HERITAGE IMPACT ASSESSMENT

In terms of Section 38(8) of the NHRA for the

Proposed establishment of 132kV Overhead Powerline (OHL) and 33/132kV Substation to evacuate power from the Karreebosch Wind Energy Facility (WEF) to the National Grid in the Western and Northern Cape

SAHRIS Ref:

HWC Ref:

Prepared by CTS Heritage

CTS HERITAGE

For

WSP

August 2022

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EXECUTIVE SUMMARY

1. Project Name:

The proposed Karreebosch 132kV OHPL and onsite 33/132kV substation associated with the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3).

2. Location:

The proposed 132kV Karreebosch OHPL, 33/132kV substation and associated infrastructure is located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

3. Locality Plan:

