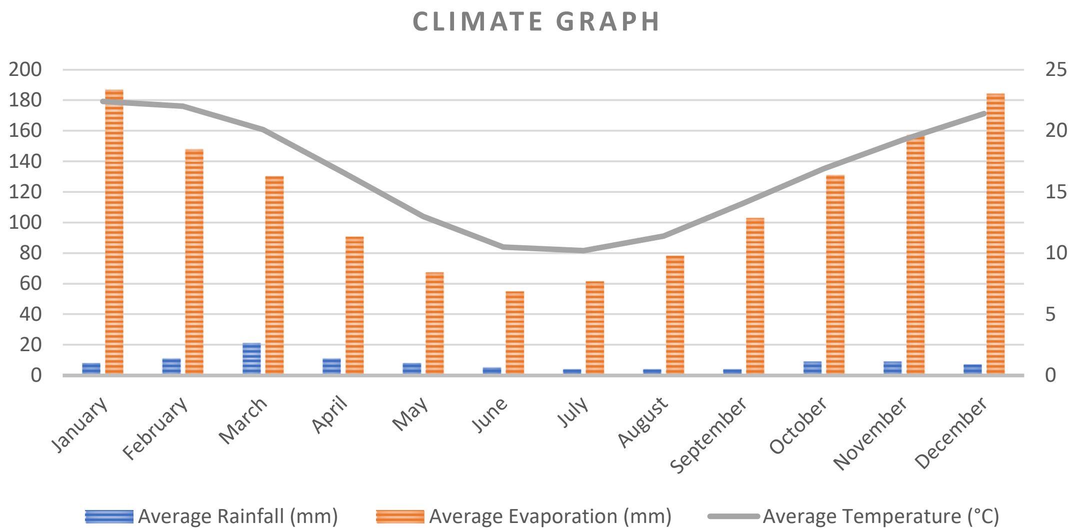

Figure 2. Average monthly rainfall (left) and temperatures (right) for the study area, collected between 1950 and 2000 (Schulze, 2009)

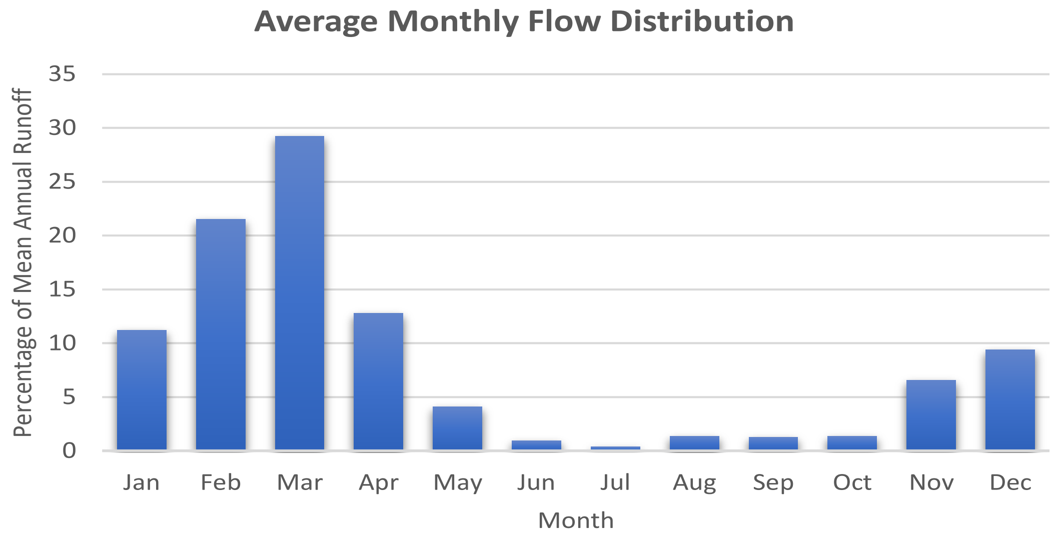

Figure 3. Monthly flow distribution within the rivers in the study area, with the monthly flow shown as a percentage of the natural mean annual runoff (nMAR) for the catchment

Flow in the smaller tributaries in the upper catchment tends to be episodic (Figure 3), with very little to no flow in the rivers for much of the year. Flow typically only occurs for a short period following localised rainfall. These rainfall events tend to mostly occur in the higher rainfall months in late summer and into autumn. When flow occurs in the watercourses, it occurs as a high flow event. This flow pattern is unlikely to change significantly due to longer-term climatic changes. The flow nature does however make erosion control measures in the watercourses, particularly on the slopes, essential mitigation.

A major fractured aquifer occurs within the area, with the water table typically occurring at depths of about 19.5 m below ground level with a yield of 0.1 to 0.5 litres a second. The groundwater quality is relatively good, with natural electrical conductivity concentrations of 70 to 150 mS/m. There is no recharge of the aquifer in the area. The aquifer is of medium susceptibility and vulnerability to contamination from anthropogenic activities.

Vegetation

Under unmodified conditions, the vegetation cover across the study area is indicated to be Gamka Karoo vegetation (Least Threatened). The vegetation type is described (Mucina and Rutherford, 2006) as comprising dwarf spiny shrubland dominated by Karoo dwarf shrubs such as *Chrysocoma ciliate, Lycium spp*. and *Rhigozum obovatum* with rare low trees such as *Euclea undulata and d*ense stands of drought-resistant grasses such as *Stipagrostis* spp. and *Aristida* spp. Most of the vegetation associated with the aquatic features within the valley floors in the study area is still largely natural and comprises a mix of low trees and shrubs such as *Vachellia karroo, Searsia lancea, Euclea undulata, Melianthus comosus, Lycium* spp. and *Asparagus striatus* within the riparian zones. The smaller watercourses have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses.

Biodiversity Importance of the Aquatic Features

A map showing the aquatic ecosystems within the wider study area is shown in Figure 4. The catchments of the Swartbaken, Muiskraal and Brandleegte Rivers to the north of the proposed OHPL corridor are mapped as a Freshwater Ecosystem Priority Area (FEPA) Sub-catchment (Figure 5). These larger rivers are also mapped as aquatic Critical Biodiversity Areas (CBAs) (Figure 6), with the wider river corridor being mapped as terrestrial CBAs.

Portions of the Daniels River in the eastern extent of the corridor are mapped as aquatic CBAs where there is good riparian vegetation. The Daniels/Kouka River Sub-catchment to the south of the OHPL corridor is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

All of the remaining watercourses are mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities.

The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

The Screening Tool has indicated that the catchment of the Brandleegte and Muiskraal Rivers to the north of the OHPL corridor are of very high sensitivity while the remainder of the site is considered of low Aquatic Biodiversity Combined Sensitivity (Figure 7). This is linked to the FEPA and aquatic CBA mapping of this river mentioned above. The main watercourse of the Daniels River is also indicated as being of very high Aquatic Biodiversity Combined Sensitivity.

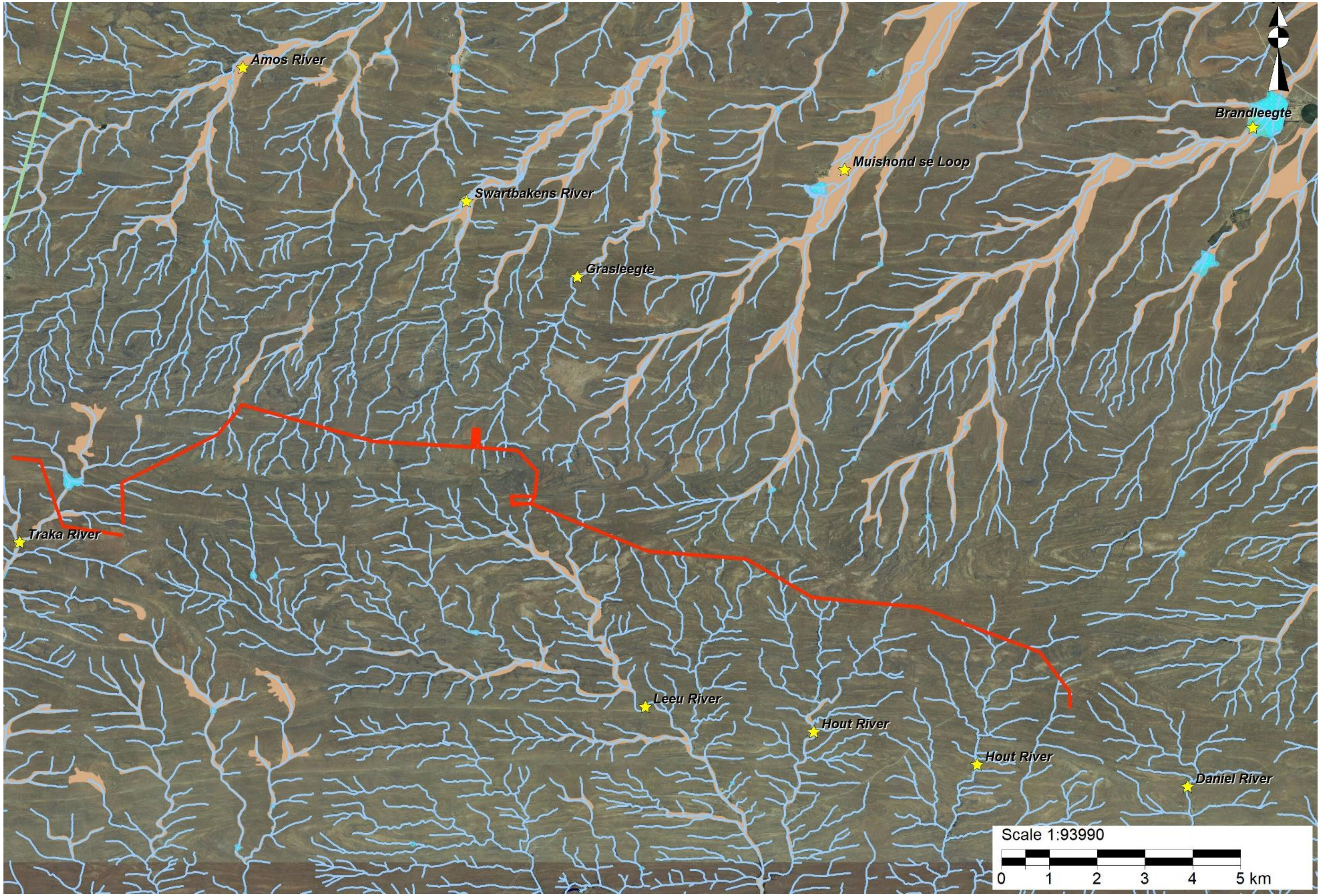

Figure 4. Orthophotograph taken in 2016, showing the location of the larger river systems described in this report

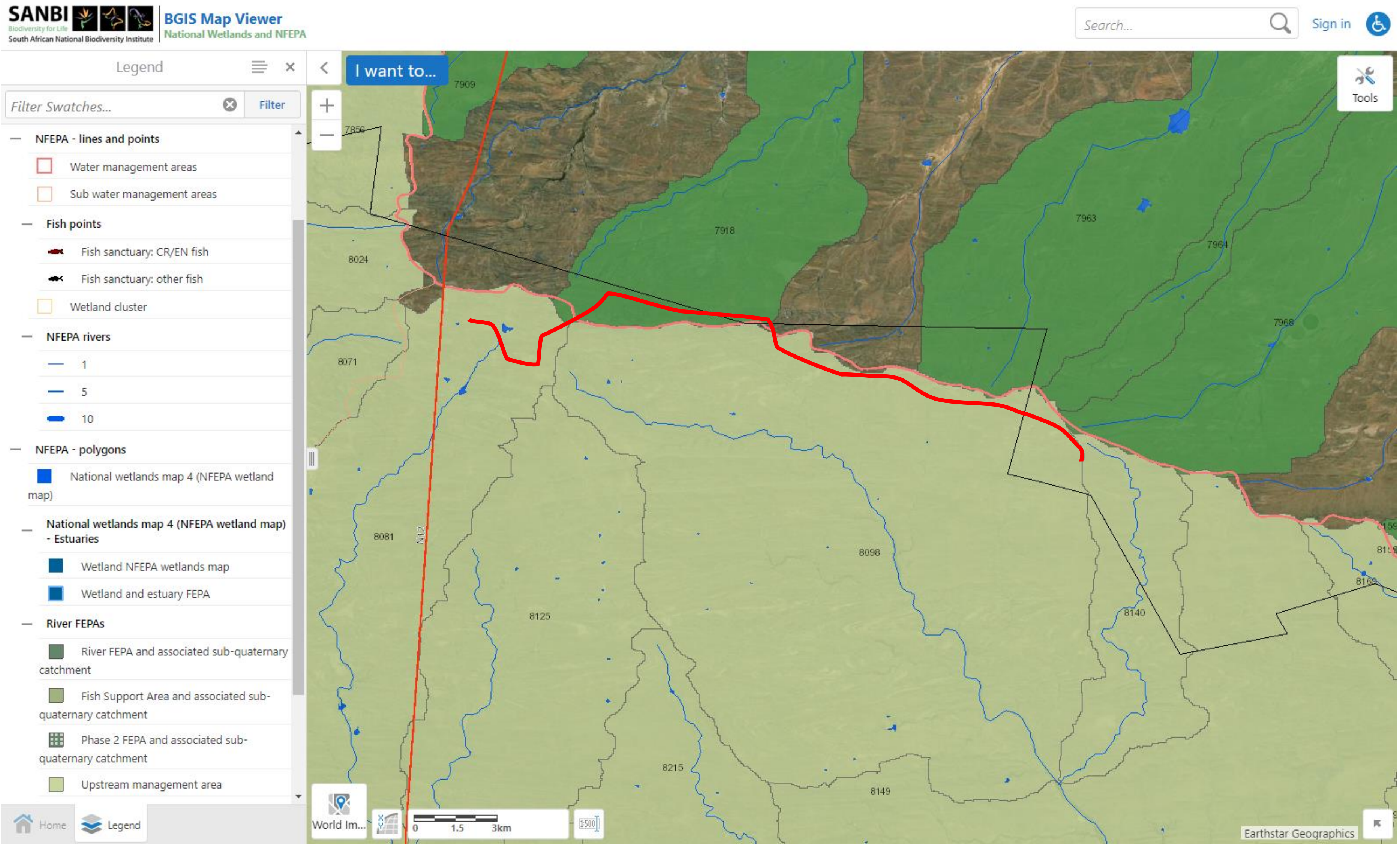

Figure 5. Freshwater Ecosystem Priority Area mapping for the site (2011 CSIR National Freshwater Ecosystem Priority Areas, obtained from SANBI Biodiversity GIS, June 2022)

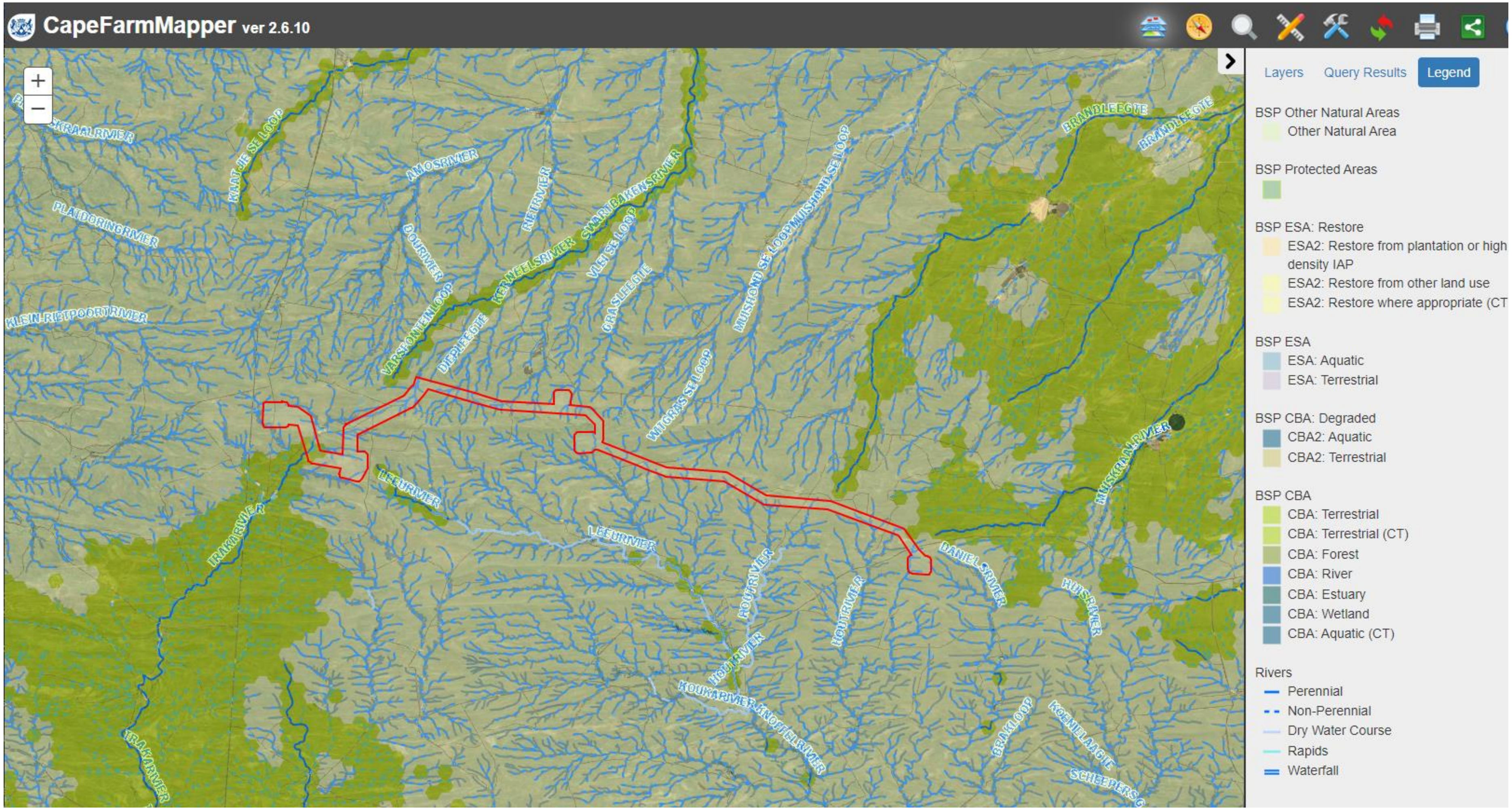

Figure 6. Aquatic Critical Biodiversity and Ecological Support Area mapping for the site (CapeFarmMapper, June 2022)

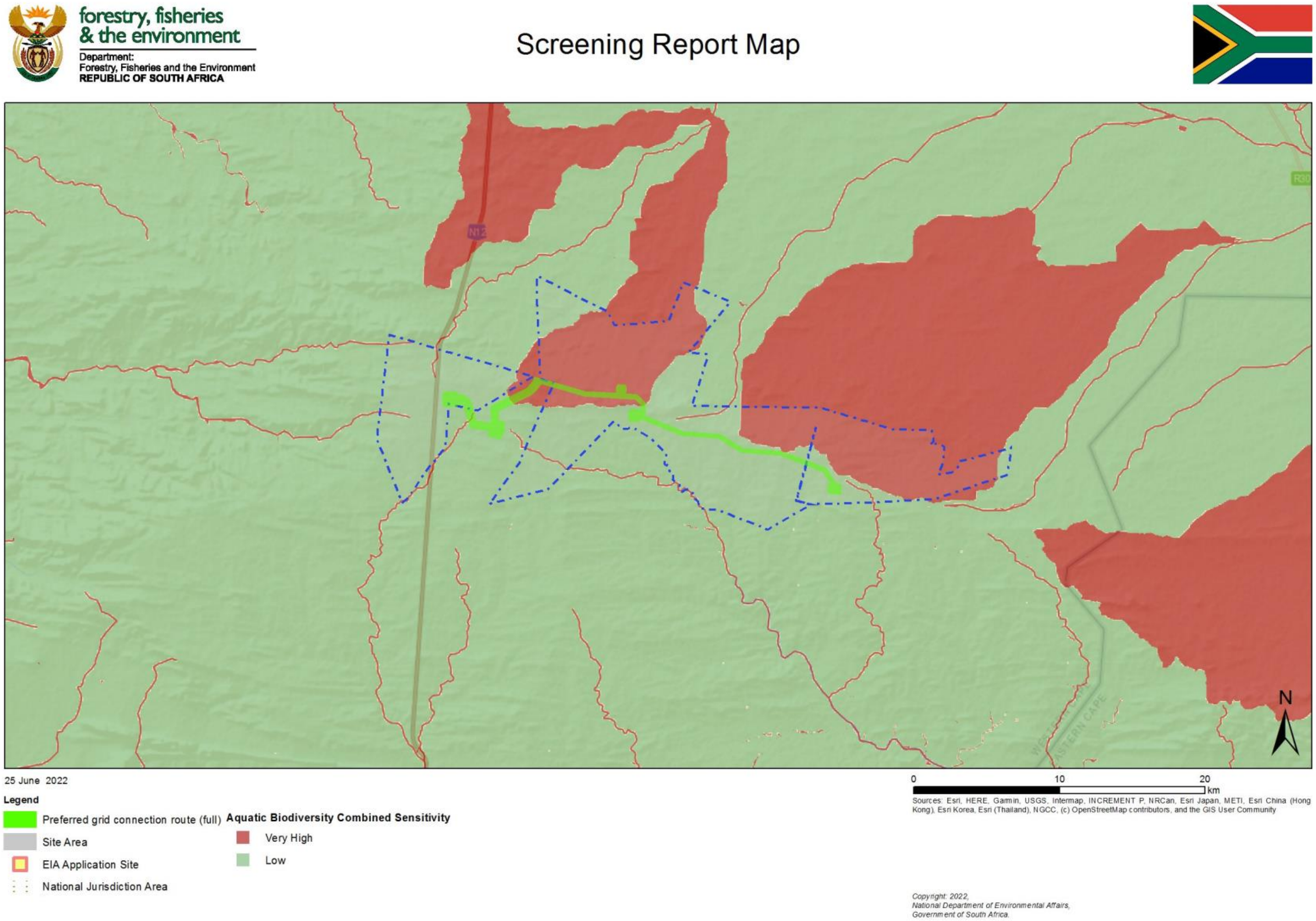

Figure 7. DFFE Screening Tool map of the site (blue polygon) for the mapped Aquatic Biodiversity Combined Sensitivity

Landcover

The landcover on the site is mostly classified as barren land with low nama karoo shrubland mapped mostly along the watercourse. Some riparian vegetation also occurs along the larger watercourses. A single residence and associated farm buildings occur in the centre of the site. The area is mostly used for sheep farming with a low grazing capacity of about 30 animals per hectare.

5.2. Aquatic Biodiversity and Ecosystems

Description of Aquatic Features

The OHPL falls across the watershed between north-east flowing streams of the Groot/Gamtoos River System; and the south to southerly flowing streams of the Gouritz River System (Figure 4).

The northerly flowing streams in the northern extent of the site are all tributaries that drain into the Amos/Sout River. This river is joined by the Kariega River at Beervlei Dam to form the Groot River. The Groot River flows in a south-easterly direction to where it is joined by the Kouga River upstream of Hankey. These two rivers form the Gamtoos River flows for a short distance before draining into the sea northeast of Jefferys Bay.

The southerly draining streams all drain into the Kouka River, a tributary of the Traka River that flows southwards through the Swartberg Mountains to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay.

Within the study area, the streams fall within the foothill zones of the Great Karoo Ecoregion. The watercourses in this region, due to the low rainfall of the area, are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily gravel bed, single to multiple channels. The larger streams contain distinct riparian vegetation that comprises a mix of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus* (Figure 8).

Figure 8. View of the Leeu River with its more significant riparian vegetation that is still in a relatively natural ecological condition

The smaller watercourses have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses (Figure 9).

Figure 9. View of the more disturbed Kouka River with a riparian zone that comprises largely of just Vachellia karroo

Only localised impacts occurred along the rivers where the agricultural activities within the site have directly impacted the watercourses. At these points that are typically along the access roads through the site, there has been some removal of indigenous riparian vegetation or habitat modification within the watercourse at the road crossing. There are about ten small instream dams within the property. Land use is largely livestock grazing that has also impacted the vegetation in and adjacent to the watercourses. The invasion of alien vegetation along the watercourses is relatively low and comprises invasive plants such as *Opuntia ficus-indica* (prickly pear), *Xanthium strumarium* (cocklebur), *Tagetes minuta* (khaki weed) and *Hypochaeris radicata* (false dandelion).

Classification of aquatic features

The geomorphological and physical characteristics of the watercourses within the site can be classified as follows:

Table 3. Geomorphological and physical features of the watercourses on site

River	Larger tributaries	Minor unnamed tributaries & drainage features
Geomorph Zone	Lower Foothill Zone	Mountain streams / upper foothill zone
Lateral mobility	Semi-Confined	
Channel form	Single to multiple channels	Simple single channel
Channel pattern	Single or braided channel with moderate sinuosity	Single channel, moderate to low sinuosity
Channel type	Bedrock and alluvium	Bedrock, alluvial and gravel
Channel modification	Channel is fairly natural with some flow and habitat modification	Natural with very small distubances
Hydrological type	Seasonal to episodic	Episodic
Ecoregion	Great Karoo	
DWA catchment	L12A, L12C and J32C	
Vegetation type	Gamka Karoo	
Rainfall region	Very late summer to autumn	

Present Ecological Condition

The evaluation of Habitat Integrity provides a measure of the degree to which a river has been modified from its natural state, in other words, an indication of the present ecological state (PES) of the watercourse. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. The severity of each impact is ranked using a six-point scale from 0 (no impact) to 25 (critical impact). The Habitat Integrity Assessment is based on an assessment of the impacts of two components of the river, the riparian zone and the instream habitat. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category (

Table 4. Instream Habitat Integrity assessment for the watercourses within the study area

Instream Criteria	Larger Rivers	Unnamed tributaries	Riparian Category	Larger Rivers	Unnamed tributaries
Water Abstraction	9	3	Vegetation Removal	6	4
Flow Modification	9	5	Exotic Vegetation	5	2
Bed Modification	8	4	Bank Erosion	5	5
Channel Modification	4	4	Channel Modification	4	4
Water Quality	5	4	Water Abstraction	6	3
Inundation	5	4	Inundation	5	4
Exotic Macrophytes	0	0	Flow Modification	5	4
Exotic Fauna	0	0	Water Quality	5	4
Rubbish Dumping	5	4			
Instream Integrity Class	B/C	B	Riparian Integrity Category	B/C	B

The habitat integrity assessment was divided into the smaller upper reaches of the watercourses that have few modifications and the lower, more modified reaches of the larger downstream reaches of the watercourses within the study area. The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site.

Table 5).

Table 4. Instream Habitat Integrity assessment for the watercourses within the study area

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Bed Modification	8	4	Bank Erosion	5	5
Channel Modification	4	4	Channel Modification	4	4
Water Quality	5	4	Water Abstraction	6	3
Inundation	5	4	Inundation	5	4
Exotic Macrophytes	0	0	Flow Modification	5	4
Exotic Fauna	0	0	Water Quality	5	4
Rubbish Dumping	5	4			
Instream Integrity Class	B/C	B	Riparian Integrity Category	B/C	B

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in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site.

Table 5. Habitat Integrity categories (From DWAF, 1999)

Category	Description	Score (%)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. Large loss of natural habitat, biota & ecosystem function occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances, ecosystem functions have been destroyed and changes are irreversible.	0

Ecological Importance and Sensitivity

The Ecological Importance and Ecological Sensitivity (EI&ES) assessment for watercourses consider several biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a four-point scale that ranges from 1 (of local importance) to 4 (of national importance). The median of the resultant score is calculated to derive the EI&ES category (Table 6).

Table 6. Ecological importance and sensitivity categories (DWAF, 1999)

EISC	General description	Median
Very high	Quaternaries/delineations unique on a national and international level based on unique biodiversity. The rivers are usually very sensitive and have little to no capacity for use.	>3-4
High	Quaternaries/delineations unique on a national scale based on biodiversity. The rivers may be sensitive to flow modifications and may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations unique on a provincial/ local scale due to biodiversity. The rivers are not very sensitive to flow modification and have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations not unique on any scale. The rivers are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

The larger watercourses in the study area, have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The results of the EIS assessment are shown in Table 7.

Table 7. Results of the EI&ES assessment of the watercourses in the study area

Biotic and Aquatic Habitat Determinants	Larger Rivers	Unnamed tributaries
Rare and endangered biota	1.5	2
Unique biota	2	1
Intolerant biota	2	2
Species/taxon richness	2	1.5
Diversity of aquatic habitat types or features	2.5	2
Refuge value of habitat type	2.5	2
Sensitivity of habitat to flow changes	2	3
Sensitivity of flow related water quality changes	2	2.5
Migration route/corridor for instream & riparian biota	2.5	1
National parks, wilderness areas, Nature Reserves & areas, PNEs	1.5	1.5
EIS CATEGORY	High	Moderate

Recommended Ecological Condition of Aquatic Ecosystems

Considering the largely natural ecological condition of the aquatic ecosystems within the study area and their moderate to high ecological importance and ecological sensitivities, the recommended ecological condition (REC) of these features would be that they remain in a largely natural ecological condition. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places; however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses.

5.3. Aquatic Habitat and Species of Concern

The Screening Tool has indicated that the catchments of the Swartbaken, Brandleegte and Muiskraal Rivers to the north of the proposed OHPL corridor are of very high sensitivity, while the catchments of the other tributaries are of very low sensitivity. The mainstem of the Leeu River is also mapped as being of very high sensitivity. The findings of this assessment indicate that all of the watercourses are of importance with the sensitivity difference rather being associated with the unique habitat that the larger watercourses provide that contains both good riparian vegetation and often patches of instream habitat. The Swartbaken River does however appear to have more baseflows that result in more aquatic and riparian vegetation being present. The areas where there is good instream and riparian vegetation provide valuable habitat to both aquatic and instream biota.

The watercourses in the study area are non-perennial and are dry for large parts of the year. As a result, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective. The species likely to be present are quite widespread and of low conservation concern. These include the Karoo Dainty Frog, *Cacosternum karooicum* (Data Deficient), the Cape Sand Frog, *Tomopterna delalandii,* Karoo Toad, *Vandijkophrynus gariepensis* and the Raucous Toad, *Amietophrynus rangeri*. The latter three amphibian species are listed as “Least concern”.

5.4. Specialist Sensitivity Analysis and Verification

The site visit confirmed that the Swartbaken, Brandleegte and Muiskraal Rivers to the north of the OHPL and many of the larger tributaries within the corridor, as well as the Traka and Leeu River to the south of the corridor, were in a largely natural ecological condition and of high ecological importance and sensitivity due to the good riparian vegetation associated with these watercourses that provide important ecological corridors in the landscape for the movement of biota.

Based on the PES, and EIS and REC determined in the previous section, buffers have been recommended to protect these ecosystems. The recommended buffer area between the aquatic features and the project components (turbines, crane pads, substations and construction camps (please note this excludes roads) to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller streams and drainage features: at least 35m from the centre of these streams;
- The larger rivers: up to 100m, measured from the top of bank of the river channels

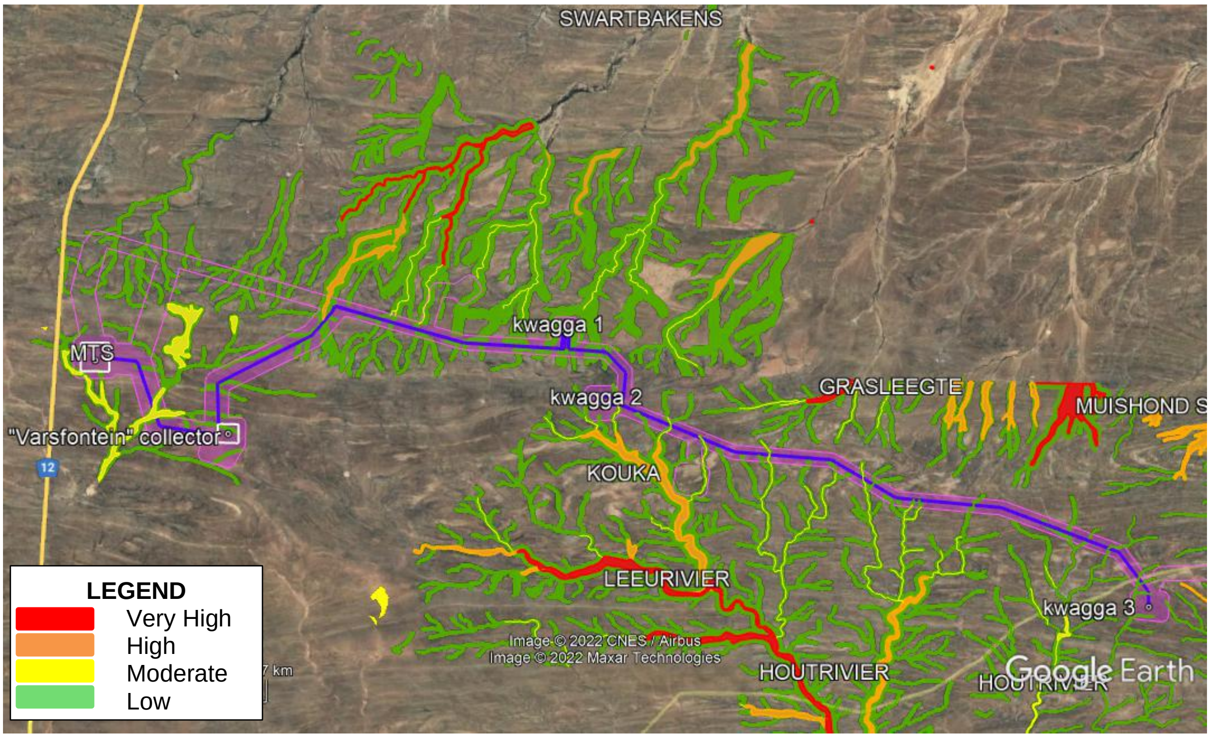

Figure 10. Google Earth image with the Aquatic Ecosystem Sensitivity mapping where the green area indicates low sensitivity, the yellow the moderate sensitivity and the red the high sensitivity areas

These recommended buffers are largely in line with the watercourse buffers that have been recommended in the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa (CSIR, 2015). A narrower 35m buffer has been recommended from the minor streams and drainage lines that are deemed appropriate to these aquatic features within the study area.

The proposed OHPL corridor is located in the higher lying areas of the river catchments where only minor tributaries of the larger rivers would be potentially impacted by the proposed construction of the grid connections.

6. Issues, Risks and Impacts

6.1. Identification of Potential Impacts/Risks

The potential impacts identified during this basic freshwater assessment are as follows:

Construction Phase: **Direct Impacts**: Disturbance or modification of aquatic habitat; increased water use and water quality impacts; **Indirect Impacts**: Degradation of aquatic ecosystem integrity
Operational Phase: **Direct Impacts:** Aquatic habitat disturbance **Indirect Impacts:** Degradation of the ecological condition of aquatic ecosystems; erosion; and alien vegetation invasion in aquatic features
Decommissioning Phase: **Direct Impacts:** Disturbance of aquatic habitats and water quality impacts.
Cumulative impacts: **Indirect Impacts:** Degradation of the ecological condition of aquatic ecosystems.

Most of the potential aquatic ecosystem impacts of the proposed OHPL are likely to take place during the construction phase. These potential impacts and the associated issues identified include:

1. Disturbance of aquatic habitats within the watercourses with the associated impacts to sensitive aquatic biota. During construction activities within watercourses could result in the disturbance or destruction of sensitive habitats and any listed and or protected plant or animal species. No aquatic obligate wetland species were observed within the proposed OHPL corridor. The terrestrial impact assessment considers the potential impact on terrestrial vegetation and associated biota such as the Critically Endangered Riverine rabbit, *Bunolagus monticulari*. The construction activities would thus be unlikely to modify aquatic habitat and biota to such an extent that the present or future desired state of the watercourses would be compromised. No Resource Quality Objectives exist for the watercourses concerned however the proposed activities are unlikely to prevent these objectives from being met.

2. Demand for water for construction could place stress on the existing available water resources. Given the limited water availability in the area, it is advised that water be obtained off-site for construction.

3. Increased sedimentation and risks of contamination of surface water runoff during construction. During construction, the earthworks near watercourses will expose and mobilise soil as well as construction materials and chemicals that may end up in the water resources. Any spills during transport or while works are conducted in proximity to a watercourse also have the potential to affect the surrounding biota. Given the low rainfall in the area, if works are undertaken during the prier periods of the year, this impact would be unlikely.

4. The removal of indigenous riparian and instream vegetation will reduce the ecological integrity and functionality of the watercourses. Construction works, in particular, could result in the loss of riparian vegetation that provides ecosystem services within the site. This would occur for the required access road as the pylons could easily avoid delineated aquatic habitats and the recommended buffers. The impact would only be very localised at road crossings through watercourses and would not impact the wider river reaches of the watercourses. With rehabilitation, this impact could be reduced to a negligible level.

During the operational phase of the proposed OHPL, potential impacts would include:

1. Ongoing disturbance of aquatic features and associated vegetation along the access road. The disturbance of aquatic habitat is likely to be very localised to the road crossings and would not impact the larger aquatic ecosystem.
2. Erosion as a result of removal of cover vegetation and a change to surface water runoff along the access road. Increased intensity of runoff along the access road for the OHPL may take place where gradients are steep and may result in erosion along the road. This can easily be mitigated by shaping of the road (placement of humps) that will disperse or impede the runoff. Ongoing monitoring and maintenance of the road would prevent this potential impact from taking place.

3. Alien vegetation infestation within the aquatic features due to disturbance. The current presence of alien vegetation on the site is limited. Sources of alien seed should be prevented from being brought onto the site with imported materials. Monitoring post-construction for the growth of alien vegetation can mitigate this potential impact.

During the decommissioning phase, the potential impacts would largely be associated with an increased disturbance of aquatic habitat due to the increased activity on the site. Increased sedimentation and risks of contamination of surface water runoff may also occur.

The cumulative impact of the project activities, together with the existing activities in the area, could have the potential to reduce the integrity of the watercourses if not properly mitigated and managed. By implementing suitable buffers (up to 100m for the larger streams and 35m for the smaller watercourses is recommended, which is in line with the SEA undertaken by CSIR for the REDZ) along the watercourses and minimising the works within the river/stream corridors the impact of the proposed project activities would be low and unlikely to impact on the integrity of the aquatic ecosystems.

6.2. Summary of Issues identified during the Public Consultation Phase

No aquatic ecosystem issues have as yet been raised.

6.3. Summary of Impact Tables for Construction, Operation and Decommissioning Phases

The more detailed assessment of the potential aquatic ecosystem impacts for each section of the OHPL area is discussed under the Appendices. The summary tables for the various impacts identified during the construction, operation and decommissioning phases of the proposed project however remain the same for all the sections and thus have been included in the main section of the report: provided on the following pages.

Impact Summary Tables: Construction Phase

Direct Impacts: Disturbance or modification of aquatic habitat; increased water use and water quality impacts;
Indirect Impacts: Degradation of aquatic ecosystem integrity

Table 8. Impact table for the potential aquatic biodiversity impacts of the project during the construction phase

Impact	Impact Criteria		Significance (Pre-Mitigation)	Potential mitigation measures	Significance (Post-Mitigation)	Confidence Level
AQUATIC BIODIVERSITY						
CONSTRUCTION PHASE						
Disturbance of aquatic habitats within the watercourses with the associated impact to sensitive aquatic biota	Status	Negative	Very low (5)	Minimise any works within aquatic ecosystems and buffers; Rehabilitate disturbed aquatic habitats by revegetating with suitable local indigenous vegetation	Very low (5)	High
	Spatial Extent	Site-specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
Increased sedimentation and risks of contamination of surface water runoff during construction	Status	Negative	Very low (5)	Construction sites and laydown areas should be placed at least 30m away from the delineated aquatic features; Good housekeeping measures should be implemented at the construction sites that are set out in the EMPr and monitored by an appointed ECO for the project.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Likely to Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
Demand for water for construction could place stress on the existing available water resources	Status	Negative	Very low (5)	The water demand construction is very low and thus the associated construction water use is extremely unlikely to result in any impact. The water should be obtained from an existing water allocation to the property or should be provided from a viable water source for construction purposes.	Very low (5)	High
	Spatial Extent	Local				
	Duration	Long term				
	Consequence	Moderate				
	Probability	Extremely Unlikely				
	Reversibility	Moderate reversibility				
	Irreplaceability	Moderate irreplaceability				

Impact Summary Tables: Operational Phase

Direct Impacts: Aquatic habitat disturbance

Indirect Impacts: Degradation of ecological condition of aquatic ecosystems; erosion; alien riparian vegetation invasion

Table 9. Impact table for the potential aquatic biodiversity impacts of the project during the operation phase

Impact	Impact Criteria	Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level	Impact
OPERATIONAL PHASE						
Ongoing disturbance of aquatic features and associated vegetation along access roads or adjacent to the infrastructure that needs to be maintained	Status	Negative	Very low (5)	The moderate to high sensitivity aquatic habitats should be avoided in the layout design such that it is only the low sensitivity habitats that would be disturbed during construction. The disturbance of these habitats would only result in a slight (negligible) alteration to aquatic ecosystems and processes.	Very low	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Likely to Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
Disturbance of cover vegetation and soil and modified runoff characteristics that have the potential to result in erosion of hillslopes and watercourses and invasion of disturbed areas with alien vegetation	Status	Negative	Very low (5)	Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants. The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.	Very low	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	Moderate reversibility				
	Irreplaceability	High irreplaceability				

Impact Summary Tables: Decommissioning Phase

Direct Impact: Disturbance of aquatic habitats and water quality impacts.

Table 10. Impact table for the potential aquatic biodiversity impacts of the project during the decommissioning phase

Impact	Impact Criteria	Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level	Impact
DECOMMISSIONING PHASE						
Increased disturbance of aquatic habitat due to the increased activity on the site	Status	Negative	Very low (5)	Minimise works within aquatic ecosystems as far as possible. Rehabilitate disturbed areas.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
Increased sedimentation and risks of contamination of surface water runoff	Status	Negative	Very low (5)	Laydown areas should be placed at least 30m away from the delineated aquatic features; Good housekeeping measures should be implemented for the decommissioning activities that are set out in the EMPr and monitored by an appointed ECO for the project.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				

6.4. Cumulative Impacts

The cumulative impact assessment is the same for all sections of the OHPL and thus included in this main section of the report.

Land use in the area currently consists of low-density livestock farming due to the limited water supply and poor carrying capacity of the cover vegetation. Current land and water use impacts on the Traka River and surrounding area are therefore low to very low. The nature of the proposed OHPL allows it to have minimal impact on the surface water features since the turbines can be placed far enough away from the freshwater features to not impact them.

The largest potential impact of these projects is a result of the associated infrastructure (access road), which can be mitigated such that its impact on the aquatic ecosystems will be of a low significance. Where possible, the road layout uses existing roads. ***One could thus expect that the cumulative impact of the proposed project would not be low provided mitigation measures are implemented.*** Availability of water is a limiting factor on the further development of this area, however, the water requirements of the project are during the construction phase and are low.

In terms of the larger cumulative impact resulting from other WEF and solar projects in an approximate 50 km radius of the proposed Kwagga WEF and grid powerline, the projects either approved or under consideration are listed in Table 11. The only WEFs are in the Prince Albert Local Municipal area to the southwest of the site. There are thus not likely to be any cumulative impacts from the proposed OHPL on the water resources.

Table 11. Renewable energy projects in process within 50 km of the proposed project (Source: DFFE REEA, 2021)

DFFE REFERENCE	PROJECT TITLE	APPLICANT	MW	STATUS
12/12/20/1784 12/12/20/1784/AM1 To AM5	Proposed development of 170 MW Wind and Photovoltaic (PV) EnergyFacility near Beaufort west in the Prince Albert local Municipality, Western Cape Province	South Africa Mainstream Renewable Power Developments(Pty) Ltd	Wind-120 MW Solar PV-50 MW	Approved
12/12/20/1784/1	Proposed Development of the 140 MW BeaufortWest Wind Farm in the Prince Albert Local Municipality, Western Cape Province	South Africa Mainstream Renewable Power Developments(Pty) Ltd	WEF 140 MW	Approved
12/12/20/1784/2 12/12/20/1784/2/AM1	Proposed Development of the 140 MW Trakas Wind Farm in the PrinceAlbert Local Municipality, Western Cape Province	South Africa Mainstream Renewable Power Developments(Pty) Ltd	WEF 140 MW	Approved
12/12/20/2133 12/12/20/2133/ AM1 to AM5	Proposed Construction of 19 MW Photovoltaic Solar Facility Proposed By Lurama 214 Pty Ltd On Portion 1 of the FarmSteenrotsfontein 168, Beaufort West, Western Cape	Lurama 214 PtyLtd BioTherm Energy (Pty) Ltd	Solar PV 19 MW	Approved
14/12/16/3/3/2/772	Proposed establishment of the Beaufort West Solar Power Plant Site 1,Western Cape	To review	Solar PV	Approved
14/12/16/3/3/2/773	Proposed Establishment of the Beaufort West Solar Power Plant Site 2,Western Cape Province	To review	Solar PV	Approved
14/12/16/3/3/2/774	Proposed Beaufort WestSolar power plant site 3 near Beaufort West	To review	Solar PV	Approved
12/12/20/2296	Proposed Construction of The Leeu Gamka SolarPower Plant and its associated Infrastructures, Near Beaufort West and Leeu Gamka, Beaufort West Local Municipality, Western Cape Province	Through Fare General TradingPty Ltd	Solar PV	In process
14/12/16/3/3/2/406	Proposed wind and solarfacility on Farm Lombaardskraal, Farm 330, Beaufort West, Western Cape	To review	Solar PV-20MW	In process
14/12/16/3/3/2/324	Proposed PV solar planton three properties, Beaufort West, WesternCape	To review	Solar PV	Withdrawn / Lapsed

Impact Summary Tables: Cumulative Impacts

Indirect Impacts: Degradation of the ecological condition of aquatic ecosystems.

Table 12. Impact table for the potential cumulative aquatic biodiversity impacts of the project during the construction, operation and decommissioning phases

Impact	Impact Criteria	Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level	Impact
CONSTRUCTION PHASE						
Increased disturbance of aquatic habitat due to the increased activity in the wider area	Status	Negative	Very low (5)	Minimise works within aquatic ecosystems as far as possible. Construct in the dry season. Rehabilitate disturbed areas. Rationalise infrastructure as far as possible by sharing of the infrastructure of using existing disturbed areas. Manage stormwater impacts.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
OPERATION PHASE						
Degradation of ecological condition of aquatic ecosystems	Status	Negative	Very low (5)	Monitor and manage for impacts such as alien vegetation growth and erosion. Limit disturbance and rehabilitate disturbed areas. Ensure there is sufficient stormwater management to prevent erosion along roads. Ensure road crossings structures are properly designed to not result in blockage in the watercourses or erosion. Limit and monitor water use.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				
DECOMMISSIONING PHASE						
Increased disturbance of aquatic habitat due to the increased activity in the wider area	Status	Negative	Very low (5)	Decommission works near aquatic features should preferably be undertaken in the dry season. Minimise disturbance and rehabilitate.	Very low (5)	High
	Spatial Extent	Site specific				
	Duration	Short term				
	Consequence	Slight				
	Probability	Unlikely				
	Reversibility	High reversibility				
	Irreplaceability	Low irreplaceability				

6.5. Impact Assessment Summary

This section provides the overall impact significance findings following the implementation of the proposed mitigation measures. These are shown in the table below:

Table 13: Overall Impact Significance (Post Mitigation)

Phase	Overall Impact Significance
Construction	Very low
Operational	Very low
Decommissioning	Very low
Nature of Impact	Negative
Cumulative - Construction	Very low
Cumulative - Operational	Very low
Cumulative - Decommissioning	Very low

6.6. Risk Assessment

A risk assessment was carried out for the proposed OHPL Section B to C. The assessment indicates the level of risk certain activities pose to freshwater resources where the outcomes are used to guide decisions regarding water use authorisation of the proposed activity. A summary of the potential risks and the risk rating classes can be seen below.

Table 14. Summary risk assessment for the proposed project

Phases	Activity	Impact	Likelihood	Significance	Risk Rating
Construction	Construction works associated with OHPL	Loss of biodiversity & habitat, impeding flow & water quality impact	12	51	L
Operation	Operational activities associated with OHPL	Disturbance to aquatic habitat - Facilitation of erosion and invasion by alien plants	12	36	L
Decommission	Removal of OHPL infrastructure	Habitat disturbance and some flow and water quality impacts	12	36	L

Table 15. Risk rating classes for the Risk Assessment

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. With these findings of the risk assessment, the water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

7. Environmental Management Programme Inputs

The recommended Environmental Management Programme (EMPr) are the same for all the OHPL sections and has thus been included in the main section of the report. Very limited impact mitigation, monitoring or management actions and outcomes will be necessary for inclusion in EMPr it the proposed works take into consideration the aquatic ecosystem constraints and avoids the delineated aquatic ecosystems as well as the recommended buffer of up to 100 m between the significant aquatic features and the proposed project activities

The recommended mitigation measures are as follows:

- Any disturbance during the construction and operation phases should be limited to the approved OPHL corridor and should avoid disturbance of the soil and natural vegetation cover. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.
- During the construction phase, site management must be undertaken at the laydown area and the construction area. This should specifically address on-site prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. Any stormwater that does arise within the construction site must be handled appropriately, where necessary, to trap sediments and reduce flow velocities.
- Invasive alien plant growth should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.

Recommendations for inclusion into the EMPr are provided in the tables on the following pages.

Monitoring Requirements

Daily compliance monitoring of the implementation of the measures as laid out in the EMPr and associated method statements should be undertaken by the Site Manager in conjunction with the ECO. A record of the monitoring undertaken during the maintenance management activities should be kept.

Visual inspections and photographs should be taken weekly upstream and downstream of sites where construction activities will need to take place within aquatic features. Once the construction activities have ceased, the frequency of the monitoring can be reduced to monthly until DWS is satisfied that the site is adequately rehabilitated.

Ongoing monitoring of invasive alien plant growth and erosion within the aquatic features and the recommended buffers biannually (every six months) for the construction phase and the first three operational years of the project. That monitoring should preferably take place before the rainfall period and following high rainfall events.

Table 16. Environmental Management Program Recommendations

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
DESIGN PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed OHPL and associated infrastructure.	Limit the disturbance of aquatic habitat. Minimise potential for erosion	Ensure final layout of OHPL avoids watercourses and recommended buffers as far as possible; utilisation should be made of existing disturbed areas where possible. The design of an access road and other infrastructure should aim to reduce the intensity of runoff particularly on the steeper slopes and reduce the intensity of the discharge into the adjacent drainage lines. For any new infrastructure placed within the watercourses: The structure should not impede or concentrate the flow in the watercourse. It is recommended that low water crossings should be utilised. Water consumption requirements for the site for the construction and operation of the site if not obtained from an authorised water user within the area, must be authorised by the DWS. Waste and wastewater should be properly contained on-site and removed to a licensed facility that can treat/dispose of the waste.	Ensure that this is taken into consideration during the planning and design phase.	During design cycle and before construction commences.	Holder of the EA

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
CONSTRUCTION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed OHPL and associated infrastructure.	Limit the disturbance of aquatic habitat. Limit the potential for contamination/pollution of aquatic ecosystems	For all project-related components within the site, the aquatic features of high sensitivity should be treated as no-go areas during the construction phase. Any activities that require construction within the delineated aquatic features and the recommended buffers should be described in method statements that are approved by the ECO. Rehabilitation of any the disturbed areas within the aquatic features and the recommended buffer areas should be undertaken immediately following completion of the disturbance activity according to rehabilitation measures as included in a method statement for that specific activity as described above; Ablution facilities should not be placed within 100m of any of the aquatic features delineated within the site; Liquid dispensing receptacles (e.g. lubricants, diesel, shutter oil etc.) must have drip trays beneath them/beneath the nozzle fixtures. Material safety data sheets (MSDS) must be available on site (if required) where products are stored so that in the event of an incident, the correct action can be taken. Depending on the types of materials stored on-site during the maintenance activities, suitable product recovery materials (such as Spillsorb or Drizit products) must be readily available. Vehicles should ideally be washed at their storage yard as opposed to on-site. Proper waste management should be undertaken within the site with facilities provided for the on-site disposal of waste and the removal of stored waste to the nearest registered solid waste disposal facility	Monitoring that no-go areas are adhered to should be undertaken on an ongoing basis for the duration of the construction phase. Ongoing monitoring of the implementation of method statements and rehabilitation measures should be undertaken in the construction phase. Weekly monitoring of basic water quality constituents (Dissolved oxygen, electrical conductivity, suspended solids, and pH) should be undertaken upstream and downstream of sites where construction activities will need to take place within aquatic features. This should be accompanied by ongoing visual inspections.	Ongoing during construction	Proponent/contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
OPERATION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed OHPL and associated infrastructure.	Limit the disturbance of aquatic habitat; Minimise potential to modify flow/hydraulics related impacts and increase the potential for erosion; Control of invasive alien plants in riparian zones and wetland areas; Limit the potential for contamination/pollution of aquatic ecosystems	Ongoing control of invasive alien plants within the site should be undertaken according to an approved plan. The plan should make use of alien clearing methods as provided by the Working for Water Programme. Monitoring and control measures should take place at least biannually for the first 3 years of the project Invasive alien plant material that has been cleared should be removed from the riparian zones and not left on the river banks or burnt within the riparian zone and buffer area; Ongoing monitoring of the structures, in particular before the rainfall period, should be undertaken to ensure that the integrity of the structures is intact and that they are not blocked with sediment or debris. Ongoing monitoring post large rainfall events should also be undertaken to identify and address any erosion occurring within the watercourses.	Ongoing monitoring of invasive alien plants within the site should be undertaken according to an approved plan. Once the construction activities have ceased, the frequency of the monitoring can be reduced.	Ongoing during operation	Proponent/contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
DECOMMISSION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed OHPL and associated infrastructure.	Limit the disturbance of aquatic habitat.	For all project-related components within the site, the aquatic features of high sensitivity should be demarcated by the appointed ECO before the commencement of the decommissioning activities and treated as no-go areas during the decommissioning phase. Any activities that require decommission activities within the delineated aquatic features and the recommended buffers should be described in method statements that are approved by the ECO Rehabilitation of any disturbed areas within the aquatic features and the recommended buffer areas should be undertaken immediately following completion of the disturbance activity according to rehabilitation measures as included in a method statement for that specific activity. Control of invasive alien plants within the site should be undertaken according to the approved plan	Monitoring that no-go areas are adhered to should be undertaken on an ongoing basis for the duration of the decommissioning phase. Ongoing monitoring of the implementation of method statements and rehabilitation measures should be undertaken in the decommissioning phase. Ongoing monitoring of invasive alien plants within the site should be undertaken according to an approved plan	Ongoing during decommissioning	Proponent/contractor and ECO

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Appendix A: Aquatic Assessment for Powerline From the proposed Eskom 132 kV SS to the proposed Beaufort West 132 kV-400 kV Linking Station (Section A to B)

Summary Baseline Description and Assessment of Aquatic Ecosystems

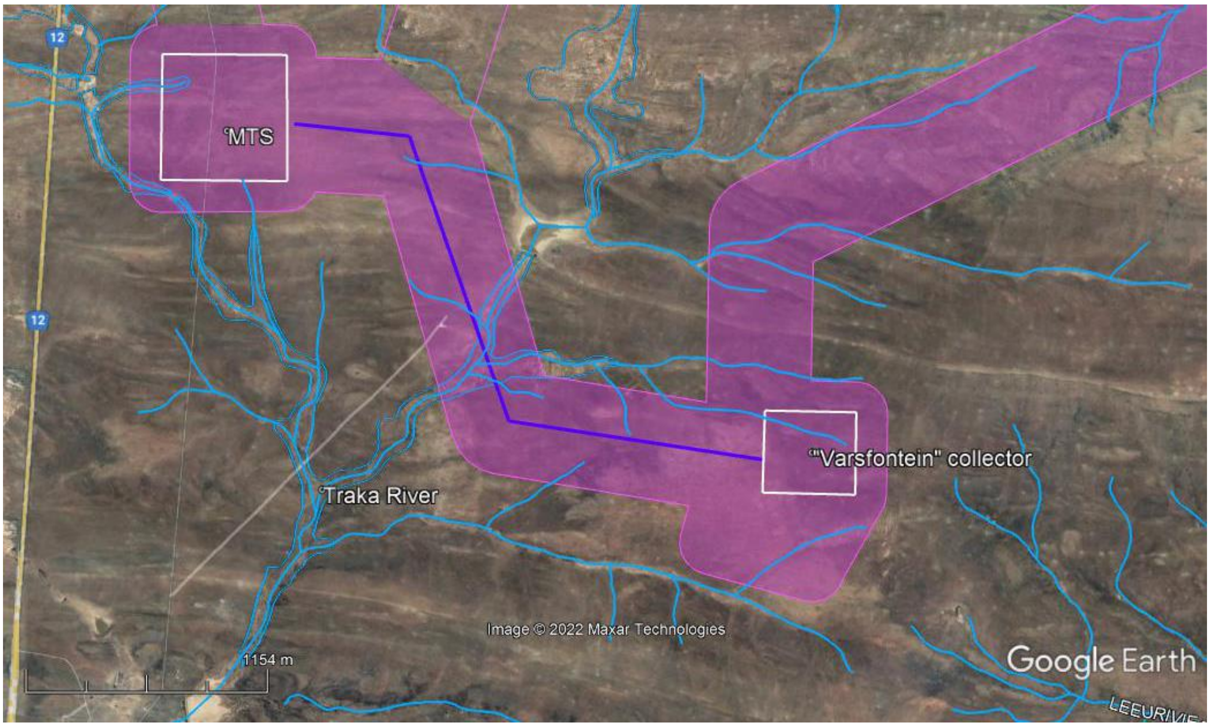
This section provides a summary of the Baseline Description and Aquatic Ecological Assessment provided in Section 5 that is specific to Powerline Section A to B.

The proposed construction of a 3km 132 kV Overhead Powerline from the Eskom 132 kV Switching Substation (Varsfontein Collector Substation) to the proposed Beaufort West 132 kV-400 kV Linking Station or Main Transfer Station (MTS) (Section A to B) will be constructed on the Portion 1 of Farm Witpoortjie No. 16 and Remainder of Farm Trakas Kuilen No. 15, near Beaufort West in the Central Karoo Municipal area of the Western Cape. The proposed works include construction of additional bays at Varsfontein collector substation and connection equipment at the main transfer station.

The study area is located in the upper catchment of the Kouka, a tributary of the Gouritz River System. Table 2 provides an overview and summary of the water resource information for the proposed OHPL Section.

Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Traka Tributary of the Kouka	Upper portion of the Olifants River in the Gouritz River
Quaternary Catchment	J32C (Kouka)	
Present Ecological state	Kouka: B (largely natural)	DWS (2012) assessment for the Kouka River (See Appendices)
Ecological Importance and Ecological Sensitivity	Kouka: High	
Location of the centre of the OHPL Section	32°56'13.95"S	Latitude
	22°34'2.54"E	Longitude



Google Earth image showing the layout for Section A to B of the proposed OHPL together with the mapped aquatic features

The proposed OHPL (Section A to B) is located in the upper reaches of the Traka Tributary, largely crossing only minor feeder streams of the tributary, although it does need to cross the larger main channel of the Traka River. Drainage tends to be in a southerly direction, towards the Traka River that flows southwards through the Swartberg Mountains, to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay. The watercourses are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily a gravel bed, single to multiple channels. The larger river contains distinct riparian vegetation of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus.* The smaller watercourses along the proposed OHPL have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses.

View of the Traka River near the proposed OHPL

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area have a high ecological importance and sensitivity while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

Identification of Environmental Sensitivities

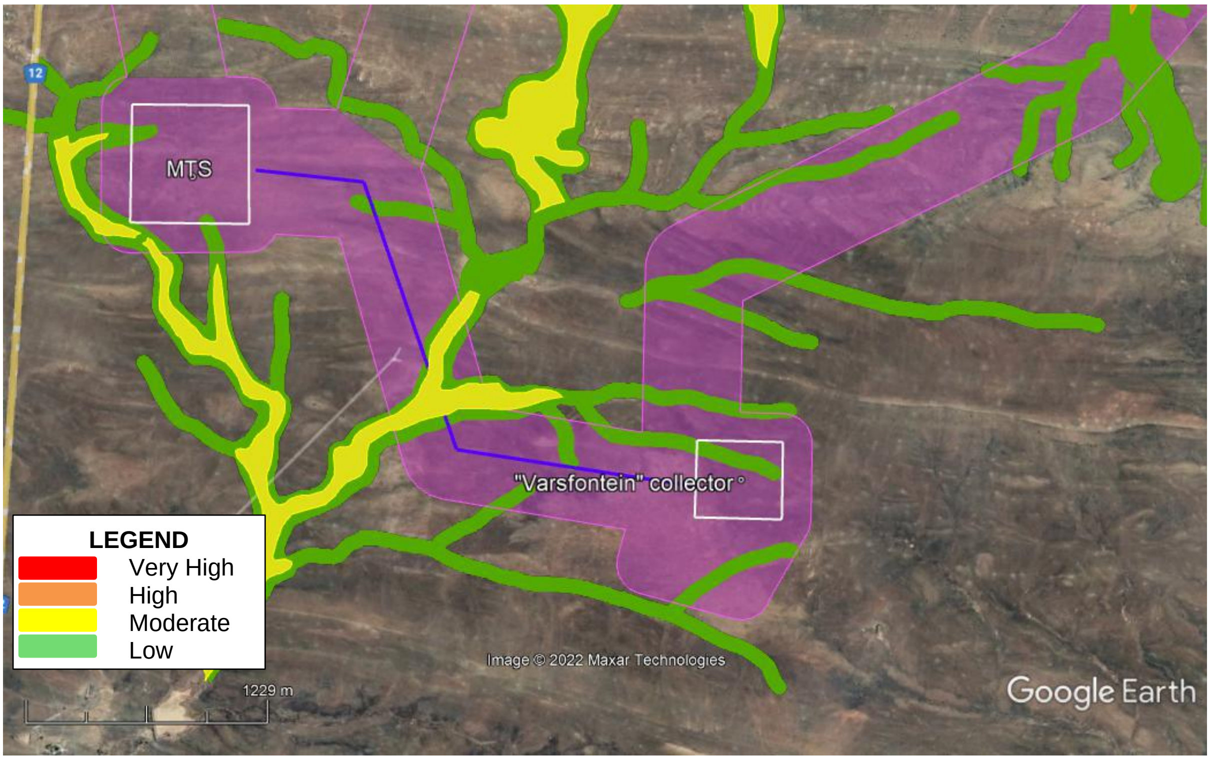
The Screening Tool has indicated the catchment of the Traka River as being of low Aquatic Biodiversity Combined Sensitivity. The mainstem of the Traka River is mapped as aquatic Critical Biodiversity Areas (CBAs), with the wider river corridor being mapped as a terrestrial CBA. The smaller feeder streams to the Traka River are mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets, but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities.

The Traka River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

Specialist Sensitivity Analysis and Verification

This assessment considers the mainstem of the Traka River within the OHPL section to be of **Moderate** sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.



Google Earth image showing the aquatic sensitivity mapping together with the proposed layout for the project for the site.

Impact Assessment

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Construction Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Construction Phase: Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18 month period). A construction camp with a temporary laydown area would likely need to be placed within the site for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

<u>Proposed mitigation:</u>

- A buffer of up to 100 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. It is recommended that the works at the substations be shifted to avoid the mapped aquatic features within the indicated footprints. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. The access road for the OHPL will need to cross the watercourse corridors but if this remains only a jeep track type access and low water crossings, the impact would be minimal with mitigation.
- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.
- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

<u>Significance of impacts after mitigation:</u> The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Operation Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.

<u>Proposed mitigation:</u>

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

<u>Significance of impacts after mitigation:</u> The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Decommission Phase Impacts

During decommissioning, the potential freshwater impacts will be much the same as that of the Construction Phase, although the potential for water quality-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.
- Disturbed areas may need to be rehabilitated and revegetated.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth) may be required.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Cumulative Impacts

The cumulative impacts of the project, as well as the project together with similar projects in the wider 50 km radius are considered under Section 6.3 of the main report.

Consideration of Alternatives

The proposed route is the shortest route possible between the substation and collector station. The alternative routes considered would require more crossings over watercourses and longer access roads. As such, the potential aquatic ecosystem impacts would be higher. Given that the potential aquatic ecosystem impacts are very low for the proposed OHPL route, and that it would have the lowest potential impact, consideration of the other route alternatives is not seen to be necessary.

The grid connection is necessary to link the approved Kwagga WEFs to the national grid, thus the no-go alternative is not a viable alternative. As for the above, considering the potential very low impact of the OHPL also implies that consideration of the no-go alternative is not necessary.

Final Specialist Statement and Authorisation Recommendation

Statement and Reasoned Opinion

The aquatic features within the study area consist of the upper reaches of the Traka River and its lesser, unnamed tributaries. The ecological habitat integrity of the rivers within the study area is still largely natural in the upper reaches with few modifications. Downstream, in the middle reaches, the rivers become largely natural to moderately modified. The larger watercourses in the study area have a high ecological importance and sensitivity while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition and should not be allowed to degrade further.

The catchment of the Traka River is mapped as being of low Aquatic Biodiversity Combined Sensitivity, this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The mainstem of the Traka River is mapped as aquatic Critical Biodiversity Areas (CBAs), with the wider river corridor being mapped as a terrestrial CBA. The smaller feeder streams to the Traka River are mapped as aquatic Ecological Support Areas. The Traka River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition. The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

This assessment determined the watercourses within the site to be of Moderate sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of Low Aquatic Biodiversity Combined Sensitivity. With mitigation, the potential freshwater impacts of the proposed OHPL for the construction, operation and decommissioning phases are likely to be very low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective, why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller feeder streams and drainage lines: at least 35 m from the center of these streams; and
- The Traka River mainstem: up to 100 m, measured from the top of bank of the river.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through watercourse should be utilised.
- Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regards to the revegetation of disturbed areas.
- During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.
- Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

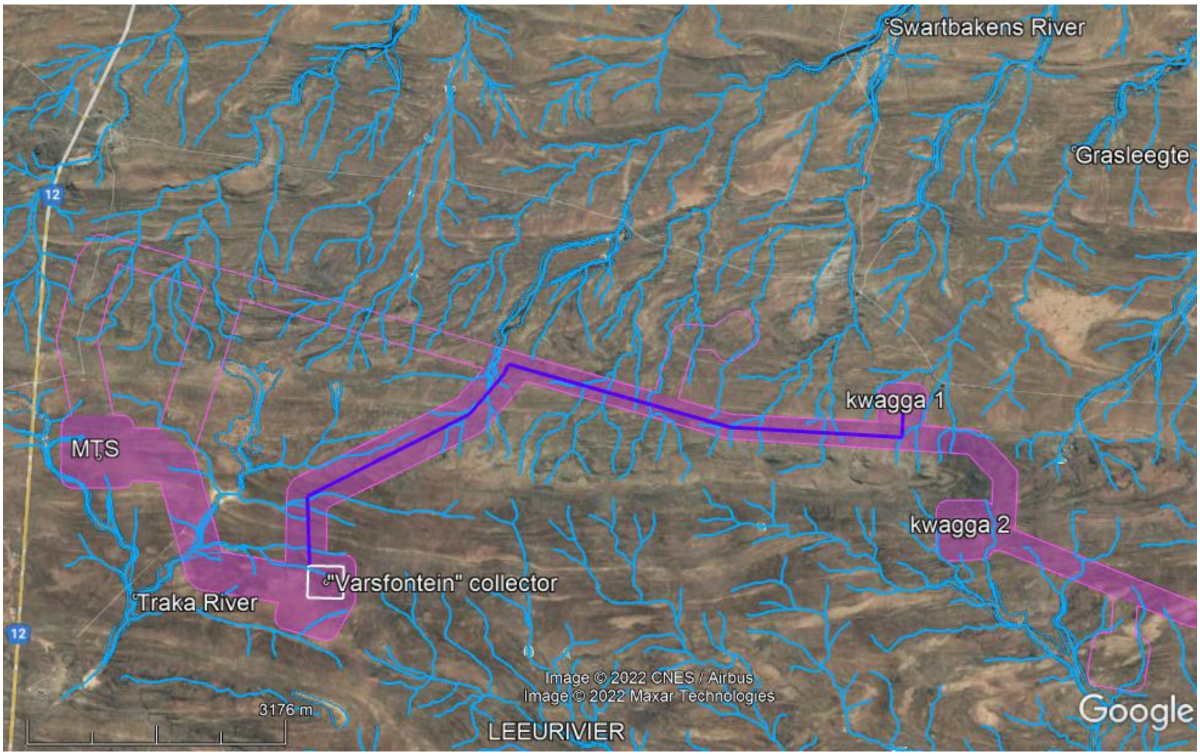
Appendix B: Aquatic Assessment for Powerline from the proposed Eskom 132 kV Substation (SS) to Kwagga WEF 1 (Section B to C)

Summary Baseline Description and Assessment of Aquatic Ecosystems

This section provides a summary of the Baseline Description and Aquatic Ecological Assessment provided in Section 5, which is specific to Powerline Section B to C.

The proposed construction of an approx. 12 km 132 kV Overhead Powerline from Kwagga WEF 1 to the proposed Eskom 132 kV SS (Varsfontein Collector substation (Section B to C) will be constructed on the Remainder and Portion 1 of the Farm Dwaalfontein Wes No. 377 as well as the Remainder of the Farm Dwaalfontein No. 379, near Beaufort West in the Central Karoo Municipal area of the Western Cape. The proposed works include the Kwagga WEF 1 switchyard and additional bays at Varsfontein collector substation.

The study area is located in the upper catchments of the Kouka, a tributary of the Gouritz River System, and the Amos/Sout River, a tributary in the Groot/Gamtoos River System.



Google Earth image showing the layout for Section B to C of the proposed OHPL together with the mapped aquatic features

The table below provides an overview and summary of the water resource information for the proposed OHPL Section.

Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Traka Tributary of the Kouka; Swartbaken Tributary of the Amos/Sout	Upper portion of the Olifants River in the Gouritz River; Upper portion of the Amos/Sout River, Groot/Gamtoos River
Quaternary Catchment	J32C (Kouka) and L12A (Swartbaken)	

Present Ecological state	Kouka: B (largely natural) Swartbaken: C (moderately modified)	DWS (2012) assessment for the Kouka and Swartbaken Rivers (See Appendices)
Ecological Importance and Ecological Sensitivity	Kouka: High/High Swartbaken: Moderate/Moderate	
Location of the centre of the OHPL Section	32°55'5.72"S	Latitude
	22°36'30.84"E	Longitude

The proposed OHPL Section B to C is located in the upper reaches of the Traka and Swartbaken Tributaries, crossing only minor feeder streams of these tributaries. Drainage in the western portion of the route tends to be a southerly direction, towards the Traka River that flows southwards through the Swartberg Mountains, to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay.

In the eastern portion, drainage is northwards to the Amos/Sout River. This river is joined by the Kariega River to form the Groot River with then flows in a south-easterly direction to join the Kouga River. These two rivers form the Gamtoos River flows for a short distance before draining into the sea northeast of Jefferys Bay.

The watercourses are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily gravel bed, single to multiple channels. The larger river contains distinct riparian vegetation of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus.* The smaller watercourses along the proposed OHPL have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses.

View of the Leeu River with its more significant riparian vegetation that is still in a relatively natural ecological condition

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area have a high ecological importance and sensitivity while the smaller tributaries/drainage features are of moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

Identification of Environmental Sensitivities

The Screening Tool has indicated that the catchment of the Swartbaken River Catchment is of very high sensitivity while the catchment of the Traka River as being of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area.

The catchment of the Swartbaken River is mapped as a Freshwater Ecosystem Priority Area (FEPA) Sub-catchment (Figure 4). The mainstem of both the Swartbaken and Traka Rivers are mapped as aquatic Critical Biodiversity Areas (CBA) (Figure 5), with the wider river corridor also being mapped as a terrestrial CBA. These areas are considered to be in a natural condition and are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. These areas should be maintained in a natural or near-natural state or where necessary, rehabilitated. Only low-impact, biodiversity-sensitive land uses are considered appropriate.

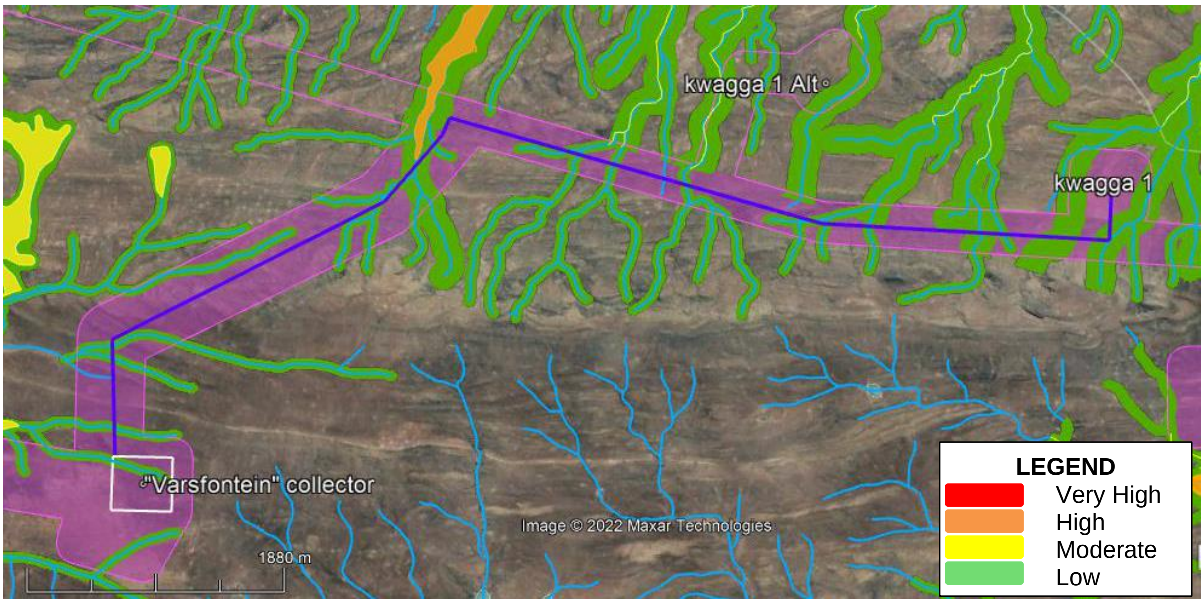
The smaller feeder streams to the Swartbaken and Traka River are mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities.

The Traka River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

The only wetlands mapped within the larger site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

Specialist Sensitivity Analysis and Verification

This assessment considers the mainstem of the Traka and Swartbaken Rivers within the OHPL section to be of **Moderate to High** sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.



Google Earth image showing the aquatic sensitivity mapping together with the proposed layout for the project for the site.

Impact Assessment

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Construction Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Construction Phase: Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18 month period). A construction camp with a temporary laydown area would likely need to be placed within the site for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

Proposed mitigation:

- A buffer of up to 100 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. . It is recommended that the works at the substations be shifted to avoid the mapped aquatic features within the indicated footprints. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. An access road for the OHPL will need to cross the watercourse corridors but if this remains only a jeep track type access and low water crossings, the impact would be minimal with mitigation.
- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.
- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Operation Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.

Proposed mitigation:

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Decommission Phase Impacts

During decommissioning, the potential freshwater impacts will be much the same as that of the Construction Phase, although the potential for water quality-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.
- Disturbed areas may need to be rehabilitated and revegetated.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth) may be required.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Cumulative Impacts

The cumulative impacts of the project, as well as the project together with similar projects in the wider 50 km radius are considered under Section 6.3 of the main report.

Consideration of Alternatives

The only alternative routes under consideration are associated with the alternative Kwagga 1 WEF Substation site versus the preferred site. The selection of this alternative is largely associated with the siting of the substation rather than the connecting OHPL route. This has been considered in the assessment for the Kwagga 1 WEF, with the preferred site having the lesser aquatic ecosystem impacts. The same applies to the OHPL to the substation, which will impact slightly less on the adjacent watercourses than the alternative one. The grid connection is necessary to link the approved Kwagga WEFs to the national grid, thus the no-go alternative is not a viable alternative. As for the above, considering the potential very low impact of the OHPL also implies that consideration of the no-go alternative is not necessary.

Final Specialist Statement and Authorisation Recommendation

Statement and Reasoned Opinion

The aquatic features within the study area consist of the upper reaches of the Traka and Swartbakens Rivers and their lesser, unnamed tributaries. The ecological habitat integrity of the rivers within the study area is still largely natural in the upper reaches with few modifications. Downstream, in the middle reaches, the rivers become largely natural to moderately modified. The larger watercourses in the study area have high ecological importance and sensitivity, while the smaller tributaries/drainage features are of moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition and should not be allowed to degrade further.

The catchment of the Swartbaken River Catchment is of very high sensitivity, while the catchment of the Traka River as being of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The mainstem of the Traka and Swartbaken Rivers are mapped as aquatic Critical Biodiversity Areas (CBAs), with the wider river corridor being mapped as a terrestrial CBA. The smaller feeder streams to the Traka and Swartbaken Rivers are mapped as aquatic Ecological Support Areas. The Traka River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition. The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

This assessment determined the watercourses within the site to be of Moderate sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of Low Aquatic Biodiversity Combined Sensitivity. With mitigation, the potential freshwater impacts of the proposed OHPL for the construction, operation and decommissioning phases are likely to be very low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller feeder streams and drainage lines: at least 35 m from the centre of these streams; and
- The river mainstem with its wider braided channels: up to 100 m, measured from the top of bank of the river.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

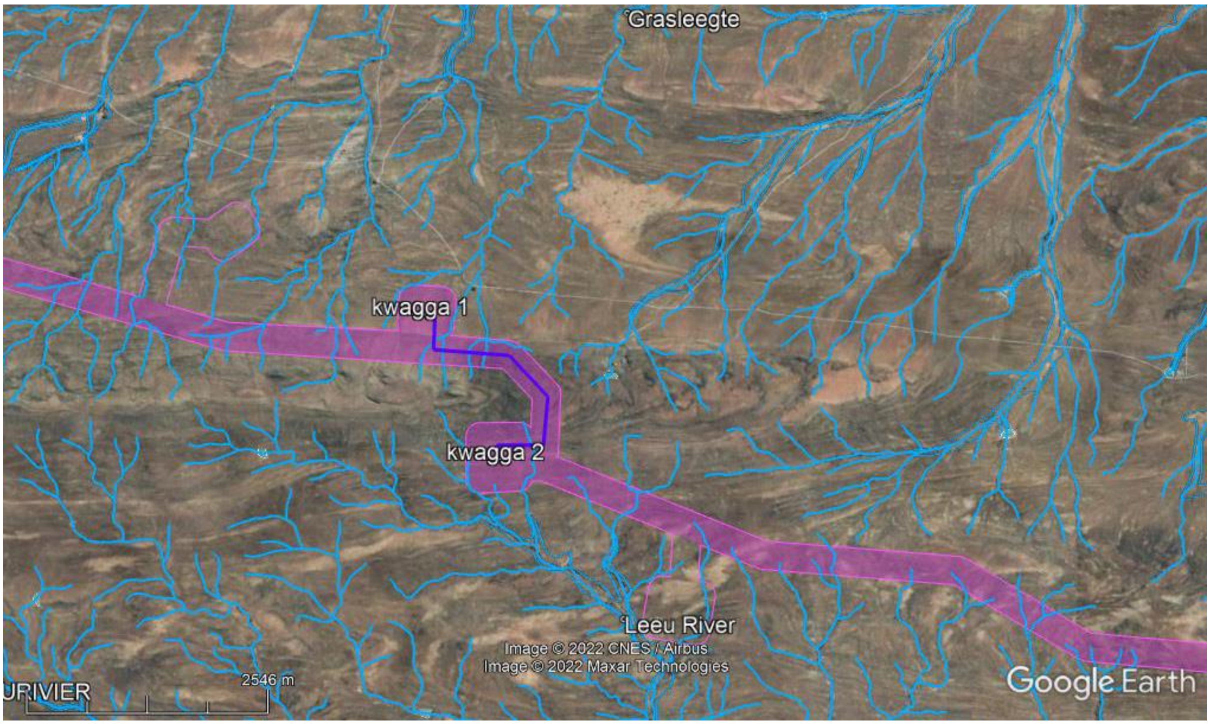
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through the watercourse should be utilised.
- Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regard to the revegetation of disturbed areas.
- During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.
- Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.
- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

Appendix C: Aquatic Assessment for Powerline from Kwagga WEF 1 to Kwagga WEF 2 (Section C to D)

Summary Baseline Description and Assessment of Aquatic Ecosystems

This section provides a summary of the Baseline Description and Aquatic Ecological Assessment provided in Section 5 that is specific to Powerline Section C to D.

The proposed construction of a 3km 132 kV Overhead Powerline from Kwagga WEF 1 to Kwagga WEF 2 (Section C to D) will be constructed on the Remainder and Portion 1 of the Farm Dwaalfontein Wes No. 377, Remainder of the Farm Dwaalfontein No. 379, Portion 3 of the Farm Tyger Poort No. 376, as well as Remainder of the Farm Wolve Kraal No. 17, near Beaufort West in the Central Karoo Municipal area of the Western Cape. The proposed works include switchyards at both substations. The study area is located in the upper catchments of the Kouka, a tributary of the Gouritz River System, and the Amos/Sout River, a tributary in the Groot/Gamtoos River System.



Google Earth image showing the layout for Section C to D of the proposed OHPL together with the mapped aquatic features

The table below provides an overview and summary of the water resource information for the proposed OHPL Section.

Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Leeu Tributary of the Kouka; Grasleegte Tributary of the Amos/Sout	Upper portion of the Olifants River in the Gouritz River; Upper portion of the Amos/Sout River, Groot/Gamtoos River
Quaternary Catchment	J32C (Leeu) and L12A (Grasleegte)	
Present Ecological state	Kouka and Muishond se Loop: B (largely natural)	

Ecological Importance and Ecological Sensitivity	Kouka and Muishond se Loop: High/High	DWS (2012) assessment for the Kouka River and Muishond se Loop (See Appendices)
Location of the centre of the OHPL Section	32°55'35.5"S	Latitude
	22°40'16.5"E	Longitude

The proposed OHPL Section C to D is located in the upper reaches of the Leeu and Grasleegte Tributaries, crossing only minor feeder streams of these tributaries. Drainage in the eastern portion of the route tends to be a southerly direction, towards the Kouka/Traka River that flows southwards through the Swartberg Mountains, to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay.

In the western portion, drainage is northwards, to the Amos/Sout River. This river is joined by the Kariega River to form the Groot River, with then flows in a south-easterly direction to join the Kouga River. These two rivers form the Gamtoos River flows for a short distance before draining into the sea northeast of Jefferys Bay.

The watercourses are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily of gravel bed, single to multiple channels. The larger river contains distinct riparian vegetation of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus.* The smaller watercourses along the proposed OHPL have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses.

View of the smaller tributaries of the Leeu River with its less significant riparian vegetation that is still in a largely natural ecological condition

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area, have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

Identification of Environmental Sensitivities

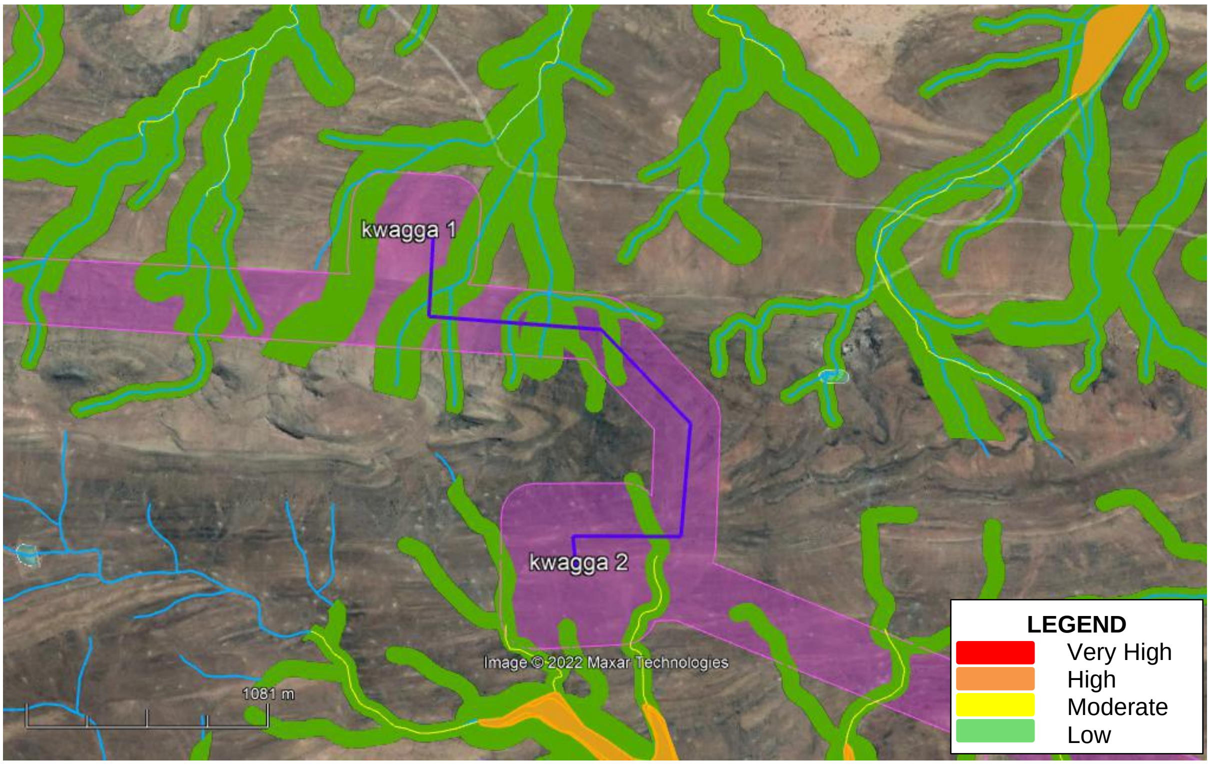
The Screening Tool has indicated that the catchment of the Grasleegte/Swartbaken River Catchment is of very high sensitivity while the catchment of the Leeu River is of low Aquatic Biodiversity Combined Sensitivity, this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area.

The catchment of the Grasleegte/Swartbaken River is mapped as a Freshwater Ecosystem Priority Area (FEPA) Sub-catchment (Figure 4) that should be maintained in a natural or near-natural state or where necessary rehabilitated. There are no aquatic Critical Biodiversity Areas (CBA) mapped within the section of OHPL (Figure 5). The smaller feeder streams to the Grasleegte and Leeu Rivers are mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets, but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities. The Leeu River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

The only wetlands mapped within the larger site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

Specialist Sensitivity Analysis and Verification

This assessment considers the mainstem of the Leeu and Grasleegte Rivers within the OHPL section to be of **Moderate** sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity. Only small watercourses will be crossed by the proposed OHPL for this section.



Google Earth image showing the aquatic sensitivity mapping together with the proposed layout for the project for the site.

Impact Assessment

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Construction Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Construction Phase: Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18 month period). A construction camp with a temporary laydown area would likely need to be placed within the site for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

Proposed mitigation:

- A buffer of up to 100 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. It is recommended that the works at the substations be shifted to avoid the mapped aquatic features within the indicated footprints. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. An access road for the OHPL will need to cross the watercourse corridors but if this remains only a jeep track type access and low water crossings, the impact would be minimal with mitigation.

- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.
- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Operation Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.

Proposed mitigation:

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Decommission Phase Impacts

During decommissioning, the potential freshwater impacts will be much the same as that of the Construction Phase, although the potential for water quality-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.
- Disturbed areas may need to be rehabilitated and revegetated.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth) may be required.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Cumulative Impacts

The cumulative impacts of the project, as well as the project together with similar projects in the wider 50 km radius are considered under Section 6.3 of the main report.

Consideration of Alternatives

The grid connection is necessary to link the approved Kwagga WEFs to the national grid, thus the no-go alternative is not a viable alternative. As for the above, considering the potential very low impact of the OHPL also implies that consideration of the no-go alternative is not necessary.

Final Specialist Statement and Authorisation Recommendation

Statement and Reasoned Opinion

The aquatic features within the study area consist of the upper reaches of the Leeu and Grasleegte Rivers and their lesser, unnamed tributaries. The ecological habitat integrity of the rivers within the study area is still largely natural in the upper reaches with few modifications. Downstream, in the middle reaches the rivers become largely natural to moderately modified. The larger watercourses in the study area have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition and should not be allowed to degrade further.

The catchment of the Grasleegte/Swartbaken River Catchment is of very high sensitivity, while the catchment of the Leeu River is of low Aquatic Biodiversity Combined Sensitivity, this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The mainstem of the Traka River is mapped as aquatic CBAs, with the wider river corridor being mapped as a terrestrial CBA. The smaller feeder streams of the Grasleegte and Leeu Rivers are mapped as aquatic Ecological Support Areas. The Leeu River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition. The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

This assessment determined the watercourses within the site to be of Moderate sensitivity while the smaller watercourses, as well as the recommended buffer areas (35m for the small watercourses), are considered as of Low Aquatic Biodiversity Combined Sensitivity. The proposed OHPL will only cross the small low, sensitivity streams.

With mitigation, the potential freshwater impacts of the proposed OHPL for the construction, operation and decommissioning phases are likely to be very low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective, why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller feeder streams and drainage lines: at least 35 m from the center of these streams.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

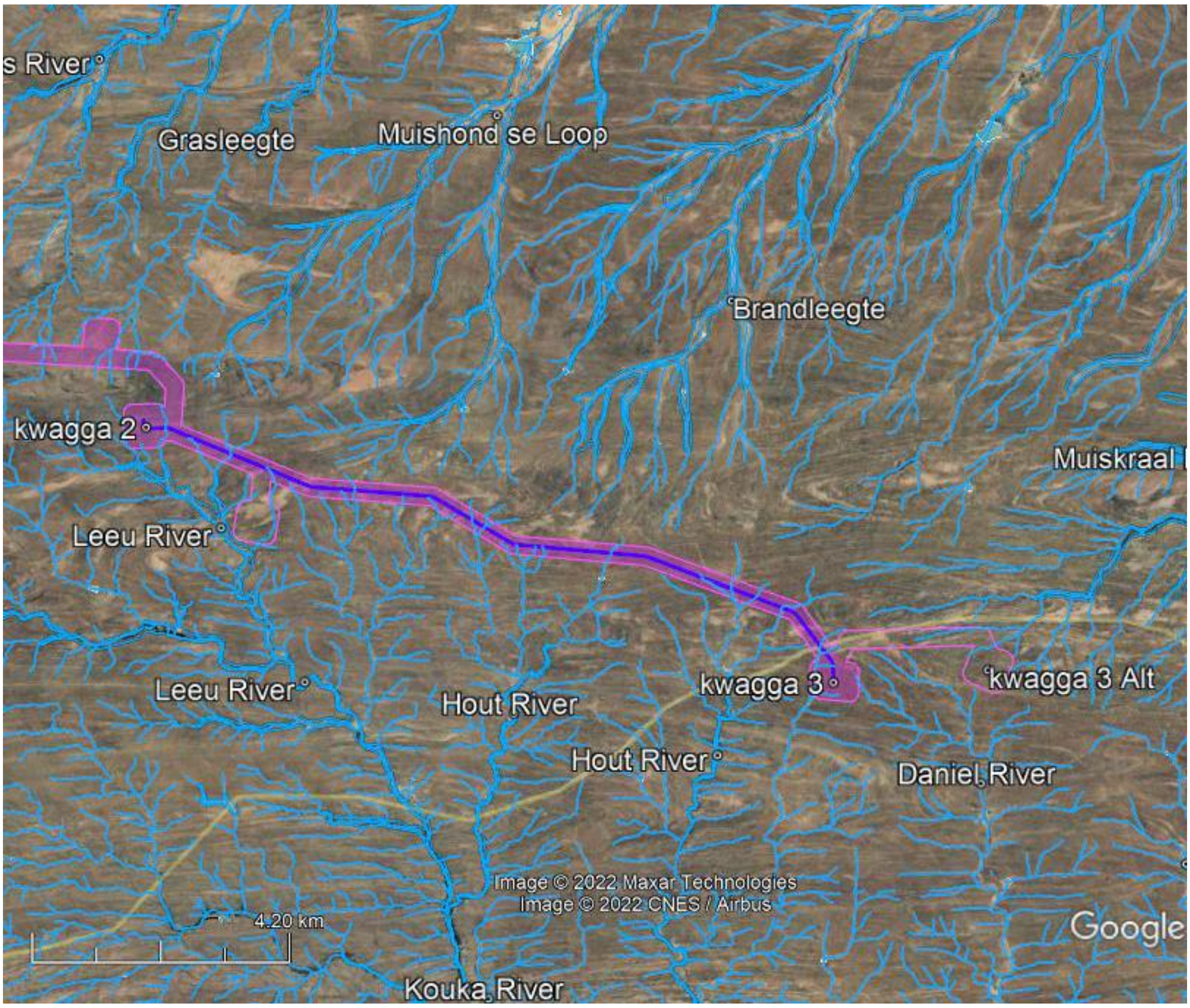
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through the watercourse should be utilised.
- Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regards to the revegetation of disturbed areas.
- During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.
- Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.
- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

Appendix D: Aquatic Assessment for Powerline from Kwagga WEF 2 to Kwagga WEF 3 (Section D to E)

Summary Baseline Description and Assessment of Aquatic Ecosystems

This section provides a summary of the Baseline Description and Aquatic Ecological Assessment provided in Section 5 that is specific to Powerline Section D to E.

The proposed construction of a 13km 132 kV Overhead Powerline from Kwagga WEF 2 to Kwagga WEF 3 (Section D to E) will be constructed on the Remainder of and Portion 9 the Farm Wolve Kraal No. 17, as well as Portion 7 of the Farm Muis Kraal No. 373, near Beaufort West in the Central Karoo Municipal area of the Western Cape. The proposed works include switchyards at both substations. The study area is located largely in the upper catchments of the Kouka, a tributary of the Gouritz River System, with only a small portion in the Amos/Sout River, a tributary in the Groot/Gamtoos River System.



Google Earth image showing the layout for Section D to E of the proposed OHPL together with the mapped aquatic features

The table below provides an overview and summary of the water resource information for the proposed OHPL Section.

Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Leeu and Hout Tributaries of the Kouka; Muiskraal Tributary of the Amos/Sout (Kwagga 3 Alternative SS)	Upper portion of the Olifants River in the Gouritz River;Upper portion of the Amos/Sout River, Groot/Gamtoos River
Quaternary Catchment	J32C (Kouka) and L12C (Muiskraal)	
Present Ecological state	Kouka and Muishond se Loop: B (largely natural)	DWS (2012) assessment for the Kouka River and Muishond se Loop (See Appendices)
Ecological Importance and Ecological Sensitivity	Kouka and Muishond se Loop: High/High	
Location of the centre of the OHPL Section	32°57'0.5"S	Latitude
	22°43'42.5"E	Longitude

The proposed OHPL Section D to E is located in the upper reaches of the Leeu and Hout Tributaries, crossing only minor feeder streams of these tributaries. Drainage tends to be in a southerly direction, towards the Kouka/Traka River that flows southwards through the Swartberg Mountains, to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay.

Only for the Kwagga 3 SS alternative is the drainage is northwards, to the Amos/Sout River. This river is joined by the Kariega River to form the Groot River with then flows in a south-easterly direction to join the Kouga River. These two rivers form the Gamtoos River flows for a short distance before draining into the sea northeast of Jefferys Bay.

The watercourses are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily of gravel bed, single to multiple channels. The larger river contains a distinct riparian vegetation of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus.* The smaller watercourses along the proposed OHPL have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses.

View of the Hout River with its more significant riparian vegetation that is still in a largely natural ecological condition

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

Identification of Environmental Sensitivities

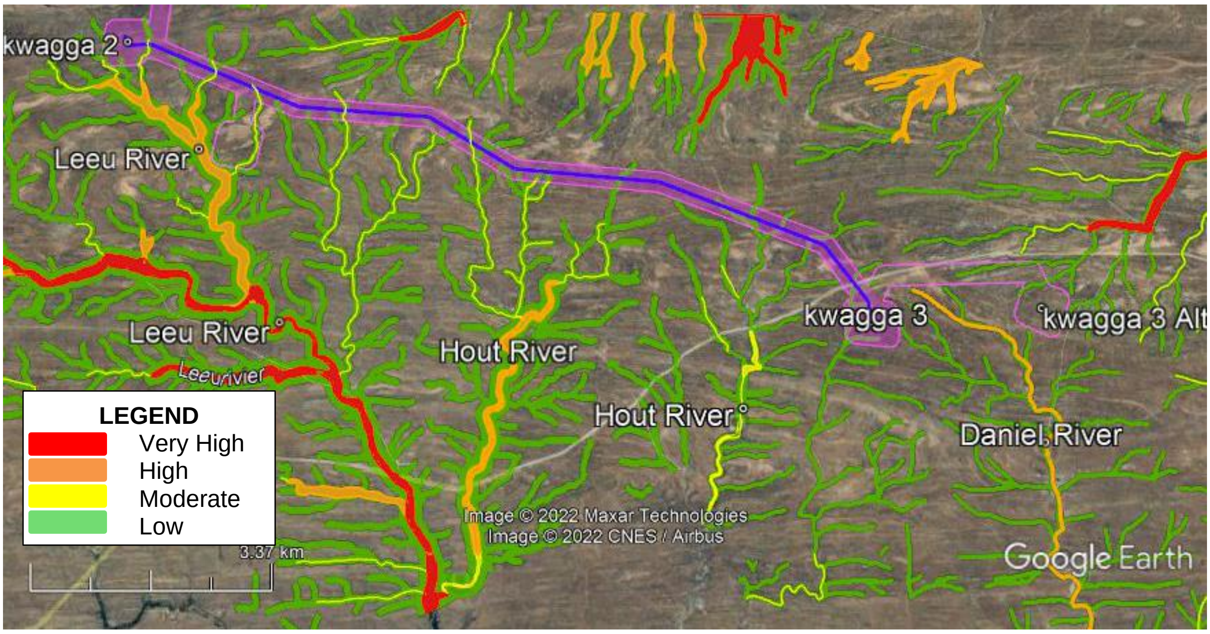
The Screening Tool has indicated that the catchment of the Muiskraal River Catchment to the northeast of the route is of very high sensitivity while the catchment of the Leeu/Hout River is of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area.

The catchment of the Muiskraal River is mapped as a Freshwater Ecosystem Priority Area (FEPA) Sub-catchment (Figure 4) that should be maintained in a natural or near-natural state or, where necessary rehabilitated. There are no aquatic Critical Biodiversity Areas (CBA) mapped within the section of OHPL (Figure 5). The smaller feeder streams to the Hout and Leeu Rivers are mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets, but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities. The Leeu River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

The only wetlands mapped within the larger site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

Specialist Sensitivity Analysis and Verification

This assessment considers the mainstem of the Leeu and Hout Rivers within the OHPL section to be of **Moderate to high** sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity. Only the Muiskraal River further to the northeast and the Leeu River to the south of the OHPL are considered of **Very high** sensitivity.



Google Earth image showing the aquatic sensitivity mapping together with the proposed layout for the project for the site.

Impact Assessment

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Construction Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Construction Phase: Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18 month period). A construction camp with a temporary laydown area would likely need to be placed within the site for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

<u>Proposed mitigation:</u>

- A buffer of up to 100 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. It is recommended that the works at the substations be shifted to avoid the mapped aquatic features within the indicated footprints. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. An access road for the OHPL will need to cross the watercourse corridors but if this remains only a jeep track type access and low water crossings, the impact would be minimal with mitigation.
- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.

- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Operation Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.

Proposed mitigation:

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Decommission Phase Impacts

During decommissioning, the potential freshwater impacts will be much the same as that of the Construction Phase, although the potential for water quality-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.
- Disturbed areas may need to be rehabilitated and revegetated.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth) may be required.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Cumulative Impacts

The cumulative impacts of the project, as well as the project together with similar projects in the wider 50 km radius are considered under Section 6.3 of the main report.

Consideration of Alternatives

The only alternative routes under consideration are associated with the alternative Kwagga 3 WEF Substation site versus the preferred site. The selection of this alternative is largely associated with the siting of the substation rather than the connecting OHPL route. This has been considered in the assessment for the Kwagga 3 WEF, with the preferred site having the lesser aquatic ecosystem impacts. The same applies to the OHPL to the substation, which will impact slightly less on the adjacent watercourses than the alternative one. The grid connection is necessary to link the approved Kwagga WEFs to the national grid, thus the no-go alternative is not a viable alternative. As for the above, considering the potential very low impact of the OHPL also implies that consideration of the no-go alternative is not necessary.

Final Specialist Statement and Authorisation Recommendation

Statement and Reasoned Opinion

The proposed OHPL Section D to E is located in the upper reaches of the Leeu and Hout Tributaries, crossing only minor feeder streams of these tributaries. Only for the Kwagga 3 SS alternative is the route in the upper reaches of the Muiskraal Tributary of Amos/Sout River. The ecological habitat integrity of the rivers within the study area is still largely natural in the upper reaches with few modifications. Downstream, in the middle reaches, the rivers become largely natural to moderately modified. The larger watercourses in the study area have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition and should not be allowed to degrade further.

The catchment of the Muiskraal River Catchment is of very high sensitivity, while the catchment of the Leeu and Hout Rivers is of low Aquatic Biodiversity Combined Sensitivity. This is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The mainstem of the Muiskraal River is mapped as aquatic CBAs, with the wider river corridor and surrounding area are mapped as a terrestrial CBA. The smaller feeder streams of the Grasleegte and Leeu Rivers are mapped as aquatic Ecological Support Areas. The Leeu/Hout River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition. The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

This assessment determined that some of the larger watercourses within the OHPL corridor are of Moderate sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of Low Aquatic Biodiversity Combined Sensitivity. With mitigation, the potential freshwater impacts of the proposed OHPL for the construction, operation and decommissioning phases are likely to be very low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller feeder streams and drainage lines: at least 35 m from the center of these streams; and
- The river mainstem with its wider braided channels: up to 100 m, measured from the top of bank of the river.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through the watercourse should be utilised.
- Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regards to the revegetation of disturbed areas.
- During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.
- Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.
- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

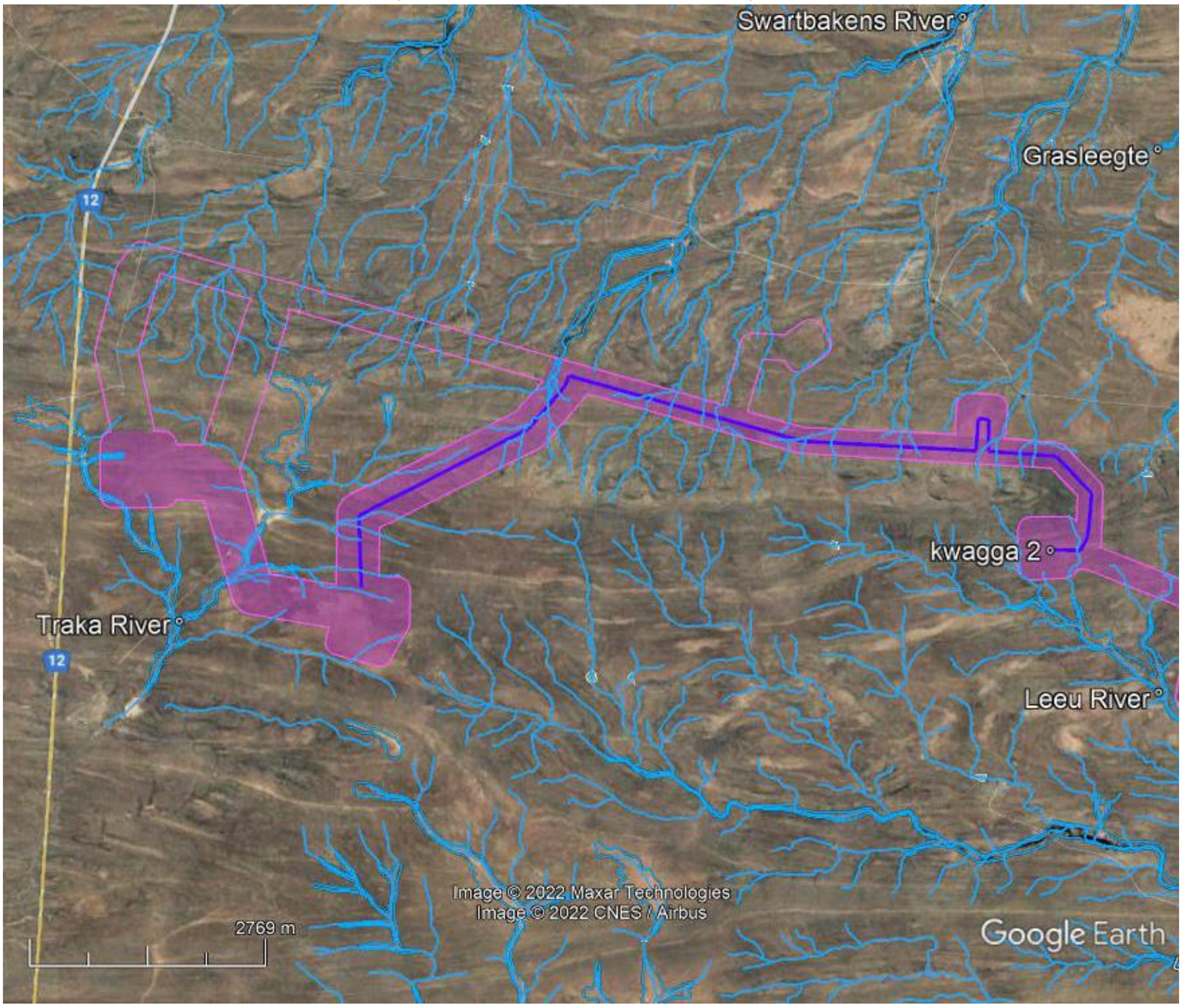
Appendix E: Aquatic Assessment for Powerline from the proposed Eskom 132 kV Substation (SS) to Kwagga WEF 2 (Section B to D)

Summary Baseline Description and Assessment of Aquatic Ecosystems

This section provides a summary of the Baseline Description and Aquatic Ecological Assessment provided in Section 5 that is specific to Powerline Section B to D.

The proposed construction of a 12km 132 kV Overhead Powerline from Kwagga WEF 2 to the proposed Eskom 132 kV SS (Section B to D) will be constructed on Portion 1 of the Farm Witpoortje No. 16, Portion 1 of the Farm Trakas Kuilen No. 15, Remainder and Portion 1 of the Farm Dwaalfontein Wes No. 377, Portion 3 of the Farm Tyger Poort No. 376, as well as the Remainder of the Farm Dwaalfontein No. 379. Remainder of the Farm Wolve Kraal No. 17, near Beaufort West in the Central Karoo Municipal area of the Western Cape. The proposed works include the Kwagga WEF 2 switchyard, connection via Kwagga WEF 1 switchyard and additional bays at Varsfontein collector substation.

The study area is located in the upper catchments of the Kouka, a tributary of the Gouritz River System, and the Amos/Sout River, a tributary of the Groot/Gamtoos River System.



Google Earth image showing the layout for Section B to D of the proposed OHPL together with the mapped aquatic features

The table below provides an overview and summary of the water resource information for the proposed OHPL Section.

Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Traka Tributary of the Kouka; Swartbaken and Grasleegte Tributaries of the Amos/Sout	Upper portion of the Olifants River in the Gouritz River; Upper portion of the Amos/Sout River, Groot/Gamtoos River
Quaternary Catchment	J32C (Kouka) and L12A (Swartbaken and Grasleegte)	
Present Ecological state	Kouka: B (largely natural) Swartbaken: C (moderately modified)	DWS (2012) assessment for the Kouka and Swartbaken Rivers (See Appendices)
Ecological Importance and Ecological Sensitivity	Kouka: High/High Swartbaken: Moderate/Moderate	
Location of the centre of the OHPL Section	32°55'11.2"S	Latitude
	22°37'25.8"E	Longitude

The proposed OHPL Section B to D is located in the upper reaches of the Traka and Swartbaken/Grasleegte Tributaries, crossing mostly minor feeder streams of these tributaries. Drainage in the southern portions of the route tends to be a southerly direction, towards the Traka River that flows southwards through the Swartberg Mountains, to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay.

In the northern portions, drainage is northwards, to the Amos/Sout River. This river is joined by the Kariega River to form the Groot River with then flows in a south-easterly direction to join the Kouga River. These two rivers form the Gamtoos River flows for a short distance before draining into the sea northeast of Jefferys Bay.

The watercourses are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily of gravel bed, single to multiple channels. The larger river contains distinct riparian vegetation of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus.* The smaller watercourses along the proposed OHPL have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses.

View of a smaller tributary of the Swartbakens River with its riparian vegetation that is still in a relatively natural ecological condition

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area, have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

Identification of Environmental Sensitivities

The Screening Tool has indicated that the catchment of the Swartbaken/Grasleegte River Catchment is of very high sensitivity while the catchment of the Traka River as being of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area.

The catchment of the Swartbaken/Grasleegte Rivers is mapped as a Freshwater Ecosystem Priority Area (FEPA) Sub-catchment (Figure 4). The mainstem of both the Swartbaken and Traka Rivers are mapped as aquatic Critical Biodiversity Areas (CBA) (Figure 5), with the wider river corridor also being mapped as a terrestrial CBA. These areas are considered to be in a natural condition and are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. These areas should be maintained in a natural or near-natural state or where necessary rehabilitated. Only low-impact, biodiversity-sensitive land uses are considered appropriate.

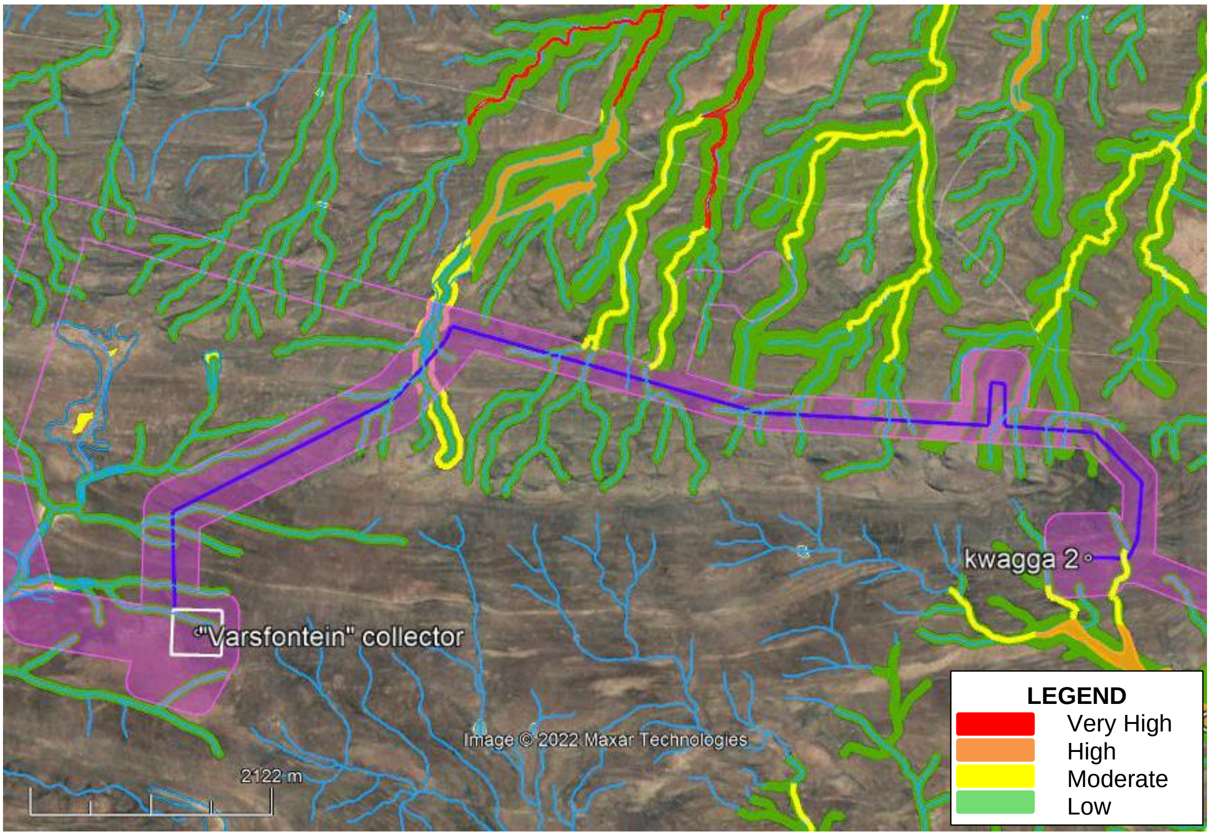
The smaller feeder streams to the Swartbaken/Grasleegte and Traka Rivers are mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets, but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities.

The Traka River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

The only wetlands mapped within the larger site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

Specialist Sensitivity Analysis and Verification

This assessment considers the mainstem of the Traka and Swartbaken Rivers within the OHPL section to be of **Moderate to High** sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.



Google Earth image showing the aquatic sensitivity mapping together with the proposed layout for the project for the site.

Impact Assessment

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Construction Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Construction Phase: Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18 month period). A construction camp with a temporary laydown area would likely need to be placed within the site for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

Proposed mitigation:

- A buffer of up to 100 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. It is recommended that the works at the substations be shifted to avoid the mapped aquatic features within the indicated footprints. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. An access road for the OHPL will need to cross the watercourse corridors but if this remains only a jeep track type access and low water crossings, the impact would be minimal with mitigation.
- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.
- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Operation Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.

Proposed mitigation:

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Decommission Phase Impacts

During decommissioning, the potential freshwater impacts will be much the same as that of the Construction Phase, although the potential for water quality-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.
- Disturbed areas may need to be rehabilitated and revegetated.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth) may be required.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Cumulative Impacts

The cumulative impacts of the project, as well as the project together with similar projects in the wider 50 km radius are considered under Section 6.3 of the main report.

Consideration of Alternatives

The grid connection is necessary to link the approved Kwagga WEFs to the national grid, thus the no-go alternative is not a viable alternative. As for the above, considering the potential very low impact of the OHPL also implies that consideration of the no-go alternative is not necessary.

Final Specialist Statement and Authorisation Recommendation

Statement and Reasoned Opinion

The aquatic features within the study area consist of the upper reaches of the Traka and Swartbakens/Grasleegte Rivers and their lesser, unnamed tributaries. The ecological habitat integrity of the rivers within the study area is still largely natural in the upper reaches with few modifications. Downstream, in the middle reaches, the rivers become largely natural to moderately modified. The larger watercourses in the study area have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition and should not be allowed to degrade further.

The catchment of the Swartbaken/Grasleegte River Catchment is of very high sensitivity, while the catchment of the Traka River as being of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The mainstem of the Traka and Swartbaken Rivers are mapped as aquatic Critical Biodiversity Areas (CBAs), with the wider river corridor being mapped as a terrestrial CBA. The smaller feeder streams to the Traka and Swartbaken and Grasleegte Rivers are mapped as aquatic Ecological Support Areas. The Traka River Sub-catchment is mapped as an Upstream Catchment that is important to be maintained in its current ecological condition. The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

This assessment determined the watercourses within the site to be of Moderate sensitivity, while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of Low Aquatic Biodiversity Combined Sensitivity. With mitigation, the potential freshwater impacts of the proposed OHPL for the construction, operation and decommissioning phases are likely to be very low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller feeder streams and drainage lines: at least 35 m from the centre of these streams; and
- The river mainstem with its wider braided channels: up to 100 m, measured from the top of bank of the river.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through the watercourse should be utilised.
- Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regards to the revegetation of disturbed areas.
- During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.
- Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.
- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

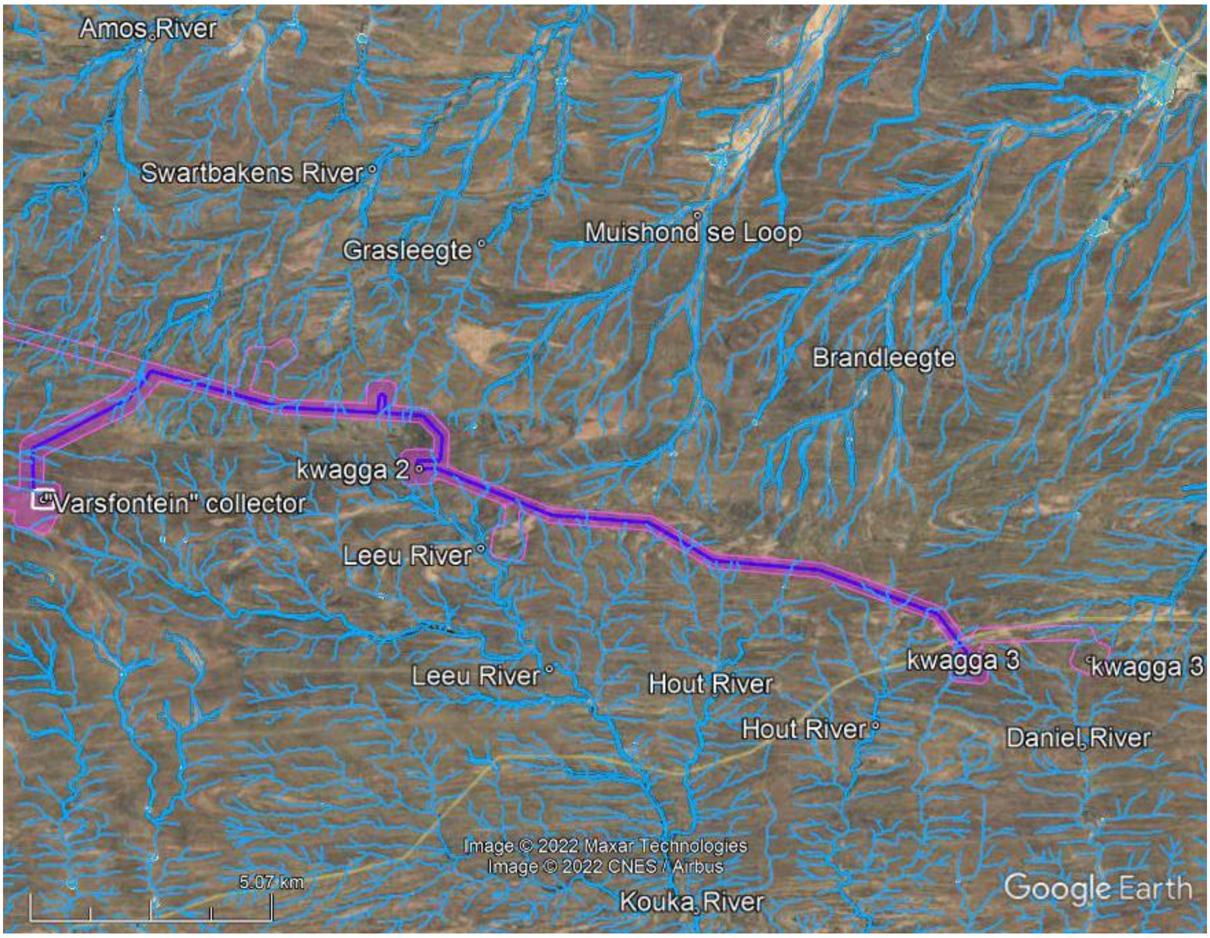
Appendix F: Aquatic Assessment for Powerline from the proposed Eskom 132 kV Substation (SS) to Kwagga WEF 3 (Section B to E)

Summary Baseline Description and Assessment of Aquatic Ecosystems

This section provides a summary of the Baseline Description and Aquatic Ecological Assessment provided in Section 5 that is specific to Powerline Section B to E.

The proposed construction of a 25km 132 kV Overhead Powerline from Kwagga WEF 3 to the proposed Eskom 132 kV SS (Section B to E) will be constructed on Portion 1 of the Farm Witpoortje No. 16, Remainder of and Portion 1 of the Farm Trakas Kuilen No. 15, Remainder and Portion 1 of the Farm Dwaalfontein Wes No. 377, Portion 3 of the Farm Tyger Poort No. 376, as well as the Remainder of the Farm Dwaalfontein No. 379. Remainder, Portion 17 of the Farm Wolve Kraal No. 17 and Portion 7 of the Farm Muis Kraal No. 373, near Beaufort West in the Central Karoo Municipal area of the Western Cape. The proposed works include the Kwagga WEF 3 switchyard, connection via Kwagga WEF 1 and Kwagga WEF 2 switchyards and additional bays at Varsfontein collector substation.

The study area is located in the upper catchments of the Kouka, a tributary of the Gouritz River System, and the Amos/Sout River, a tributary in the Groot/Gamtoos River System.



Google Earth image showing the layout for Section B to E of the proposed OHPL together with the mapped aquatic features

The table below provides an overview and summary of the water resource information for the proposed OHPL Section.

Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Traka, Leeu and Hout Tributaries of the Kouka; Swartbaken, Grasleegte, Brandleegte, Muishond se Loop and Muikraal Tributaries of the Amos/Sout	Upper portion of the Olifants River in the Gouritz River; Upper portion of the Amos/Sout River, Groot/Gamtoos River
Quaternary Catchment	J32C (Kouka) L12A (Swartbakens) L12A (Muishond se Loop)	
Present Ecological state	Kouka: B (largely natural) Swartbakens: C (moderately modified) Muishond se Loop: (largely natural)	DWS (2012) assessment for the Kouka, Swartbakens and Muishond se Loop Rivers (See Appendices)
Ecological Importance and Ecological Sensitivity	Kouka: High/High Swartbakens: Moderate/Moderate Muishond se Loop: High/High	
Location of the centre of the OHPL Section	32°56'44.2"S	Latitude
	22°43'15.5"E	Longitude

The proposed OHPL Section B to E is located in the upper reaches of the Traka/Leeu/Hout and Swartbaken/Grasleegte/Muishond se Loop/Muiskraal Tributaries, crossing mostly minor feeder streams of these tributaries. Drainage in the southern portions of the route tends to be a southerly direction, towards the Traka River that flows southwards through the Swartberg Mountains to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay.

In the northern portions, drainage is northwards, to the Amos/Sout River. This river is joined by the Kariega River to form the Groot River with then flows in a south-easterly direction to join the Kouga River. These two rivers form the Gamtoos River flows for a short distance before draining into the sea northeast of Jefferys Bay.

The watercourses are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily of gravel bed, single to multiple channels. The larger river contains distinct riparian vegetation of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus.* The smaller watercourses along the proposed OHPL have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses.

View of the Leeu River with its riparian vegetation that is still in a relatively natural ecological condition

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area, have a high ecological importance and sensitivity, while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

Identification of Environmental Sensitivities

The Screening Tool has indicated that the Swartbaken/Grasleegte and Muiskraal River Catchments are of very high sensitivity while the Traka and Leeu/Hout River Catchments are of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area.

The catchment of the Swartbaken/Grasleegte Rivers and the Muiskraal River are mapped as Freshwater Ecosystem Priority Area (FEPA) Sub-catchments (Figure 4). The mainstem of the Swartbaken, Muiskraal and Traka Rivers are mapped as aquatic Critical Biodiversity Areas (CBA) (Figure 5), with the wider river corridors also being mapped as a terrestrial CBA. These areas are considered to be in a natural condition and are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. These areas should be maintained in a natural or near-natural state or where necessary rehabilitated. Only low-impact, biodiversity-sensitive land uses are considered appropriate.

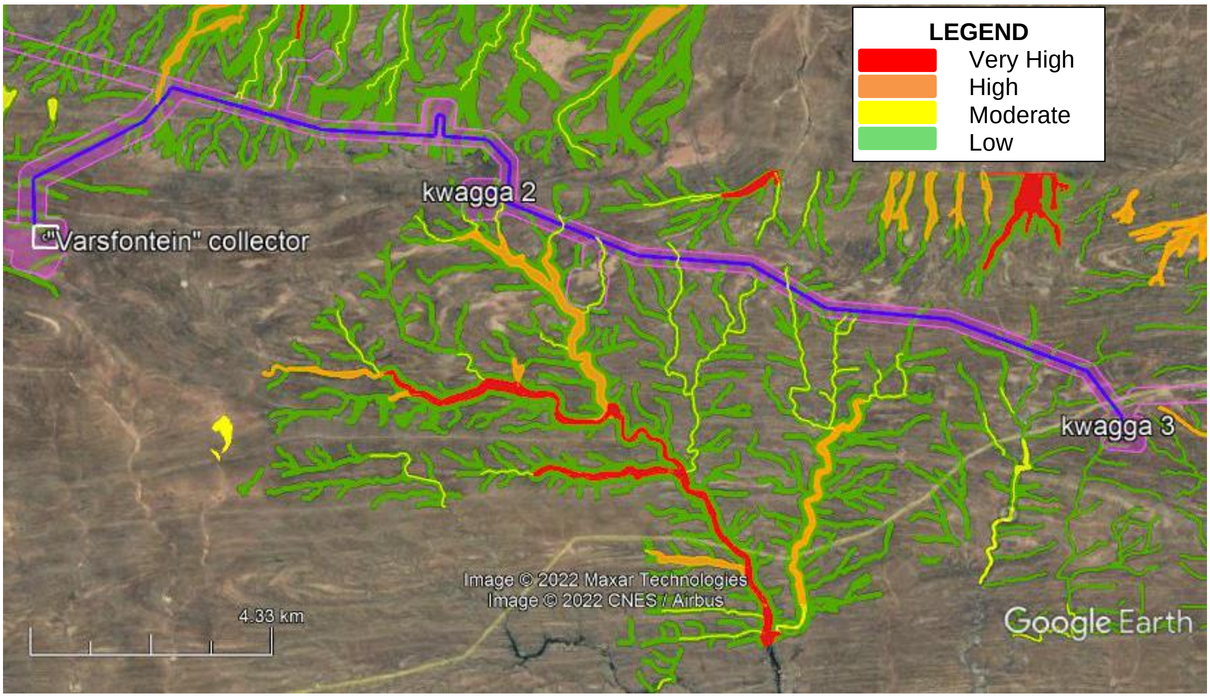
The smaller feeder streams to the rivers are all mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets, but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities.

The Traka and Leeu/Hout River Sub-catchments are mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

The only wetlands mapped within the larger site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

Specialist Sensitivity Analysis and Verification

This assessment considers the mainstem of the Traka and Swartbaken Rivers within the OHPL section to be of **Moderate to High** sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.



Google Earth image showing the aquatic sensitivity mapping together with the proposed layout for the project for the site.

Impact Assessment

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Construction Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Construction Phase: Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18 month period). A construction camp with a temporary laydown area would likely need to be placed within the site for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

Proposed mitigation:

- A buffer of up to 100 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. It is recommended that the works at the substations be shifted to avoid the mapped aquatic features within the indicated footprints. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. An access road for the OHPL will need to cross the watercourse corridors but if this remains only a jeep track type access and low water crossings, the impact would be minimal with mitigation.
- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.

- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Operation Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.

Proposed mitigation:

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Decommission Phase Impacts

During decommissioning, the potential freshwater impacts will be much the same as that of the Construction Phase, although the potential for water quality-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.
- Disturbed areas may need to be rehabilitated and revegetated.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth) may be required.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Cumulative Impacts

The cumulative impacts of the project, as well as the project together with similar projects in the wider 50 km radius are considered under Section 6.3 of the main report.

Consideration of Alternatives

The grid connection is necessary to link the approved Kwagga WEFs to the national grid, thus the no-go alternative is not a viable alternative. As for the above, considering the potential very low impact of the OHPL also implies that consideration of the no-go alternative is not necessary.

Final Specialist Statement and Authorisation Recommendation

Statement and Reasoned Opinion

The aquatic features within the study area consist of the upper reaches of the Traka/Leeu/Hout and Swartbakens/Grasleegte/Muiskraal Rivers and their lesser, unnamed tributaries. The ecological habitat integrity of the rivers within the study area is still largely natural in the upper reaches with few modifications. Downstream, in the middle reaches, the rivers become largely natural to moderately modified. The larger watercourses in the study area have high ecological importance and sensitivity, while the smaller tributaries/drainage features are of moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition and should not be allowed to degrade further.

The Swartbaken/Grasleegte River and Muiskraal Catchments are of very high sensitivity, while the catchment of the Traka/Leeu/Hout River as being of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The mainstem of the Traka and Swartbaken Rivers are mapped as aquatic Critical Biodiversity Areas (CBAs), with the wider river corridor being mapped as a terrestrial CBA. The smaller feeder streams to the rivers are all mapped as aquatic Ecological Support Areas. The Traka and Leeu/Hout River Sub-catchments are mapped as an Upstream Catchment that is important to be maintained in their current ecological condition. The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

This assessment determined the watercourses within the site to be of Moderate to High sensitivity, while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of Low Aquatic Biodiversity Combined Sensitivity. With mitigation, the potential freshwater impacts of the proposed OHPL for the construction, operation and decommissioning phases are likely to be very low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller feeder streams and drainage lines: at least 35 m from the center of these streams; and
- The river mainstem with its wider braided channels: up to 100 m, measured from the top of bank of the river.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through the watercourse should be utilised.

- Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regard to the revegetation of disturbed areas.
- During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.
- Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.
- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

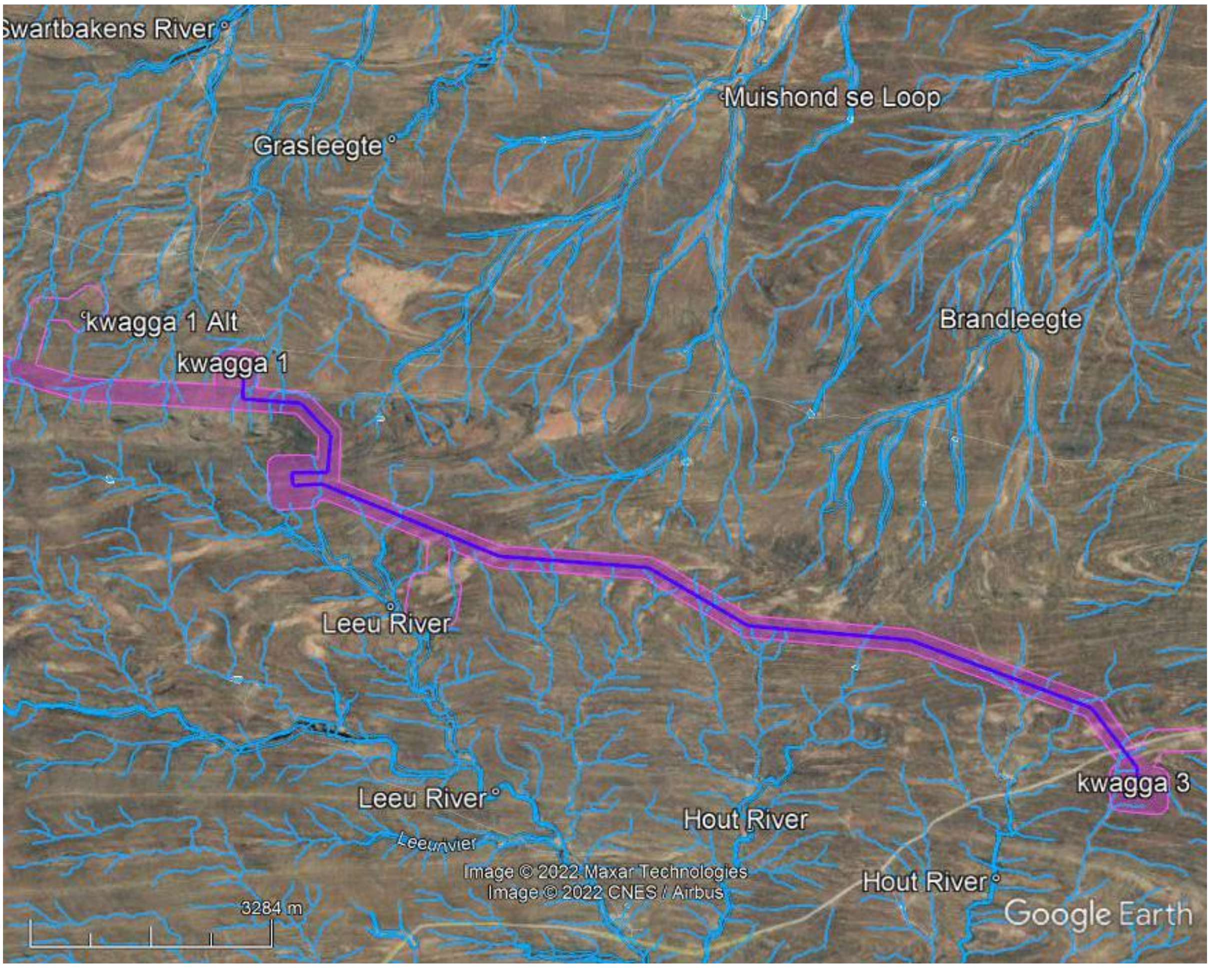
Appendix G: Aquatic Assessment for Powerline from the Kwagga WEF 1 to Kwagga WEF 3 (Section C to E)

Summary Baseline Description and Assessment of Aquatic Ecosystems

This section provides a summary of the Baseline Description and Aquatic Ecological Assessment provided in Section 5 that is specific to Powerline Section C to E.

The proposed construction of a 16km 132 kV Overhead Powerline from Kwagga WEF 1 to Kwagga WEF 3 (Section C to E) will be constructed on Portion 1 of the Farm Witpoortje No. 16, Remainder and Portion 1 of the Farm Dwaalfontein Wes No. 377, Portion 3 of the Farm Tyger Poort No. 376, as well as the Remainder of the Farm Dwaalfontein No. 379. Remainder, Portion 17 of the Farm Wolve Kraal No. 17 and Portion 7 of the Farm Muis Kraal No. 373, near Beaufort West in the Central Karoo Municipal area of the Western Cape. The proposed works include the Kwagga WEF 3 and Kwagga WEF 1 switchyard, connection via Kwagga WEF 2 switchyard.

The study area is located in the upper catchments of the Kouka, a tributary of the Gouritz River System, and the Amos/Sout River, a tributary of the Groot/Gamtoos River System.



Google Earth image showing the layout for Section C to E of the proposed OHPL together with the mapped aquatic features

The table below provides an overview and summary of the water resource information for the proposed OHPL Section.

Key water resources information for the proposed project development area

Descriptor	Name / details	Notes
Water Management Area (WMA)	Breede-Gouritz WMA and Fish to Tsitsikamma WMA	
Catchment Area	Leeu and Hout Tributaries of the Kouka; Grasleegte, Brandleegte, Muishond se Loop and Muikraal Tributaries of the Amos/Sout	Upper portion of the Olifants River in the Gouritz River; Upper portion of the Amos/Sout River, Groot/Gamtoos River
Quaternary Catchment	J32C (Kouka) L12A (Muishond se Loop)	
Present Ecological state	Kouka: B (largely natural) Muishond se Loop: (largely natural)	DWS (2012) assessment for the Kouka and Muishond se Loop Rivers (See Appendices)
Ecological Importance and Ecological Sensitivity	Kouka: High/High Muishond se Loop: High/High	
Location of the centre of the OHPL Section	32°57'6.2"S	Latitude
	22°44'3.6"E	Longitude

The proposed OHPL Section C to E is located in the upper reaches of the Leeu/Hout and Grasleegte/Muishond se Loop/Muiskraal Tributaries, crossing mostly minor feeder streams of these tributaries. Drainage in the southern portions of the route tends to be a southerly direction, towards the Traka River that flows southwards through the Swartberg Mountains, to join the Olifants River in its upper reaches. The Olifants River joins the Gamka River downstream of Calizdorp to form the Gouritz River that drains into the sea west of Mossel Bay.

In the northern portions, drainage is northwards, to the Amos/Sout River. This river is joined by the Kariega River to form the Groot River with then flows in a south-easterly direction to join the Kouga River. These two rivers form the Gamtoos River flows for a short distance before draining into the sea northeast of Jefferys Bay.

The watercourses are non-perennial (ephemeral) rivers tending to only flow for relatively short periods immediately following rainfall events. They comprise primarily of gravel bed, single to multiple channels. The larger river contains a distinct riparian vegetation of low trees and shrubs such as *Vachellia karroo*, *Searsia lancea, Searsia pallens*, *Gymnosporia* sp., *Carissa haematocarpa, Melianthus comosus, Lycium* spp. and *Asparagus striatus.* The smaller watercourses along the proposed OHPL have less distinct vegetation that tends to comprise a low density of *Vachellia karroo* with *Stipagrostis namaquensis* and other grasses*.*

View of the Leeu River with its riparian vegetation that is still in a relatively natural ecological condition

The ecological habitat integrity of the rivers within the study area is still in a largely natural condition in their upper reaches with few modifications, becoming largely natural to moderately modified in their lower reaches on the site. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact on the overall ecological integrity or ecological importance and sensitivity of the watercourses. The larger watercourses in the study area, have high ecological importance and sensitivity, while the smaller tributaries/drainage features are of moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts, while the smaller tributaries are less ecologically important but more sensitive to flow, water quality and habitat modification. The recommended ecological condition of these features would be that they remain in a largely natural ecological condition.

Due to the fact that the watercourses in the study area are non-perennial and are dry for large parts of the year, no indigenous fishes occur within the rivers and the amphibian diversity within the study area is likely to be relatively low. No species of conservation concern are known to occur in the study area from an aquatic perspective.

Identification of Environmental Sensitivities

The Screening Tool has indicated that the Grasleegte and Muiskraal River Catchments are of very high sensitivity while the Leeu/Hout River Catchments are of low Aquatic Biodiversity Combined Sensitivity; this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area.

The catchment of the Grasleegte Rivers and the Muiskraal River are mapped as a Freshwater Ecosystem Priority Area (FEPA) Sub-catchments (Figure 4). The mainstem of the Muiskraal River is mapped as an aquatic Critical Biodiversity Areas (CBA) (Figure 5), with the wider river corridors also being mapped as a terrestrial CBA. These areas are considered to be in a natural condition and are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure. These areas should be maintained in a natural or near-natural state or, where necessary rehabilitated. Only low-impact, biodiversity-sensitive land uses are considered appropriate.

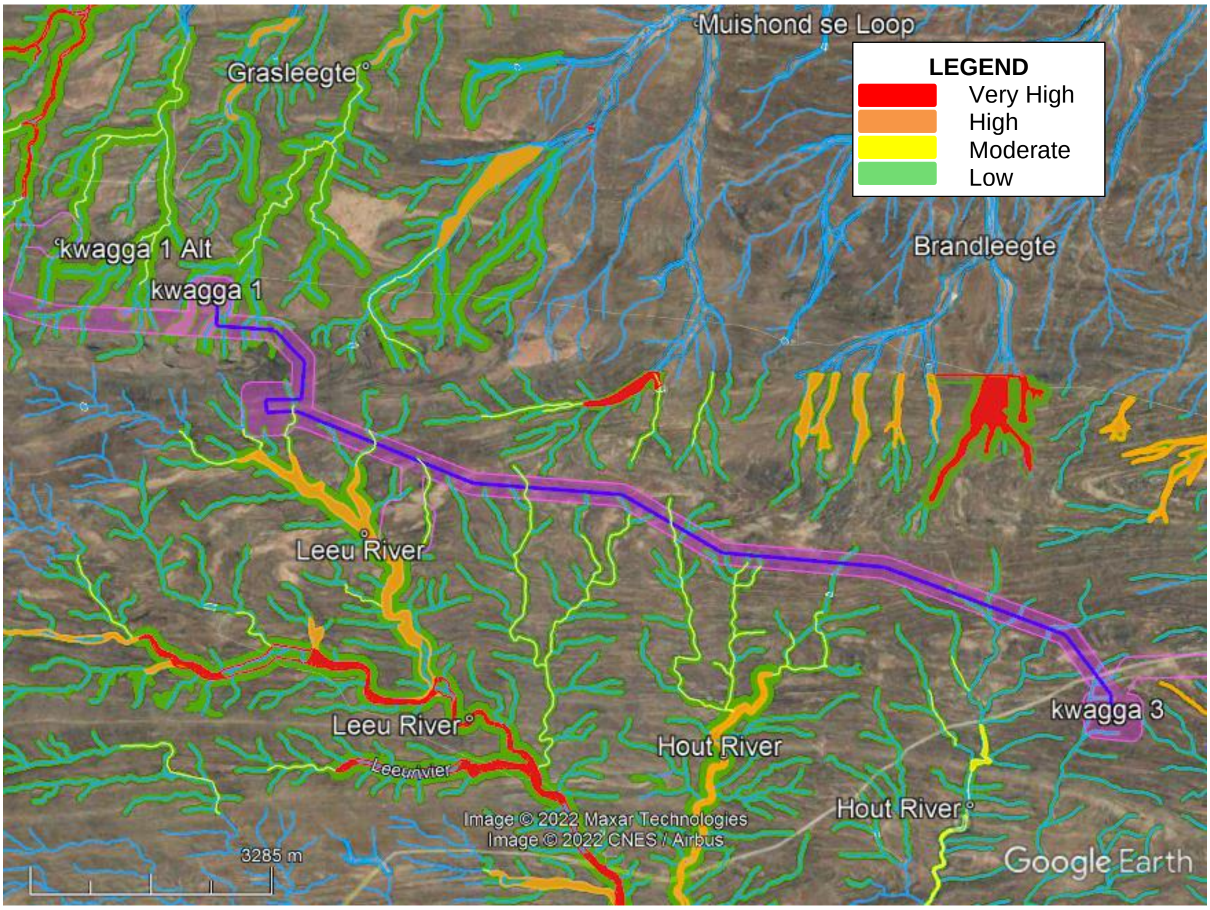
The smaller feeder streams to the rivers are all mapped as aquatic Ecological Support Areas that are not essential for meeting biodiversity targets but that play an important role in delivering ecosystem services. The ecological functioning of these watercourses should not be compromised by the proposed project activities.

The Leeu/Hout River Sub-catchments are mapped as an Upstream Catchment that is important to be maintained in its current ecological condition to not impact the downstream Olifants River that provides important habitat for indigenous fish species.

The only wetlands mapped within the larger site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

Specialist Sensitivity Analysis and Verification

This assessment considers the mainstem of the Leeu, Brandleegte and Muihond se Loop Rivers within the OHPL section to be of **Moderate to High** sensitivity while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.



Google Earth image showing the aquatic sensitivity mapping together with the proposed layout for the project for the site.

Impact Assessment

The potential aquatic ecosystem impacts of the proposed OHPL are likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

Construction Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Construction Phase: Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18 month period). A construction camp with a temporary laydown area would likely need to be placed within the site for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

Proposed mitigation:

- A buffer of up to 100 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. It is recommended that the works at the substations be shifted to avoid the mapped aquatic features within the indicated footprints. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.

- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. An access road for the OHPL will need to cross the watercourse corridors but if this remains only a jeep track type access and low water crossings, the impact would be minimal with mitigation.
- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.
- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Operation Phase Impacts

Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.

Proposed mitigation:

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Decommission Phase Impacts

During decommissioning, the potential freshwater impacts will be much the same as that of the Construction Phase, although the potential for water quality-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.
- Disturbed areas may need to be rehabilitated and revegetated.
- Mitigation and follow-up monitoring of residual impacts (alien vegetation growth) may be required.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

Cumulative Impacts

The cumulative impacts of the project, as well as the project together with similar projects in the wider 50 km radius are considered under Section 6.3 of the main report.

Consideration of Alternatives

The grid connection is necessary to link the approved Kwagga WEFs to the national grid, thus the no-go alternative is not a viable alternative. As for the above, considering the potential very low impact of the OHPL also implies that consideration of the no-go alternative is not necessary.

Final Specialist Statement and Authorisation Recommendation

Statement and Reasoned Opinion

The aquatic features within the study area consist of the upper reaches of the Leeu/Hout and Grasleegte/Muiskraal Rivers and their lesser, unnamed tributaries. The ecological habitat integrity of the rivers within the study area is still largely natural in the upper reaches with few modifications. Downstream, in the middle reaches the rivers become largely natural to moderately modified. The larger watercourses in the study area have high ecological importance and sensitivity, while the smaller tributaries/drainage features are of moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition and should not be allowed to degrade further.

The Grasleegte River and Muiskraal Catchments are of very high sensitivity, while the catchment of the Traka/Leeu/Hout River as being of low Aquatic Biodiversity Combined Sensitivity, this is largely based on the National FEPA and aquatic CBA mapping for the aquatic ecosystems within the proposed OHPL study area. The mainstem of the Brandleegte and Muiskraal Rivers are mapped as aquatic Critical Biodiversity Areas (CBAs), with the wider river corridor being mapped as a terrestrial CBA. The smaller feeder streams to the rivers are all mapped as aquatic Ecological Support Areas. The Leeu/Hout River Sub-catchments are mapped as an Upstream Catchment that is important to be maintained in its current ecological condition. The only wetlands mapped within the site are wetlands associated with dams that are mapped as artificial FEPA Wetlands.

This assessment determined the watercourses within the site to be of Moderate to High sensitivity, while the smaller watercourses, as well as the recommended buffer areas (up to 100m for the larger streams and 35m for the smaller watercourses), are considered as of Low Aquatic Biodiversity Combined Sensitivity. With mitigation, the potential freshwater impacts of the proposed OHPL for the construction, operation and decommissioning phases are likely to be very low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective, why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. The OHPL is located in high-lying areas where limited aquatic features occur. It is also possible to span the watercourses where the OHPL needs to cross them. The potential aquatic ecosystem impacts of the proposed OHPL are thus likely to be very low in terms of any potential impact on aquatic ecosystem integrity for all phases of the proposed development as the proposed works avoid the delineated aquatic features as well as the recommended buffer areas.

The risk assessment determined that the proposed OHPL poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows:

- Smaller feeder streams and drainage lines: at least 35 m from the center of these streams; and
- The river mainstem with its wider braided channels: up to 100 m, measured from the top of bank of the river.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. Where new access routes need to be constructed through the watercourses, the disturbance of the channels should be limited – a single jeep track that minimises disturbance of cover vegetation and hardening of surfaces should be used. Low water crossings through watercourse should be utilised.
- Any indigenous vegetation clearing within or adjacent to the watercourses should occur in a phased manner to minimise erosion and/or run-off. An Environmental Control Officer or a specialist with knowledge and experience of the local flora should be appointed during the construction phase to be able to make clear recommendations with regards to the revegetation of disturbed areas.
- During the construction phase, site management must be undertaken at the laydown area, batching plant and the individual turbine construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during the construction activities such as hydrocarbon spills.
- Any disturbed areas should be rehabilitated and monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth. Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff from developed areas such as the access road should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales when located within steep embankments. Should any erosion features develop, they should be stabilised as soon as possible.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider.
- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

Appendix H - Specialist Expertise

Name:	Antonia (Toni) Belcher ***(Pr. Sci. Nat)***
Profession:	Aquatic scientist
Nationality:	South African
Years of experience:	30 years
Professional Registration:	Professional Environmental Scientist (Pr. Sci. Nat 400040/10) Professional Ecological Science (Pr. Sci. Nat 400040/10)
Accreditation:	SASS5 (Macro-invertebrate assessment method)
Academic Qualifications:	1998 - M.Sc. in Environmental Management, Potchefstroom University (*cum laude*) 1989 - B.Sc. (Hons) in Oceanography, University of Port Elizabeth 1987 - B.Sc. – Mathematics, Applied Mathematics, University of Port Elizabeth 1984 – Matriculation, Lawson Brown High School, Port Elizabeth
Areas of specialisation:	Environmental water requirement studies River maintenance and management plans (MMP) Aquatic ecosystem monitoring and assessments Design of water quality and monitoring programmes for aquatic ecosystems Compilation of State of River reports (aquatic data collection, interpretation, presentation, graphic layout and design and preparation of technical and glossy print ready copies) Environmental Impact Assessments River classification and environmental water requirements (Ecological Reserve determinations) Integrated Water Resource Management River, Wetlands and Estuary management Water quality assessment and management reporting Water resource legislation Water resource institutions Water education
Countries Worked in:	South Africa, Namibia, Swaziland, Lesotho, Rwanda
Employment Record:	2020 – present Self-employed 2013 -2020 BlueScience (Pty) Ltd (Principal Specialist Scientist) 2007 – 2012 Self-employed 1999 – 2007 Assistant and Deputy Director, Water Resource Protection, Western Cape Regional Office, Department of Water Affairs, Cape Town 1995 – 1999 Institute for Water Quality Studies, Department of Water Affairs 1991 – 1995 Water Pollution Control Officer, Water Quality Management, Department of Water Affairs, Pretoria 1989 – 1990 Mathematics tutor and administrator, Master maths, Randburg and Braamfontein Colleges, Johannesburg 1987 – 1988 Part-time field researcher, Department of Oceanography, University of Port Elizabeth
Awards and Achievements:	Woman in Water award for Environmental Education (2006) Runner up for the Woman in Water prize for Water Research (2006)
Summary of recent experience	2008 – **Environmental water requirement studies** for various rivers in South Africa and Lesotho; Berg (Zones 1-3), Kingna, Baden, Konings and Poesjesnel **rivers maintenance and management plans**; **Water quality impact assessment** for the upgrade of more than 15 waste water treatment works in the Western Cape and consideration of reuse of the treated wastewater from many of these works for potable water supply; More than **500 freshwater impact assessments studies** as input into EIA decision making processes. Toni has conducted more than **150 water use authorisation applications.** This included more than 40 freshwater impact assessments for roads, power line and substation and renewable energy projects.

	Development of RDM (**Resource Directed Measures**) curriculum for a Master degree programme at University of science institutions in South Africa. Free State **river health monitoring** programme (monitoring for 3 year period). **Classification of the water resources** of the Olifants Doorn Water Management Area. Graphic design, layout, technical compilation and preparation of print ready glossy publications for the **State-of-River reports** for the Gouritz and Breede Water Management Areas Development and piloting of a National Strategy to **Improve Gender Representation in Water Management Institution**s, where the focus is on improving the capacity (specifically amongst women) to participate in water related decision making in Limpopo, Eastern Cape and KZN. Compilation of a background document as well as a framework management plan towards the development of an **integrated water resources management plan for the Sandveld**; Aquatic specialist to the City of Cape Town project: Determination of additional resources to **manage pollution in stormwater and river systems**; Framework for Education and Training in Water (FETWATER), Resource Directed Measures Network partner which has undertaken **training initiatives on environmental water requirements** in the SADC region; Resource Directed Management of Water Quality: **Development of training materials**, Department of Water Affairs and Forestry; and 2000 –2007: Manager responsible for the implementation of the Reserve Directed Measures component of the National Water Act Western Cape Regional Office; and Provincial Champion for the River Health Programme in the Western Cape and designed, implemented and compiled State-of-River reports for 7 catchment areas in the Western Cape. 1995 - 2000: Project manager and coordinator for the freshwater and marine water quality guidelines for South Africa; and Provided specialist input into various aspects of the new National Water Act and its implementation 1991 -1995: Water quality catchment studies Development and implementation of marine water quality policy for South Africa.

Appendix I - Specialist Statement of Independence

I, **Antonia Belcher**, 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: -

Date: 25 June 2022

Appendix J: PES, EI AND ES FOR THE SWATERBAKENS, LEEU/KOUKA AND MUISHOND SE LOOP RIVERS (DWS, 2012)

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L12A-07918	Swartbakens	21.96	1	Y		MODERATELY MODIFIED	C
MEAN EI CLASS	**MEAN ES CLASS**	**DEFAULT ECOLOGICAL CATEGORY (EC)**	**RECOMMENDED ECOLOGICAL CATEGORY (REC)**				
MODERATE	MODERATE	C	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	MODERATE	FISH SPP/SQ		INVERT TAXA/SQ	15.00	FISH PHYS-CHEM SENS DESCRIPTION	
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	#DIV/0!	INVERT AVERAGE CONFIDENCE	1.00	FISH NO-FLOW SENSITIVITY DESCRIPTION	
POTENTIAL INSTREAM HABITAT MOD ACT.	MODERATE	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT REPRESENTIVITY PER SECONDARY, CLASS	MODERATE	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND ZONE MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT RARITY PER SECONDARY: CLASS	LOW	INVERTS VELOCITY SENSITIVITY	HIGH
POTENTIAL FLOW MOD ACT.	SERIOUS	FISH RARITY PER SECONDARY: CLASS		ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	MODERATE	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	MODERATE	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	HIGH		

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
J32C-08098	Kouka	29.53	1	Y		LARGELY NATURAL	B
MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (EC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)				
HIGH	HIGH	B	#NUM!				
PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ		INVERT TAXA/SQ		FISH PHYS-CHEM SENS DESCRIPTION	
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE		INVERT AVERAGE CONFIDENCE		FISH NO-FLOW SENSITIVITY DESCRIPTION	
POTENTIAL INSTREAM HABITAT MOD ACT.	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT REPRESENTIVITY PER SECONDARY, CLASS		INVERT PHYS-CHEM SENS DESCRIPTION	
RIPARIAN-WETLAND ZONE MOD	MODERATE	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT RARITY PER SECONDARY: CLASS		INVERTS VELOCITY SENSITIVITY	
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS		ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	VERY HIGH	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	HIGH
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH)	VERY HIGH	HABITAT DIVERSITY CLASS	VERY LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	VERY HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	HIGH	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL	HIGH
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON	VERY HIGH	INSTREAM MIGRATION LINK CLASS	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT	HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	VERY HIGH		

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
L12A-07868	Muishond se Loop	33.00	1	Y		LARGELY NATURAL	B
MEAN EI CLASS	**MEAN ES CLASS**	**DEFAULT ECOLOGICAL CATEGORY (EC)**	**RECOMMENDED ECOLOGICAL CATEGORY (REC)**				
HIGH	MODERATE	B	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ		INVERT TAXA/SQ	27.00	FISH PHYS-CHEM SENS DESCRIPTION	
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	#DIV/0!	INVERT AVERAGE CONFIDENCE	1.15	FISH NO-FLOW SENSITIVITY DESCRIPTION	
POTENTIAL INSTREAM HABITAT MOD ACT.	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT REPRESENTIVITY PER SECONDARY, CLASS	VERY HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	MODERATE
RIPARIAN-WETLAND ZONE MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS		INVERT RARITY PER SECONDARY: CLASS	VERY HIGH	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS		ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	NONE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	VERY HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	HIGH	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	VERY HIGH		

Appendix K: Impact Assessment Methodology

The impact assessment includes:
- the nature, significance and consequences of the impact and risk;
- the extent and duration of the impact and risk;
- the probability of the impact and risk occurring;
- the degree to which impacts and risks can be mitigated;
- the degree to which the impacts and risks can be reversed; and
- the degree to which the impacts and risks can cause loss of irreplaceable resources.

As per the DEFFT Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect and cumulative:
- 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 as a result 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 as a result of the activity.
- Cumulative impacts are impacts 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 a period of time and can include both direct and indirect impacts.

The impact assessment methodology includes the following aspects:

- Nature of impact/risk - The type of effect that a proposed activity will have on the environment.

- Status - Whether the impact/risk on the overall environment will be:
    - Positive - environment overall will benefit from the impact/risk;
    - Negative - environment overall will be adversely affected by the impact/risk; or
    - Neutral - environment overall not be affected.

- Spatial extent – The size of the area that will be affected by the impact/risk:
    - Site specific;
    - Local (<10 km from site);
    - Regional (<100 km of site);
    - National; or
    - International (e.g. Greenhouse Gas emissions or migrant birds).

- Duration – The timeframe during which the impact/risk will be experienced:
    - Very short term (instantaneous);
    - Short term (less than 1 year);
    - Medium term (1 to 10 years);
    - Long term (the impact will cease after the operational life of the activity (i.e. the impact or risk will occur for the project duration)); or
    - Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e. the impact will occur beyond the project decommissioning)).

- Consequence – The anticipated consequence of the risk/impact:

- Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
- Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
- Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
- Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or
- Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).

- Reversibility of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):
  - High reversibility of impacts (impact is highly reversible at end of project life i.e. this is the most favourable assessment for the environment);
  - Moderate reversibility of impacts;
  - Low reversibility of impacts; or
  - Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment).

- Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):
  - High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment);
  - Moderate irreplaceability of resources;
  - Low irreplaceability of resources; or
  - Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).

Using the criteria above, the impacts have been further assessed in terms of the following:

- Probability – The probability of the impact/risk occurring:
  - Extremely unlikely (little to no chance of occurring);
  - Very unlikely (<30% chance of occurring);
  - Unlikely (30-50% chance of occurring)
  - Likely (51 – 90% chance of occurring); or
  - Very Likely (>90% chance of occurring regardless of prevention measures).

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 1).

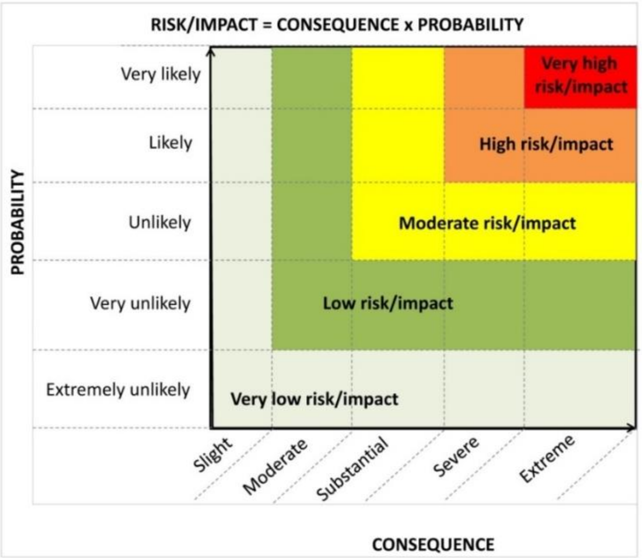


Figure 1. Guide to assessing risk/impact significance as a result of consequence and probability.

- Significance – Will the impact cause a notable alteration of the environment?
    - Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
    - Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
    - Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);
    - High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and
    - Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- Very low = 5;
- Low = 4;
- Moderate = 3;
- High = 2; and
- Very high = 1.

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:
- Low;
- Medium; or
- High.

Appendix L: Compliance with the Aquatic Biodiversity Protocol (GN 320, 20 March 2020)

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	Section where this has been addressed in the Specialist Report
2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects: 2.3.1. a description of the aquatic biodiversity and ecosystems on the site, including; a) aquatic ecosystem types; and b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;	Section 5.2 and Appendices A to E
2.3.2. the threat status of the ecosystem and species as identified by the screening tool;	Section 5.3 and Appendices A to E
2.3.3. an indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free -flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area); and	Section 5.1 and Appendices A to E
2.3.4. a description of the ecological importance and sensitivity of the aquatic ecosystem including: a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).	Section 5.2 and Appendices A to E
2.4. The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	Appendices A to E
2.5. Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions: 2.5.1. Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal? 2.5.2. Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present? 2.5.3. How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include: a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub -catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);	and Appendices A to E

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	Section where this has been addressed in the Specialist Report
c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary I seasonal I permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and d) to what extent will the risks associated with water uses and related activities change;	
2.5.4. how will the proposed development impact on the functioning of the aquatic feature? This must include: a) base flows (e.g. too little or too much water in terms of characteristics and requirements of the system); b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river); c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley- bottom wetland to a channelled valley -bottom wetland); d) quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); e) fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);	Appendices A to E
2.5.5. how will the proposed development impact on key ecosystems regulating and supporting services especially: a) flood attenuation; b) streamflow regulation; c) sediment trapping; d) phosphate assimilation; e) nitrate assimilation; f) toxicant assimilation; g) erosion control; and h) carbon storage?	Appendices A to E
2.5.6. how will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator - prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Appendices A to E
2.6. In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: a) size of the estuary; b) availability of sediment; c) wave action in the mouth; d) protection of the mouth; e) beach slope; f) volume of mean annual runoff; and g) extent of saline intrusion (especially relevant to permanently open systems).	N/A
2.7. The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:	

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	Section where this has been addressed in the Specialist Report
2.7.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Section 1.2 and Appendix H
2.7.2. a signed statement of independence by the specialist;	Appendix I
2.7.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2
2.7.4. the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;	Section 2
2.7.5. a description of the assumptions made, any uncertainties or gaps in knowledge or data;	Section 2.2
2.7.6. the location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;	Appendices A to E
2.7.7. additional environmental impacts expected from the proposed development;	Appendices A to E
2.7.8. any direct, indirect and cumulative impacts of the proposed development on site;	Appendices A to E
2.7.9. the degree to which impacts and risks can be mitigated;	Appendices A to E
2.7.10. the degree to which the impacts and risks can be reversed;	Appendices A to E
2.7.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	Appendices A to E
2.7.12. a suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	Appendices A to E
2.7.13. proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	Appendices A to E
2.7.14. a motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate;	-
2.7.15. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	Appendices A to E
2.7.16. any conditions to which this statement is subjected.	Appendices A to E
2.8. The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, that are to be included in the EMPr.	
2.9. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	

Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.6





Avifauna Impact Assessment

AVIFAUNAL SPECIALIST ASSESSMENT:

Basic Assessment for the Proposed Development of a 132 kV Overhead Transmission Powerline and its associated electrical grid infrastructure in support of the proposed Kwagga WEF 1-3, near Beaufort West, Western Cape Province

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Project 6: The proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Kwagga Wind Energy Facility 1 on-site substation (C), via the Kwagga Wind Energy Facility 2 on-site substation (D) near Beaufort West in the Western Cape Province

Report prepared for:	*Report prepared by:*
ABO Wind renewable energies (Pty) Ltd. Unit B1, Mayfair Square Century Way, Century City 7441 South Africa	AFRIMAGE Photography (Pty) Ltd t/a: **Chris van Rooyen Consulting** VAT#: 4580238113 email: vanrooyen.chris@gmail.com Tel: +27 (0)82 4549570 cell

June 2022

ABO Wind renewable energies (Pty) Ltd ("the Developer") is proposing the construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022.

The seven proposed 132 kV overhead transmission powerlines will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1). ABO Wind will be the Project Applicant for each of the seven proposed 132 kV overhead transmission powerlines and its associated Electricity Grid Infrastructure.

This report deals specifically with Project 6 i.e. Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Kwagga Wind Energy Facility 1 on-site substation (C), via the Kwagga Wind Energy Facility 2 on-site substation (D) near Beaufort West in the Western Cape Province

1 Avifauna

The SABAP2 data indicates that a total of 160 bird species could potentially occur within the Project Area of Impact (PAOI), which includes all the project sites in similar habitat. APPENDIX F provides a comprehensive list of all the species. Of these, 38 species are classified as powerline sensitive species and 10 of these are South African Red List species. Of the powerline sensitive species, 20 are likely to occur regularly at the PAOI and immediate surrounding area, and another 18 could occur sporadically.

2 Impacts Ratings

2.1 Potential Impacts during the Construction Phase

The following impacts have been identified for the construction phase.

Impact 1: Displacement due to disturbance associated with the construction of the 132kV grid connection and substations

This impact is rated as negative, with a site specific spatial extent and a short term duration due to the temporary nature of the construction phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed Section 7.2.2.1.

Impact 2: Displacement due to habitat transformation associated with the construction of the 132kV grid connection and substations

This impact is rated as negative, with a site specific spatial extent and a long term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and an unlikely probability, which will render the impact significance as low, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance will remain at low. The recommended mitigation measures are detailed Section 7.2.2.1.

2.2 Potential Impacts during the Operational Phase

The following impacts have been identified for the operational phase.

Impact 1: Mortality of powerline sensitive avifauna through electrocution in the proposed substations.

This impact is rated as negative, with a site specific spatial extent and a long term duration due to the extended timeframe of the operational. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and unlikely probability, which will render the impact significance as low. As detailed in Section 7.2.2.3, mitigation will reduce the impact to very low.

Impact 2: Mortality of powerline sensitive species due to collisions with the 132kV grid connection

This impact is rated as negative, with a local spatial extent and a long term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a severe consequence and likely probability, which will render the impact significance as high, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to moderate. The recommended mitigation measures are detailed in Section 7.2.2.3.

2.3 Potential Impacts during the Decommissioning Phase

The following impacts have been identified for the decommissioning phase.

Impact 1: Displacement due to disturbance associated with the decommissioning of 132kV grid connections and associated substations

The noise and movement associated with the potential decommissioning activities relating to the proposed 132kV grid connection, Kwagga 1 onsite substation and Eskom 132kV switching station will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site specific spatial extent and a short term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed in Section 7.2.4.2.

2.4 Cumulative impacts

The cumulative impact assessed is the collective impact of the proposed onsite 132kV grid connections and associated substations of the Kwagga 1- 3 grid connection and associated substations, along with the authorised projects renewable energy projects at the end of April 2022. The only existing HV line in the 50km radius around the project site is the Droërivier – Proteus 400kV transmission line, of which approximately 110km is contained in the 50km radius. The maximum length of planned and authorised grid connections in the 50km radius amounts to approximately 33.5km. The total length of planned and existing HV lines thus comes to approximately 143.5km, of which the proposed Kwagga 1 - 3 grid connection and other planned grid connections constitute approximately 23%. The pre-mitigation impacts range from moderate to high, but will be reduced to an overall level of low if mitigation is applied.

2.5 Overall impact significance

Overall Impact Significance (Post Mitigation)

Phase	**Overall Impact Significance**
Construction	Low
Operational	Low
Decommissioning	Low
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	Low
Cumulative - Operational	Low
Cumulative - Decommissioning	Low

3 Mitigation measures

The following mitigation measures are proposed to reduce the impact of the proposed project:

Construction phase

- Construction activity should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.

Operational phase

- Vegetation clearance should be limited to what is absolutely necessary.
- The mitigation measures proposed by the biodiversity specialist must be strictly enforced.
- Bird flight diverters should be installed on the whole line according to the applicable Eskom standard.
- The hardware within the proposed transmission substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red List priority species is unlikely to frequent the substation and be electrocuted.

De-commissioning phase

- Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.

4 Impact statement

The expected impacts of the proposed Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Kwagga Wind Energy Facility 1 on-site substation (C), via the Kwagga Wind Energy Facility

2 on-site substation (D) were rated to be Low to Moderate negative pre-mitigation. However, with appropriate mitigation, the overall post-mitigation significance of all the identified impacts for should be reduced to Low for all phases of the project. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables (Section 7) and the Environmental Management Programme (EMPr) are strictly implemented.

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List of Abbreviations

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
BA	Basic Assessment
BESS	Battery Energy Storage System
BGIS	Biodiversity Geographic Information System
BLSA	BirdLife South Africa
CBD	Convention on Biological Diversity
CMS	Convention on Migratory Species
DFFE	Department of Forestry, Fisheries and Environment
EIA	Environmental Impact Assessment
EGI	Electricity Grid Infrastructure
EMPr	Environmental Management Programme
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
NEMA	National Environmental Management Act (Act 107 of 1998, as amended)
PAOI	Project Area of Impact
SABAP 1	South African Bird Atlas 1
SABAP 2	South African Bird Atlas 2
SACNASP	South African Council for Natural and Scientific Professions
SANBI	South African Biodiversity Institute
SAPAD	South Africa Protected Areas Database
UNEP	United Nations Environment Programme

Glossary

Definitions	
Project area of impact (PAOI)	A 2km area around the proposed grid corridor and substation, which is regarded as the primary impact zone of the proposed infrastructure.
Broader area	A consolidated data set for a total of 21 pentads where the PAOI is located.
Powerline sensitive species	Species which could potentially be impacted by powerline collisions or electrocutions, based on specific morphological and/or behavioural characteristics.
Cumulative impact	The past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities” (NEMA EIA Reg GN R982 of 2014).

ABO Wind renewable energies (Pty) Ltd ("the Developer") is proposing the construction of seven 132 kV overhead transmission powerlines in support of the proposed Kwagga Wind Energy Facility (WEF) 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072), near Beaufort West in the Western Cape. The DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 on 7 April 2022.

The seven proposed 132 kV overhead transmission powerlines will facilitate the connection of the proposed Kwagga WEFs 1-3 to the national grid via the proposed Eskom 132 kV Switching Substation (DFFE Reference number pending) and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1).

It is understood that the proposed Eskom 132 kV Switching Substation and the proposed Beaufort West 132 kV-400 kV Linking Station (DFFE Ref: 14-12-16-3-3-2-925-1) will be constructed by South Africa Mainstream Renewable Power Developments (Pty) Ltd ("Mainstream") in support of their Beaufort West WEF (DFFE Ref: 12-12-20-1784-1-AM2) and the Trakas WEF (DFFE Ref: 12-12-20-1784-2-AM2) that are to be located on land directly adjacent to the proposed Kwagga WEFs 1-3. ABO Wind has signed a servitude agreement and relevant powers of attorney with the landowner of the relevant Beaufort West and Trakas WEFs affected land portions and obtained agreement with Mainstream to facilitate the connection of the proposed Kwagga WEFs 1-3 via 132 kV overhead powerlines, via the aforementioned Eskom Switching Substation and the Beaufort West 132 kV-400 kV Linking Station, to the existing Droërivier–Proteus 400 kV overhead powerline that runs parallel to the N12 in a north- south direction.

ABO Wind will be the Project Applicant for each of the seven proposed 132 kV overhead transmission powerlines and its associated Electricity Grid Infrastructure.

The seven projects are the following:

Project 2: C-B	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 1 on-site substation (C) to the proposed Eskom 132 kV Switching Substation (B), near Beaufort West in the Western Cape Province.
Project 3: D-C-B	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 2 on-site substation (D) to the proposed Eskom 132 kV Switching Substation (B) via the Kwagga Wind Energy Facility 1 on-site substation (C), near Beaufort West in the Western Cape Province.
Project 4: E-D-C-B	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Eskom 132 kV Switching Substation (B), via the Kwagga Wind Energy Facility 2 on-site substation (D) and the Kwagga Wind Energy Facility 1 on-site substation (C) near Beaufort West in the Western Cape Province.
Project 5: D-C	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 2 on-site substation (D) to the proposed Kwagga Wind Energy Facility 1 on-site substation (C) , near Beaufort West in the Western Cape Province.
Project 6: E-D-C	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Kwagga Wind Energy Facility 1 on-site substation (C), via the Kwagga Wind Energy Facility 2 on-site substation (D) near Beaufort West in the Western Cape Province
Project 7: E-D	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Kwagga Wind Energy Facility 2 on-site substation D, near Beaufort West in the Western Cape Province

Project 1: B-A	Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Eskom 132 kV Switching Substation (B) to the proposed Beaufort West 132kV-400kV Linking Station (A), near Beaufort West in the Western Cape Province

See Figure 1 for the proposed lay-out of the various projects.

This report deals specifically with Project 6 i.e. Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Kwagga Wind Energy Facility 1 on-site substation (C), via the Kwagga Wind Energy Facility 2 on-site substation (D) near Beaufort West in the Western Cape Province.

1. Introduction

1.1. Scope, Purpose and Objectives of this Specialist Report

The specialist report assesses the expected impacts on avifauna of a proposed 132kV Overhead Transmission Powerline (OHL) and its associated electrical grid infrastructure in support of the proposed Kwagga 1-3 Wind Energy Facilities (WEFs), near Beaufort West in the Western Cape Province, and provides recommendations for the mitigation of the said impacts to acceptable levels.

1.2. Details of Specialist

This specialist assessment has been undertaken by Albert Froneman and Chris van Rooyen of Chris van Rooyen Consulting. Albert Froneman is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400177/09 in the field of Zoological Sciences. Chris van Rooyen works under the supervision of and in association with Albert Froneman as stipulated by the Natural Scientific Professions Act 27 of 2003. A curriculum vitae is included in Appendix A of this specialist assessment.

In addition, a signed specialist statement of independence is included in Appendix B of this specialist assessment.

1.3. Terms of Reference

The terms of reference for this assessment report can be summarised as follows:

- Describe the affected environment from an avifaunal perspective;
- Discuss gaps in baseline data and other limitations;
- List and describe the expected impacts associated with the proposed 132kV powerline grid connections and associated infrastructure;
- Perform an assessment of the potential impacts; and
- Recommend mitigation measures to reduce the significance of the expected impacts.

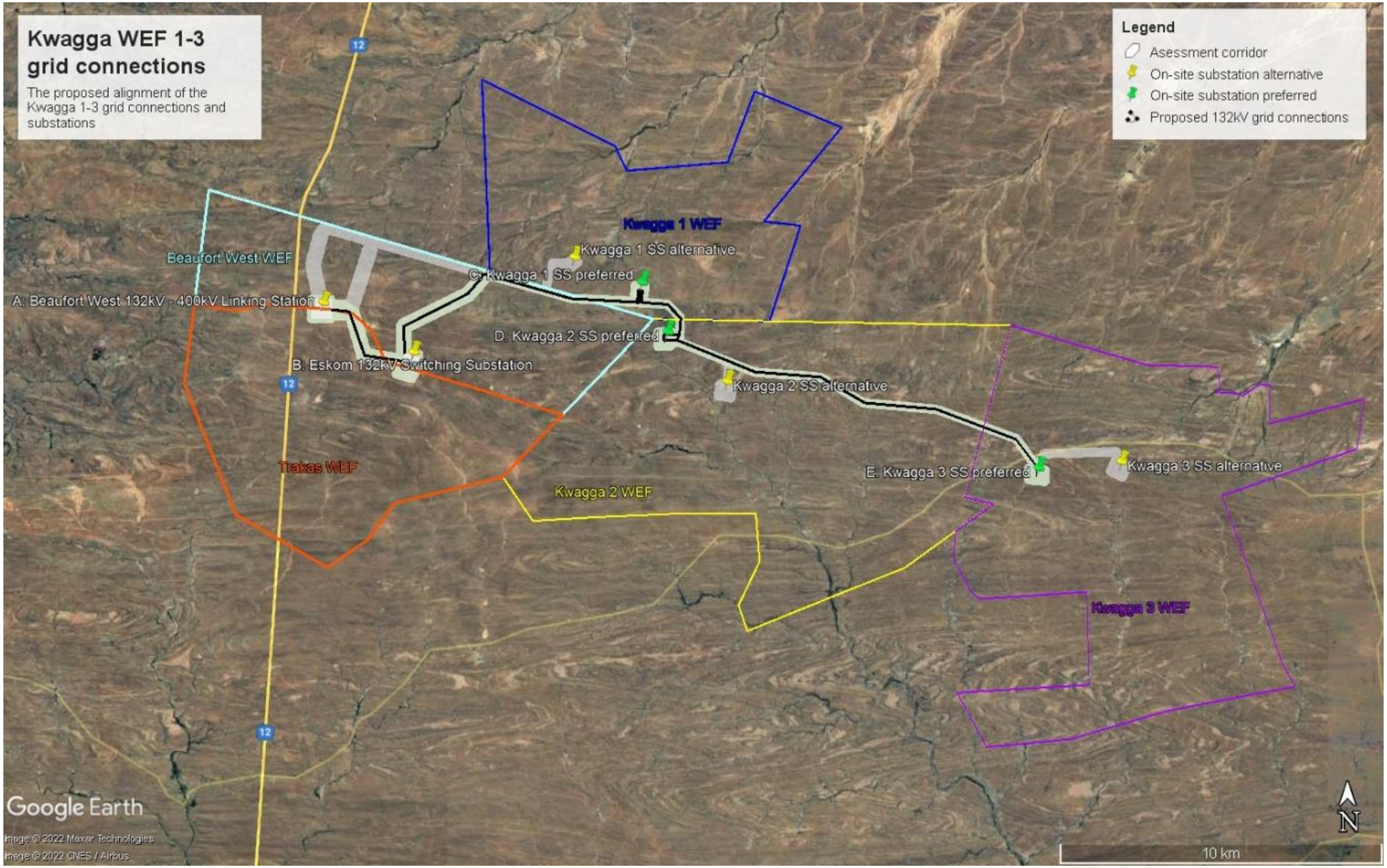


Figure 1: The proposed lay-out of the Kwagga WEF 1-3 grid connections.

2. Approach and Methodology

The following methods were employed to conduct this study:

- The Project Area of Impact (PAOI) was defined as a 2km zone around the proposed grid connection.
- Powerline sensitive species were defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'' × 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a broader area of 21 pentads, some of which intersect and others that are near the study area. The decision to include multiple pentads around the study area was influenced by the fact that some of the pentads within which the proposed development is located have few completed full protocol surveys. The additional pentads and their data augment the bird distribution data. The 21 pentad grid cells are the following: 3250_2230, 3250_2235, 3250_2240, 3250_2250, 3255_2230, 3255_2235, 3255_2240, 3255_2245, 3255_2250, 3300_2230, 3300_2235, 3300_2240, 3300_2245, 3300_2250. A total of 57 full protocol lists (i.e., surveys lasting a minimum of two hours each) have been completed for this area. In addition, 183 ad hoc protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area and is supplemented with data collected at the proposed Kwagga WEF 1 – 3, the proposed Trakas and Beaufort West WEFs, and general familiarity with the avifauna of the Nama Karoo.
- A classification of the vegetation types in the study area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006).
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015), and the latest authoritative summary of southern African bird biology (Hockey et al. 2005).
- The global threatened status of all priority species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick et al. 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.
- The Department of Forest Fisheries and Environment National Screening Tool was used to determine the assigned avian sensitivity of the PAOI (June, 2022).
- Guidelines for the Implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for EIAs in South Africa produced by the South African National Biodiversity Institute on behalf of the Department of Environment, Forestry and Fisheries (2020) were used to assist with the interpretation of the relevant protocol.
- The results of an integrated pre-construction programme conducted over 12-months at the proposed Kwagga WEF 1, 2 and 3 sites from March 2019 – March 2020 were used to inform the current study. Site inspections were also conducted on 05 October and 08 November 2021 at the proposed Trakas and Beaufort West Wind Farms and to record all avifaunal sensitivities as part of an avifaunal impact assessment study for the 132kV grid connection.

2.1. Information Sources

Data / Information	Source	Date	Type	Description
South African Protected Areas Database (SAPAD)	Department of Forestry, Fisheries and the Environment (DFFE)	2021, Q3	Spatial	Spatial delineation of protected areas in South Africa. Updated quarterly
Atlas of Southern African Birds 1 (SABAP1)	University of Cape Town	1987-1991	Spatial, reference	SABAP1, which took place from 1987-1991.
South African Bird Atlas Project 2 (SABAP2)	University of Cape Town	February 2022	Spatial, database	SABAP2 is the follow-up project to the SABAP1. The second bird atlas project started on 1 July 2007 and is still growing. The project aims to map the distribution and relative abundance of birds in southern Africa.
National Vegetation Map	South African National Biodiversity Institute (SANBI) (BGIS)	2018	Spatial	The National Vegetation Map Project (VEGMAP) is a large collaborative project established to classify, map and sample the vegetation of South Africa, Lesotho and Swaziland.
Red Data Book of Birds of South Africa, Lesotho and Swaziland	BirdLife South Africa	2015	Reference	The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland is an updated and peer-reviewed conservation status assessment of the 854 bird species occurring in South Africa undertaken in collaboration between BirdLife South Africa, the Animal Demography Unit of the University of Cape Town, and the SANBI.
IUCN Red List of Threatened Species (2021.3)	IUCN	2021.3	Online reference source	Established in 1964, the International Union for Conservation of Nature's Red List of Threatened Species is the world's most comprehensive information source on the global extinction risk status of animal, fungus and plant species.
Important Bird and Biodiversity Areas of South Africa	BirdLife South Africa	2015	Reference work	Important Bird and Biodiversity Areas (IBAs), as defined by BirdLife International, constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria.
The National Screening Tool	Department of Forestry, Fisheries and the Environment	February 2022	Spatial	The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity.

Data / Information	Source	Date	Type	Description
Pre-construction monitoring	Chris van Rooyen Consulting	2019 – 2020, 2021	Spatial and quantitative data	The results of an integrated pre-construction programme conducted over 12-months at the proposed Kwagga WEF 1, 2 and 3 sites from March 2019 – March 2020. Site inspections were also conducted on 05 October and 08 November 2021 at the proposed Trakas and Beaufort West Wind Farms and to record all avifaunal sensitivities as part of an avifaunal impact assessment study for the 132kV grid connection.

2.2. Assumptions, Knowledge Gaps and Limitations

This study assumed that the sources of information used in this report are reliable. In this respect, the following must be noted:

- It was assumed that the SABAP 2 is an accurate representation of the avifauna that are likely to occur in the broader area, based on the adequate number of completed lists for this area.
- The focus of the study was primarily on the potential impacts of the proposed grid infrastructure on priority species.
- Priority species are defined as species which could potentially be impacted by powerline collisions or electrocutions, based on their morphology:
  - Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the gaps between electrical components than smaller birds.
  - Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- It was assumed that the data collected during the 12-months monitoring at the Kwagga 1,2 and 3 WEF in 2019 - 2020 sites are remains valid because the habitat has not changed in any material way.
- Conclusions drawn in this study are based on experience of the specialist in relation to the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that would be valid under all circumstances.

2.3. Consultation Processes Undertaken

No specific consultation processes were undertaken

3. Legislative and Permit Requirements

3.1 Legislative Framework

There is no legislation pertaining specifically to the impact of wind facilities and associated electrical grid infrastructure on avifauna.

<u>3.1.1 Agreements and conventions</u>

Relevant international agreements and conventions are described in this section.

Table 1: International agreements and conventions which South Africa is party to, and which are relevant to the conservation of avifauna.

Convention name	Description	Geographic scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of AEWA is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. Developed under the framework of the Convention on Migratory Species (CMS) and administered by the United Nations Environment Programme (UNEP), AEWA brings together countries and the wider international conservation community in an effort to establish coordinated conservation and management of migratory waterbirds throughout their entire migratory range.	Regional
Convention on Biological Diversity (CBD), Nairobi, 1992	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has three main objectives: • The conservation of biological diversity; • The sustainable use of the components of biological diversity; and • The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	As an environmental treaty under the aegis of the UNEP, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia	The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

3.1.2 National legislation

3.1.2.1 Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa provides in the Bill of Rights that: Everyone has the right –

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
  - (i) prevent pollution and ecological degradation;
  - (ii) promote conservation; and
  - (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

3.1.2.2 The National Environmental Management Act NEMA (Act 107 of 1998, as amended)

The NEMA creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out a number of guiding principles that apply to the actions of all organs of state that may significantly affect the environment. Sustainable development (socially, environmentally and economically) is one of the key principles, and internationally accepted principles of environmental management, such as the precautionary principle and the polluter pays principle, are also incorporated.

NEMA also provides that a wide variety of listed developmental activities (via the promulgation of the EIA Regulations 2014, as amended), which may significantly affect the environment, may be performed only after an EIA or BA has been undertaken and environmental authorisation has been obtained from the relevant competent authority. Many of these listed activities can potentially have negative impacts on bird populations in a variety of ways. The clearance of natural vegetation, for instance, can lead to a loss of habitat and may depress prey populations, while erecting structures needed for generating and distributing energy, communication, and so forth can cause mortalities by collision or electrocution.

NEMA makes provision for the prescription of procedures for the assessment and minimum criteria for reporting on identified environmental themes (Sections 24(5)(a) and (h) and 44) when applying for environmental authorisation. The Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020) is applicable in the case of potential impacts on avifauna by powerlines and substations.

3.1.2.3 The National Environmental Management: Biodiversity Act 10 of 2004 and the Threatened or Protected Species Regulations, February 2007

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act (Act 10 of 2004, as amended) read with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). Chapter 1 sets out the objectives of the Act, and they are aligned with the objectives of the Convention on Biological Diversity, which are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits of the use of genetic resources. The Act also gives effect to CITES, the Ramsar Convention, and the Bonn Convention on Migratory Species of Wild Animals (as noted in Table 5 above). The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

3.1.3 Provincial legislation

3.1.3.1 Western Cape Nature Conservation Laws Amendment Act, 2000

This statute provides for the amendment of various laws on nature conservation in order to transfer the administration of the provisions of those laws to the Western Cape Nature Conservation Board, which includes various regulations pertaining to wild animals, including avifauna.

4. Description of Project Aspects relevant to avifauna

The proposed EGI projects will consist of the components listed below. It is important to note at the outset that the exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction (subsequent to the issuing of an EA, should such an authorisation be granted for the proposed projects), but that the information provided below is seen as the worst-case scenario for the projects.

- Overhead Transmission Powerlines
    - Line capacity: Up to 132 kV
    - Line/pylon height: Up to 30 m
    - Pylon type: Monopole
    - The registered servitude for each of the seven proposed 132 kV overhead transmission powerlines will be up to 50 m wide. The entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant Eskom standards and

- Associated electrical infrastructure (including but not limited to feeder bays, busbars, new transformer bays (up to 500 MVA) and possible extension to the existing footprint at the proposed Eskom 132 kV Switching Substation). The following substations are relevant to these BA projects:
    - Proposed Eskom 132 kV substation (Footprint: approximately 17 ha)
    - Proposed Beaufort West 132 kV- 400 kV Linking Station (Footprint: approximately 35 ha)
    - Proposed Kwagga WEF 1
        - Preferred substation (Footprint: approximately 5.21 ha)
        - Alternative substation (Footprint: approximately 7.59 ha)
    - Proposed Kwagga WEF 2
        - Preferred substation (Footprint: approximately 18.5 ha)
        - Alternative substation (Footprint: approximately 11.7 ha)
    - Proposed Kwagga WEF 3
        - Preferred substation (Footprint: approximately 17 ha)
        - Alternative substation (Footprint: approximately 17.7 ha).

5. Issues, Risks and Impacts

5.1. Identification of Potential Impacts/Risks

Negative impacts on avifauna by electricity infrastructure generally take two (2) main forms, namely electrocution and collisions (Ledger & Annegarn, 1981; Ledger 1983; Ledger, 1984; Hobbs and Ledger, 1986a; Hobbs & Ledger, 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn, 1996; Kruger & Van Rooyen, 1998; Van Rooyen, 1998; Kruger, 1999; Van Rooyen, 1999; Van Rooyen, 2000; Van Rooyen, 2004; Jenkins et al., 2010). Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure and other associated infrastructure is another impact that could potentially impact on avifauna.

The following potential impacts have been identified. Due to the similarity in habitat, the impacts are expected to be identical for all the applications, as well as the site area alternatives.

Construction Phase

- Displacement due to disturbance associated with the construction of the substation, associated infrastructure and 132kV powerline.
- Displacement due to habitat transformation associated with the construction of the associated infrastructure and 132kV powerline.

Operational Phase

- Collisions with the 132kV powerline.
- Electrocutions within the substation yard.

Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the substation, associated infrastructure and 132kV powerline.

Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the substation, associated infrastructure and 132kV powerline.
- Displacement due to habitat transformation associated with the substation, associated infrastructure and 132kV powerline.
- Collisions with the 132kV overhead powerline
- Electrocutions within the substation yard.

5.2. Summary of Issues identified during the Public Consultation Phase

No issues were raised during the Public Consultation Phase

6. Baseline Environmental Description

6.1 General Description

6.1.1 Natural environment

The PAOI is located in Gamka Karoo, which is one of most arid vegetation units of the Nama Karoo biome. It consists of undulating plains covered with dwarf spiny shrubland dominated by Karoo dwarf shrubs, with sparse low trees. Dense stands of drought-resistant grasses cover broad sandy bottomlands, but only after abundant rains, which happens seldom (Mucina & Rutherford 2006). The development areas contain many ephemeral drainage lines which are characterised by sandy channels with *Vachellia karoo* shrubs and small trees growing on the edges. This region is in the rain shadow of the Cape Fold Belt mountains in the south, with mean annual precipitation ranging from 100 – 240 mm, mostly between December and April. Mean maximum and minimum monthly temperatures in Beaufort West are 38.7˚C and -3.2˚C for January (summer) and July (winter) respectively (Mucina & Rutherford 2006). Strong north-westerly winds occur in winter (Mucina & Rutherford 2006). The only longer-term surface water in the PAOI consists of a couple of earth dams and many boreholes with water troughs. Drainage lines flow only briefly after good rains. The only large trees that are found in the PAOI are exotics, mostly Eucalyptus, which are located at homesteads. The land is used mostly for sheep and game farming. The Droërivier - Proteus 400kV high voltage line bisects the extreme west of the PAOI, parallel to the N12 national road.

6.1.2 Modified environment

Whilst the distribution and abundance of the bird species in the broader area are mostly associated with natural vegetation, as this comprises virtually all the habitat, it is also necessary to examine the few external modifications to the environment that have relevance for birds.

The following avifaunal-relevant anthropogenic habitat modifications were recorded within the PAOI:

- **Water points:** The land use in the PAOI is mostly small stock farming. The entire area is divided into grazing camps, with associated boreholes and drinking troughs. In this arid environment, open water is a big draw card for birds which use the open water troughs to bath and drink.
- **Dams:** The PAOI contains a few ground dams located in drainage lines. When these dams fill up after good rains, they contain standing surface water for several months, which attracts birds to bath and drink.
- **Transmission lines:** The Droërivier - Proteus 400kV high voltage line bisects the extreme west of the PAOI, parallel to the N12 national road. A Martial Eagle nest is present on Tower 162. The nest is located approximately 12.5km from the Beaufort West 132kV – 400kV Linking Station.

APPENDIX C provides a photographic record of the habitat at the project site.

6.1.3 Important Bird Areas (IBAs)

The Swartberg Mountains Important Bird Area (IBA) SA106 is the closest IBA and is located approximately 37 km south of the project site at its closest point (Marnewick *et al.* 2015). The development is not expected to have any impact on the avifauna in this IBA due to the distance from the project site.

6.1.4 National Protected Areas

The closest protected area to the proposed application site is the Cape Floral Region Protected Areas. The avifauna in these protected areas is not expected to be impacted by the proposed development due to the distance from the project site (37+ km).

6.1.5 Avifauna

The SABAP2 data indicates that a total of 160 bird species could potentially occur within the PAOI, which includes all the project sites in similar habitat. APPENDIX F provides a comprehensive list of all the species. Of these, 38 species are classified as powerline sensitive species and 10 of these are South African Red List species. Of the powerline sensitive species, 20 are likely to occur regularly at the PAOI and immediate surrounding area, and another 18 could occur sporadically.

Error! Reference source not found. below lists all the powerline sensitive species and the possible impact on the respective species by the proposed on-site substations and 132kV overhead powerline.

Table 2: Powerline sensitive species that could occur on the PAOI

NT = Near threatened VU = Vulnerable EN = Endangered H = High M = Medium L = Low

Species name	Scientific name	SABAP2 reporting rate		Status		Recorded during surveys	Likelihood of regular occurrence in the PAOI	Impacts			
		Full protocol	Ad hoc protocol	Global status	Regional status			Electrocution: substation	Collision: HV line	Displacement: disturbance	Displacement: habitat
African Sacred Ibis	*Threskiornis aethiopicus*	5.26	0.00	-	-		L		x		
African Spoonbill	*Platalea alba*	5.26	1.64	-	-		L		x		
Amur Falcon	*Falco amurensis*	0.00	0.55	-	-		L	x		x	
Black Harrier	*Circus maurus*	1.75	0.55	EN	EN	x	L			x	x
Black-headed Heron	*Ardea melanocephala*	5.26	0.00	-	-		L	x	x		
Black-necked Grebe	*Podiceps nigricollis*	1.75	0.00	-	-		L		x		
Black-winged Kite	*Elanus caeruleus*	0.00	0.55	-	-		L	x		x	
Blue Crane	*Grus paradisea*	7.02	1.09	VU	NT	x	M		x	x	x
Booted Eagle	*Hieraaetus pennatus*	7.02	1.09	-	-	x	M	x		x	x
Cape Crow	*Corvus capensis*	52.63	33.88	-	-	x	H	x		x	x
Cape Shoveler	*Spatula smithii*	1.75	0.00	-	-		L		x		
Cape Teal	*Anas capensis*	1.75	0.55	-	-		L		x		
Common Buzzard	*Buteo buteo*	1.75	0.00	-	-		L	x		x	
Egyptian Goose	*Alopochen aegyptiaca*	43.86	12.02	-	-	x	H	x	x	x	
Gabar Goshawk	*Micronisus gabar*	1.75	0.00	-	-		L			x	
Greater Kestrel	*Falco rupicoloides*	21.05	11.48	-	-	x	H	x		x	x
Hadada Ibis	*Bostrychia hagedash*	17.54	2.73	-	-	x	M	x	x	x	x
Helmeted Guineafowl	*Numida meleagris*	14.04	3.28	-	-	x	M	x		x	x
Jackal Buzzard	*Buteo rufofuscus*	3.51	0.00	-	-		L	x		x	
Karoo Korhaan	*Eupodotis vigorsii*	87.72	34.43	-	NT	x	H		x	x	x
Kori Bustard	*Ardeotis kori*	5.26	0.00	NT	NT	x	M		x	x	x
Lanner Falcon	*Falco biarmicus*	7.02	0.00	-	VU	x	M	x		x	x
Little Grebe	*Tachybaptus ruficollis*	7.02	1.64	-	-		L		x		
Ludwig's Bustard	*Neotis ludwigii*	8.77	4.92	EN	EN	x	H		x	x	x
Martial Eagle	*Polemaetus bellicosus*	5.26	2.19	EN	EN	x	M	x		x	x
Pale Chanting Goshawk	*Melierax canorus*	52.63	18.58	-	-	x	H	x		x	x
Pied Crow	*Corvus albus*	71.93	32.79	-	-	x	H	x		x	x
Red-billed Teal	*Anas erythrorhyncha*	7.02	1.64	-	-		L		x		
Red-knobbed Coot	*Fulica cristata*	7.02	0.55	-	-	x	M		x	x	
Rock Kestrel	*Falco rupicolus*	8.77	7.65	-	-	x	M	x		x	x
Secretarybird	*Sagittarius serpentarius*	3.51	0.00	EN	VU		M		x	x	x
South African Shelduck	*Tadorna cana*	33.33	6.01	-	-	x	H		x	x	
Southern Black Korhaan	*Afrotis afra*	0.00	0.55	VU	VU		L		x		
Spotted Eagle-Owl	*Bubo africanus*	5.26	0.00	-	-	x	M	x	x	x	x
Verreaux's Eagle	*Aquila verreauxii*	5.26	2.19	-	VU	x	L	x	x		
White-necked Raven	*Corvus albicollis*	5.26	1.64	-	-	x	M	x		x	x
Yellow-billed Duck	*Anas undulata*	1.75	0.00	-	-		L		x		
Yellow-billed Kite	*Milvus aegyptius*	0.00	0.55	-	-		L	x			

6.1. Project Specific Description

The baseline environmental conditions at the Project 6 site, including the avifauna, are representative of the PAOI as described in 6.1.1. There are no distinguishing features which puts it apart from the rest of the PAOI in terms of the habitat features relevant to avifauna, or avifaunal abundance and variety.

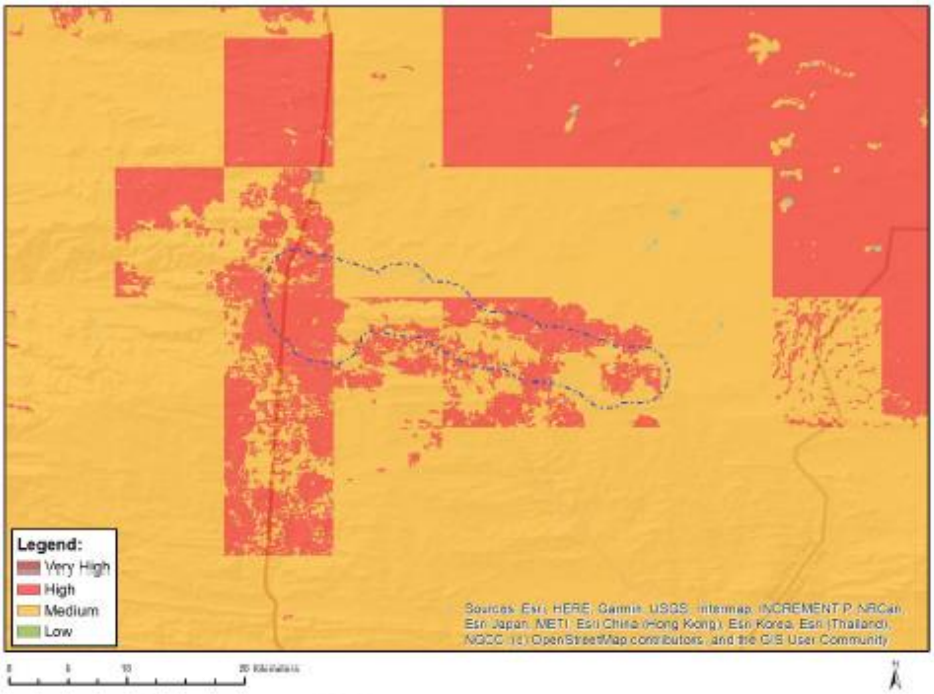
6.2. Identification of Environmental Sensitivities

6.2.1. Sensitivities identified by the National Web-Based Environmental Screening Tool

The PAOI is classified as Medium to High sensitivity for avifauna, according to the DFFE online screening tool (see Figure 2). The High classification is linked to the potential occurrence of species of conservation concern (SCC) Ludwig's Bustard (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Vulnerable), Black Harrier (Globally and Regionally Endangered), Southern Black Korhaan (Globally and Regionally Vulnerable) and Verreaux's Eagle (Regionally Vulnerable). The medium classification is linked to Ludwig's Bustard, Southern Black Korhaan and Verreaux's Eagle.

The PAOI, which contains all the development sites with the same homogeneous habitat, contains confirmed habitat for species of conservation concern (SCC), as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). The occurrence of SCC was confirmed during the surveys conducted in 2019-2020 and in 2021 in the PAOI and immediate adjacent area in similar habitat i.e. Ludwig's Bustard, Black Harrier, Blue Crane (Globally Vulnerable and Regionally Near-threatened), Karoo Korhaan (Regionally Near-threatened), Kori Bustard (Globally and Regionally Near-threatened), Lanner Falcon (Regionally Vulnerable), Martial Eagle and Verreaux's Eagle were recorded. This classification is assessed to be accurate as far as the impact of the proposed powerline and associated infrastructure is concerned, based on actual conditions recorded on the ground during the site visits in October 2021, and the 12-months of pre-construction monitoring in 2019 - 2020 (see APPENDIX C for the Site Sensitivity Verification report).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis ludwigii
High	Aves-Polemaetus bellicosus
High	Aves-Circus maurus
High	Aves-Afrotis afra
High	Aves-Aquila verreauxii
Low	Subject to confirmation
Medium	Aves-Neotis ludwigii
Medium	Aves-Afrotis afra
Medium	Aves-Aquila verreauxii

Figure 2: The results of the DFFE screening tool for the PAOI. The High classification is linked to the potential occurrence of species of conservation concern (SCC) Ludwig's Bustard (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Vulnerable), Black Harrier (Globally and Regionally Endangered), Southern Black Korhaan (Globally and Regionally Vulnerable) and Verreaux's Eagle (Regionally Vulnerable). The medium classification is linked to Ludwig's Bustard, Southern Black Korhaan and Verreaux's Eagle.

6.2.2. Specialist Sensitivity Analysis and Verification

The entire PAOI, including the area occupied by Project 6, is high sensitivity based on the confirmed occurrence of several powerline sensitive SCC. The birds move randomly across the whole PAOI, therefore no specific areas can be delineated as being more sensitive than others.

6.2.3. Sensitivity Analysis Summary Statement

The classification of High and Medium sensitivity in the screening tool is assessed to be accurate as far as the impact of the proposed powerline and associated infrastructure on avifauna, and specifically SCC is concerned. This is based on actual conditions recorded on the ground during the site visits in October 2021, and the 12-months of pre-construction monitoring in 2019 - 2020 (see APPENDIX C for the Site Sensitivity Verification report).

7. Impact Assessment

7.1 General

Negative impacts on avifauna by electricity infrastructure generally take two (2) main forms, namely electrocution and collisions (Ledger & Annegarn, 1981; Ledger 1983; Ledger, 1984; Hobbs and Ledger, 1986a; Hobbs & Ledger, 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn, 1996; Kruger & Van Rooyen, 1998; Van Rooyen, 1998; Kruger, 1999; Van Rooyen, 1999; Van Rooyen, 2000; Van Rooyen, 2004; Jenkins *et al*., 2010). Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure and other associated infrastructure is another impact that could potentially impact on avifauna.

The following potential impacts have been identified. **Due to the similarity in habitat, the impacts are expected to be identical for all the projects, as well as all site area alternatives.**

7.2 Potential Impacts during the Construction Phase

The following impacts have been identified for the construction phase.

7.1.1 Impact 1: Displacement due to disturbance associated with the construction of the 132kV grid connection and substations

The noise and movement associated with the construction activities at the proposed 132kV grid connection and Kwagga 1, 2 and 3 onsite substations will be a source of disturbance which would lead to the displacement of avifauna from the area. The construction activities will inter alia constitute the following:

- Site clearance and preparation
- Construction of the infrastructure (i.e. the on-site substation, associated infrastructure and overhead powerline)
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site
- Removal of vegetation for the proposed on-site substation, stockpiling of topsoil and cleared vegetation
- Excavations for infrastructure

The above-listed activities impact on birds through disturbance leading to displacement; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Terrestrial species are most likely to be affected by displacement due to disturbance in the study area.

The broader area contains one (1) Martial Eagle territory, with the nest situated on Tower 162 of the Droërivier - Proteus 400kV. However, construction activities at the proposed powerline, substation and associated infrastructure should not impact on the birds, due to the distance from the proposed infrastructure.

The priority species which are potentially vulnerable to displacement due to disturbance are the following:

- Amur Falcon
- Black Harrier
- Black-winged Kite
- Blue Crane
- Booted Eagle
- Cape Crow
- Common Buzzard
- Gabar Goshawk
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Jackal Buzzard
- Karoo Korhaan
- Kori Bustard
- Lanner Falcon
- Ludwig's Bustard
- Martial Eagle
- Pale Chanting Goshawk
- Pied Crow
- Rock Kestrel
- Secretarybird
- Spotted Eagle-Owl
- White-necked Raven

This impact is rated as negative, with a site specific spatial extent and a short term duration due to the temporary nature of the construction phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed Section 7.2.2.1 below.

7.1.2 Impact 2: Displacement due to habitat transformation associated with the construction of the 132kV grid connection and substations

This impact relates to the total or partial displacement of avifauna due to habitat transformation associated with the presence of the 132kV grid connection and the Kwagga 1, 2 and 3 onsite substations. The construction activities could impact on birds breeding, foraging and roosting in or in close proximity of the proposed substation through transformation of habitat, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the on-site substation yard is unavoidable. In the case of the 132kV powerline, the direct habitat transformation is limited to the pole footprints and the servitude track under the powerline. However, the habitat in the study area is highly uniform from a bird impact perspective. The loss of a relatively small quantity of the habitat for priority species due to direct habitat transformation associated with the construction of the proposed on-site substation, associated infrastructure and 132kV overhead powerline is likely to be minimal.

The priority species which are potentially vulnerable to displacement are the following:

- Black Harrier
- Blue Crane
- Booted Eagle
- Cape Crow
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Karoo Korhaan
- Kori Bustard
- Lanner Falcon
- Ludwig's Bustard
- Martial Eagle
- Pale Chanting Goshawk
- Pied Crow
- Rock Kestrel
- Secretarybird
- Spotted Eagle-Owl
- White-necked Raven

This impact is rated as negative, with a site specific spatial extent and a long term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and an unlikely probability, which will render the impact significance as low, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance will remain at low. The recommended mitigation measures are detailed Section 7.2.2.1 below.

7.1.2.1 Impact Summary Tables: Construction Phase

The rating of the impacts identified for the construction phase is discussed in this section. The assessment methodology is explained in APPENDIX D.

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CONSTRUCTION PHASE						
Impact 1: Displacement due to disturbance associated with the construction of the 132kV grid connection and associated substations	*Status*	*Negative*	*Moderate (3)*	▪ *Activity should as far as possible be restricted to the footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical.* ▪ *Access to the rest of the property must be restricted.* ▪ *The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.*	*Low (4)*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CONSTRUCTION PHASE						
Impact 2: Displacement due to habitat transformation associated with the construction of the 132kV grid connection and associated substations	*Status*	*Negative*	*Low (4)*	▪ *Vegetation clearance should be limited to what is absolutely necessary.* ▪ *The mitigation measures proposed by the vegetation specialist must be strictly enforced.*	*Low (4)*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

7.1.3 **Potential Impacts during the Operational Phase**

The following impacts have been identified for the operational phase.

7.1.3.1 Impact 1: Mortality of powerline sensitive avifauna through electrocution in the proposed substations.

This impact relates to the bird kills and injury as a result of potential electrocution in the Kwagga 1, 2 and 3 onsite substations. Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (Van Rooyen, 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed overhead powerline, the electrocution risk is envisaged to be low because the proposed design of the 132kV line, namely the steel monopole and the clearance distances between the live and earthed components. The 132kV powerline should not pose an electrocution threat to the priority species which are likely to occur in the study area and immediate surrounding environment. Electrocutions within the proposed on-site substation yard are possible but should not affect the more sensitive Red List bird species, as these species are unlikely to use the infrastructure within the substation yard for perching or roosting. Species that are more vulnerable to this impact are corvids, owls and certain species of waterbirds. The priority species which are potentially vulnerable to this impact are the following:

- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Booted Eagle
- Cape Crow
- Common Buzzard
- Egyptian Goose
- Greater Kestrel
- Hadada Ibis
- Helmeted Guineafowl
- Jackal Buzzard
- Lanner Falcon
- Martial Eagle
- Pale Chanting Goshawk
- Pied Crow
- Rock Kestrel
- Spotted Eagle-Owl
- Verreaux's Eagle
- White-necked Raven
- Yellow-billed Kite

This impact is rated as negative, with a site specific spatial extent and a long term duration due to the extended timeframe of the operational. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and unlikely probability, which will render the impact significance as low. As detailed in Section 7.2.2.3 below, mitigation will reduce the impact to very low.

7.1.3.2 Impact 2: Mortality of powerline sensitive species due to collisions with the 132kV grid connection

This impact deals with potential collisions with the 132kV grid connection. Collisions are the biggest threat posed by high voltage lines to birds in southern Africa (Van Rooyen, 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen, 2004; Anderson, 2001). In a PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors (APLIC, 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger, 1998; Rubolini et al., 2005; Jenkins et al., 2010).

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk (Bevanger, 1998; Janss, 2000). These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw, 2010; Martin, 2011; Martin et al., 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger, 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson, 1978; Anderson, 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown et al., 1987; Henderson et al., 1996).

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g. those that separate feeding and roosting areas, or cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 2012).

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude, or locating them along other features such as tree lines, are both approaches thought to reduce risk (Bevanger, 1994). In general, low lines with short span lengths (i.e. the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger, 1994; Jenkins et al., 2010). On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause the majority of collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires (Brown et al., 1987; Faanes, 1987; Alonso et al., 1994a; Bevanger, 1994)."

From incidental record keeping by the Endangered Wildlife Trust (EWT), it is possible to give a measure of what species are generally susceptible to powerline collisions in South Africa (Figure 3).

Powerline collisions are generally accepted as a key threat to bustards (Raab *et al*., 2009; Raab *et al*., 2010; Jenkins & Smallie, 2009; Barrientos *et al*., 2012, Shaw, 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two (2) years, and low voltage distribution lines for one (1) year (Shaw, 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw, 2013).

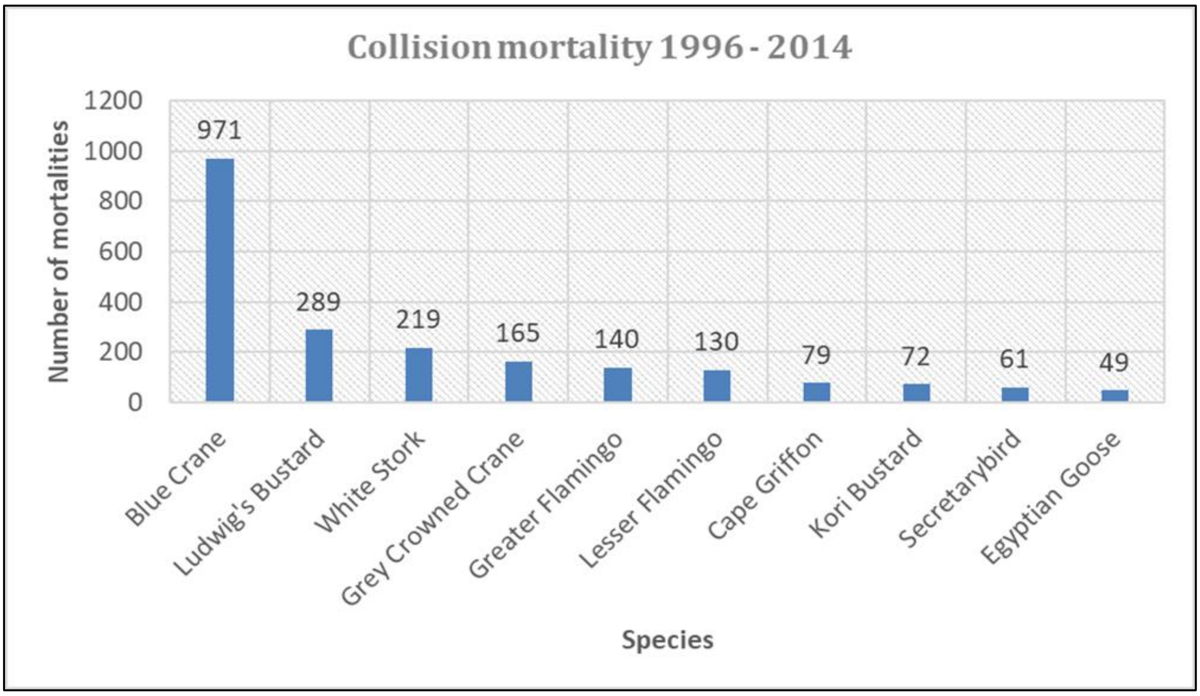


Figure 3: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and powerline configuration. An important additional factor that previously has received little attention is the visual capacity of birds; i.e. whether they are able to see obstacles such as powerlines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is key to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin & Shaw, 2010). Visual fields were determined in three (3) bird species representative of families known to be subject to high levels of mortality associated with powerlines i.e. Kori Bustards, Blue Cranes and White Stork *Ciconia ciconia*. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and powerlines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas similar to those of bustards and cranes, and are also known to be vulnerable to powerline collisions.

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins *et al*., 2010; Martin *et al.,* 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (e.g. Bernardino *et al.,* 2018; Sporer *et al.,* 2013, Barrientos *et al*., 2011; Jenkins *et al*., 2010; Alonso & Alonso, 1999; Koops & De Jong, 1982), including to some extent for bustards (Barrientos *et al*., 2012; Hoogstad, 2015 pers.comm). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Barrientos *et al.* (2011) reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease of 55–94% in bird mortalities. Koops and De Jong (1982) found that the spacing of the BFDs was critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5m, whereas using the same devices at 10m intervals only reduces the mortality by 57%. Barrientos *et al*. (2012) found that larger BFDs were more effective in reducing Great Bustard collisions than smaller ones. Line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin *et al*., 2010).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two (2) types of line markers in reducing powerline collision mortalities of large birds on three 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig’s Bustard. The two (2) different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one (1) type of marker over the other (Shaw *et al*., 2017).

The powerline sensitive species which are potentially vulnerable to this impact are the following:

- African Sacred Ibis
- African Spoonbill
- Black-headed Heron
- Black-necked Grebe
- Blue Crane
- Cape Shoveler
- Cape Teal
- Egyptian Goose
- Hadada Ibis
- Karoo Korhaan
- Kori Bustard
- Little Grebe
- Ludwig's Bustard
- Red-billed Teal
- Red-knobbed Coot
- Secretarybird
- South African Shelduck
- Southern Black Korhaan
- Spotted Eagle-Owl
- Verreaux's Eagle
- Yellow-billed Duck

This impact is rated as negative, with a local spatial extent and a long term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a severe consequence and likely probability, which will render the impact significance as high, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to moderate. The recommended mitigation measures are detailed in Section 7.2.2.3 below.

7.1.3.3 Impact Summary Tables: Operational Phase

The rating of the impacts identified for the operational phase is discussed in this section.

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Mortality of powerline sensitive avifauna through electrocution in the proposed substations.	*Status*	*Negative*	*Low (4)*	▪ *The hardware within the proposed transmission substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red List priority species is unlikely to frequent the substation and be electrocuted.*	*Very Low (5)*	*Medium*
	Spatial Extent	*Site specific*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Collision mortality of powerline sensitive species due to the 132kV grid connections.	*Status*	*Negative*	*High (2)*	*Bird Flight Diverters must be fitted to the entire grid connection according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines)..*	*Moderate (3)*	*Medium*
	Spatial Extent	*Local*				
	Duration	*Long term*				
	Consequence	*Severe*				
	Probability	*Likely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

7.1.4 Potential Impacts during the Decommissioning Phase

The following impacts have been identified for the decommissioning phase.

7.1.4.1 Impact 1: Displacement due to disturbance associated with the decommissioning of 132kV grid connections and associated substations

The noise and movement associated with the potential decommissioning activities relating to the proposed 132kV grid connection and Kwagga 1, 2 and 3 onsite substations and Eskom 132kV switching station will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site specific spatial extent and a short term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed in Section 7.2.4.2 below.

7.1.4.2 Impact Summary Tables: Decommissioning Phase

The rating of the impacts identified for the decommissioning phase is discussed in this section.

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISSIONING PHASE						
The noise and movement associated with the activities at the study area will be a source of disturbance which would lead to the displacement of avifauna from the area.	*Status*	*Negative*	*Moderate (3)*	▪ *Activity should as far as possible be restricted to the footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical.* ▪ *The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned*	*Low (4)*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

7.3 Cumulative Impacts

In relation to an activity, cumulative impact means "the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities" (NEMA EIA Reg GN R982 of 2014). The projects which are considered for the cumulative impacts are those which have received an Environmental Authorisation by the end of April 2022 (see Table3 and Figure 4).

Table 3: Authorised projects within a 50km radius around the project site

DFFE REFERENCE Nr	SHORT TITLE
12/12/20/1784/1/AM2	Beaufort West Wind Energy Facility
12/12/20/1784/2/AM1	Trakas Wind Energy Facility
14/12/16/3/3/2/2070	Kwagga 1 Wind Energy Facility
14/12/16/3/3/2/2071	Kwagga 2 Wind Energy Facility
14/12/16/3/3/2/2072	Kwagga 3 Wind Energy Facility

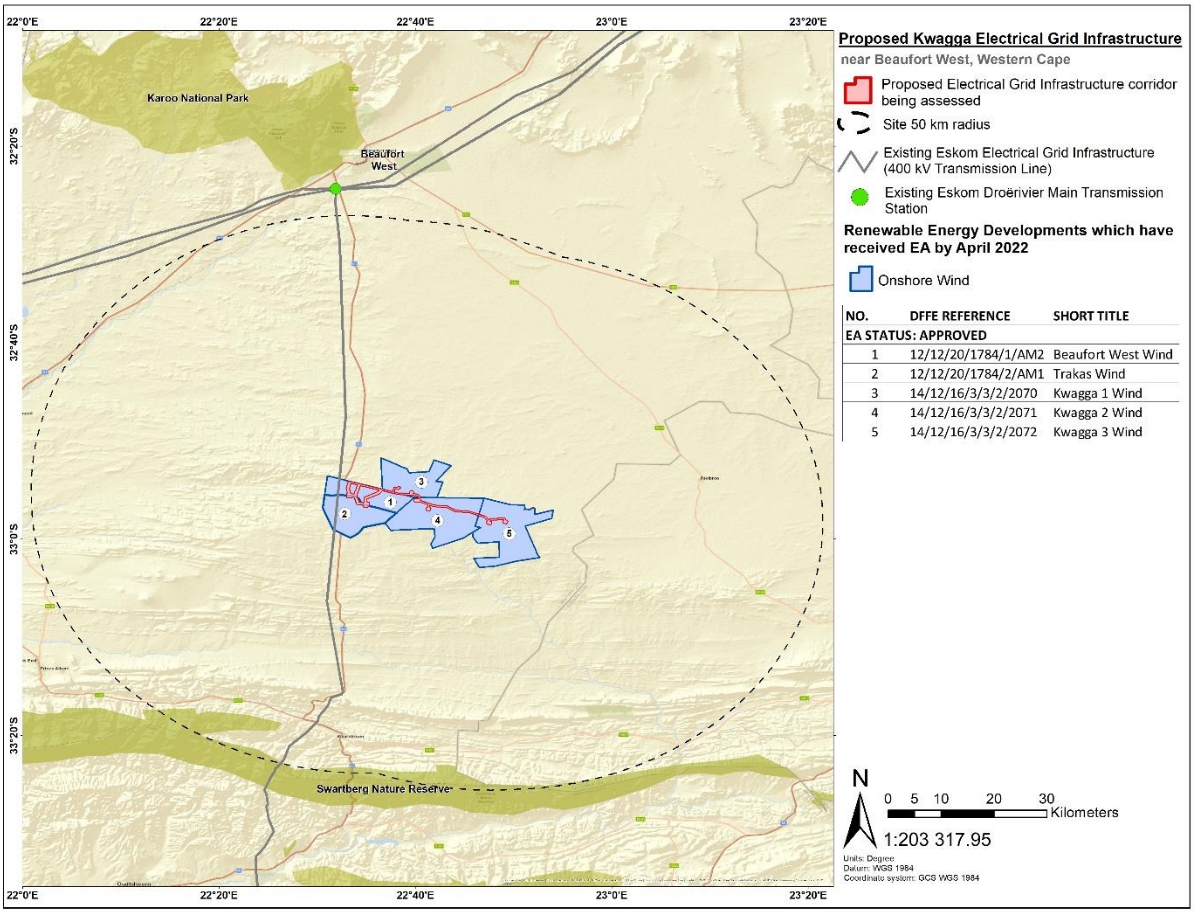


Figure 4: Authorised projects within a 50km radius around the project site

The cumulative impact assessed is therefore the collective impact of the proposed onsite 132kV grid connections and associated substations of the Kwagga 1- 3 grid connection and associated substations, along with the authorised projects listed in Table 3.

The only existing HV line in the 50km radius around the project site is the Droërivier – Proteus 400kV transmission line, of which approximately 110km is contained in the 50km radius. The maximum length of planned and authorised grid connections in the 50km radius amounts to approximately 33.5km. The total length of planned and existing HV lines thus comes to approximately 143.5km, of which the proposed Kwagga 1 - 3 grid connection and other planned grid connections constitute approximately 23%.

The cumulative impact of the Kwagga 1 - 3 grid connection, together with the planned grid connections and substations within a 50km radius, is assessed below.

7.3.1 Impact 1: Construction Phase - Displacement due to disturbance associated with the construction of the 132kV grid connection and associate substations

This impact deals with potential displacement due to disturbance associated with the construction of the 132kV grid connections and associate substations at this and other similar projects in a 50 km radius. This impact is rated as negative, with a site specific spatial extent and a short term duration due to the temporary nature of the construction phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed in Section 7.3.6 below.

7.3.2 Impact 2: Construction Phase - Displacement due to habitat transformation associated with the construction of the 132kV grid connection and substations

This impact deals with potential displacement due to habitat transformation associated with the construction of the 132kV grid connections and associate substations at this and other similar projects in a 50 km radius. The impact is rated as negative, with a site specific spatial extent and a long term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and a very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance will be reduced to low. The recommended mitigation measures are detailed in Section 7.3.6 below.

7.3.3 Impact 3: Operational Phase - Electrocution of powerline sensitive species in the on-site substations

This impact deals with potential electrocution of powerline sensitive species in substations at this and other similar projects in a 50 km radius. This impact is rated as negative, with a site specific spatial extent and a long term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and unlikely probability, which will render the impact significance as low. As detailed in Section 7.3.6 below, mitigation will reduce the impact to very low.

7.3.4 Impact 4: Operational Phase - Collisions with the 132kV grid connections

This impact deals with potential collisions with the 132kV grid connections during the operational phase with regards to this and other similar projects in the 50 km radius. This impact is rated as negative, with a regional spatial extent and a long term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a severe consequence and likely probability, which will render the impact significance as high, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to moderate. The recommended mitigation measures are detailed in Section 7.3.6 below.

7.3.5 Impact 5: Decommissioning Phase - Displacement due to disturbance associated with the decommissioning of the 132kV grid connections and onsite substations

The noise and movement associated with the potential decommissioning activities (in terms of this and other similar projects in the 50 km radius) will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site specific spatial extent and a short term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed in Section 7.3.6 below.

7.3.6 Impact Summary Tables: Cumulative Impacts

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Displacement due to disturbance associated with the construction of the 132kV grids and onsite substations	*Status*	*Negative*	*Moderate (3)*	▪ *Activity should as far as possible be restricted to the footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical.* ▪ *Access to the rest of the property must be restricted.* ▪ *The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.*	*Low (4)*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

CONSTRUCTION PHASE						
Displacement due to disturbance associated with the construction of the 132kV grids and onsite substations	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Regional* *Long term* *Substantial* *Likely* *High* *Low*	*Moderate (3)*	▪ *Vegetation clearance should be limited to what is absolutely necessary.* ▪ *The mitigation measures proposed by the vegetation specialist must be strictly enforced.*	*Low (4)*	*High*
OPERATIONAL PHASE						
Electrocution of powerline sensitive species in the on-site substations	*Status*	*Negative*	*Low (4)*	▪ *Vegetation clearance should be limited to what is absolutely necessary.* ▪ *The mitigation measures proposed by the vegetation specialist must be strictly enforced.*	*Very Low (5)*	*Medium*
OPERATIONAL PHASE						
Collision mortality of powerline sensitive species due to the 132kV grid connections.	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Regional* *Long term* *Moderate* *Unlikely* *High* *Low*	*High (2)*	*Bird Flight Diverters must be fitted to the entire grid connection according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines)..*	*Moderate (3)*	*Medium*
DECOMMISSIONING PHASE						
The noise and movement associated with the activities at the study area will be a source of disturbance which would lead to the displacement of avifauna from the area	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Site specific* *Short term* *Substantial* *Very likely* *High* *Low*	*Moderate (3)*	▪ *Activity should as far as possible be restricted to the footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical.* ▪ *The recommendations of the ecological and botanical specialist studies*	*Low (4)*	

				must be strictly implemented, especially as far as limitation of the activity footprint is concerned		

8. Impact Assessment Summary

Table 4 summarises the overall impact significance findings, following the implementation of the proposed mitigation measures:

Table 4: Overall Impact Significance (Post Mitigation)

Phase	**Overall Impact Significance**
Construction	Low
Operational	Low
Decommissioning	Low
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	Low
Cumulative - Operational	Low
Cumulative - Decommissioning	Low

9. Environmental Management Programme Inputs

The key mitigation and monitoring recommendations for each applicable mitigation measure identified for all phases of the project for inclusion in the EMPr or environmental authorisation are listed below.

Management Plan for the Planning and Design Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
None					

Management Plan for the Construction Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to disturbance					
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	A site-specific CEMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr	1. Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance.	1. On a daily basis 2. Monthly 3. Monthly 4. Monthly 5. Monthly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
which would lead to the displacement of avifauna from the area		and should apply good environmental practice during construction. The CEMPr must specifically include the following: 1. No off-road driving; 2. Maximum use of existing roads, where possible; 3. Measures to control noise and dust according to latest best practice; 4. Restricted access to the rest of the property; 5. Strict application of all recommendations in the biodiversity specialist report pertaining to the limitation of the footprint.	2. Ensure that construction personnel are made aware of the impacts relating to off-road driving. 3. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.		
Avifauna: Mortality due to collision with the 132kV OHL					
Mortality of avifauna due to collisions with the 132kV OHL.	Reduction of avian collision mortality	OHL to be marked with Eskom approved Bird Flight Diverters (BFDs).	1. Fit Eskom approved Bird Flight Diverters on the earthwire of the OHL.	2. Once-off 3. Once-off	1. Contractor 2. Contractor and ECO

Management Plan for the Operational Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to habitat transformation in the substations					
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance in the onsite substations.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented where possible by an appropriately qualified rehabilitation specialist, according to the recommendations of the botanical specialist study.	1. Develop a Habitat Restoration Plan (HRP) and ensure that it is approved. 2. Monitor rehabilitation via site audits and site inspections to ensure compliance. Record and report any non-compliance.	1. Appointment of rehabilitation specialist to develop HRP. 2. Site inspections to monitor progress of HRP. 3. Adaptive management to ensure HRP goals are met.	1. Once-off 2. Once a year 3. As and when required	1. Facility operator
Avifauna: Mortality of avifauna due to electrocution in the onsite substations					
Mortality of avifauna due to electrocutions in the substations	Reduction of avian electrocution mortality	1. Monitor the electrocution mortality in the substations. 2. Apply mitigation when and if required.	1. Regular inspections of the substation yard	1. Monthly	1. Facility operator

Management Plan for the Decommissioning Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to disturbance					
The noise and movement associated with the decommissioning activities will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Decommissioning EMPr.	A site-specific Decommissioning EMPr (DEMPr) must be implemented, which gives appropriate and detailed description of how activities must be conducted. All contractors are to adhere to the DEMPr and should apply good environmental practice during decommissioning. The DEMPr must specifically include the following: 1. No off-road driving; 2. Maximum use of existing roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical; 3. Measures to control noise and dust according to latest best practice; 4. Restricted access to the rest of the property; 5. Strict application of all recommendations in the botanical specialist report pertaining to the limitation of the footprint.	1. Implementation of the DEMPr. Oversee activities to ensure that the DEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that decommissioning personnel are made aware of the impacts relating to off-road driving. 3. Access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the decommissioning area is demarcated clearly and that personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	1. On a daily basis 2. Monthly 3. Monthly 4. Monthly 5. Monthly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO

10. Final Specialist Statement and Authorisation Recommendation

11.1. Statement and Reasoned Opinion

The expected impacts of the proposed Basic Assessment for the proposed construction of a 132 kV Overhead Powerline from the proposed Kwagga Wind Energy Facility 3 on-site substation (E) to the proposed Kwagga Wind Energy Facility 1 on-site substation (C), via the Kwagga Wind Energy Facility 2 on-site substation (D) were rated to be Low to Moderate negative pre-mitigation. However, with appropriate mitigation, the overall post-mitigation significance of all the identified impacts for should be reduced to Low for all phases of the project. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables (Section 7) and the Environmental Management Programme (EMPr) are strictly implemented.

11.2. EA Condition Recommendations

See section 9 above.

12. References

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Curriculum Vitae: Chris van Rooyen

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	BA LLB
Nationality	:	South African
Years of experience	:	26 years

Key Experience

Chris van Rooyen has twenty-two years' experience in the assessment of avifaunal interactions with industrial infrastructure. He was employed by the Endangered Wildlife Trust as head of the Eskom-EWT Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has consulted in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. He also has extensive project management experience and he has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author and/or co-author of 17 conference papers, co-author of two book chapters, several research reports and the current best practice guidelines for avifaunal monitoring at wind farm sites. He has completed around 130 power line assessments; and has to date been employed as specialist avifaunal consultant on more than 50 renewable energy generation projects. He has also conducted numerous risk assessments on existing power lines infrastructure. He also works outside the electricity industry and he has done a wide range of bird impact assessment studies associated with various residential and industrial developments. He serves on the Birds and Wind Energy Specialist Group which was formed in 2011 to serve as a liaison body between the ornithological community and the wind industry.

Key Project Experience

Bird Impact Assessment Studies and avifaunal monitoring for wind-powered generation facilities:

1. Eskom Klipheuwel Experimental Wind Power Facility, Western Cape
2. Mainstream Wind Facility Jeffreys Bay, Eastern Cape (EIA and monitoring)
3. Biotherm, Swellendam, (Excelsior), Western Cape (EIA and monitoring)
4. Biotherm, Napier, (Matjieskloof), Western Cape (pre-feasibility)
5. Windcurrent SA, Jeffreys Bay, Eastern Cape (2 sites) (EIA and monitoring)
6. Caledon Wind, Caledon, Western Cape (EIA)
7. Innowind (4 sites), Western Cape (EIA)
8. Renewable Energy Systems (RES) Oyster Bay, Eastern Cape (EIA and monitoring)
9. Oelsner Group (Kerriefontein), Western Cape (EIA)
10. Oelsner Group (Langefontein), Western Cape (EIA)
11. InCa Energy, Vredendal Wind Energy Facility Western Cape (EIA)
12. Mainstream Loeriesfontein Wind Energy Facility (EIA and monitoring)
13. Mainstream Noupoort Wind Energy Facility (EIA and monitoring)
14. Biotherm Port Nolloth Wind Energy Facility (Monitoring)
15. Biotherm Laingsburg Wind Energy Facility (EIA and monitoring)
16. Langhoogte Wind Energy Facility (EIA)
17. Vleesbaai Wind Energy Facility (EIA and monitoring)
18. St. Helena Bay Wind Energy Facility (EIA and monitoring)
19. Electrawind, St Helena Bay Wind Energy Facility (EIA and monitoring)
20. Electrawind, Vredendal Wind Energy Facility (EIA)
21. SAGIT, Langhoogte and Wolseley Wind Energy facilities
22. Renosterberg Wind Energy Project – 12-month preconstruction avifaunal monitoring project
23. De Aar – North (Mulilo) Wind Energy Project – 12-month preconstruction avifaunal monitoring project
24. De Aar – South (Mulilo) Wind Energy Project – 12-month bird monitoring
25. Namies – Aggenys Wind Energy Project – 12-month bird monitoring
26. Pofadder - Wind Energy Project – 12-month bird monitoring
27. Dwarsrug Loeriesfontein - Wind Energy Project – 12-month bird monitoring
28. Waaihoek – Utrecht Wind Energy Project – 12-month bird monitoring
29. Amathole – Butterworth Utrecht Wind Energy Project – 12-month bird monitoring & EIA specialist
30. Phezukomoya and San Kraal Wind Energy Projects 12-month bird monitoring & EIA specialist study (Innowind)
31. Beaufort West Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
32. Leeuwdraai Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
33. Sutherland Wind Energy Facility 12-month bird monitoring (Mainstream)
34. Maralla Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
35. Esizayo Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
36. Humansdorp Wind Energy Facility 12-month bird monitoring & EIA specialist study (Cennergi)

37. Aletta Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
38. Eureka Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
39. Makambako Wind Energy Faclity (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
40. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
41. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
42. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
43. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
44. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
45. Kuruman Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
46. Dassieklip Wind Energy Facility 3 years post-construction monitoring (Biotherm)
47. Loeriesfontein 2 Wind Energy Facility 2 years post-construction monitoring (Mainstream)
48. Khobab Wind Energy Facility 2 years post-construction monitoring (Mainstream)
49. Excelsior Wind Energy Facility 18 months construction phase monitoring (Biotherm)
50. Boesmansberg Wind Energy Facility 12-months pre-construction bird monitoring (juwi)
51. Mañhica Wind Energy Facility, Mozambique, 12-months pre-construction monitoring (Windlab)
52. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
53. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre-construction monitoring (ABO).
54. Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
55. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
56. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
57. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
58. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
59. Mainstream Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
60. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
61. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
62. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
63. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
64. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
65. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
66. Pofadder Wind Energy Facility, Northren Cape, Screening Report (Atlantic Energy)
67. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
68. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
69. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi). **Bird Impact**

Assessment Studies for Solar Energy Plants:

1. Concentrated Solar Power Plant, Upington, Northern Cape.
2. Globeleq De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
3. JUWI Kronos PV project, Copperton, Northern Cape
4. Sand Draai CSP project, Groblershoop, Northern Cape
5. Biotherm Helena PV Project, Copperton, Northern Cape
6. Biotherm Letsiao CSP Project, Aggeneys, Northern Cape
7. Biotherm Enamandla PV Project, Aggeneys, Northern Cape
8. Biotherm Sendawo PV Project, Vryburg, North-West
9. Biotherm Tlisitseng PV Project, Lichtenburg, North-West
10. JUWI Hotazel Solar Park Project, Hotazel, Northern Cape
11. Namakwa Solar Project, Aggeneys, Northern Cape
12. Brypaal Solar Power Project, Kakamas, Northern Cape
13. ABO Vryburg 1,2,3 Solar PV Project, Vryburg, North-West
14. NamPower CSP Facility near Arandis, Namibia
15. Dayson Klip PV Facility near Upington, Northern Cape
16. Geelkop PV Facility near Upington, Northern Cape
17. Oya PV Facility, Ceres, Western Cape
18. Vrede and Rondawel PV Facilities, Free State
19. Kolkies & Sadawa PV Facilities, Western Cape
20. Leeuwbosch PV1 and 2 and Wildebeeskuil PV1 and 2 Facilities, North-West

21. Kenhardt PV 3,4 and 5, Northern Cape
22. Wittewal PV, Grootfontein PV and Hoekdoornen PV Facilities, Touws River, Western Cape

Bird Impact Assessment Studies for the following overhead line projects:

1. Chobe 33kV Distribution line
2. Athene - Umfolozi 400kV
3. Beta-Delphi 400kV
4. Cape Strengthening Scheme 765kV
5. Flurian-Louis-Trichardt 132kV
6. Ghanzi 132kV (Botswana)
7. Ikaros 400kV
8. Matimba-Witkop 400kV
9. Naboomspruit 132kV
10. Tabor-Flurian 132kV
11. Windhoek - Walvisbaai 220 kV (Namibia)
12. Witkop-Overyssel 132kV
13. Breyten 88kV
14. Adis-Phoebus 400kV
15. Dhuva-Janus 400kV
16. Perseus-Mercury 400kV
17. Gravelotte 132kV
18. Ikaros 400 kV
19. Khanye 132kV (Botswana)
20. Moropule – Thamaga 220 kV (Botswana)
21. Parys 132kV
22. Simplon –Everest 132kV
23. Tutuka-Alpha 400kV
24. Simplon-Der Brochen 132kV
25. Big Tree 132kV
26. Mercury-Ferrum-Garona 400kV
27. Zeus-Perseus 765kV
28. Matimba B Integration Project
29. Caprivi 350kV DC (Namibia)
30. Gerus-Mururani Gate 350kV DC (Namibia)
31. Mmamabula 220kV (Botswana)
32. Steenberg-Der Brochen 132kV
33. Venetia-Paradise T 132kV
34. Burgersfort 132kV
35. Majuba-Umfolozi 765kV
36. Delta 765kV Substation
37. Braamhoek 22kV
38. Steelpoort Merensky 400kV
39. Mmamabula Delta 400kV
40. Delta Epsilon 765kV
41. Gerus-Zambezi 350kV DC Interconnector: Review of proposed avian mitigation measures for the Okavango and Kwando River crossings
42. Giyani 22kV Distribution line
43. Liqhobong-Kao 132/11kV distribution power line, Lesotho
44. 132kV Leslie – Wildebeest distribution line
45. A proposed new 50 kV Spoornet feeder line between Sishen and Saldanha
46. Cairns 132kv substation extension and associated power lines
47. Pimlico 132kv substation extension and associated power lines
48. Gyani 22kV
49. Matafin 132kV
50. Nkomazi_Fig Tree 132kV
51. Pebble Rock 132kV
52. Reddersburg 132kV
53. Thaba Combine 132kV
54. Nkomati 132kV
55. Louis Trichardt – Musina 132kV
56. Endicot 44kV
57. Apollo Lepini 400kV
58. Tarlton-Spring Farms 132kV
59. Kuschke 132kV substation
60. Bendstore 66kV Substation and associated lines
61. Kuiseb 400kV (Namibia)

62. Gyani-Malamulele 132kV
63. Watershed 132kV
64. Bakone 132kV substation
65. Eerstegoud 132kV LILO lines
66. Kumba Iron Ore: SWEP - Relocation of Infrastructure
67. Kudu Gas Power Station: Associated power lines
68. Steenberg Booysendal 132kV
69. Toulon Pumps 33kV
70. Thabatshipi 132kV
71. Witkop-Silica 132kV
72. Bakubung 132kV
73. Nelsriver 132kV
74. Rethabiseng 132kV
75. Tilburg 132kV
76. GaKgapane 66kV
77. Knobel Gilead 132kV
78. Bochum Knobel 132kV
79. Madibeng 132kV
80. Witbank Railway Line and associated infrastructure
81. Spencer NDP phase 2 (5 lines)
82. Akanani 132kV
83. Hermes-Dominion Reefs 132kV
84. Cape Pensinsula Strengthening Project 400kV
85. Magalakwena 132kV
86. Benficosa 132kV
87. Dithabaneng 132kV
88. Taunus Diepkloof 132kV
89. Taunus Doornkop 132kV
90. Tweedracht 132kV
91. Jane Furse 132kV
92. Majeje Sub 132kV
93. Tabor Louis Trichardt 132kV
94. Riversong 88kV
95. Mamatsekele 132kV
96. Kabokweni 132kV
97. MDPP 400kV Botswana
98. Marble Hall NDP 132kV
99. Bokmakiere 132kV Substation and LILO lines
100. Styldrift 132kV
101. Taunus – Diepkloof 132kV
102. Bighorn NDP 132kV
103. Waterkloof 88kV
104. Camden – Theta 765kV
105. Dhuva – Minerva 400kV Diversion
106. Lesedi –Grootpan 132kV
107. Waterberg NDP
108. Bulgerivier – Dorset 132kV
109. Bulgerivier – Toulon 132kV
110. Nokeng-Fluorspar 132kV
111. Mantsole 132kV
112. Tshilamba 132kV
113. Thabamoopo - Tshebela – Nhlovuko 132kV
114. Arthurseat 132kV
115. Borutho 132kV MTS
116. Volspruit - Potgietersrus 132kV
117. Neotel Optic Fibre Cable Installation Project: Western Cape
118. Matla-Glockner 400kV
119. Delmas North 44kV
120. Houwhoek 11kV Refurbishment
121. Clau-Clau 132kV
122. Ngwedi-Silwerkrans 134kV
123. Nieuwehoop 400kV walk-through
124. Booysendal 132kV Switching Station
125. Tarlton 132kV
126. Medupi - Witkop 400kV walk-through
127. Germiston Industries Substation
128. Sekgame 132kV

129. Botswana – South Africa 400kV Transfrontier Interconnector
130. Syferkuil – Rampheri 132kV
131. Queens Substation and associated 132kV powerlines
132. Oranjemond 400kV Transmission line
133. Aries – Helios – Juno walk-down
134. Kuruman Phase 1 and 2 Wind Energy facilities 132kV Grid connection
135. Transnet Thaba 132kV

Bird Impact Assessment Studies for the following residential and industrial developments:

1. Lizard Point Golf Estate
2. Lever Creek Estates
3. Leloko Lifestyle Estates
4. Vaaloewers Residential Development
5. Clearwater Estates Grass Owl Impact Study
6. Somerset Ext. Grass Owl Study
7. Proposed Three Diamonds Trading Mining Project (Portion 9 and 15 of the Farm Blesbokfontein)
8. N17 Section: Springs To Leandra –"Borrow Pit 12 And Access Road On (Section 9, 6 And 28 Of The Farm Winterhoek 314 Ir)
9. South African Police Services Gauteng Radio Communication System: Portion 136 Of The Farm 528 Jq, Lindley.
10. Report for the proposed upgrade and extension of the Zeekoegat Wastewater Treatment Works, Gauteng.
11. Bird Impact Assessment for Portion 265 (a portion of Portion 163) of the farm Rietfontein 189-JR, Gauteng.
12. Bird Impact Assessment Study for Portions 54 and 55 of the Farm Zwartkop 525 JQ, Gauteng.
13. Bird Impact Assessment Study Portions 8 and 36 of the Farm Nooitgedacht 534 JQ, Gauteng.
14. Shumba's Rest Bird Impact Assessment Study
15. Randfontein Golf Estate Bird Impact Assessment Study
16. Zilkaatsnek Wildlife Estate
17. Regenstein Communications Tower (Namibia)
18. Avifaunal Input into Richards Bay Comparative Risk Assessment Study
19. Maquasa West Open Cast Coal Mine
20. Glen Erasmia Residential Development, Kempton Park, Gauteng
21. Bird Impact Assessment Study, Weltevreden Mine, Mpumalanga
22. Bird Impact Assessment Study, Olifantsvlei Cemetery, Johannesburg
23. Camden Ash Disposal Facility, Mpumalanga
24. Lindley Estate, Lanseria, Gauteng
25. Proposed open cast iron ore mine on the farm Lylyveld 545, Northern Cape
26. Avifaunal monitoring for the Sishen Mine in the Northern Cape as part of the EMPr requirements
27. Steelpoort CNC Bird Impact Assessment Study

Professional affiliations

I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.

Curriculum vitae: Albert Froneman

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	MSc (Conservation Biology)
Nationality	:	South African
Years of experience	:	24 years

Key Qualifications

Albert Froneman (*Pr.Sci.Nat*) has more than 22 years' experience in the management of avifaunal interactions with industrial infrastructure. He holds a M.Sc. degree in Conservation Biology from the University of Cape Town. He managed the Airports Company South Africa (ACSA) – Endangered Wildlife Trust Strategic Partnership from 1999 to 2008 which has been internationally recognized for its achievements in addressing airport wildlife hazards in an environmentally sensitive manner at ACSA's airports across South Africa. Albert is recognized worldwide as an expert in the field of bird hazard management on airports and has worked in South Africa, Swaziland, Botswana, Namibia, Kenya, Israel, and the USA. He has served as the vice chairman of the International Bird Strike Committee and has presented various papers at international conferences and workshops. At present he is consulting to ACSA with wildlife hazard management on all their airports. He also an accomplished specialist ornithological consultant outside the aviation industry and has completed a wide range of bird impact assessment studies. He has co-authored many avifaunal specialist studies and pre-construction monitoring reports for proposed renewable energy developments across South Africa. He also has vast experience in using Geographic Information Systems to analyse and interpret avifaunal data spatially and derive meaningful conclusions. Since 2009 Albert has been a registered Professional Natural Scientist (reg. nr 400177/09) with The South African Council for Natural Scientific Professions, specialising in Zoological Science.

Key Project Experience

Renewable Energy Facilities – avifaunal monitoring projects in association with Chris van Rooyen Consulting:

1. Jeffrey's Bay Wind Farm – 12-months preconstruction avifaunal monitoring project
2. Oysterbay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
3. Ubuntu Wind Energy Project near Jeffrey's Bay – 12-months preconstruction avifaunal monitoring project
4. Bana-ba-Pifu Wind Energy Project near Humansdorp – 12-months preconstruction avifaunal monitoring project
5. Excelsior Wind Energy Project near Caledon – 12-months preconstruction avifaunal monitoring project
6. Laingsburg Spitskopvlakte Wind Energy Project – 12-months preconstruction avifaunal monitoring project
7. Loeriesfontein Wind Energy Project Phase 1, 2 & 3 – 12-months preconstruction avifaunal monitoring project
8. Noupoort Wind Energy Project – 12-months preconstruction avifaunal monitoring project
9. Vleesbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
10. Port Nolloth Wind Energy Project – 12-months preconstruction avifaunal monitoring project
11. Langhoogte Caledon Wind Energy Project – 12-months preconstruction avifaunal monitoring project
12. Lunsklip – Stilbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
13. Indwe Wind Energy Project – 12-months preconstruction avifaunal monitoring project
14. Zeeland St Helena bay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
15. Wolseley Wind Energy Project – 12-months preconstruction avifaunal monitoring project
16. Renosterberg Wind Energy Project – 12-months preconstruction avifaunal monitoring project
17. De Aar – North (Mulilo) Wind Energy Project – 12-months preconstruction avifaunal monitoring project (2014)
18. De Aar – South (Mulilo) Wind Energy Project – 12-months bird monitoring
19. Namies – Aggenys Wind Energy Project – 12-months bird monitoring
20. Pofadder - Wind Energy Project – 12-months bird monitoring
21. Dwarsrug Loeriesfontein - Wind Energy Project – 12-months bird monitoring
22. Waaihoek – Utrecht Wind Energy Project – 12-months bird monitoring
23. Amathole – Butterworth Wind Energy Project – 12-months bird monitoring & EIA specialist study
24. De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
25. Makambako Wind Energy Faclity (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
26. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)

27. Aletta Wind Energy Facility 12-month bird monitoring (Biotherm)
28. Maralla Wind Energy Facility 12-month bird monitoring (Biotherm)
29. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
30. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
31. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
32. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
33. KurumanWind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
34. Mañhica Wind Energy Facility 12-month bird monitoring & EIA specialist study (Windlab)
35. Klipheuwel-Dassiefontein Wind Energy Facility, Caledon, Western Cape – Operational phase bird monitoring – Year 5 (Klipheuwel-Dassiefontein Wind Energy Facility)
36. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
37. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre- construction monitoring (ABO). Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
38. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
39. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
40. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
41. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
42. Mainstream Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
43. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
44. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
45. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
46. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
47. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
48. Kappa Solar PV facility, Touwsrivier, Western Cape, pre-construction monitoring (Veroniva)
49. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
50. Pofadder Wind Energy Facility, Northren Cape, Screening Report (AtlanticEnergy)
51. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
52. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
53. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).
54. Iphiko Wind Energy facilities, Laingsburg, Western Cape, screening and pre-construction monitoring (G7 Energies)
55. Kangnas Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
56. Perdekraal East Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
57. Aberdeen 1, 2 & Aberdeen Kudu (3&4) Wind Energy Facilities, Eastern Cape, 12- month pre-construction monitoring (Atlantic Renewable Energy Partners)
58. Loxton / Beaufort West Wind Energy Facilities, Northern Cape, 12-month pre-construction monitoring (Genesis Eco-Energy Developments)
59. Ermelo & Volksrust Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
60. Aardvark Solar PV facility, Copperton, Northern Cape, 12-month pre-construction monitoring (ABO)
61. Bestwood Solar PV facility, Kathu, Northern Cape, pre-construction monitoring (AMDA)
62. Boundary Solar PV facility, Kimberley, Northern Cape, Site sensitivity verification(Atlantic Renewable Energy Partners)
63. Excelsior Wind Energy Facility, Swellendam, Western Cape, Operational Phase 2 years avifaunal monitoring & implementation of Shut Down on Demand (SDOD) pro-active mitigation strategy (Biotherm)
64. De Aar cluster Solar PV facilities, De Aar, Western Cape, Site sensitivity verification (Atlantic Renewable Energy Partners)
65. Rinkhals Solar PV facilities, Kimberley, Northern Cape, Pre-construction monitoring (ABO)
66. Kolkies Sadawa Solar PV facilities, Touwsrivier, Western Cape, pre-construction monitoring (Mainstream)
67. Leeudoringstad Solar PV facilities, Leeudoringstad, North West, Pre-construction monitoring (Upgrade Energy)
68. Noupoort Umsobomvu Solar PV facilities, Noupoort, Northern Cape, Pre-construction monitoring (EDF Renewables)

69. Oya Solar PV facilities, Matjiesfontein, Western Cape, pre-construction monitoring (G7 Energies)
70. Scafell Solar PV facilities, Sasolburg, Free state, pre-construction monitoring (Mainstream)
71. Vrede & Rondawel Solar PV facilities, Kroonstad, Free state, pre-construction monitoring (Mainstream)
72. Gunstfontein Wind Energy Facilities, Sutherland, Northern Cape, additional pre-construction monitoring (ACED)
73. Ezelsjacht Wind Energy Facility, De Doorns, Western Cape, pre-construction monitoring (Mainstream)
74. Klipkraal Wind Energy Facility, Fraserburg, Northern Cape, avifaunal screening (Klipkraal WEF)
75. Pofadder Wind Energy Facility, Pofadder, Northern Cape, pre-construction monitoring (Atlantic Renewable Energy Partners)

Bird Impact Assessment studies and / or GIS analysis:

1. Aviation Bird Hazard Assessment Study for the proposed Madiba Bay Leisure Park adjacent to Port Elizabeth Airport.
2. Extension of Runway and Provision of Parallel Taxiway at Sir Seretse Khama Airport, Botswana Bird / Wildlife Hazard Management Specialist Study
3. Maun Airport Improvements Bird / Wildlife Hazard Management Specialist Study
4. Bird Impact Assesment Study - Bird Helicopter Interaction – The Bitou River, Western Cape Province South Africa
5. Proposed La Mercy Airport – Bird Aircraft interaction specialists study using bird detection radar to assess swallow flocking behaviour
6. KwaZulu Natal Power Line Vulture Mitigation Project – GIS analysis
7. Perseus-Zeus Powerline EIA – GIS Analysis
8. Southern Region Pro-active GIS Blue Crane Collision Project.
9. Specialist advisor ~ Implementation of a bird detection radar system and development of an airport wildlife hazard management and operational environmental management plan for the King Shaka International Airport
10. Matsapha International Airport – bird hazard assessment study with management recommendations
11. Evaluation of aviation bird strike risk at candidate solid waste disposal sites in the Ekurhuleni Metropolitan Municipality
12. Gateway Airport Authority Limited – Gateway International Airport, Polokwane: Bird hazard assessment; Compile a bird hazard management plan for the airport
13. Bird Specialist Study - Evaluation of aviation bird strike risk at the Mwakirunge Landfill site near Mombasa Kenya
14. Bird Impact Assessment Study - Proposed Weltevreden Open Cast Coal Mine Belfast, Mpumalanga
15. Avian biodiversity assessment for the Mafube Colliery Coal mine near Middelburg Mpumalanga
16. Avifaunal Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
17. Avifaunal Impact Assessment Study (with specific reference to African Grass Owls and other Red List species) Stone Rivers Arch
18. Airport bird and wildlife hazard management plan and training to Swaziland Civil Aviation Authority (SWACAA) for Matsapha and Sikhupe International Airports
19. Bird Impact Assessment Study - Proposed 60 year Ash Disposal Facility near to the Kusile Power Station
20. Avifaunal pre-feasibility assessment for the proposed Montrose dam, Mpumalanga
21. Bird Impact Assessment Study – Proposed ESKOM Phantom Substation near Knysna, Western Cape
22. Habitat sensitivity map for Denham’s Bustard, Blue Crane and White-bellied Korhaan in the Kouga Municipal area of the Eastern Cape Province
23. Swaziland Civil Aviation Authority – Sikhuphe International Airport – Bird hazard management assessment
24. Avifaunal monitoring – extension of Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
25. Avifaunal Specialist Study – Meerkat Hydro Electric Dam – Hope Town, Northern Cape
26. The Stewards Pan Reclamation Project – Bird Impact Assessment study
27. Airports Company South Africa – Avifaunal Specialist Consultant – Airport Bird and Wildlife Hazard Mitigation
28. Strategic Environmental Assessment For Gas Pipeline Development, CSIR
29. Avifaunal Specialist Assessment - Proposed monopole telecommunications mast –

Roodekrans, Roodepoort, Gauteng (Enviroworks)

30. Gromis-Nama-Aggeneis 400kv Ipp Integration: Environmental Screening - Avifaunal Specialist Desktop Study
31. Melkspruit - Rouxville 132kV Distribution Line - Avifaunal Amendment and Walk-through Report
32. Gamma - Kappa 2nd 765kV transmission line – Avifaunal impact assessment GIS analysis

Geographic Information System analysis & maps

1. ESKOM Power line Makgalakwena EIA – GIS specialist & map production
2. ESKOM Power line Benficosa EIA – GIS specialist & map production
3. ESKOM Power line Riversong EIA – GIS specialist & map production
4. ESKOM Power line Waterberg NDP EIA – GIS specialist & map production
5. ESKOM Power line Bulge Toulon EIA – GIS specialist & map production
6. ESKOM Power line Bulge DORSET EIA – GIS specialist & map production
7. ESKOM Power lines Marblehall EIA – GIS specialist & map production
8. ESKOM Power line Grootpan Lesedi EIA – GIS specialist & map production
9. ESKOM Power line Tanga EIA – GIS specialist & map production
10. ESKOM Power line Bokmakierie EIA – GIS specialist & map production
11. ESKOM Power line Rietfontein EIA – GIS specialist & map production
12. Power line Anglo Coal EIA – GIS specialist & map production
13. ESKOM Power line Camcoll Jericho EIA – GIS specialist & map production
14. Hartbeespoort Residential Development – GIS specialist & map production
15. ESKOM Power line Mantsole EIA – GIS specialist & map production
16. ESKOM Power line Nokeng Flourspar EIA – GIS specialist & map production
17. ESKOM Power line Greenview EIA – GIS specialist & map production
18. Derdepoort Residential Development – GIS specialist & map production
19. ESKOM Power line Boynton EIA – GIS specialist & map production
20. ESKOM Power line United EIA – GIS specialist & map production
21. ESKOM Power line Gutshwa & Malelane EIA – GIS specialist & map production
22. ESKOM Power line Origstad EIA – GIS specialist & map production
23. Zilkaatsnek Development Public Participation –map production
24. Belfast – Paarde Power line - GIS specialist & map production
25. Solar Park Solar Park Integration Project Bird Impact Assessment Study – avifaunal GIS analysis.
26. Kappa-Omega-Aurora 765kV Bird Impact Assessment Report – Avifaunal GIS analysis.
27. Gamma – Kappa 2nd 765kV – Bird Impact Assessment Report – Avifaunal GIS analysis.
28. ESKOM Power line Kudu-Dorstfontein Amendment EIA – GIS specialist & map production.
29. ProposedHeilbron filling station EIA – GIS specialist & map production
30. ESKOM Lebatlhane EIA – GIS specialist & map production
31. ESKOM Pienaars River CNC EIA – GIS specialist & map production
32. ESKOM Lemara Phiring Ohrigstad EIA – GIS specialist & map production
33. ESKOM Pelly-Warmbad EIA – GIS specialist & map production
34. ESKOM Rosco-Bracken EIA –GIS specialist & map production
35. ESKOM Ermelo-Uitkoms EIA – GIS specialist & map production
36. ESKOM Wisani bridge EIA – GIS specialist & map production
37. City of Tswane – New bulkfeeder pipeline projects x3Map production
38. ESKOM Lebohang Substation and 132kV Distribution Power Line Project Amendment GIS specialist & map production
39. ESKOM Geluk Rural Powerline GIS & Mapping
40. Eskom Kimberley Strengthening Phase 4 Project GIS & Mapping
41. ESKOM Kwaggafontein - Amandla Amendment Project GIS & Mapping
42. ESKOM Lephalale CNC – GIS Specialist & Mapping
43. ESKOM Marken CNC – GIS Specialist & Mapping
44. ESKOM Lethabong substation and powerlines – GIS Specialist & Mapping
45. ESKOM Magopela- Pitsong 132kV line and new substation – GIS Specialist & Mapping
46. Vlakfontein Filling Station – GIS Specialist & Mapping - EIA
47. Prieska – Hoekplaas Solar PV & BESS - GIS Specialist & Mapping – EIA
48. Mulilo Total Hydra Storage (MTHS) De Aar - GIS Specialist & Mapping – EIA
49. Merensky Uchoba Powerline, Steelpoort - GIS Specialist & Mapping – EIA
50. Douglas Solar Part 2 Amendment – grid connection - GIS Specialist & Mapping – EIA

Professional affiliations

- South African Council for Natural Scientific Professions (SACNASP) registered Professional Natural Scientist (reg. nr 400177/09) – specialist field: Zoological Science. Registered since 2009.

- Southern African Wildlife Management Association - Member
- Zoological Society of South Africa - Member

Appendix B - Specialist Statement of Independence

I, Chris van Rooyen, 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: Chris van Rooyen Consulting
Date: 30 June 2022

I, Albert Froneman, 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: Chris van Rooyen Consulting
Date: 30 June 2022

Appendix C: Site Sensitivity Verification

Prior to commencing with the specialist assessment in accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

The details of the site sensitivity verification are noted below:

Date of Site Visit	▪ 18 March 2019 And 5 - 10 May 2020 ▪ 17 – 26 July and 6-8 August 2019 ▪ 12 - 28 September 2019 ▪ 16 – 20 January 2020 and 3 – 4 March 2020 ▪ 05 October and 08 November 2021
Supervising Specialist Name	Albert Froneman
Professional Registration Number	400177/09
Specialist Affiliation / Company	Chris van Rooyen Consulting

1 METHODOLOGY

- The Project Area of Impact (PAOI) was defined as a 2km zone around the proposed Kwagga WEF 1 – 3 grid connection.
- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'' × 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a broader area of 21 pentads, some of which intersect and others that are near the study area. The decision to include multiple pentads around the study area was influenced by the fact that some of the pentads within which the proposed development is located have few completed full protocol surveys. The additional pentads and their data augment the bird distribution data. The 21 pentad grid cells are the following: 3250_2230, 3250_2235, 3250_2240, 3250_2250, 3255_2230, 3255_2235, 3255_2240, 3255_2245, 3255_2250, 3300_2230, 3300_2235, 3300_2240, 3300_2245, 3300_2250. A total of 57 full protocol lists (i.e., surveys lasting a minimum of two hours each) have been completed for this area. In addition, 183 ad hoc protocol lists (i.e., surveys lasting less than two hours but still yielding valuable data) have been completed. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area and is supplemented with data collected at the proposed Kwagga WEF 1 – 3, the proposed Trakas and Beaufort West WEFs, and general familiarity with the avifauna of the Nama Karoo.
- A classification of the vegetation types in the PAOI was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006).
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015), and the latest authoritative summary of southern African bird biology (Hockey et al. 2005).
- The global threatened status of all priority species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick et al. 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.

- The Department of Forest Fisheries and Environment National Screening Tool was used to determine the assigned avian sensitivity of the PAOI (June, 2022).

2 RESULTS

The PAOI is located in Gamka Karoo, which is one of most arid vegetation units of the Nama Karoo biome. It consists of undulating plains covered with dwarf spiny shrubland dominated by Karoo dwarf shrubs, with sparse low trees. Dense stands of drought-resistant grasses cover broad sandy bottomlands, but only after abundant rains, which happens seldom (Mucina & Rutherford 2006). The development areas contain many ephemeral drainage lines which are characterised by sandy channels with *Vachellia karoo* shrubs and small trees growing on the edges. This region is in the rain shadow of the Cape Fold Belt mountains in the south, with mean annual precipitation ranging from 100 – 240 mm, mostly between December and April. Mean maximum and minimum monthly temperatures in Beaufort West are 38.7˚C and -3.2˚C for January (summer) and July (winter) respectively (Mucina & Rutherford 2006). Strong north-westerly winds occur in winter (Mucina & Rutherford 2006). The only longer-term surface water in the PAOI consists of a couple of earth dams and many boreholes with water troughs. Drainage lines flow only briefly after good rains. The only large trees that are found in the PAOI are exotics, mostly Eucalyptus, which are located at homesteads. The land is used mostly for sheep and game farming. The Droërivier - Proteus 400kV high voltage line bisects the extreme west of the PAOI, parallel to the N12 national road.

The following avifaunal-relevant anthropogenic habitat modifications were recorded within the PAOI:

- **Water points:** The land use in the PAOI is mostly small stock farming. The entire area is divided into grazing camps, with associated boreholes and drinking troughs. In this arid environment, open water is a big draw card for birds which use the open water troughs to bath and drink.
- **Dams:** The PAOI contains a few ground dams located in drainage lines. When these dams fill up after good rains, they contain standing surface water for several months, which attracts birds to bath and drink.
- **Transmission lines:** The Droërivier - Proteus 400kV high voltage line bisects the extreme west of the PAOI, parallel to the N12 national road. A Martial Eagle nest is present on Tower 162 .The nest is located approximately 12.5km from the Beaufort West 132kV – 400kV Linking Station.

See Figures 1 – 4 for examples of the habitat features in the PAOI.


Figure 1: Karoo shrubland


Figure 2: A borehole and water trough


Figure 3: A ground dam

Figure 4: The Droërivier - Proteus 400kV high voltage line

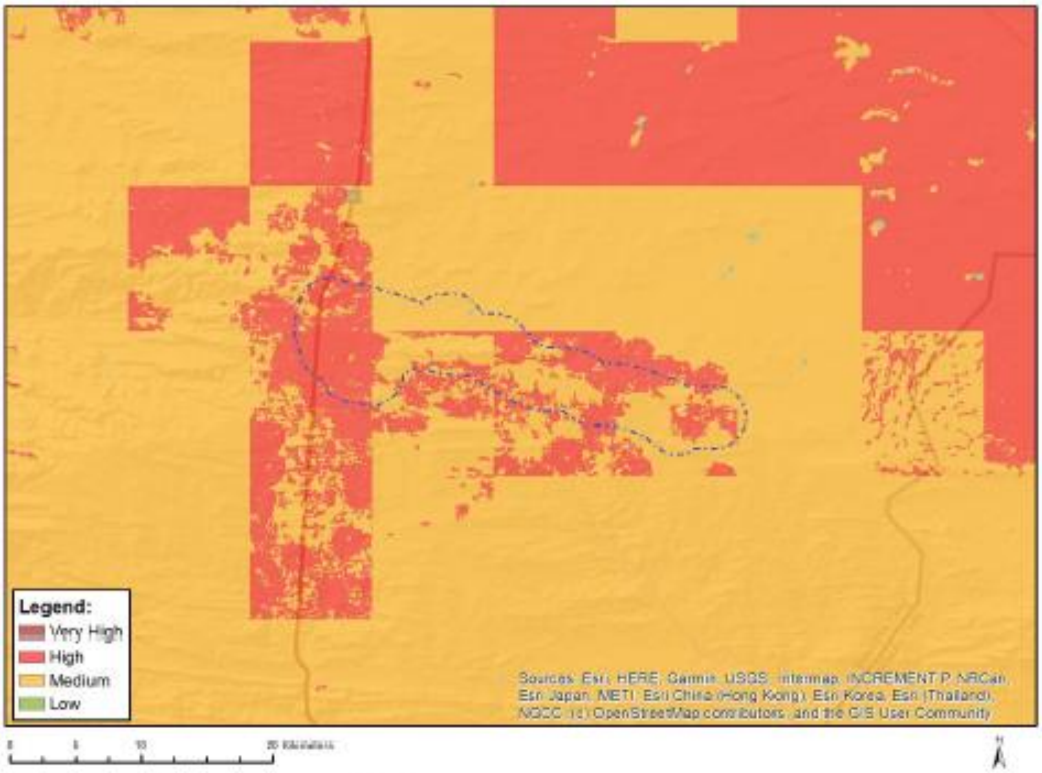
3 CONCLUSION

The PAOI is classified as Medium to High sensitivity for avifauna, according to the DFFE online screening tool (see Figure 5). The High classification is linked to the potential occurrence of species of conservation concern (SCC) Ludwig's Bustard (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Vulnerable), Black Harrier (Globally and Regionally Endangered), Southern Black Korhaan (Globally and Regionally Vulnerable) and Verreaux's Eagle (Regionally Vulnerable). The medium classification is linked to Ludwig's Bustard, Southern Black Korhaan and Verreaux's Eagle.

The PAOI, which contains all the development sites with the same homogeneous habitat, contains confirmed habitat for species of conservation concern (SCC), as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). The occurrence of SCC was confirmed during the surveys conducted in 2019-2020 and in 2021 in the PAOI and immediate adjacent area in similar habitat i.e. Ludwig's Bustard, Black Harrier, Blue Crane (Globally Vulnerable and Regionally Near-threatened), Karoo Korhaan (Regionally Near-threatened), Kori Bustard (Globally and Regionally Near-threatened), Lanner Falcon (Regionally Vulnerable), Martial Eagle and Verreaux's Eagle were recorded.

A classification of High sensitivity is assessed to be accurate as far as the impact of the proposed powerline and associated infrastructure is concerned, based on actual conditions recorded on the ground during the site visits in October 2021, and the 12-months of pre-construction monitoring in 2019 - 2020.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis ludwigii
High	Aves-Polemaetus bellicosus
High	Aves-Circus maurus
High	Aves-Afrotis afra
High	Aves-Aquila verreauxii
Low	Subject to confirmation
Medium	Aves-Neotis ludwigii
Medium	Aves-Afrotis afra
Medium	Aves-Aquila verreauxii

Figure 5: The results of the DFFE screening tool for the PAOI. The High classification is linked to the potential occurrence of species of conservation concern (SCC) Ludwig's Bustard (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Vulnerable), Black Harrier (Globally and Regionally Endangered), Southern Black Korhaan (Globally and Regionally Vulnerable) and Verreaux's Eagle (Regionally Vulnerable). The medium classification is linked to Ludwig's Bustard, Southern Black Korhaan and Verreaux's Eagle.

Appendix D: Impact Assessment Methodology

The impact assessment includes:

- the nature, significance and consequences of the impact and risk;
- the extent and duration of the impact and risk;
- the probability of the impact and risk occurring;
- the degree to which impacts and risks can be mitigated;
- the degree to which the impacts and risks can be reversed; and
- the degree to which the impacts and risks can cause loss of irreplaceable resources.

As per the DEFFT Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect and cumulative:

- 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 as a result 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 as a result of the activity.
- Cumulative impacts are impacts 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 a period of time and can include both direct and indirect impacts.

The impact assessment methodology includes the following aspects:

- Nature of impact/risk - The type of effect that a proposed activity will have on the environment.

- Status - Whether the impact/risk on the overall environment will be:
    - Positive - environment overall will benefit from the impact/risk;
    - Negative - environment overall will be adversely affected by the impact/risk; or
    - Neutral - environment overall not be affected.

- Spatial extent – The size of the area that will be affected by the impact/risk:
    - Site specific;
    - Local (<10 km from site);
    - Regional (<100 km of site);
    - National; or
    - International (e.g. Greenhouse Gas emissions or migrant birds).

- Duration – The timeframe during which the impact/risk will be experienced:
    - Very short term (instantaneous);
    - Short term (less than 1 year);
    - Medium term (1 to 10 years);
    - Long term (the impact will cease after the operational life of the activity (i.e. the impact or risk will occur for the project duration)); or
    - Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e. the impact will occur beyond the project decommissioning)).

- Consequence – The anticipated consequence of the risk/impact:
    - Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
    - Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
    - Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);

- *Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or*
  - *Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).*

- *Reversibility of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High reversibility of impacts (impact is highly reversible at end of project life i.e. this is the most favourable assessment for the environment);*
  - *Moderate reversibility of impacts;*
  - *Low reversibility of impacts; or*
  - *Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment).*

- *Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment);*
  - *Moderate irreplaceability of resources;*
  - *Low irreplaceability of resources; or*
  - *Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).*

Using the criteria above, the impacts have been further assessed in terms of the following:

- *Probability – The probability of the impact/risk occurring:*
  - *Extremely unlikely (little to no chance of occurring);*
  - *Very unlikely (<30% chance of occurring);*
  - *Unlikely (30-50% chance of occurring)*
  - *Likely (51 – 90% chance of occurring); or*
  - *Very Likely (>90% chance of occurring regardless of prevention measures).*

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 1).

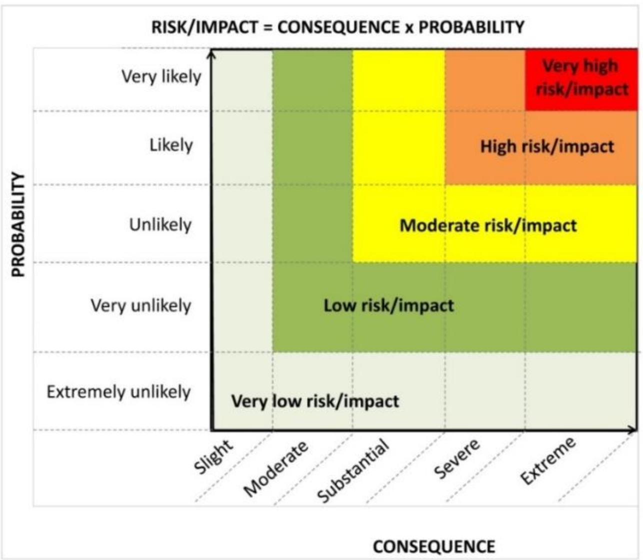


Figure 1. Guide to assessing risk/impact significance as a result of consequence and probability.

- *Significance – Will the impact cause a notable alteration of the environment?*

- *Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
- *Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
- *Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);*
- *High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and*
- *Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).*

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- *Very low = 5;*
- *Low = 4;*
- *Moderate = 3;*
- *High = 2; and*
- *Very high = 1.*

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:
- *Low;*
- *Medium; or*
- *High.*

Appendix E: Compliance with the Appendix 6 of the 2014 EIA Regulations (as amended)

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
1. (1) A specialist report prepared in terms of these Regulations must contain - a) details of - i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	*Appendix A and B*
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	*Appendix B*
c) an indication of the scope of, and the purpose for which, the report was prepared;	*Section 1*
(cA) an indication of the quality and age of base data used for the specialist report;	*Section 2 Appendix C*
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	*Sections 6 and 7*
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	*Section 2 Appendix C*
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	*Section 2*
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	*Section 2*
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 2*
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	*Sections 7 and 8*
k) any mitigation measures for inclusion in the EMPr;	*Section 9*
l) any conditions for inclusion in the environmental authorisation;	*Section 9*
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	*Section 9*
n) a reasoned opinion- i. 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, and where applicable, the closure plan;	*Section 10*
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	*N/A*
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	*N/A*
q) any other information requested by the competent authority.	

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
(2) Where a government notice 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.	*Sections 2 and 6* *Appendix C*

Appendix F: SABAP2 species list for the broader area

Species name	Scientific name	Full protocol	Ad hoc protocol	Global status	Regional status	Endemic (SA)	Powerline sensitive species	Recorded during surveys
Acacia Pied Barbet	*Tricholaema leucomelas*	66.67	19.67	-	-			x
African Black Swift	*Apus barbatus*	10.53	1.09	-	-			x
African Hoopoe	*Upupa africana*	8.77	1.64	-	-			x
African Pipit	*Anthus cinnamomeus*	19.30	5.46	-	-			x
African Red-eyed Bulbul	*Pycnonotus nigricans*	35.09	6.01	-	-			x
African Reed Warbler	*Acrocephalus baeticatus*	7.02	0.55	-	-			
African Sacred Ibis	*Threskiornis aethiopicus*	5.26	0.00	-	-		x	
African Spoonbill	*Platalea alba*	5.26	1.64	-	-		x	
Alpine Swift	*Tachymarptis melba*	5.26	0.55	-	-			x
Amur Falcon	*Falco amurensis*	0.00	0.55	-	-		x	
Ant-eating Chat	*Myrmecocichla formicivora*	7.02	2.19	-	-			x
Barn Swallow	*Hirundo rustica*	35.09	5.46	-	-			x
Bar-throated Apalis	*Apalis thoracica*	1.75	0.00	-	-			
Black Harrier	*Circus maurus*	1.75	0.55	EN	EN	x	x	x
Black-eared Sparrow-Lark	*Eremopterix australis*	8.77	1.64	-	-	x		x
Black-headed Canary	*Serinus alario*	5.26	3.83	-	-	x		x
Black-headed Heron	*Ardea melanocephala*	5.26	0.00	-	-		x	
Black-necked Grebe	*Podiceps nigricollis*	1.75	0.00	-	-		x	
Blacksmith Lapwing	*Vanellus armatus*	19.30	4.37	-	-			x
Black-throated Canary	*Crithagra atrogularis*	10.53	1.09	-	-			x
Black-winged Kite	*Elanus caeruleus*	0.00	0.55	-	-		x	
Black-winged Stilt	*Himantopus himantopus*	7.02	1.64	-	-			
Blue Crane	*Grus paradisea*	7.02	1.09	VU	NT		x	x
Bokmakierie	*Telophorus zeylonus*	22.81	5.46	-	-			x
Booted Eagle	*Hieraaetus pennatus*	7.02	1.09	-	-		x	x
Brown-hooded Kingfisher	*Halcyon albiventris*	1.75	0.00	-	-			
Brown-throated Martin	*Riparia paludicola*	1.75	1.09	-	-			x
Cape Bulbul	*Pycnonotus capensis*	5.26	0.00	-	-	x		
Cape Bunting	*Emberiza capensis*	42.11	12.57	-	-			x
Cape Crow	*Corvus capensis*	52.63	33.88	-	-		x	x
Cape Penduline Tit	*Anthoscopus minutus*	7.02	2.73	-	-			x
Cape Robin-Chat	*Cossypha caffra*	22.81	4.37	-	-			x
Cape Shoveler	*Spatula smithii*	1.75	0.00	-	-		x	
Cape Sparrow	*Passer melanurus*	78.95	24.59	-	-			x
Cape Teal	*Anas capensis*	1.75	0.55	-	-		x	
Cape Turtle Dove	*Streptopelia capicola*	56.14	16.39	-	-			x
Cape Wagtail	*Motacilla capensis*	45.61	5.46	-	-			x
Cape Weaver	*Ploceus capensis*	3.51	0.00	-	-	x		
Cape White-eye	*Zosterops virens*	19.30	1.09	-	-	x		x
Capped Wheatear	*Oenanthe pileata*	10.53	1.09	-	-			
Cardinal Woodpecker	*Dendropicos fuscescens*	8.77	1.64	-	-			
Chat Flycatcher	*Melaenornis infuscatus*	35.09	11.48	-	-			x
Chestnut-vented Warbler	*Curruca subcoerulea*	56.14	9.29	-	-			x
Common Buzzard	*Buteo buteo*	1.75	0.00	-	-		x	
Common Greenshank	*Tringa nebularia*	1.75	0.55	-	-			

Species name	Scientific name	Full protocol	Ad hoc protocol	Global status	Regional status	Endemic (SA)	Powerline sensitive species	Recorded during surveys
Common House Martin	*Delichon urbicum*	0.00	0.55	-	-			
Common Ostrich	*Struthio camelus*	0.00	1.09	-	-			
Common Sandpiper	*Actitis hypoleucos*	1.75	0.00	-	-			
Common Scimitarbill	*Rhinopomastus cyanomelas*	3.51	0.00	-	-			x
Common Starling	*Sturnus vulgaris*	3.51	0.00	-	-			
Common Swift	*Apus apus*	3.51	0.55	-	-			x
Common Waxbill	*Estrilda astrild*	12.28	1.09	-	-			
Crowned Hornbill	*Lophoceros alboterminatus*	3.51	0.00	-	-			
Crowned Lapwing	*Vanellus coronatus*	19.30	2.73	-	-			x
Diederik Cuckoo	*Chrysococcyx caprius*	1.75	0.00	-	-			
Double-banded Courser	*Rhinoptilus africanus*	15.79	4.37	-	-			x
Dusky Sunbird	*Cinnyris fuscus*	38.60	6.56	-	-			x
Eastern Clapper Lark	*Mirafra fasciolata*	1.75	0.00	-	-			
Egyptian Goose	*Alopochen aegyptiaca*	43.86	12.02	-	-		x	x
European Bee-eater	*Merops apiaster*	3.51	0.00	-	-			
Fairy Flycatcher	*Stenostira scita*	36.84	8.20	-	-	x		x
Familiar Chat	*Oenanthe familiaris*	36.84	4.37	-	-			x
Fiscal Flycatcher	*Melaenornis silens*	19.30	4.37	-	-	x		x
Fork-tailed Drongo	*Dicrurus adsimilis*	5.26	0.00	-	-			
Gabar Goshawk	*Micronisus gabar*	1.75	0.00	-	-		x	
Giant Kingfisher	*Megaceryle maxima*	1.75	0.00	-	-			
Greater Honeyguide	*Indicator indicator*	1.75	0.00	-	-			
Greater Kestrel	*Falco rupicoloides*	21.05	11.48	-	-		x	x
Greater Striped Swallow	*Cecropis cucullata*	35.09	4.92	-	-			x
Grey Tit	*Melaniparus afer*	19.30	4.37	-	-	x		x
Grey-backed Cisticola	*Cisticola subruficapilla*	17.54	1.64	-	-			x
Grey-backed Sparrow-Lark	*Eremopterix verticalis*	35.09	8.20	-	-			x
Hadada Ibis	*Bostrychia hagedash*	17.54	2.73	-	-		x	x
Helmeted Guineafowl	*Numida meleagris*	14.04	3.28	-	-		x	x
House Sparrow	*Passer domesticus*	29.82	4.92	-	-			x
Jackal Buzzard	*Buteo rufofuscus*	3.51	0.00	-	-	x	x	
Karoo Chat	*Emarginata schlegelii*	80.70	40.98	-	-			x
Karoo Eremomela	*Eremomela gregalis*	15.79	4.92	-	-	x		x
Karoo Korhaan	*Eupodotis vigorsii*	87.72	34.43	-	NT		x	x
Karoo Lark	*Calendulauda albescens*	1.75	0.00	-	-	x		
Karoo Long-billed Lark	*Certhilauda subcoronata*	71.93	31.69	-	-			x
Karoo Prinia	*Prinia maculosa*	49.12	10.38	-	-	x		x
Karoo Scrub Robin	*Cercotrichas coryphoeus*	59.65	14.75	-	-			x
Karoo Thrush	*Turdus smithi*	17.54	2.19	-	-	x		x
Kittlitz's Plover	*Charadrius pecuarius*	8.77	1.09	-	-			x
Kori Bustard	*Ardeotis kori*	5.26	0.00	NT	NT		x	x
Lanner Falcon	*Falco biarmicus*	7.02	0.00	-	VU		x	x
Large-billed Lark	*Galerida magnirostris*	45.61	14.75	-	-	x		x
Lark-like Bunting	*Emberiza impetuani*	63.16	25.14	-	-			x
Laughing Dove	*Spilopelia senegalensis*	38.60	7.65	-	-			x
Layard's Warbler	*Curruca layardi*	10.53	2.19	-	-	x		x

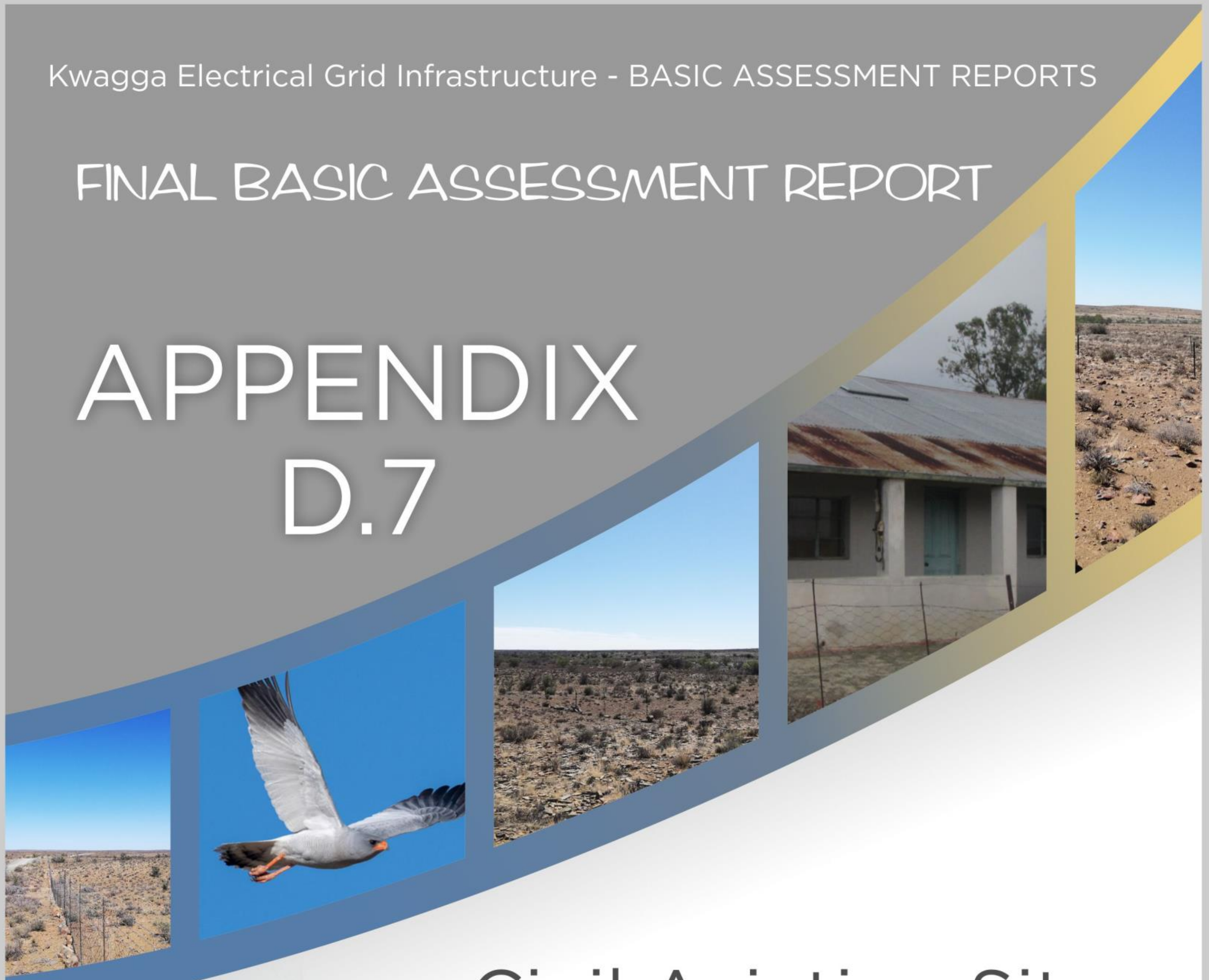
Species name	Scientific name	Full protocol	Ad hoc protocol	Global status	Regional status	Endemic (SA)	Powerline sensitive species	Recorded during surveys
Little Grebe	*Tachybaptus ruficollis*	7.02	1.64	-	-		x	
Little Stint	*Calidris minuta*	0.00	0.55	-	-			
Little Swift	*Apus affinis*	29.82	4.37	-	-			x
Long-billed Crombec	*Sylvietta rufescens*	22.81	1.64	-	-			x
Long-billed Pipit	*Anthus similis*	0.00	1.09	-	-			x
Ludwig's Bustard	*Neotis ludwigii*	8.77	4.92	EN	EN		x	x
Malachite Sunbird	*Nectarinia famosa*	22.81	1.09	-	-			x
Martial Eagle	*Polemaetus bellicosus*	5.26	2.19	EN	EN		x	x
Mountain Wheatear	*Myrmecocichla monticola*	31.58	7.65	-	-			x
Namaqua Dove	*Oena capensis*	38.60	6.56	-	-			x
Namaqua Sandgrouse	*Pterocles namaqua*	28.07	7.10	-	-			x
Namaqua Warbler	*Phragmacia substriata*	5.26	1.64	-	-	x		
Neddicky	*Cisticola fulvicapilla*	1.75	0.00	-	-			
Nicholson's Pipit	*Anthus nicholsoni*	14.04	1.09	-	-			
Pale Chanting Goshawk	*Melierax canorus*	52.63	18.58	-	-		x	x
Pale-winged Starling	*Onychognathus nabouroup*	1.75	0.00	-	-			x
Pearl-breasted Swallow	*Hirundo dimidiata*	5.26	1.09	-	-			x
Pied Avocet	*Recurvirostra avosetta*	10.53	4.92	-	-			
Pied Crow	*Corvus albus*	71.93	32.79	-	-		x	x
Pied Starling	*Lamprotornis bicolor*	31.58	6.56	-	-	x		x
Pin-tailed Whydah	*Vidua macroura*	3.51	0.00	-	-			
Plain-backed Pipit	*Anthus leucophrys*	3.51	1.09	-	-			x
Pririt Batis	*Batis pririt*	28.07	7.65	-	-			x
Red-billed Firefinch	*Lagonosticta senegala*	0.00	0.55	-	-			
Red-billed Quelea	*Quelea quelea*	3.51	1.09	-	-			
Red-billed Teal	*Anas erythrorhyncha*	7.02	1.64	-	-		x	
Red-capped Lark	*Calandrella cinerea*	17.54	6.01	-	-			x
Red-eyed Dove	*Streptopelia semitorquata*	5.26	0.00	-	-			
Red-faced Mousebird	*Urocolius indicus*	36.84	2.73	-	-			x
Red-headed Finch	*Amadina erythrocephala*	8.77	4.92	-	-			x
Red-knobbed Coot	*Fulica cristata*	7.02	0.55	-	-		x	x
Red-winged Starling	*Onychognathus morio*	10.53	1.64	-	-			x
Rock Dove	*Columba livia*	1.75	0.00	-	-			
Rock Kestrel	*Falco rupicolus*	8.77	7.65	-	-		x	x
Rock Martin	*Ptyonoprogne fuligula*	50.88	10.93	-	-			x
Rufous-cheeked Nightjar	*Caprimulgus rufigena*	0.00	0.55	-	-			
Rufous-eared Warbler	*Malcorus pectoralis*	66.67	26.78	-	-			x
Sabota Lark	*Calendulauda sabota*	10.53	0.00	-	-			x
Scaly-feathered Weaver	*Sporopipes squamifrons*	0.00	3.28	-	-			
Secretarybird	*Sagittarius serpentarius*	3.51	0.00	EN	VU		x	

Species name	Scientific name	Full protocol	Ad hoc protocol	Global status	Regional status	Endemic (SA)	Powerline sensitive species	Recorded during surveys
Sickle-winged Chat	*Emarginata sinuata*	5.26	1.09	-	-	x		x
Sombre Greenbul	*Andropadus importunus*	0.00	0.55	-	-			
South African Shelduck	*Tadorna cana*	33.33	6.01	-	-		x	x
Southern Black Korhaan	*Afrotis afra*	0.00	0.55	VU	VU	x	x	
Southern Double-collared Sunbird	*Cinnyris chalybeus*	8.77	0.55	-	-	x		x
Southern Fiscal	*Lanius collaris*	49.12	8.20	-	-			
Southern Grey-headed Sparrow	*Passer diffusus*	10.53	1.09	-	-			x
Southern Masked Weaver	*Ploceus velatus*	38.60	4.37	-	-			x
Southern Red Bishop	*Euplectes orix*	3.51	1.64	-	-			x
Speckled Mousebird	*Colius striatus*	0.00	1.09	-	-			x
Speckled Pigeon	*Columba guinea*	50.88	16.94	-	-			x
Spike-heeled Lark	*Chersomanes albofasciata*	63.16	28.96	-	-			x
Spotted Eagle-Owl	*Bubo africanus*	5.26	0.00	-	-		x	x
Spotted Flycatcher	*Muscicapa striata*	3.51	0.00	-	-			
Spotted Thick-knee	*Burhinus capensis*	5.26	2.19	-	-			x
Three-banded Plover	*Charadrius tricollaris*	36.84	9.84	-	-			x
Tractrac Chat	*Emarginata tractrac*	17.54	2.73	-	-			
Verreaux's Eagle	*Aquila verreauxii*	5.26	2.19	-	VU		x	x
Wattled Starling	*Creatophora cinerea*	1.75	0.55	-	-			
White-backed Mousebird	*Colius colius*	17.54	2.73	-	-			x
White-necked Raven	*Corvus albicollis*	5.26	1.64	-	-		x	x
White-rumped Swift	*Apus caffer*	21.05	1.64	-	-			x
White-throated Canary	*Crithagra albogularis*	59.65	13.66	-	-			x
White-throated Swallow	*Hirundo albigularis*	5.26	1.09	-	-			
Yellow Canary	*Crithagra flaviventris*	49.12	20.22	-	-			x
Yellow-bellied Eremomela	*Eremomela icteropygialis*	50.88	8.20	-	-			x
Yellow-billed Duck	*Anas undulata*	1.75	0.00	-	-		x	
Yellow-billed Kite	*Milvus aegyptius*	0.00	0.55	-	-		x	
Zitting Cisticola	*Cisticola juncidis*	1.75	0.00	-	-			

Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.7



Civil Aviation Site Sensitivity Verification

CIVIL AVIATION SITE SENSITIVITY VERIFICATION

CONTENTS

D. 7 CIVIL AVIATION SITE SENSITIVITY VERIFICATION

D.7.1 Background

This report serves as the Site Sensitivity Verification for the Civil Aviation Theme for the Basic Assessments (BAs) for the proposed construction of seven 132 kV Overhead Transmission Powerlines in support of the proposed authorised Kwagga Wind Energy Facilities i.e., the 279 MW Kwagga Wind Energy Facility 1 (hereinafter referred to as "Kwagga WEF 1"), the 341 MW Kwagga Wind Energy Facility 2 (hereinafter referred to as "Kwagga WEF 2") and the 204.6 MW Kwagga Wind Energy Facility 3 (hereinafter referred to as "Kwagga WEF 3"), near Beaufort West in the Western Cape Province. The National DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072) projects on 7 April 2022.

The construction of the seven proposed 132 kV Overhead Transmission Powerlines that are required to facilitate the connection of the proposed authorised Kwagga WEF 1-3 projects to the national electrical grid network, are being proposed by the Project Applicant, ABO Wind renewable energies (Pty) Ltd. These proposed powerline projects, also referred to as Section 1 to 7 of the proposed Kwagga EGI Corridor ("Kwagga EGI projects"), are located approximately 60 km south of the town of Beaufort West in the Western Cape. The proposed Kwagga EGI projects are the subjects of these seven separate BA Processes, namely:

- Proposed Construction of a 132 kV overhead transmission powerline between the proposed authorised Beaufort West 132 kV-400 kV Linking Station and the proposed Eskom 132 kV Switching Station (i.e., **Kwagga EGI Section 1**) – this powerline facilitates connection of Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3;
- Proposed Construction of a 132 kV overhead transmission powerline between the proposed Eskom 132 kV Switching Station and the Kwagga WEF 1 (i.e., **Kwagga EGI Section 2**) – this powerline facilitates connection of Kwagga WEF 1, as well as Kwagga WEF 2 and Kwagga WEF 3 (where Kwagga WEF 1 on-site substation is used as collector);
- Proposed Construction of a 132 kV overhead transmission powerline between the proposed Eskom 132 kV Switching Station and the Kwagga WEF 2 (i.e., **Kwagga EGI Section 3**) – this powerline facilitates connection of Kwagga WEF 2, as well as Kwagga WEF 3 (where Kwagga WEF 2 on-site substation is used as a collector);
- Proposed Construction of a 132 kV overhead transmission powerline between the proposed Eskom 132 kV Switching Station and the Kwagga WEF 3 (i.e., **Kwagga EGI Section 4**) – this powerline facilitates connection of Kwagga WEF 3;
- Proposed Construction of a 132 kV overhead transmission powerline between Kwagga WEF 1 and Kwagga WEF 2 (i.e., **Kwagga EGI Section 5**) – this powerline facilitates connection of Kwagga WEF 2;
- Proposed Construction of a 132 kV overhead transmission powerline between Kwagga WEF 1 and Kwagga WEF 3 (i.e., **Kwagga EGI Section 6**) – this powerline facilitates connection Kwagga WEF 3; and

- Proposed Construction of a 132 kV overhead transmission powerline between Kwagga WEF 2 and Kwagga WEF 3 (i.e., **Kwagga EGI Section 7**) – this powerline facilitates connection Kwagga WEF 3.

D.7.2 Need for the Site Sensitivity Verification

On 20 March 2020, in Government Gazette 43110, Government Notice (GN) R320, the then Department of Environment, Forestry and Fisheries (now operating as the Department Forestry, Fisheries and the Environment (DFFE)) published procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) when applying for an Environmental Authorisation (EA). GN R320 prescribes general requirements for undertaking Site Sensitivity Verification, as well as protocols for assessment and minimum report content requirements of environmental impacts associated with specified environmental themes for activities requiring EA. GN R320 was enforced within 50 days of publication of the notice i.e. on 9 May 2020.

GN R320 specifically includes a protocol that provides the criteria for the specialist assessment and minimum report content requirements for impacts on civil aviation installations for activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).

This specific protocol states that prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the National Web-Based Environmental Screening Tool (“Screening Tool”) must be confirmed by undertaking a Site Sensitivity Verification according to the requirements specified in this protocol.

Then, based on the outcome of the Site Sensitivity Verification undertaken in terms of this protocol, a proposed development that occur on sites identified as Very High, High or Medium sensitivity, as it relates to Civil Aviation and is depicted on the Screening Tool, must include a Civil Aviation Compliance Statement. It also states that there are no further requirements if the proposed development occur on sites identified and verified as Low sensitivity on the Screening Tool as it relates to Civil Aviation.

Therefore, since the seven proposed Kwagga EGI projects requires an EA in terms of the 2014 NEMA EIA Regulations (as amended), and Civil Aviation was identified as a relevant theme for the Wind Methodology on the Screening Tool, as well as a required study, GN R320 must be complied with.

D.7.3 Methodology

The Site Sensitivity Verification Process and Report has been compiled based on the following methodology:

- Existing spatial databases were used to determine the location of civil aviation installations in relation to the proposed Kwagga EGI Corridor, and to identify preliminary areas of concern in terms of impacts to civil aviation installations;
- The proposed Kwagga EGI Corridor and preliminary powerline route were plotted on the Screening Tool to identify the sensitivity allocated;
- A site visit was undertaken to confirm the current land-use and the environmental sensitivity as it relates to Civil Aviation;
- Additional research was undertaken to substantiate the Site Sensitivity Verification process; and
- A Site Sensitivity Verification Report was compiled (i.e., this report).

The information sources listed in Table D.7-1 were used in the Site Sensitivity Verification process.

Table D.7-1: Information Sources used for the Site Sensitivity Verification process

Data / Information	Source	Date	Type	Description
National Web-Based Environmental Screening Tool (Screening Tool)	Department of Forestry, Fisheries and the Environment (DFFE)	2022	Spatial / Online Assessment	The Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an Application for EA in terms of the 2014 NEMA EIA Regulations (as amended) to screen the proposed site for any environmental sensitivity[1].
Republic of South Africa (RSA) Airspaces in 3D	Air Traffic and Navigation Services SOC Limited (ATNS)	2022	Google Earth KMZ File	The RSA Airspaces in 3D data KMZ file is an initiative undertaken by the ATNS to illustrate the definitions and complexities of airspace, routes, aerodromes and navigational facilities within South Africa to the public in the interest of safety[2].
Airport, Airfields and Obstacle Datasets [Note that this dataset was used in the Visual Impact Assessment undertaken for the proposed project]	Civil Aviation Authority (CAA)	2018	Spatial Vector Dataset	Location of airfields in RSA.
Wind and Solar PV Phase 1 Strategic Environmental Assessment (SEA)	Department of Environmental Affairs (DEA)	2015	Report	SEA commissioned by the DEA [now operating as the DEFF) in 2013 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying eight Renewable Energy Development Zones (REDZs) to focus and incentivize such development (i.e. Phase 1 REDZs SEA: CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B).
Wind and Solar PV Phase 2 SEA	Department of Environment, Forestry and Fisheries (DEFF)	2019	Report	SEA commissioned by the DEFF in 2016 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying three additional REDZs to focus and incentivize such development (i.e. Phase 2 REDZ SEA. CSIR Report Number: CSIR/SPLA/SECO/ER/2019/0085).
Scoping and EIA	Council for Scientific and Industrial Research (CSIR)	2021	Report	Scoping and Environmental Impact Assessment for the proposed development of the 279 MW Kwagga Wind Energy Facility 1 (i.e. Kwagga WEF 1) and associated infrastructure near Beaufort West in the Western Cape. Environmental Impact Assessment Report. CSIR Report Number: CSIR/SPLA/SECO/ER/2021/0033/B
Scoping and EIA	Council for Scientific and Industrial Research (CSIR)	2021	Report	Scoping and Environmental Impact Assessment for the proposed development of the 341 MW Kwagga Wind Energy Facility 2 (i.e. Kwagga WEF 2) with associated infrastructure near Beaufort West in the

[1] https://screening.environment.gov.za/screeningtool/index.html#/pages/welcome
[2] https://www.atns.co.za/rsakmz.php

				Western Cape. CSIR Report Number: CSIR/SPLA/SECO/ER/2021/0034/B
Scoping and EIA	Council for Scientific and Industrial Research (CSIR)	2021	Report	Scoping and Environmental Impact Assessment for the proposed development of the 204.6 MW Kwagga Wind Energy Facility 3 (i.e. Kwagga WEF 3) and associated infrastructure near Beaufort West in the Western Cape. CSIR Report Number: CSIR/SPLA/SECO/ER/2021/0035/B

Therefore, the Site Sensitivity Verification was undertaken using desktop analysis, satellite imagery, preliminary on-site inspection, and other available and relevant information.

D.7.4 Proposed Project Location

The corridor in which the seven proposed Kwagga EGI projects will be developed traverses the following land portions:

- Remainder of the Farm Dwaalfontein Wes No. 377 (Surveyor General 21 Digit Code: C00900000000037700000);
- Portion 1 of the Farm Dwaalfontein Wes No. 377 (Surveyor General 21 Digit Code: C00900000000037700001);
- Remainder of the Farm Dwaalfontein No. 379 (Surveyor General 21 Digit Code: C00900000000037900000);
- Portion 3 of the Farm Tyger Poort No. 376 (Surveyor General 21 Digit Code: C00900000000037600003);
- Remainder of the Farm Wolve Kraal No. 17 (Surveyor General 21 Digit Code: C06100000000001700000);
- Portion 9 of the Farm Wolve Kraal No.17 (Surveyor General 21 Digit Code: C06100000000001700009);
- Portion 7 of the Farm Muis Kraal No. 373 (Surveyor General 21 Digit Code: C00900000000037300007);
- Portion 1 of the Farm Witpoortje No. 16 (Surveyor General 21 Digit Code: C06100000000001600001);
- Remainder of the Farm Trakas Kuilen No. 15 (Surveyor General 21 Digit Code: C06100000000001500000); and
- Portion 1 of the Farm Trakas Kuilen No. 15 (Surveyor General 21 Digit Code: C06100000000001500001).

The Kwagga EGI projects comprising the seven proposed 132 kV overhead transmission powerlines are not located within any of the Renewable Energy Development Zones (REDZs) gazetted in Gazette 41445, GN R114 on 16 February 2018; and Gazette 44191, GN R144 on 26 February 2021; however, it is located in close proximity (< 5km) to the gazetted Beaufort West REDZ. The proposed Kwagga EGI projects are also not located within any of the Strategic Transmission Corridors gazetted in Gazette 41445, GN R113 on 16 February 2018; however, they are also located in close proximity (< 10 km) to the Central Strategic Transmission Corridor (as gazetted on 16 February 2018, GN R113).

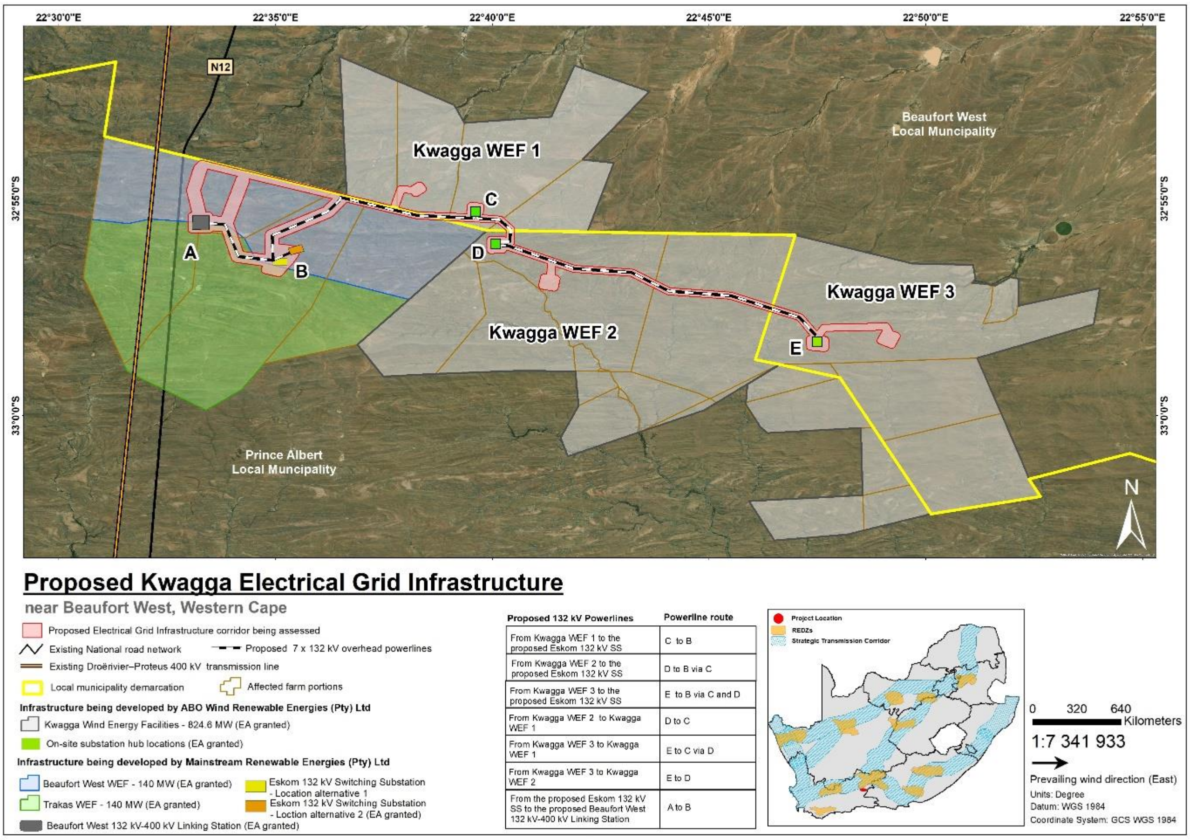


Figure D-1: Locality map for the proposed Kwagga EGI projects near Beaufort West in the Western Cape.

D.7.5 Details of the Environmental Assessment Practitioner

GN R320 states that prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the Screening Tool must be confirmed by undertaking a Site Sensitivity Verification. GN R320 further notes that the Site Sensitivity Verification must be undertaken by an Environmental Assessment Practitioner (EAP) or a specialist with expertise in radar.

This Site Sensitivity Verification has been undertaken by Lizande Kellerman, the EAP at the CSIR. Lizande Kellerman is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400076/10 in the field of Botanical Sciences. Inputs to the Site Sensitivity Verification Report were provided by Dhiveshni Moodley and Rohaida Abed of the CSIR.

D.7.6 Findings of the Screening Tool

Separate Screening Tool Reports were generated for the seven proposed Kwagga EGI projects using the following classification: Utilities Infrastructure | Electricity | Distribution and Transmission | Powerline.
The maps of the relative Civil Aviation (Powerline) theme sensitivity generated and included in the Screening Tool depicted that the proposed Kwagga EGI project corridor is located in a low sensitivity area from a civil aviation perspective i.e. there are no major or other types of civil aviation aerodromes or air traffic services buffers that intersect with the proposed development footprint (Figure D.7-2 to D.7-8).

In terms of GN R320, this would mean that, should the proposed site (i.e., proposed Kwagga EGI Corridor) be found to be of low sensitivity during the site visit, no further requirements are applicable i.e. a Compliance Statement is <u>not</u> required.

Figure D-2: Screening Tool Map showing the proposed Kwagga EGI Section 1 powerline corridor as it relates to Civil Aviation Sensitivity (Source: DFFE, 2022).

Figure D-3: Screening Tool Map showing the proposed Kwagga EGI Section 2 powerline corridor as it relates to Civil Aviation Sensitivity (Source: DFFE, 2022).

Figure D-4: Screening Tool Map showing the proposed Kwagga EGI Section 3 powerline corridor as it relates to Civil Aviation Sensitivity (Source: DFFE, 2022).

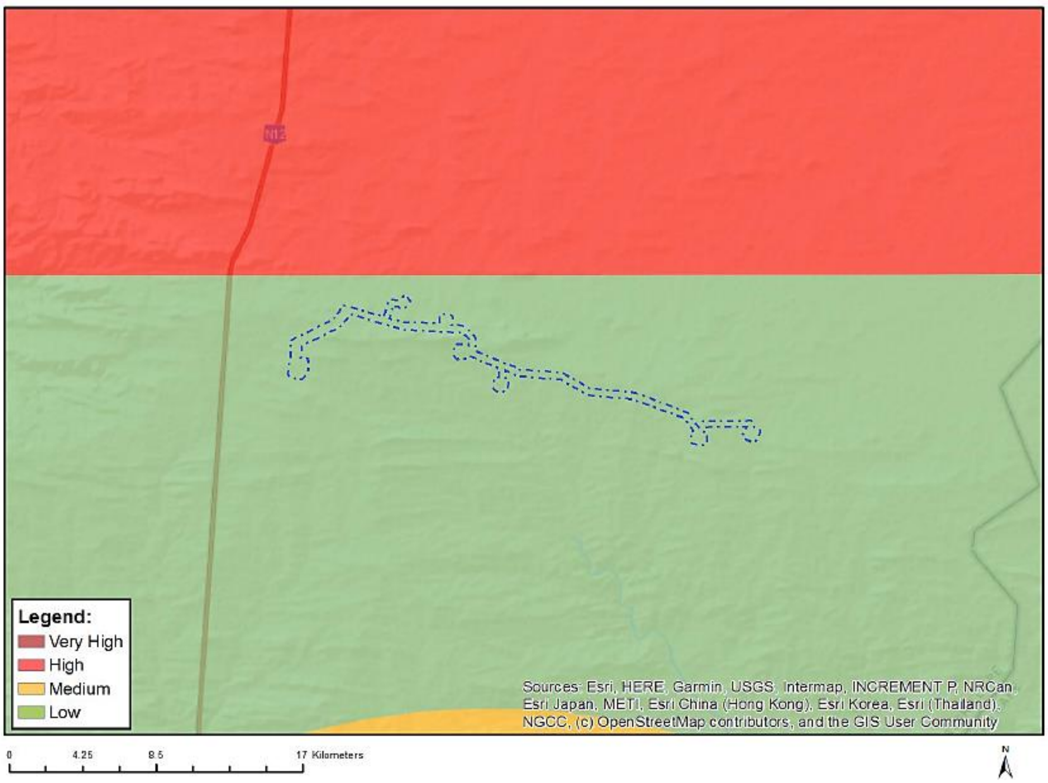


Figure D-5: Screening Tool Map showing the proposed Kwagga EGI Section 4 powerline corridor as it relates to Civil Aviation Sensitivity (Source: DFFE, 2022).

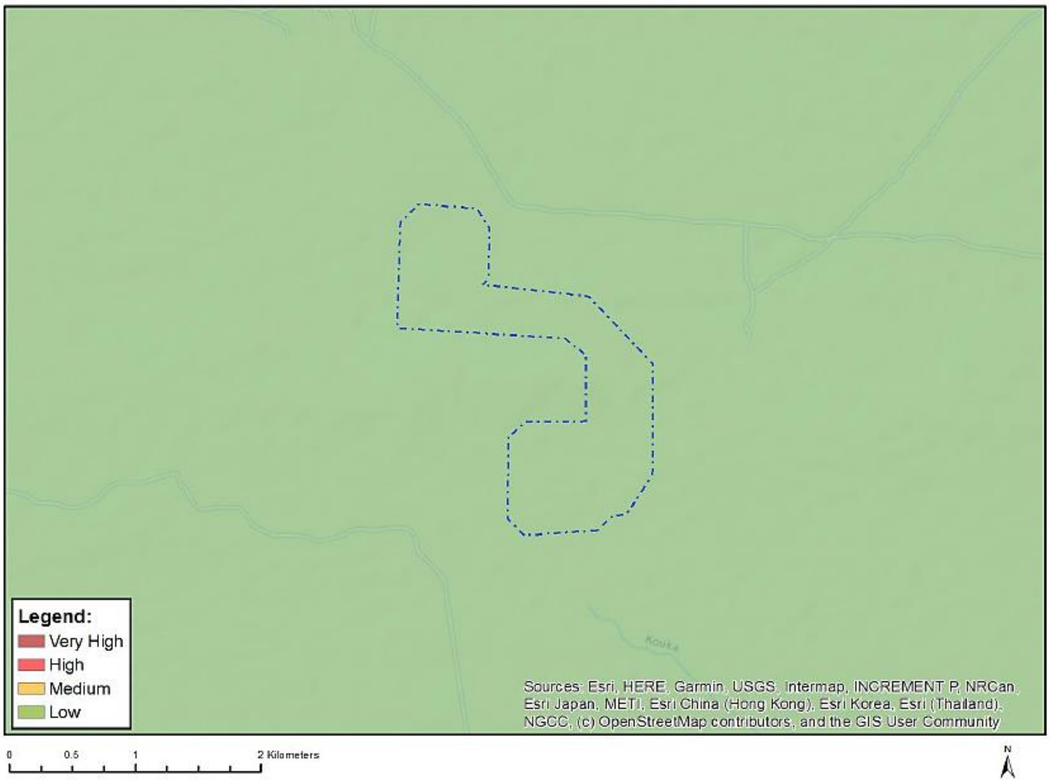


Figure D-6: Screening Tool Map showing the proposed Kwagga EGI Section 5 powerline corridor as it relates to Civil Aviation Sensitivity (Source: DFFE, 2022).

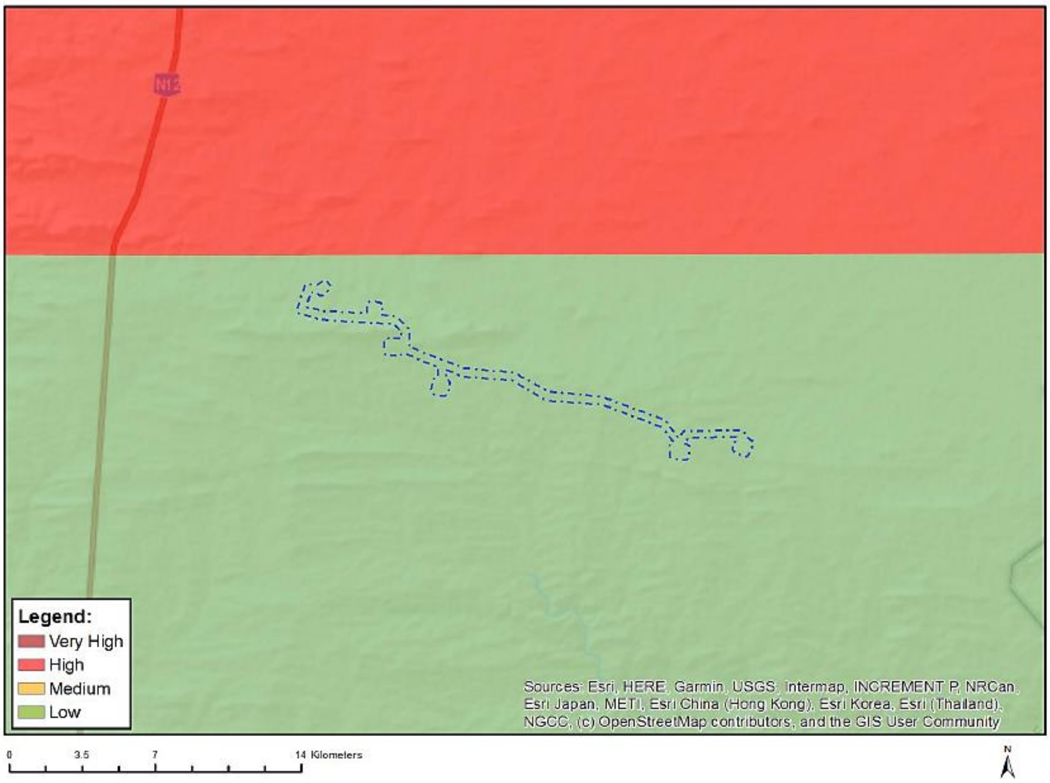


Figure D-7: Screening Tool Map showing the proposed Kwagga EGI Section 6 powerline corridor as it relates to Civil Aviation Sensitivity (Source: DFFE, 2022).

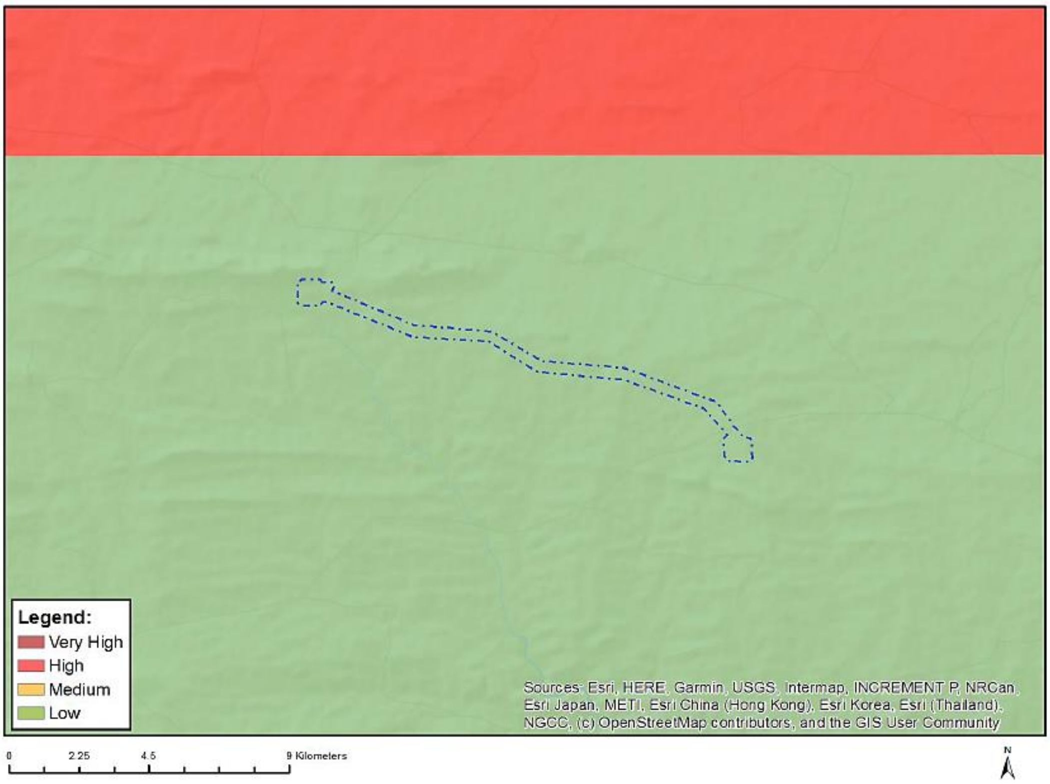


Figure D-8: Screening Tool Map showing the proposed Kwagga EGI Section 7 powerline corridor as it relates to Civil Aviation Sensitivity (Source: DFFE, 2022).

D.7.7 Details of the Site Visit

The details of the site visit undertaken by the EAP are noted below:

Date of Site Visit:	14 – 15 June 2022
Specialist Name:	Lizande Kellerman (EAP)
Professional Registration Number:	SACNASP Reg. No. 400076/10
Specialist Affiliation / Company:	CSIR Environmental Management Services

D.7.8 Findings from the Site Sensitivity Verification

The proposed Kwagga EGI project corridor is located within an arid environment that is typified by sparse, low-growing vegetation dominated by dwarf, spiny Karoo shrubs characteristic of the Nama Karoo Biome. The site visit confirmed that the proposed Kwagga EGI project corridor is currently being used for agriculture activities. However, the limited climatic moisture availability, exacerbated by the ongoing drought, largely limits the agricultural land-use to low-density small stock grazing.

The 'low' sensitivity of the entire extent of the proposed Kwagga EGI project corridor as identified by the Screening Tool from a civil aviation perspective was verified by the EAP during the site visit.

Note that no civil aviation installations were found within the actual proposed development footprint, on the ground, for the entire Kwagga EGI project corridor.

Refer to Figures D-9 to D-18 for views of the affected farm properties on which the proposed Kwagga EGI projects, in part, are to be developed.

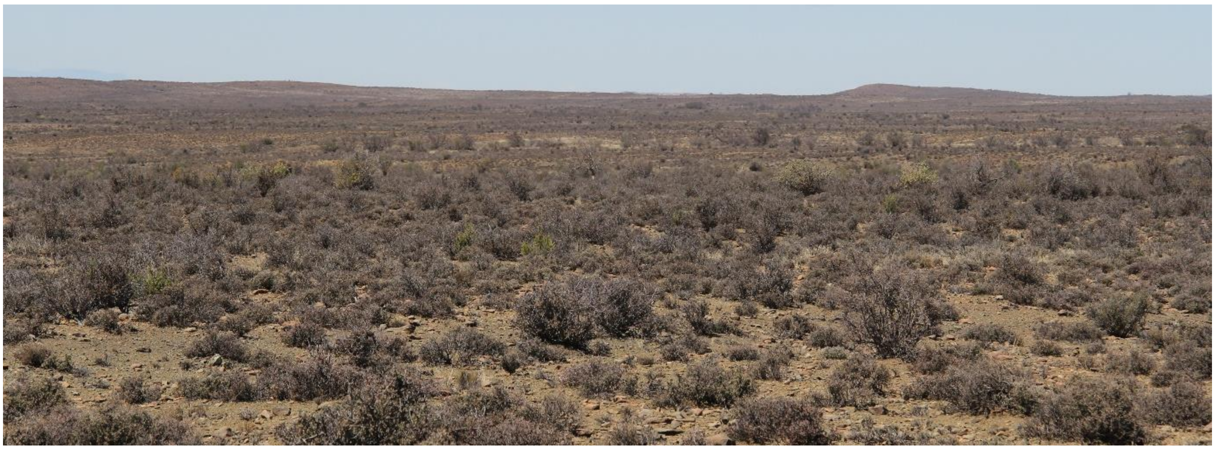


Figure D-9: View of Dwaalfontein Farm (E direction) (Photo: L. Kellerman)

Figure D-10: View of Dwaalfontein Farm (NE direction) (Photo: L. Kellerman)

Figure D-11: View of Dwaalfontein Farm towards Wolwe Kraal Farm (S direction) (Photo: L. Kellerman)

Figure D-12: View of Dwaalfontein Farm towards the N12 (W direction) (Photo: L. Kellerman)

Figure D-13: View of Wolwe Kraal Farm towards Muis Kraal Farm (E direction) (Photo: R. Invernizzi)

Figure D-14: View of Wolwe Kraal Farm towards Tyger Poort Farm (N direction) (Photo: R. Invernizzi)

Figure D-15: View of Wolwe Kraal Farm towards N12 (W direction) (Photo: R. Invernizzi)

Figure D-16: View of Muis Kraal Farm (N direction) (Photo: R. Invernizzi)

Figure D-17: View of Trakas Kuilen Farm (SW direction) (Photo: M. Klapwijk)

Figure D-18: View of Witpoortje Farm (E direction) (Photo: M. Klapwijk)

The South African Civil Aviation Authority (SACAA) has confirmed that the designation of "dangerous and restricted airspace (FAD)" relates to air traffic services (ATS), specifically the airspace identified as the Beaufort West Flight Information Region (FIR) associated with the Cape Town International Airport Airspace. A FIR is a specified region of airspace in which a flight information service as well as an alerting service (ALRS) are provided. Flight information services and ALRS are the basic levels of air traffic services, providing information pertinent to the safe and efficient conduct of flights as well as alerting the different relevant authorities should an aircraft be in distress (shown in Figure D-19).

Additionally, the Air Traffic and Navigation Services SOC Limited (ATNS) data (dated May 2022) indicates that there is a licensed Aerodrome (i.e. Karoo Gateway Airport) located approximately 70 km north of the proposed EGI project corridor, as well as one licensed Aerodrome (i.e. Oudtshoorn) and one unlicensed aerodrome (i.e. Willowmore) located more than 70 km away from the proposed EGI project corridor in a southerly direction (shown in Figure D-19 below). Based on its location, these Aerodromes will not be affected by the proposed EGI development.

The ATNS data further notes that although Conventional Routes relating to Air Traffic Services (ATS) associated with the Cape Town International Airport Airspace intersect the 50 km radius area from the proposed EGI project corridor, none intersect with the proposed EGI project airspace. The ATNS data also notes that Area Navigation Routes (ANR) associated with the Cape Town International Airport Airspace intersect with the 50 km radius area from the EGI project corridor, with one ANR slightly intersecting with the north-western section of the proposed EGI project airspace (i.e. the northern portion of Portion 1 of Farm Dwaalfontein No. 377). These ANR's will not be affected by the proposed EGI development.

The ATNS has also confirmed that the designation of "dangerous and restricted airspace" which lies north of the proposed EGI project corridor, is ascribed to the FAD 29 Beaufort West General Flying Area (GFA) that is associated with the Beaufort West Aerodrome (i.e. FABW - Karoo Gateway Airport) and is designated a 'Danger Area' that is used by various operators for both general flying and training flights. Based on its location, none of the seven proposed EGI projects will impact on this GFA.

In addition, the ATNS data also indicates the location of the Oudtshoorn Military Shooting Range, which is classified as restricted airspace, located more than 80 km away to the south of the proposed project corridor. Based on its location, the Oudtshoorn Military Shooting Range will not be impacted on by the proposed EGI development. The ATNS data further demarcates a dangerous airspace, which is situated to the east and west of the Oudtshoorn Military Shooting Range that is also located more than 80 km away from the proposed EGI project site in a southerly direction. Based on its location, this demarcated airspace will not be affected by the proposed EGI development.

Figure D-19 indicates the location of the identified civil aviation features noted above, which informed this Site Sensitivity Verification.

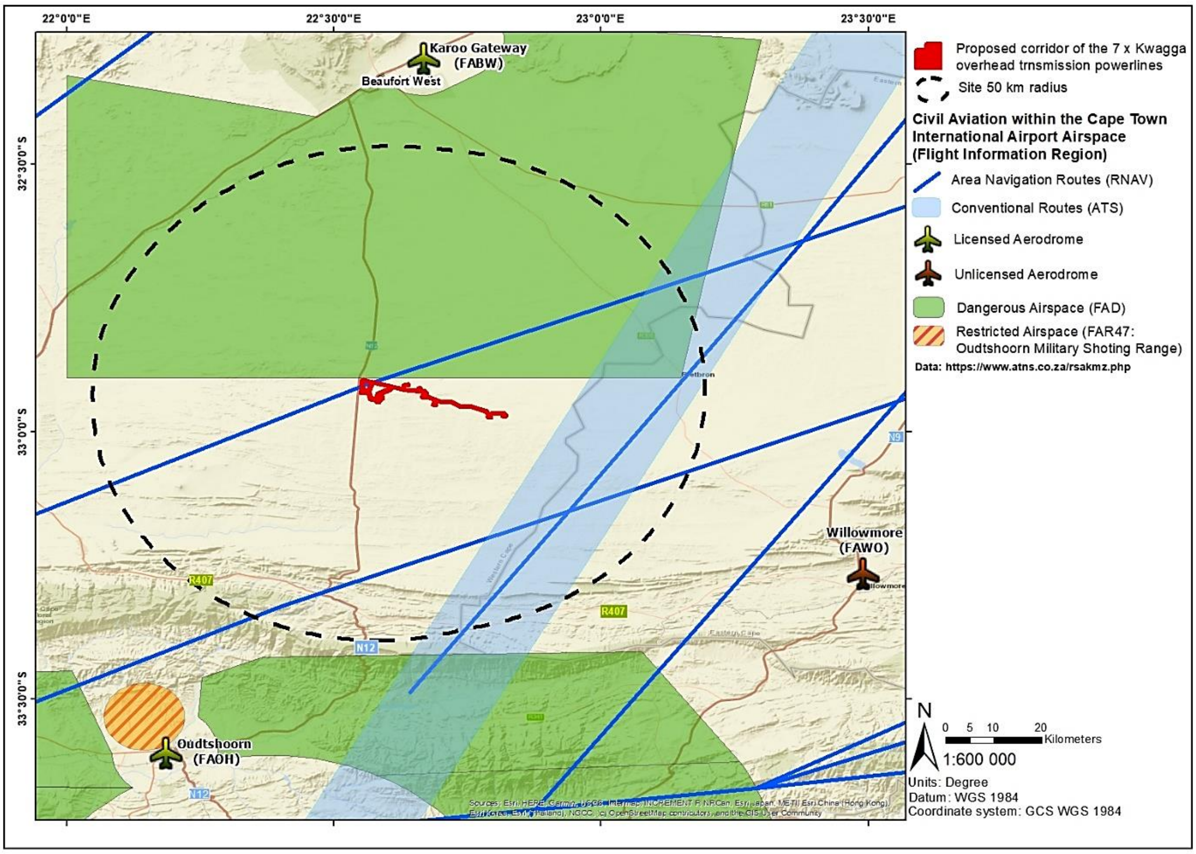


Figure D-19: Civil Aviation Features relative to the proposed Kwagga EGI project corridor (indicated in red).

D.7.9 Concluding Statement

The entire proposed Kwagga EGI project corridor was determined and verified to be of low sensitivity (as it relates to civil aviation). This was determined through a site visit and based on existing databases, and confirms the sensitivity allocated on the Screening Tool. Based on the above, in terms of GN R320, no further requirements are applicable i.e. a Compliance Statement is not required.

D.7.10 APPENDIX A: EAP DECLARATION

I, **Lizande Kellerman**, declare that –

- I act as the independent environmental assessment practitioner in this site sensitivity verification;
- I have expertise in conducting environmental impact assessments, 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 will perform the work relating to the site sensitivity verification in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I will take into account, to the extent possible, the matters listed in Regulation 13 of the Regulations when preparing the site sensitivity verification and any report relating to the site sensitivity verification;
- 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 site sensitivity verification by the Competent Authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the Competent Authority, unless access to that information is protected by law, in which case it will be indicated that such information exists and will be provided to the Competent Authority;
- I will perform all obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I am aware of what constitutes an offence in terms of Regulation 48 and that a person convicted of an offence in terms of Regulation 48(1) is liable to the penalties as contemplated in Section 49B of the Act.

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;
- ~~I have a vested interest in the proposed activity proceeding, such vested interest being:~~

Signature of the Environmental Assessment Practitioner:	
Name of Company:	CSIR Environmental Management Services
Date:	8 July 2022

D.7.11 APPENDIX B: CURRICULUM VITAE

PO Box 320
Stellenbosch
7599
South Africa

Office : +27 21 888 2489
Cell : +27 83 799 0949
Fax : +27 21 888 2473
Email lkellerman@csir.co.za

CV OF LIZANDE KELLERMAN

Position in Firm:	Principal Environmental Assessment Practitioner
Full Name:	Millicent Johanna Susanna Kellerman
Specialisation:	Strategic Environmental Assessment & Integrated Environmental Management
Date of Birth:	11 October 1978
Nationality:	South African
Drivers licence:	Code EB and Advanced Driver Qualification (4x4)

BIO-SKETCH:

Lizande Kellerman is a Principal EAP and scientist at the CSIR in Stellenbosch, with more than 10 years of experience in environmental impact studies, primarily in the planning, preparation and management of BAs, EIAs, and SEAs, as well as EMPrs, Screening/Fatal Flaw Studies, Biodiversity Risk Assessments, Biodiversity Resource Assessments and license applications for agriculture, atmospheric emissions, water use, waste management, mining, bioprospecting and biodiversity permitting, for numerous projects in the agricultural (including aquaculture), construction, conservation, mining and renewable energy sectors.

Lizande holds a BSc degree in Zoology and Entomology, with an Honours and Masters in Botany both at the University of Pretoria. She is currently working towards completing her PhD in Conservation Ecology. She commenced work at the CSIR in 2012 after spending three years working as an environmental scientist in the private sector. She has published several articles, both peer reviewed scientific and popular, and presented at five international conferences. She has also lectured on biodiversity, ecological and EIA at various universities in South Africa. Her training and experience as a qualified terrestrial ecologist has enabled her to provide expert input into ecological impact assessments and to perform specialist reviews of various terrestrial biodiversity and ecology impact assessments as part of BAs, EIAs and SEA.

Lizande is a registered Professional Natural Scientist (400046/10) with the South African Council for Natural Scientific Professions (SACNASP).

PROJECT EXPERIENCE RECORD

The following table presents a sample of key projects that Lizande Kellerman has undertaken to date:

Completion Date	Project description	Role	Client
2020 - 2021	Basic Assessments for the proposed development of the 810 MW Rinkhals Solar PV energy facilities 1-7 and associated infrastructure near Kimberley, Northern Cape and Free State	Project Leader and Environmental Assessment Practitioner	ABO Wind renewable energies (Pty) Ltd
2020 - 2021	Scoping and EIA for the proposed development of the 825 MW Kwagga Wind Energy Facilities 1-3 and	Project Leader and Environmental	ABO Wind renewable energies (Pty) Ltd

Completion Date	Project description	Role	Client
	associated infrastructure near Beaufort West in the Western Cape	Assessment Practitioner	
2021 - 2022	Landscaping and development of educational walkways with teaching materials at the CSIR Science Centre in Cofimvaba, Eastern Cape Province	Project Manager and Environmental Assessment Practitioner	Department of Science and Innovation (previously DST)
2020	A Desktop Fatal Flaw Assessment of the property affected by the proposed development of a solar photovoltaic (PV) energy facility near Windmeul, Western Cape (i.e. Project Suikerbekkie)	Project Manager and Principal Author	ABO Wind renewable energies (Pty) Ltd
2020	A Desktop Fatal Flaw Assessment of the properties affected by the proposed development of two solar photovoltaic (PV) energy facilities near Kimberley, Northern Cape (i.e. Project Rinkhals) and Vryburg in the North West (i.e. Project Skilpad)	Project Manager and Principal Author	ABO Wind renewable energies (Pty) Ltd
2020	A Desktop Fatal Flaw Assessment of the properties affected by the proposed development of two solar photovoltaic (PV) energy facilities near Kimberley, Free State Province (i.e. Project Rinkhals 1 and Project Rinkhals 2)	Project Manager and Principal Author	ABO Wind renewable energies (Pty) Ltd
2019 – 2020	Environmental compliance and performance improvement for the foundry industry of South Africa: Phase 1 – Status Quo Assessment	Project Manager and Principal author	National Cleaner Production Centre of South Africa
2016 – 2019	Strategic Environmental Assessment for Marine and Freshwater Aquaculture Development in South Africa	Project Manager, Principal Author and Report Editor	Department of Environmental Affairs and Department of Agriculture, Forestry and Fisheries
2019	Risk Assessment with Alien and Invasive Species Permit Application Process for the EA1TM Dust Suppressant	Environmental Assessment Practitioner	Earth Alive Clean Technologies Inc.
2019	Environmental Screening Study for the proposed Wool Scouring Facility on Erf 3476 at Mount Fletcher in the Elundini Local Municipality, Eastern Cape Province	Project Manager and Environmental Assessment Practitioner	CSIR Advanced Agriculture and Food Division
2019 - 2020	Water Use License Application Process for the Vryburg Solar 1 (Pty) Ltd Photovoltaic Energy Facility and Supporting Electrical Grid Infrastructure near Vryburg, North West Province	Project Manager and Environmental Assessment Practitioner	ABO Wind renewable energies (Pty) Ltd
2019 - 2020	Water Use License Application Processes for the Kuruman Phase 1 and Phase 2 Wind Energy Facilities and Supporting Electrical Grid Infrastructure near Kuruman, Northern Cape Province	Project Manager and Environmental Assessment Practitioner	Mulilo Renewable Project Developments (Pty) Ltd

Completion Date	Project description	Role	Client
2019	National Coastal Climate Change Vulnerability Index Assessment	Public Participation Practitioner	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
2018 – 2019	Strategic Environmental Assessment for the Identification of Energy Corridors, as well as Assessment and Management Measures for the Development of a Phased Gas Pipeline Network in South Africa: Biodiversity and Ecology Specialist Assessment including Terrestrial and Aquatic Ecosystems, and Species of the Desert, Nama Karoo & Succulent Karoo Biomes	Specialist Input and Principal Author	Department of Environmental Affairs, Eskom and iGas
2018	The Implementation of the Development of an Ecological Infrastructure Investment Framework (EIIF) and an Alien Invasive Species Strategy (AISS) for the Western Cape Province	Public Participation Practitioner	Western Cape Department of Environmental Affairs and Development Planning
2018	Basic Assessment for the proposed development of the 325 MW Kudusberg Wind Energy Facility and associated infrastructure between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces: Terrestrial Ecology Specialist Study	Specialist Input and Contributing Author	G7 Renewable Energies (Pty) Ltd
2018	Development of a Biodiversity Economy Transformation Strategy for the North West Province, South Africa	Specialist Input and Contributing Author	North West Rural, Environment and Agricultural Development
2018	Bioprospecting, biotrade and biodiversity permitting applications for Boscia albitrunca, as part of a Feasibility Study on Motlopi coffee, North West	Project Manager and Environmental Assessment Practitioner	North West Finance, Economy and Enterprise Development
2017 – 2018	Environmental Impact Assessment for Kuruman Wind Energy Facilities Phase 1 and Phase 2 near Kuruman, Northern Cape	Project Manager and Environmental Assessment Practitioner	Mulilo Renewable Project Developments (Pty) Ltd
2017 – 2018	Basic Assessment for supporting electrical infrastructure for the Kuruman Wind Energy Facilities Phase 1 and Phase 2 near Kuruman, Northern Cape	Project Manager and Environmental Assessment Practitioner	Mulilo Renewable Project Developments (Pty) Ltd
2012 – 2016	Bioprospecting beneficiation and implementation of the Nourivier Medicinal Plants Project at Nourivier, Northern Cape	Project Manager, Environmental Scientist	Department of Science and Technology (DST)
2012 – 2016	Bioprospecting beneficiation and implementation of the Witdraai Medicinal Plants Project at Andriesvale, Northern Cape	Project Manager, Environmental Scientist	Department of Science and Technology (DST)
2012 – 2016	Bioprospecting beneficiation and implementation of the Letsemeng Medicinal Plants Project at Petrusburg, Free State	Project Manager, Environmental Scientist	Department of Science and Technology (DST)

Completion Date	Project description	Role	Client
2013 – 2016	Bioprospecting beneficiation and implementation of the Abbey Medicinal Plants Project near Madibeng, Northern Cape	Project Manager, Environmental Scientist	Department of Science and Technology (DST)
2013 – 2016	Bioprospecting beneficiation and implementation of the Driekop Essential Oils and Moringa Project near Burgersfort, Limpopo	Project Manager, Environmental Scientist	Department of Rural Development and Land Reform (DRDLR)
2013 – 2014	Resource assessment, including bioprospecting, biotrade and biodiversity permitting applications for *Elephantorrhiza elephantina*, Northern Cape	Project Manager, Environmental Scientist	DST and CSIR Biosciences
2009 – 2010	Environmental screening and legal compliance of the Sidasoas Essential Oils (Rose Geranium) project near Onseepkans, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2010	Environmental screening and legal compliance of the Pelsan Essential Oils (Rose Geranium) project near Pella, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2010	Environmental screening and legal compliance of the Oppermans Essential Oils (Rose Geranium) project near Maubane, North West	Environmental Scientist	DST and CSIR ECD
2009 – 2010	Section 24G Rectification Application for the Sidasoas Essential Oils (Rose Geranium) project near Onseepkans, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2011	Bioprospecting beneficiation, environmental screening and legal compliance of the Nourivier Medicinal Plants Project at Nourivier, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2011	Bioprospecting beneficiation, environmental screening and legal compliance of the Witdraai Medicinal Plants Project at Witdraai, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2010	EIA and Waste Management License Application at the Kumba Iron Ore Mine at Sishen, Northern Cape	Project Manager and EAP	Anglo American / Kumba Iron Ore
2009 – 2010	EIA for the development of the new Veremo Magnetite Mine near Stoffberg, Mpumalanga	Project Manager and EAP	Veremo Holdings / Kermas Limited
2009 – 2010	EIA for the proposed construction and upgrades of roads on various properties east of Orange Farm and west of the R82, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the proposed establishment of the new head office complex for the National Department of Land Affairs (DLA) as part of a public private partnership process, Pretoria, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the proposed construction of the internal road network and associated storm water pipes at Flamingo Park X2, Welkom, Free State	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the proposed construction of an access road and a sewer pipeline for the use of the proposed Gautrain Visitors Centre, Midrand, Gauteng	Project Manager and EAP	Bombela Consortium
2009 – 2010	BA for the proposed residential development and associated infrastructure on Erf 7402 and Erf 19642, Mamelodi-West, City of Tshwane, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the MTN Fibre Optic Deployment along roads R21 and R101, Gauteng	Project Manager and EAP	MTN Group Limited

Completion Date	Project description	Role	Client
2009 – 2010	BA and Waste Management License Application for the establishment of Phase 1 of the proposed provision of Bulk Water Supply Infrastructure and Purified Water Supply, Jozini, Kwa-Zulu Natal	Project Manager and EAP	PD Naidoo and Associates
2009 – 2010	BA for the proposed housing development situated on Klipspruit Ext 11, a portion of the remaining extent of the Farm Freehold 389 IQ, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	Environmental Management Plan for the Blouberg Local Municipality, Capricorn District, Limpopo	Project Manager and EAP	Capricorn District Municipality
2009 – 2010	Environmental Fatal Flaw Assessment for the proposed development of the Statistics South Africa Head Office Complex: Persequor Park, Gauteng	Project Manager and EAP	Eco-Agent CC
2009 – 2010	Environmental Fatal Flaw Assessment for the proposed development of the Statistics South Africa Head Office Complex: Salvokop, Gauteng	Project Manager and EAP	Eco-Agent CC

EMPLOYMENT RECORD

- CSIR Environmental Management Services (EMS) — Apr 2016 – present
- CSIR Enterprise Creation for Development (ECD) — Jan 2012 – Mar 2016
- Midrand Graduate Institute — Jan 2011 – Dec 2011
- Polygon Environmental Planning cc — Jan 2011 – Dec 2011
- The MSA Group (Environmental, Legal and Mining Services) — Apr 2009 – Dec 2010
- Department of Botany, University of Pretoria — Aug 2003 – Mar 2009

QUALIFICATIONS

- 2006 University of South Africa (Postgraduate Certificate for Higher Education and Further Training)
- 2004 University of Pretoria MSc *Cum Laude* (Botany)
- 2001 University of Pretoria BSc Honours (Botany)
- 2000 University of Pretoria BSc (Zoology and Entomology)

SHORT-COURSES / WORKSHOPS

- 2015 Finances for Non-Financial Managers, CSIR Innovation Leadership & Learning Academy, Pretoria.
- 2014 IWRM, the NWA, and Water Use Authorisations, focusing on Water Use License Applications – Procedures, Guidelines, IWWMP's and Monitoring, Carin Bosman Sustainable Solutions, Pretoria.

CONFERENCE PRESENTATIONS & PAPER PUBLICATIONS

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- **Kellerman, L.** Snyman-Van der Walt, L., Morant, P., Mashabela, K. & Lochner, P. (2017). Progress on the Strategic Environmental Assessment (SEA) for aquaculture development in South Africa. International Association for Impact Assessment – South Africa Conference 2017, Rawsonville, Western Cape Province.
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- **Kellerman, L.** (2012). Wild-harvesting for Commodity Beneficiation. European Union's Conference for Sector Budget Support. Department of Science and Technology, Roodevallei, Pretoria, Gauteng Province.

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- **Kellerman, L.** & Wild, S. (2015): A 'happy pill' to boost rural economies. – In: Wild, S. (Author), Fraser, S. [Editor]: Innovation – Shaping South Africa Through Science. Part 3: pp. 113-120, Pac Macmillan South Africa, in association with the Gordon Institute of Business Science, University of Pretoria.
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- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published in the Farmersweekly Magazine on 09 June 2017.
- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published in the Stywe Lyne/Tight Lines Magazine, Issue 690 in August 2017.
- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published online at the CSIR website on 26 June 2017. https://www.csir.co.za/csir-calls-public-participate-rapid-citizen-science-survey/
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LANGUAGE CAPABILITY

	Speaking	Reading	Writing
Afrikaans	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent

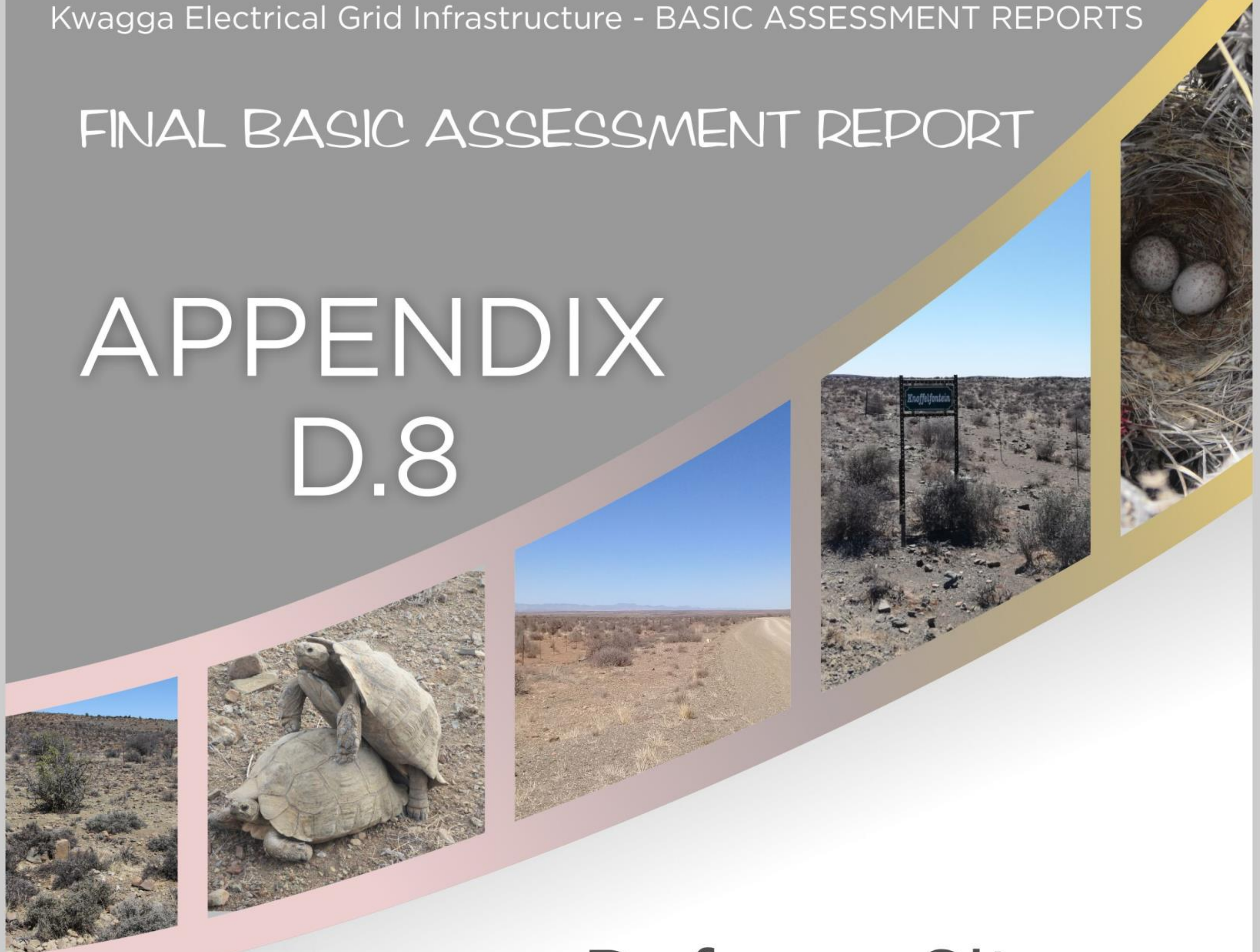
PROFESSIONAL REGISTRATIONS / MEMBERSHIPS

- Professional Natural Scientist (Pr.Sci.Nat. Number 400076/10 – Botanical Sciences) with the SACNASP
- International Association of Impact Assessment South Africa (IAIAsa) – Registration number: 343955
- Botanical Society of South Africa (BotSoc) – Registration Number: S01/58657

Kwagga Electrical Grid Infrastructure - BASIC ASSESSMENT REPORTS

FINAL BASIC ASSESSMENT REPORT

APPENDIX D.8



Defence Site Sensitivity Verification

DEFENCE SITE SENSITIVITY VERIFICATION

CONTENTS

D.8 DEFENCE SITE SENSITIVITY VERIFICATION

D.8.1 Introduction

This report serves as the Site Sensitivity Verification for the Defence (Powerline) Theme for the seven Basic Assessments (BAs) for the proposed construction of seven 132 kV Overhead Transmission Powerlines in support of the proposed authorised Kwagga Wind Energy Facilities i.e., the 279 MW Kwagga Wind Energy Facility 1 (hereinafter referred to as "Kwagga WEF 1"), the 341 MW Kwagga Wind Energy Facility 2 (hereinafter referred to as "Kwagga WEF 2") and the 204.6 MW Kwagga Wind Energy Facility 3 (hereinafter referred to as "Kwagga WEF 3"), near Beaufort West in the Western Cape Province. The National DFFE has granted Environmental Authorisation (EA) for the proposed Kwagga WEF 1 (DFFE Ref: 14-12-16-3-3-2-2070), Kwagga WEF 2 (DFFE Ref: 14-12-16-3-3-2-2071) and Kwagga WEF 3 (DFFE Ref: 14-12-16-3-3-2-2072) projects on 7 April 2022.

The construction of the seven 132 kV Overhead Transmission Powerlines that are required to facilitate the connection of the proposed authorised Kwagga WEF 1-3 projects to the national electrical grid network, are being proposed by the Project Applicant, ABO Wind renewable energies (Pty) Ltd. These proposed powerline projects, also referred to as Section 1 to 7 of the proposed Kwagga EGI Corridor ("Kwagga EGI projects"), are located approximately 60 km south of the town of Beaufort West in the Western Cape. The proposed Kwagga EGI projects are the subjects of these seven separate BA Processes, namely:

- Proposed Construction of a 132 kV overhead transmission powerline between the proposed authorised Beaufort West 132 kV-400 kV Linking Station and the proposed Eskom 132 kV Switching Station (i.e., **Kwagga EGI Section 1**) – this powerline facilitates connection of Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3;
- Proposed Construction of a 132 kV overhead transmission powerline between the proposed Eskom 132 kV Switching Station and the Kwagga WEF 1 (i.e., **Kwagga EGI Section 2**) – this powerline facilitates connection of Kwagga WEF 1, as well as Kwagga WEF 2 and Kwagga WEF 3 (where Kwagga WEF 1 on-site substation is used as collector);
- Proposed Construction of a 132 kV overhead transmission powerline between the proposed Eskom 132 kV Switching Station and the Kwagga WEF 2 (i.e., **Kwagga EGI Section 3**) – this powerline facilitates connection of Kwagga WEF 2, as well as Kwagga WEF 3 (where Kwagga WEF 2 on-site substation is used as a collector);
- Proposed Construction of a 132 kV overhead transmission powerline between the proposed Eskom 132 kV Switching Station and the Kwagga WEF 3 (i.e., **Kwagga EGI Section 4**) – this powerline facilitates connection of Kwagga WEF 3;
- Proposed Construction of a 132 kV overhead transmission powerline between Kwagga WEF 1 and Kwagga WEF 2 (i.e., **Kwagga EGI Section 5**) – this powerline facilitates connection of Kwagga WEF 2;
- Proposed Construction of a 132 kV overhead transmission powerline between Kwagga WEF 1 and Kwagga WEF 3 (i.e., **Kwagga EGI Section 6**) – this powerline facilitates connection Kwagga WEF 3; and

- Proposed Construction of a 132 kV overhead transmission powerline between Kwagga WEF 2 and Kwagga WEF 3 (i.e., **Kwagga EGI Section 7**) – this powerline facilitates connection Kwagga WEF 3.

D.8.2 Need for the Site Sensitivity Verification

On 20 March 2020, in Government Gazette 43110, Government Notice (GN) R320, the then Department of Environment, Forestry and Fisheries (now operating as the Department of Forestry, Fisheries and the Environment (DFFE)) published procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) when applying for an Environmental Authorisation (EA). GN R320 prescribes general requirements for undertaking Site Sensitivity Verification, as well as protocols for assessment and minimum report content requirements of environmental impacts associated with specified environmental themes for activities requiring EA. GN R320 was enforced within 50 days of publication of the notice i.e. on 9 May 2020.

GN R320 specifically includes a protocol that provides the criteria for the specialist assessment and minimum report content requirements for impacts on defence installations for activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).

This specific protocol states that proposed developments that occur on sites identified as Very High, High or Medium sensitivity, as depicted on the National Web-Based Environmental Screening Tool (Screening Tool), must include a Defence Compliance Statement. It further states that there are no requirements if the proposed developments occur on sites identified and verified as Low sensitivity on the Screening Tool. However, a Site Sensitivity Verification is required for the Defence Protocol.

Therefore, since the seven proposed 132 kV overhead transmission powerlines, to be constructed in support of the proposed authorised Kwagga WEF 1, Kwagga WEF 2 and Kwagga WEF 3 projects, each requires an EA in terms of the 2014 NEMA EIA Regulations (as amended), and Defence was identified as a relevant theme for the Powerline Methodology on the Screening Tool, as well as a required study, GN R320 must be complied with.

D.8.3 Methodology

The Site Sensitivity Verification Process and Report has been compiled based on the following methodology:

- Existing spatial databases were used to determine the location of defence installations in relation to the proposed project study area, and to identify preliminary areas of concern in terms of impacts to defence installations;
- The proposed powerline corridor and development footprints were plotted on the Screening Tool to identify the sensitivity allocated;
- A site visit was undertaken to confirm the current land-use and the environmental sensitivity as it relates to defence;
- Additional research was undertaken to substantiate the Site Sensitivity Verification process; and
- A Site Sensitivity Verification Report was compiled (i.e., this report).

The information sources listed in Table D.8-1 were used in the Site Sensitivity Verification process.

Table D.8-1: Information Sources used for the Site Sensitivity Verification process

Data / Information	Source	Date	Type	Description
National Web-Based Environmental Screening Tool (Screening Tool)	Department of Forestry, Fisheries and the Environment (DFFE)	2022	Spatial / Online Assessment	The Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an Application for EA in terms of the 2014 NEMA EIA Regulations (as amended) to screen the proposed site for any environmental sensitivity[1].
Republic of South Africa (RSA) Airspaces in 3D	Air Traffic and Navigation Services SOC Limited (ATNS)	2022	Google Earth KMZ File	The RSA Airspaces in 3D data KMZ file is an initiative undertaken by the ATNS to illustrate the definitions and complexities of airspace, routes, aerodromes and navigational facilities within South Africa to the public in the interest of safety[2].
Wind and Solar PV Phase 1 Strategic Environmental Assessment (SEA)	Department of Environmental Affairs (DEA)	2015	Report	SEA commissioned by the DEA [now operating as the DFFE) in 2013 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying eight Renewable Energy Development Zones (REDZs) to focus and incentivize such development (i.e. Phase 1 REDZs SEA: CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B).
Wind and Solar PV Phase 2 SEA	Department of Environment, Forestry and Fisheries (DEFF)	2019	Report	SEA commissioned by the DEFF in 2016 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying three additional REDZs to focus and incentivize such development (i.e. Phase 2 REDZ SEA. CSIR Report Number: CSIR/SPLA/SECO/ER/2019/0085).
Scoping and EIA	Council for Scientific and Industrial Research (CSIR)	2021	Report	Scoping and Environmental Impact Assessment for the proposed development of the 279 MW Kwagga Wind Energy Facility 1 (i.e. Kwagga WEF 1) and associated infrastructure near Beaufort West in the Western Cape. Environmental Impact Assessment Report. CSIR Report Number: CSIR/SPLA/SECO/ER/2021/0033/B
Scoping and EIA	Council for Scientific and Industrial Research (CSIR)	2021	Report	Scoping and Environmental Impact Assessment for the proposed development of the 341 MW Kwagga Wind Energy Facility 2 (i.e. Kwagga WEF 2) with associated infrastructure near Beaufort West in the Western Cape. CSIR Report Number: CSIR/SPLA/SECO/ER/2021/0034/B
Scoping and EIA	Council for Scientific and Industrial Research (CSIR)	2021	Report	Scoping and Environmental Impact Assessment for the proposed development of the 204.6 MW Kwagga Wind Energy Facility 3 (i.e. Kwagga WEF 3) and associated infrastructure near Beaufort West in the Western Cape. CSIR Report Number: CSIR/SPLA/SECO/ER/2021/0035/B

[1] https://screening.environment.gov.za/screeningtool/index.html#/pages/welcome

[2] https://www.atns.co.za/rsakmz.php

Therefore, the Site Sensitivity Verification was undertaken using desktop analysis, satellite imagery, preliminary on-site inspection, and other available and relevant information.

D.8.4 Proposed Project Location

The corridor in which the seven proposed Kwagga EGI projects will be developed traverses the following land portions:

- Remainder of the Farm Dwaalfontein Wes No. 377 (Surveyor General 21 Digit Code: C00900000000037700000);
- Portion 1 of the Farm Dwaalfontein Wes No. 377 (Surveyor General 21 Digit Code: C00900000000037700001);
- Remainder of the Farm Dwaalfontein No. 379 (Surveyor General 21 Digit Code: C00900000000037900000);
- Portion 3 of the Farm Tyger Poort No. 376 (Surveyor General 21 Digit Code: C00900000000037600003);
- Remainder of the Farm Wolve Kraal No. 17 (Surveyor General 21 Digit Code: C06100000000001700000);
- Portion 9 of the Farm Wolve Kraal No.17 (Surveyor General 21 Digit Code: C06100000000001700009);
- Portion 7 of the Farm Muis Kraal No. 373 (Surveyor General 21 Digit Code: C00900000000037300007);
- Portion 1 of the Farm Witpoortje No. 16 (Surveyor General 21 Digit Code: C06100000000001600001);
- Remainder of the Farm Trakas Kuilen No. 15 (Surveyor General 21 Digit Code: C06100000000001500000); and
- Portion 1 of the Farm Trakas Kuilen No. 15 (Surveyor General 21 Digit Code: C06100000000001500001).

The Kwagga EGI projects comprising the seven proposed 132 kV overhead transmission powerlines are not located within any of the Renewable Energy Development Zones (REDZs) gazetted in Gazette 41445, GN R114 on 16 February 2018; and Gazette 44191, GN R144 on 26 February 2021; however, it is located in close proximity (< 5km) to the gazetted Beaufort West REDZ. The proposed Kwagga EGI projects are also not located within any of the Strategic Transmission Corridors gazetted in Gazette 41445, GN R113 on 16 February 2018; however, they are also located in close proximity (< 10 km) to the Central Strategic Transmission Corridor (as gazetted on 16 February 2018, GN R113).

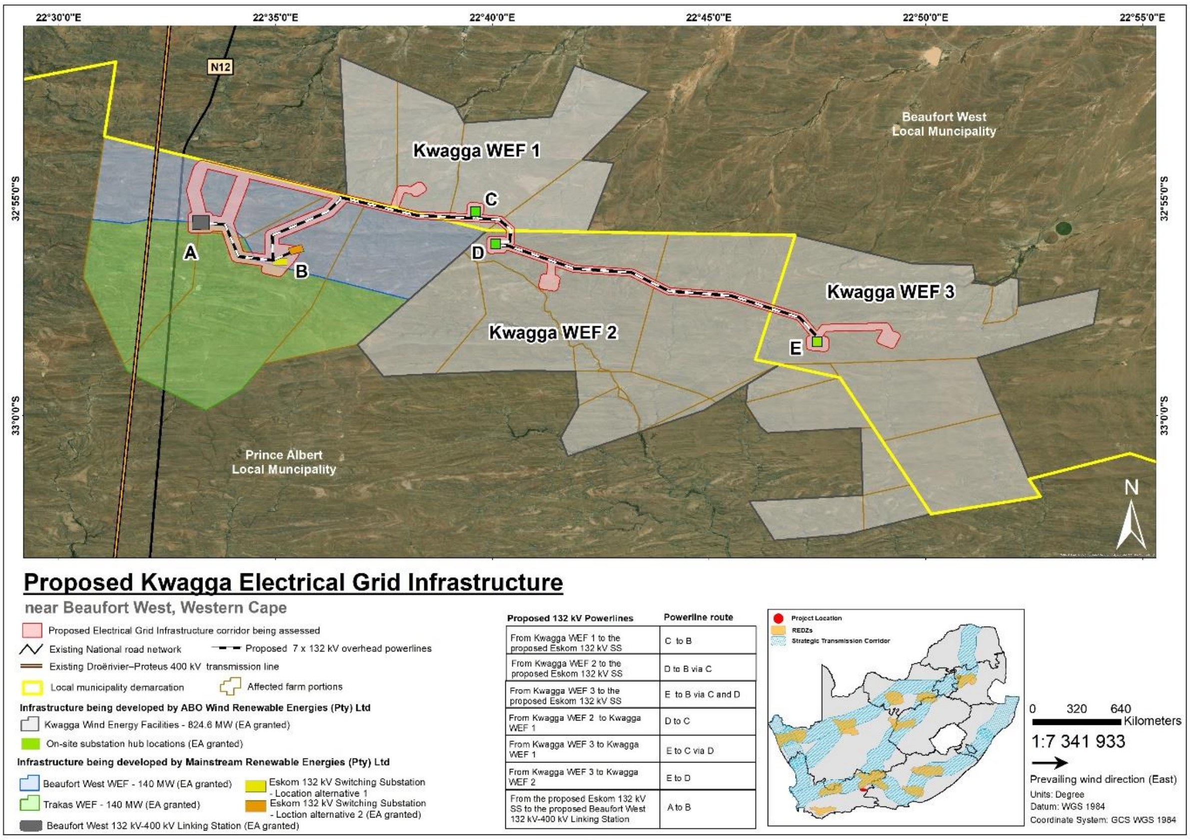


Figure D.8-1: Locality map for the proposed Kwagga EGI projects near Beaufort West in the Western Cape.

D.8.5 Details of the Environmental Assessment Practitioner

GN R320 states that prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the Screening Tool must be confirmed by undertaking a Site Sensitivity Verification. GN R320 further notes that the Site Sensitivity Verification must be undertaken by an Environmental Assessment Practitioner (EAP) or a specialist with expertise in radar.

This Site Sensitivity Verification has been undertaken by Lizande Kellerman, an EAP at the CSIR. Lizande Kellerman is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400076/10 in the field of Botanical Sciences. Inputs to the Site Sensitivity Verification Report were provided by Dhiveshni Moodley and Rohaida Abed of the CSIR.

D.8.6 Findings of the Screening Tool

Separate Screening Tool Reports were generated for the seven proposed Kwagga EGI projects using the following classification: Utilities Infrastructure | Electricity | Distribution and Transmission | Powerline. The maps of the relative Defence (Powerline) theme sensitivity generated and included in the Screening Tool depicted that the proposed Kwagga EGI project corridor is located in a low sensitivity area from a defence perspective i.e. there are no major or other types of defence installations that intersect with the proposed development footprint (Figure D.8-2 to D.8-8).

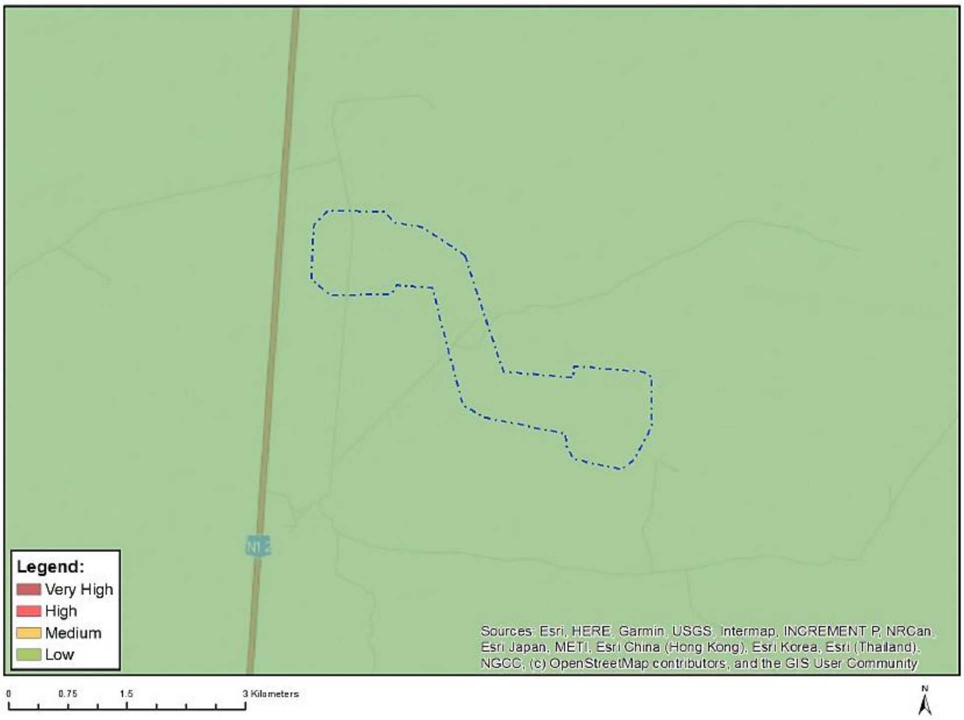


Figure D.8-2: Screening Tool Map showing the proposed Kwagga EGI Section 1 powerline corridor as it relates to Defence Sensitivity (Source: DFFE, 2022).

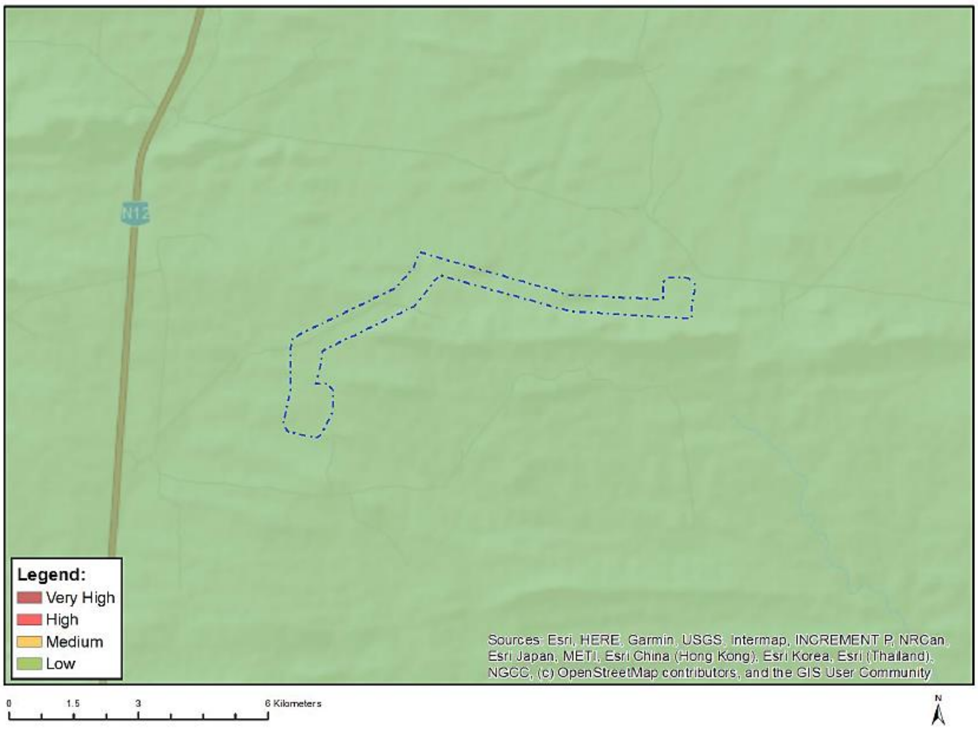


Figure D.8-3: Screening Tool Map showing the proposed Kwagga EGI Section 2 powerline corridor as it relates to Defence Sensitivity (Source: DFFE, 2022).

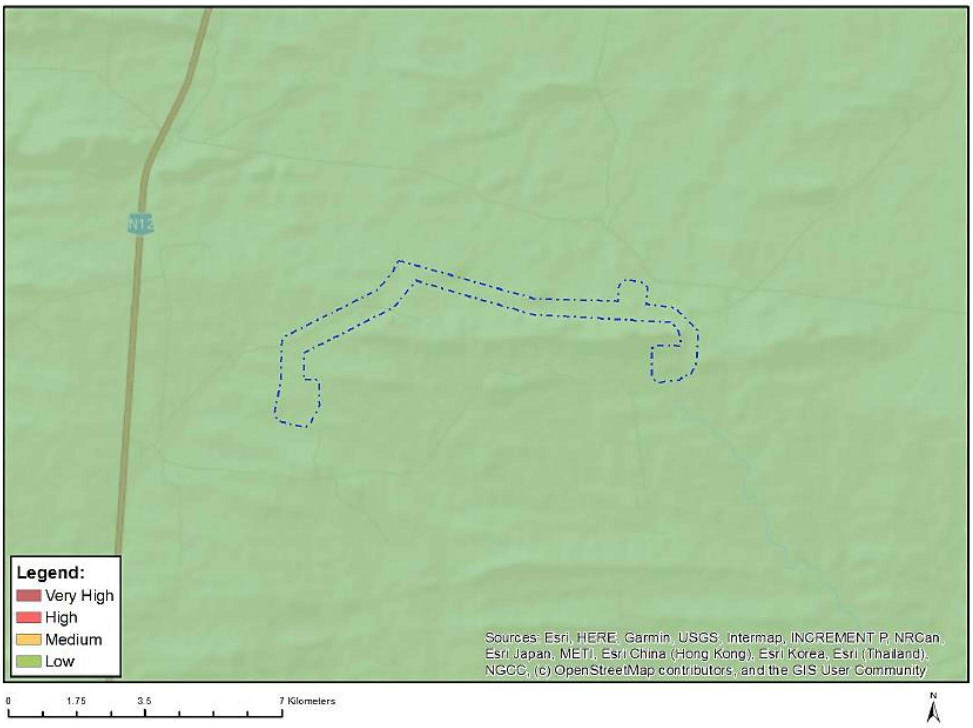


Figure D.8-4: Screening Tool Map showing the proposed Kwagga EGI Section 3 powerline corridor as it relates to Defence Sensitivity (Source: DFFE, 2022).

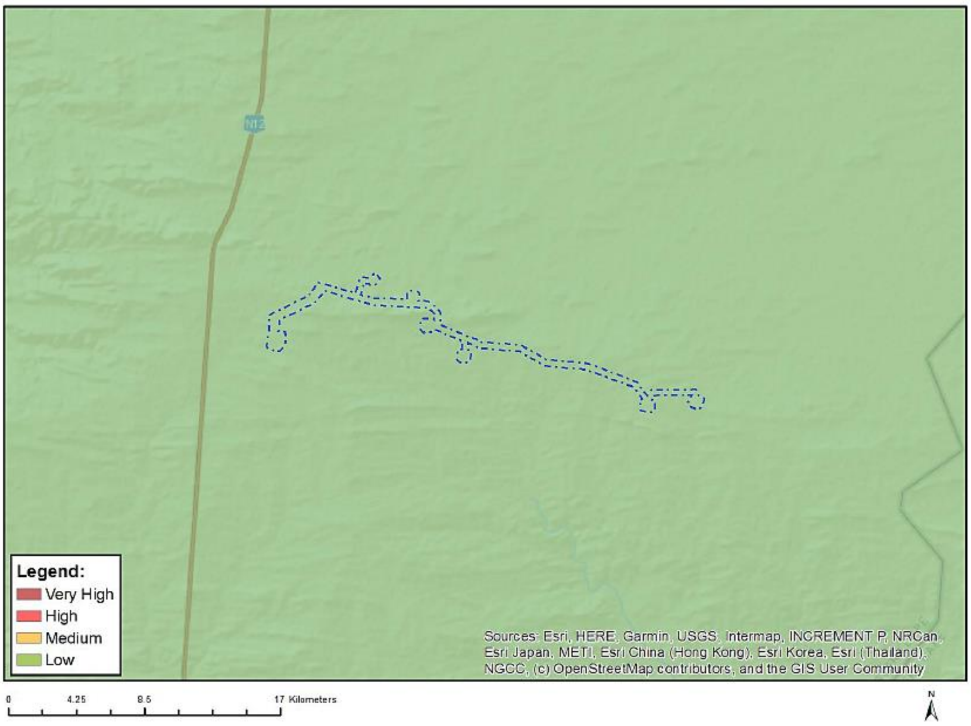


Figure D.8-5: Screening Tool Map showing the proposed Kwagga EGI Section 4 powerline corridor as it relates to Defence Sensitivity (Source: DFFE, 2022).

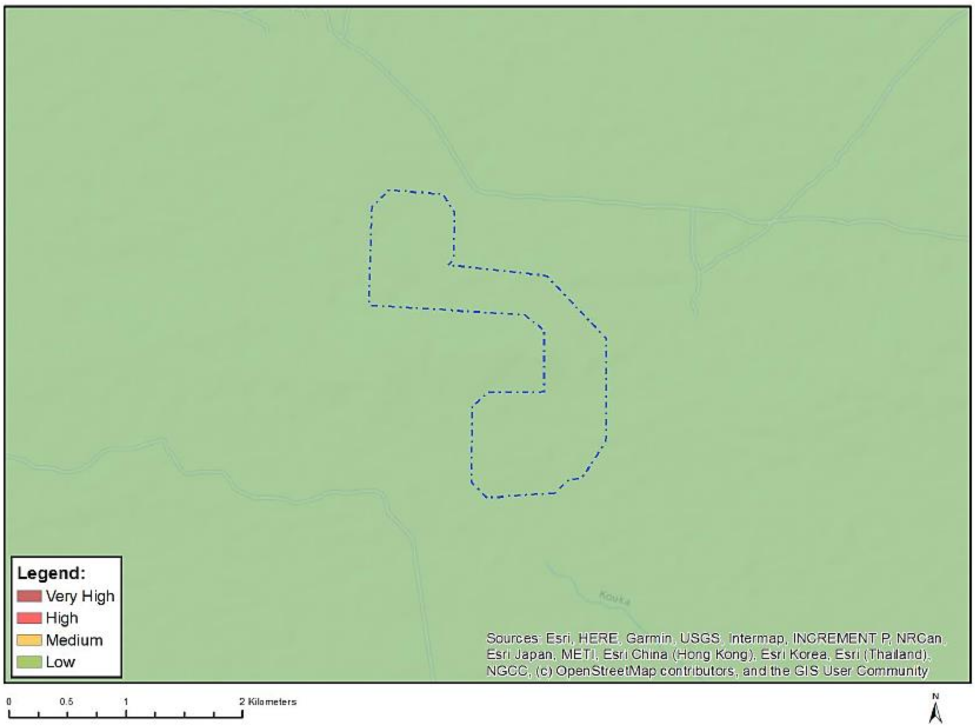


Figure D.8-6: Screening Tool Map showing the proposed Kwagga EGI Section 5 powerline corridor as it relates to Defence Sensitivity (Source: DFFE, 2022).

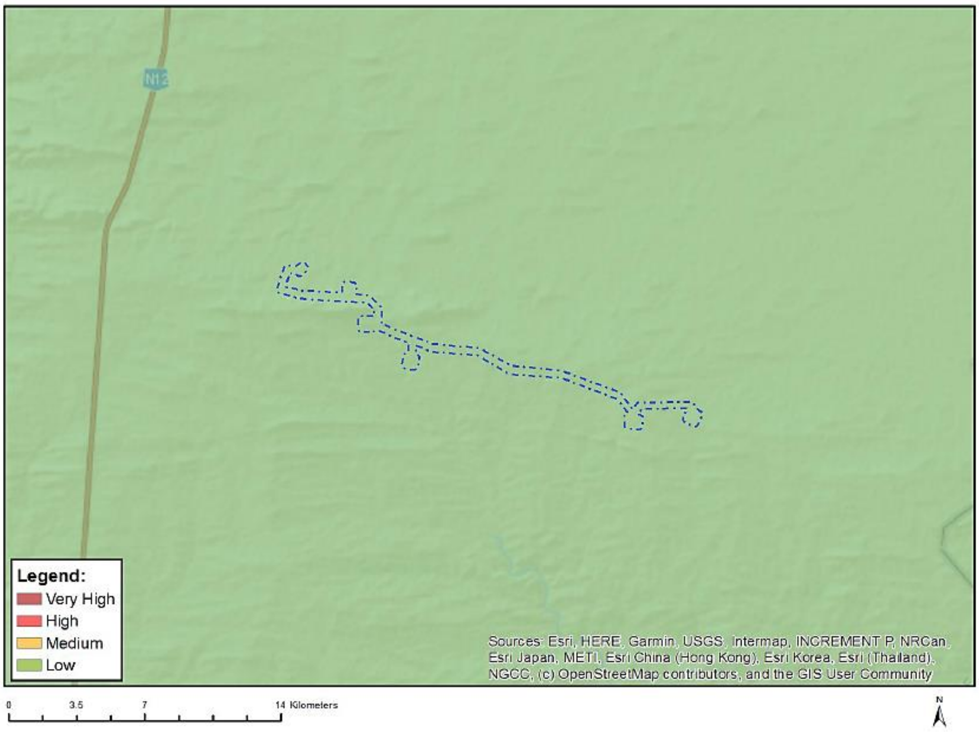


Figure D.8-7: Screening Tool Map showing the proposed Kwagga EGI Section 6 powerline corridor as it relates to Defence Sensitivity (Source: DFFE, 2022).

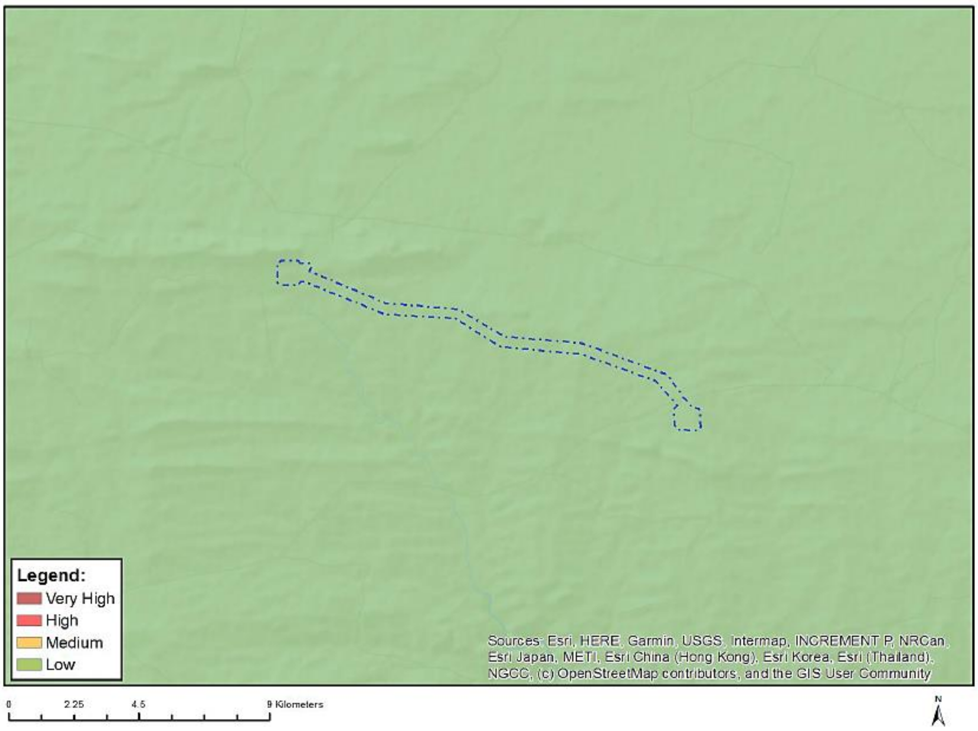


Figure D.8-8: Screening Tool Map showing the proposed Kwagga EGI Section 7 powerline corridor as it relates to Defence Sensitivity (Source: DFFE, 2022).

In terms of GN R320, this would mean that, should the proposed Kwagga EGI project corridor be found to be of low sensitivity during the site visit, no further requirements are applicable i.e. a Compliance Statement is not required.

D.8.7 Details of the Site Visit

The details of the site visit are noted below:

Date of Site Visit:	14 – 15 June 2022
Specialist Name:	Lizande Kellerman (EAP)
Professional Registration Number:	SACNASP Registration Number 400076/10
Specialist Affiliation / Company:	CSIR

D.8.8 Findings from the Site Sensitivity Verification

The proposed Kwagga EGI project corridor is located within an arid environment that is typified by sparse, low-growing vegetation dominated by dwarf, spiny Karoo shrubs characteristic of the Nama Karoo Biome. The site visit confirmed that the proposed Kwagga EGI project corridor is currently being used for agriculture activities. However, the limited climatic moisture availability, exacerbated by the ongoing drought, largely limits the agricultural land-use to low-density small stock grazing.

The 'low' sensitivity of the entire extent of the proposed Kwagga EGI project corridor as identified by the Screening Tool from a defence perspective was verified by the EAP during the site visit.

Note that no defence installations were found within the actual proposed development footprint, on the ground, for the entire Kwagga EGI project corridor. Refer to Figures D.8-9 to D.8-18 for views of the affected farm portions, on which the proposed project developments will take place.

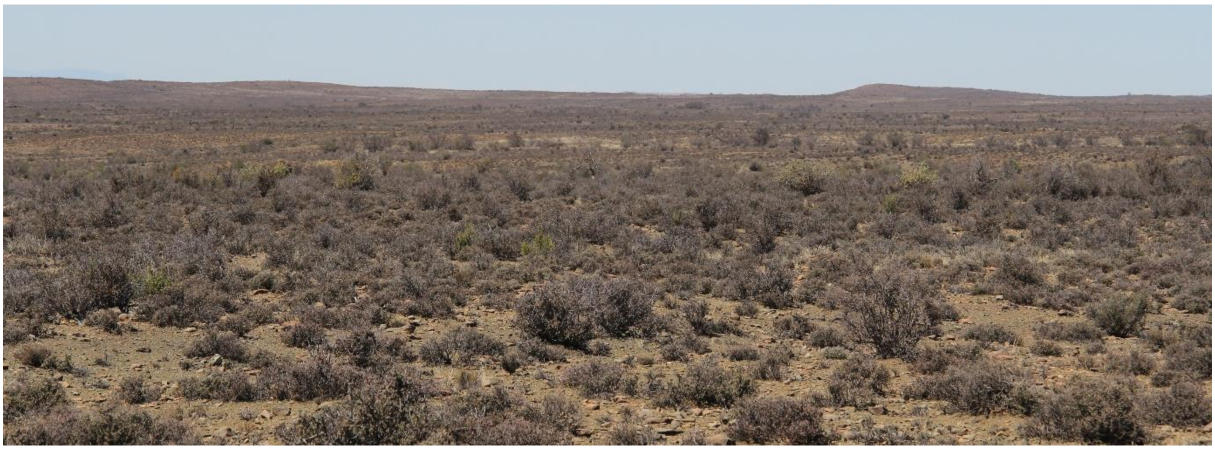


Figure D.8-9: View of Dwaalfontein Farm (E direction) (Photo: L. Kellerman)

Figure D.8-10: View of Dwaalfontein Farm (NE direction) (Photo: L. Kellerman)

Figure D.8-11: View of Dwaalfontein Farm towards Wolwe Kraal Farm (S direction) (Photo: L. Kellerman)

Figure D.8-12: View of Dwaalfontein Farm towards the N12 (W direction) (Photo: L. Kellerman)

Figure D.8-13: View of Wolwe Kraal Farm towards Muis Kraal Farm (E direction) (Photo: R. Invernizzi)

Figure D.8-14: View of Wolwe Kraal Farm towards Tyger Poort Farm (N direction) (Photo: R. Invernizzi)

Figure D.8-15: View of Wolwe Kraal Farm towards N12 (W direction) (Photo: R. Invernizzi)

Figure D.8-16: View of Muis Kraal Farm (N direction) (Photo: R. Invernizzi)

Figure D.8-17: View of Trakas Kuilen Farm (SW direction) (Photo: M. Klapwijk)

Figure D.8-18: View of Witpoortje Farm (E direction) (Photo: M. Klapwijk)

The Air Traffic and Navigation Services SOC Limited (ATNS) data (dated May 2022) indicates the location of the Oudtshoorn Military Shooting Range, which is classified as restricted airspace, located more than 80 km away to the south of the proposed project corridor. Based on its location, the Oudtshoorn Military Shooting Range will not be impacted on by the proposed EGI development. The ATNS data further demarcates a dangerous airspace, which is situated to the east and west of the Oudtshoorn Military Shooting Range that is also located more than 80 km away from the proposed EGI project corridor in a southerly direction. Based on its location, this demarcated airspace will not be affected by the proposed EGI development.

Figure D.8-19 indicates the location of the defence feature noted above, which informed this Site Sensitivity Verification.

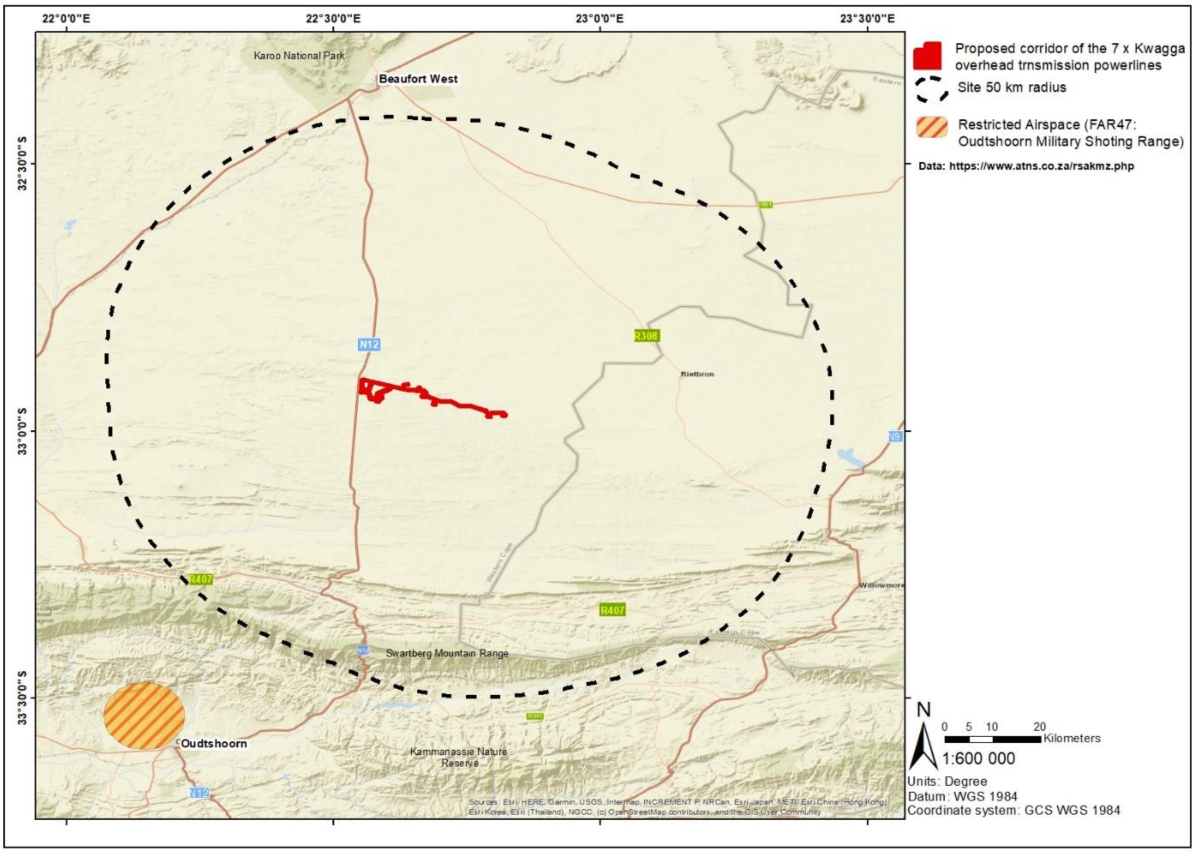


Figure D.8-19: Defence features relative to the proposed Kwagga EGI project corridor (indicated in red).

D.8.9 Concluding Statement

The entire proposed Kwagga EGI project corridor was determined and verified to be of low sensitivity (as it relates to defence). This was determined through a site visit and based on existing databases, and confirms the sensitivity allocated on the Screening Tool. Based on the above, in terms of GN R320, no further requirements are applicable i.e. a Compliance Statement is not required.

D.8.10 APPENDIX A: EAP DECLARATION

I, **Lizande Kellerman**, declare that –

- I act as the independent environmental assessment practitioner in this site sensitivity verification;
- I have expertise in conducting environmental impact assessments, 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 will perform the work relating to the site sensitivity verification in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I will take into account, to the extent possible, the matters listed in Regulation 13 of the Regulations when preparing the site sensitivity verification and any report relating to the site sensitivity verification;
- 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 site sensitivity verification by the Competent Authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the Competent Authority, unless access to that information is protected by law, in which case it will be indicated that such information exists and will be provided to the Competent Authority;
- I will perform all obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I am aware of what constitutes an offence in terms of Regulation 48 and that a person convicted of an offence in terms of Regulation 48(1) is liable to the penalties as contemplated in Section 49B of the Act.

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;
- ~~I have a vested interest in the proposed activity proceeding, such vested interest being:~~

Signature of the Environmental Assessment Practitioner:	
Name of Company:	CSIR
Date:	8 July 2022

D.8.11 APPENDIX B: CURRICULUM VITAE

PO Box 320
Stellenbosch
7599
South Africa

Office : +27 21 888 2489
Cell : +27 83 799 0949
Fax : +27 21 888 2473
Email lkellerman@csir.co.za

CV OF LIZANDE KELLERMAN

Position in Firm:	Principal Environmental Assessment Practitioner
Full Name:	Millicent Johanna Susanna Kellerman
Specialisation:	Strategic Environmental Assessment & Integrated Environmental Management
Date of Birth:	11 October 1978
Nationality:	South African
Drivers licence:	Code EB and Advanced Driver Qualification (4x4)

BIO-SKETCH:

Lizande Kellerman is a Principal EAP and scientist at the CSIR in Stellenbosch, with more than 10 years of experience in environmental impact studies, primarily in the planning, preparation and management of BAs, EIAs, and SEAs, as well as EMPrs, Screening/Fatal Flaw Studies, Biodiversity Risk Assessments, Biodiversity Resource Assessments and license applications for agriculture, atmospheric emissions, water use, waste management, mining, bioprospecting and biodiversity permitting, for numerous projects in the agricultural (including aquaculture), construction, conservation, mining and renewable energy sectors.

Lizande holds a BSc degree in Zoology and Entomology, with an Honours and Masters in Botany both at the University of Pretoria. She is currently working towards completing her PhD in Conservation Ecology. She commenced work at the CSIR in 2012 after spending three years working as an environmental scientist in the private sector. She has published several articles, both peer reviewed scientific and popular, and presented at five international conferences. She has also lectured on biodiversity, ecological and EIA at various universities in South Africa. Her training and experience as a qualified terrestrial ecologist has enabled her to provide expert input into ecological impact assessments and to perform specialist reviews of various terrestrial biodiversity and ecology impact assessments as part of BAs, EIAs and SEA.

Lizande is a registered Professional Natural Scientist (400046/10) with the South African Council for Natural Scientific Professions (SACNASP).

PROJECT EXPERIENCE RECORD

The following table presents a sample of key projects that Lizande Kellerman has undertaken to date:

Completion Date	Project description	Role	Client
2020 - 2021	Basic Assessments for the proposed development of the 810 MW Rinkhals Solar PV energy facilities 1-7 and associated infrastructure near Kimberley, Northern Cape and Free State	Project Leader and Environmental Assessment Practitioner	ABO Wind renewable energies (Pty) Ltd
2020 - 2021	Scoping and EIA for the proposed development of the 825 MW Kwagga Wind Energy Facilities 1-3 and	Project Leader and Environmental	ABO Wind renewable energies (Pty) Ltd

Completion Date	Project description	Role	Client
	associated infrastructure near Beaufort West in the Western Cape	Assessment Practitioner	
2021 - 2022	Landscaping and development of educational walkways with teaching materials at the CSIR Science Centre in Cofimvaba, Eastern Cape Province	Project Manager and Environmental Assessment Practitioner	Department of Science and Innovation (previously DST)
2020	A Desktop Fatal Flaw Assessment of the property affected by the proposed development of a solar photovoltaic (PV) energy facility near Windmeul, Western Cape (i.e. Project Suikerbekkie)	Project Manager and Principal Author	ABO Wind renewable energies (Pty) Ltd
2020	A Desktop Fatal Flaw Assessment of the properties affected by the proposed development of two solar photovoltaic (PV) energy facilities near Kimberley, Northern Cape (i.e. Project Rinkhals) and Vryburg in the North West (i.e. Project Skilpad)	Project Manager and Principal Author	ABO Wind renewable energies (Pty) Ltd
2020	A Desktop Fatal Flaw Assessment of the properties affected by the proposed development of two solar photovoltaic (PV) energy facilities near Kimberley, Free State Province (i.e. Project Rinkhals 1 and Project Rinkhals 2)	Project Manager and Principal Author	ABO Wind renewable energies (Pty) Ltd
2019 – 2020	Environmental compliance and performance improvement for the foundry industry of South Africa: Phase 1 – Status Quo Assessment	Project Manager and Principal author	National Cleaner Production Centre of South Africa
2016 – 2019	Strategic Environmental Assessment for Marine and Freshwater Aquaculture Development in South Africa	Project Manager, Principal Author and Report Editor	Department of Environmental Affairs and Department of Agriculture, Forestry and Fisheries
2019	Risk Assessment with Alien and Invasive Species Permit Application Process for the EA1TM Dust Suppressant	Environmental Assessment Practitioner	Earth Alive Clean Technologies Inc.
2019	Environmental Screening Study for the proposed Wool Scouring Facility on Erf 3476 at Mount Fletcher in the Elundini Local Municipality, Eastern Cape Province	Project Manager and Environmental Assessment Practitioner	CSIR Advanced Agriculture and Food Division
2019 - 2020	Water Use License Application Process for the Vryburg Solar 1 (Pty) Ltd Photovoltaic Energy Facility and Supporting Electrical Grid Infrastructure near Vryburg, North West Province	Project Manager and Environmental Assessment Practitioner	ABO Wind renewable energies (Pty) Ltd
2019 - 2020	Water Use License Application Processes for the Kuruman Phase 1 and Phase 2 Wind Energy Facilities and Supporting Electrical Grid Infrastructure near Kuruman, Northern Cape Province	Project Manager and Environmental Assessment Practitioner	Mulilo Renewable Project Developments (Pty) Ltd

Completion Date	Project description	Role	Client
2019	National Coastal Climate Change Vulnerability Index Assessment	Public Participation Practitioner	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
2018 – 2019	Strategic Environmental Assessment for the Identification of Energy Corridors, as well as Assessment and Management Measures for the Development of a Phased Gas Pipeline Network in South Africa: Biodiversity and Ecology Specialist Assessment including Terrestrial and Aquatic Ecosystems, and Species of the Desert, Nama Karoo & Succulent Karoo Biomes	Specialist Input and Principal Author	Department of Environmental Affairs, Eskom and iGas
2018	The Implementation of the Development of an Ecological Infrastructure Investment Framework (EIIF) and an Alien Invasive Species Strategy (AISS) for the Western Cape Province	Public Participation Practitioner	Western Cape Department of Environmental Affairs and Development Planning
2018	Basic Assessment for the proposed development of the 325 MW Kudusberg Wind Energy Facility and associated infrastructure between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces: Terrestrial Ecology Specialist Study	Specialist Input and Contributing Author	G7 Renewable Energies (Pty) Ltd
2018	Development of a Biodiversity Economy Transformation Strategy for the North West Province, South Africa	Specialist Input and Contributing Author	North West Rural, Environment and Agricultural Development
2018	Bioprospecting, biotrade and biodiversity permitting applications for Boscia albitrunca, as part of a Feasibility Study on Motlopi coffee, North West	Project Manager and Environmental Assessment Practitioner	North West Finance, Economy and Enterprise Development
2017 – 2018	Environmental Impact Assessment for Kuruman Wind Energy Facilities Phase 1 and Phase 2 near Kuruman, Northern Cape	Project Manager and Environmental Assessment Practitioner	Mulilo Renewable Project Developments (Pty) Ltd
2017 – 2018	Basic Assessment for supporting electrical infrastructure for the Kuruman Wind Energy Facilities Phase 1 and Phase 2 near Kuruman, Northern Cape	Project Manager and Environmental Assessment Practitioner	Mulilo Renewable Project Developments (Pty) Ltd
2012 – 2016	Bioprospecting beneficiation and implementation of the Nourivier Medicinal Plants Project at Nourivier, Northern Cape	Project Manager, Environmental Scientist	Department of Science and Technology (DST)
2012 – 2016	Bioprospecting beneficiation and implementation of the Witdraai Medicinal Plants Project at Andriesvale, Northern Cape	Project Manager, Environmental Scientist	Department of Science and Technology (DST)
2012 – 2016	Bioprospecting beneficiation and implementation of the Letsemeng Medicinal Plants Project at Petrusburg, Free State	Project Manager, Environmental Scientist	Department of Science and Technology (DST)

Completion Date	Project description	Role	Client
2013 – 2016	Bioprospecting beneficiation and implementation of the Abbey Medicinal Plants Project near Madibeng, Northern Cape	Project Manager, Environmental Scientist	Department of Science and Technology (DST)
2013 – 2016	Bioprospecting beneficiation and implementation of the Driekop Essential Oils and Moringa Project near Burgersfort, Limpopo	Project Manager, Environmental Scientist	Department of Rural Development and Land Reform (DRDLR)
2013 – 2014	Resource assessment, including bioprospecting, biotrade and biodiversity permitting applications for *Elephantorrhiza elephantina*, Northern Cape	Project Manager, Environmental Scientist	DST and CSIR Biosciences
2009 – 2010	Environmental screening and legal compliance of the Sidasoas Essential Oils (Rose Geranium) project near Onseepkans, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2010	Environmental screening and legal compliance of the Pelsan Essential Oils (Rose Geranium) project near Pella, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2010	Environmental screening and legal compliance of the Oppermans Essential Oils (Rose Geranium) project near Maubane, North West	Environmental Scientist	DST and CSIR ECD
2009 – 2010	Section 24G Rectification Application for the Sidasoas Essential Oils (Rose Geranium) project near Onseepkans, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2011	Bioprospecting beneficiation, environmental screening and legal compliance of the Nourivier Medicinal Plants Project at Nourivier, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2011	Bioprospecting beneficiation, environmental screening and legal compliance of the Witdraai Medicinal Plants Project at Witdraai, Northern Cape	Environmental Scientist	DST and CSIR ECD
2009 – 2010	EIA and Waste Management License Application at the Kumba Iron Ore Mine at Sishen, Northern Cape	Project Manager and EAP	Anglo American / Kumba Iron Ore
2009 – 2010	EIA for the development of the new Veremo Magnetite Mine near Stoffberg, Mpumalanga	Project Manager and EAP	Veremo Holdings / Kermas Limited
2009 – 2010	EIA for the proposed construction and upgrades of roads on various properties east of Orange Farm and west of the R82, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the proposed establishment of the new head office complex for the National Department of Land Affairs (DLA) as part of a public private partnership process, Pretoria, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the proposed construction of the internal road network and associated storm water pipes at Flamingo Park X2, Welkom, Free State	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the proposed construction of an access road and a sewer pipeline for the use of the proposed Gautrain Visitors Centre, Midrand, Gauteng	Project Manager and EAP	Bombela Consortium
2009 – 2010	BA for the proposed residential development and associated infrastructure on Erf 7402 and Erf 19642, Mamelodi-West, City of Tshwane, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	BA for the MTN Fibre Optic Deployment along roads R21 and R101, Gauteng	Project Manager and EAP	MTN Group Limited

Completion Date	Project description	Role	Client
2009 – 2010	BA and Waste Management License Application for the establishment of Phase 1 of the proposed provision of Bulk Water Supply Infrastructure and Purified Water Supply, Jozini, Kwa-Zulu Natal	Project Manager and EAP	PD Naidoo and Associates
2009 – 2010	BA for the proposed housing development situated on Klipspruit Ext 11, a portion of the remaining extent of the Farm Freehold 389 IQ, Gauteng	Project Manager and EAP	Basil Read (Pty) Ltd
2009 – 2010	Environmental Management Plan for the Blouberg Local Municipality, Capricorn District, Limpopo	Project Manager and EAP	Capricorn District Municipality
2009 – 2010	Environmental Fatal Flaw Assessment for the proposed development of the Statistics South Africa Head Office Complex: Persequor Park, Gauteng	Project Manager and EAP	Eco-Agent CC
2009 – 2010	Environmental Fatal Flaw Assessment for the proposed development of the Statistics South Africa Head Office Complex: Salvokop, Gauteng	Project Manager and EAP	Eco-Agent CC

EMPLOYMENT RECORD

- CSIR Environmental Management Services (EMS) — Apr 2016 – present
- CSIR Enterprise Creation for Development (ECD) — Jan 2012 – Mar 2016
- Midrand Graduate Institute — Jan 2011 – Dec 2011
- Polygon Environmental Planning cc — Jan 2011 – Dec 2011
- The MSA Group (Environmental, Legal and Mining Services) — Apr 2009 – Dec 2010
- Department of Botany, University of Pretoria — Aug 2003 – Mar 2009

QUALIFICATIONS

- 2006 University of South Africa (Postgraduate Certificate for Higher Education and Further Training)
- 2004 University of Pretoria MSc *Cum Laude* (Botany)
- 2001 University of Pretoria BSc Honours (Botany)
- 2000 University of Pretoria BSc (Zoology and Entomology)

SHORT-COURSES / WORKSHOPS

- 2015 Finances for Non-Financial Managers, CSIR Innovation Leadership & Learning Academy, Pretoria.
- 2014 IWRM, the NWA, and Water Use Authorisations, focusing on Water Use License Applications – Procedures, Guidelines, IWWMP’s and Monitoring, Carin Bosman Sustainable Solutions, Pretoria.

CONFERENCE PRESENTATIONS & PAPER PUBLICATIONS

INTERNATIONAL CONFERENCES

- **Kellerman, L.** Snyman-Van der Walt, L., Morant, P., Mashabela, K. & Lochner, P. (2017). Progress on the Strategic Environmental Assessment (SEA) for aquaculture development in South Africa. International Association for Impact Assessment – South Africa Conference 2017, Rawsonville, Western Cape Province.
- **Kellerman, L.** Snyman-Van der Walt, L., Morant, P., Mashabela, K. & Lochner, P. (2017). National Strategic Environmental Assessment (SEA) for aquaculture development in South Africa – A synopsis of the current marine and freshwater aquaculture environment and the need to promote sustainable growth and incentivisation. World Aquaculture Conference 2017, Cape Town, Western Cape Province.
- **Kellerman, L.** (2012). Success with Technology Transfer activities within the context of Enterprise Development that generate Social and Economic Development Opportunities. Conference on Innovation for Poverty Alleviation: South Africa - European Union Summit, Brussels, Belgium.

- **Kellerman, L.** (2012). New Medicinal Plants Demonstration Agronomy. European Union's Conference for Sector Budget Support. Department of Science and Technology, Roodevallei, Pretoria, Gauteng Province.
- **Kellerman, L.** (2012). Wild-harvesting for Commodity Beneficiation. European Union's Conference for Sector Budget Support. Department of Science and Technology, Roodevallei, Pretoria, Gauteng Province.

NATIONAL CONFERENCES

- **Kellerman, L.** & Moeng, E. (2013). Technology transfer to facilitate the sustainable cultivation harvesting and processing of arid zone indigenous plants. Annual Conference of the Indigenous Plant Use Forum, Agricultural Research Council, Nelspruit, Mpulamalanga Province.
- **Kellerman, L.** (2012). Capitalizing on South Africa's Indigenous Plants – Demonstration agro-processing for social impact. Annual Conference of the Indigenous Plant Use Forum, University of Venda, Thohoyandou, Limpopo Province.
- **Kellerman, M.J.S.**, Strobach, M. & Van Rooyen, M.W. (2008). Comparison of leaf trait spectra of two contrasting southern African environments. Annual Conference of South African Association for Botanists, Drakensville, Free State Province.
- Strobach, M, **Kellerman, M.J.S.** & Van Rooyen, M.W. (2008). Comparison of leaf functional types of two contrasting southern African environments. Annual Conference of South African Association for Botanists, Drakensville, Free State Province.
- **Kellerman, M.J.S.** & Grote, W. (2007). The Tswaing Crater… A blast from the past. 10th Annual Conference of the South African Association for Science and Technology Centres, Bayworld, Port Elizabeth, Eastern Cape Province.
- **Kellerman, M.J.S.** & Van Rooyen, M.W. (2006). Plant diversity in old fields of various ages in the Upland Succulent Karoo, South Africa. Arid Zone Ecology Forum, Kamieskroon, Northern Cape Province.
- **Kellerman, M.J.S.** & Van Rooyen, M.W. (2002). Seed bank dynamics of selected habitat types in the Tembe Elephant Park, Maputaland. Annual Conference of South African Association for Botanists, Rhodes University, Eastern Cape Province.

SCIENTIFIC BOOKS / JOURNAL PUBLICATIONS

- **Kellerman, L.** & Wild, S. (2015): A 'happy pill' to boost rural economies. – In: Wild, S. (Author), Fraser, S. [Editor]: Innovation – Shaping South Africa Through Science. Part 3: pp. 113-120, Pac Macmillan South Africa, in association with the Gordon Institute of Business Science, University of Pretoria.
- Wesuls, D., Strohbach, M., Horn, A., Kos, M., Zimmermann, J., Hoffmann, J., Geldenhuys, C., Dreber, N., **Kellerman, L.**, van Rooyen, M. W., Poschlod, P. (2010): Plant functional traits and types as a tool to analyse landuse impacts on vegetation. – In: Schmiedel, U., Jürgens, N. [Eds.]: Biodiversity in southern Africa. Volume 2: Patterns and processes at regional scale: pp. 222–232, Klaus Hess Publishers, Göttingen & Windhoek.
- **Kellerman, L** & Van Rooyen, G. (2009). Can time heal the old fields of the Kamiesberg? Veld & Flora 95(2): 78-81.
- **Kellerman, M.J.S.** & Van Rooyen, M.W. (2007). Seasonal variation in soil seed bank size and species composition of selected habitat types in Maputaland, South Africa. Bothalia 37,2: 249-258.
- Van Rooyen, M.W., Tosh, C.A., Van Rooyen, N., Matthews, W.S. & **Kellerman, M.J.S.** (2004). Impact of harvesting and fire on *Phragmites australis* reed quality in Tembe Elephant Park, Maputaland. Koedoe 47(1): 31-40.
- Steenkamp, Y., **Kellerman, M.J.S.** & Van Wyk, A.E. (2001). Fire, frost, waterlogged soil or something else: What selected for the Geoxylic Suffrutex growth form in Africa? Plantlife 25: 4-6.

MEDIA INTERVIEWS / PUBLICATIONS

- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published online at the Landbouweekblad on 26 May 2017. http://www.landbou.com/nuus/help-die-wnnr-met-nylkurper-opname/

- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published in the Farmersweekly Magazine on 09 June 2017.
- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published in the Stywe Lyne/Tight Lines Magazine, Issue 690 in August 2017.
- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published online at the CSIR website on 26 June 2017. https://www.csir.co.za/csir-calls-public-participate-rapid-citizen-science-survey/
- **L Kellerman**, article on the Nile Tilapia Citizen Science Survey for the Aquaculture SEA published online at the DEA website in July 2017. https://www.environment.gov.za/projectsprogrammes/operationphakisa/oceanseconomy/
- **Kellerman, L**. (2015). Landbou – Kougoed. kykNet – Dagbreek television show.
- Interviewed by Wild, S. (2015). Bushmen cure – all's prospects hit a new high. Mail & Guardian Newspaper, pp: 26-27.
- Interviewed by Mostert, M. (2015). Kougoed-projek in Nourivier. Die Plattelander Newspaper, pp: Annexure.
- Interviewed by Smith, M. (2015). Geld te maak uit Kougoed, Jantjie-Bêrend. Landbouweekblad Magazine, pp: 28.
- **Kellerman, L**. (2014). Kougoed (*Sceletium tortuosum*) Medicinal Plants Project in Nourivier. SKEP eNews – www.skep.org.za
- Interviewed by Van Rooyen, B. (2014). Reaping rewards from South Africa's botanical riches. – In: Improving lives – Careers at the CSIR. ScienceScope, Volume 7(1), pp: 38-39. Publication of the Council for Scientific and Industrial Research, Pretoria.
- Interviewed by Van Rooyen, B. (2014). Successful cultivation of medicinal plants in the Kalahari generates work for hundreds. CSIR eNews – Enterprise Creation for Development.
- Interviewed by Van Rooyen, B. (2012). Local succulents yield natural, calmative agent. CSIR eNews – Enterprise Creation for Development.
- Interviewed by Van Rooyen, B. (2012). Mr Derek Hanekom visits DST-funded projects in the Northern Cape. CSIR eNews – Enterprise Creation for Development.

LANGUAGE CAPABILITY

	Speaking	Reading	Writing
Afrikaans	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent

PROFESSIONAL REGISTRATIONS / MEMBERSHIPS

- Professional Natural Scientist (Pr.Sci.Nat. Number 400076/10 – Botanical Sciences) with the SACNASP
- International Association of Impact Assessment South Africa (IAIAsa) – Registration number: 343955
- Botanical Society of South Africa (BotSoc) – Registration Number: S01/58657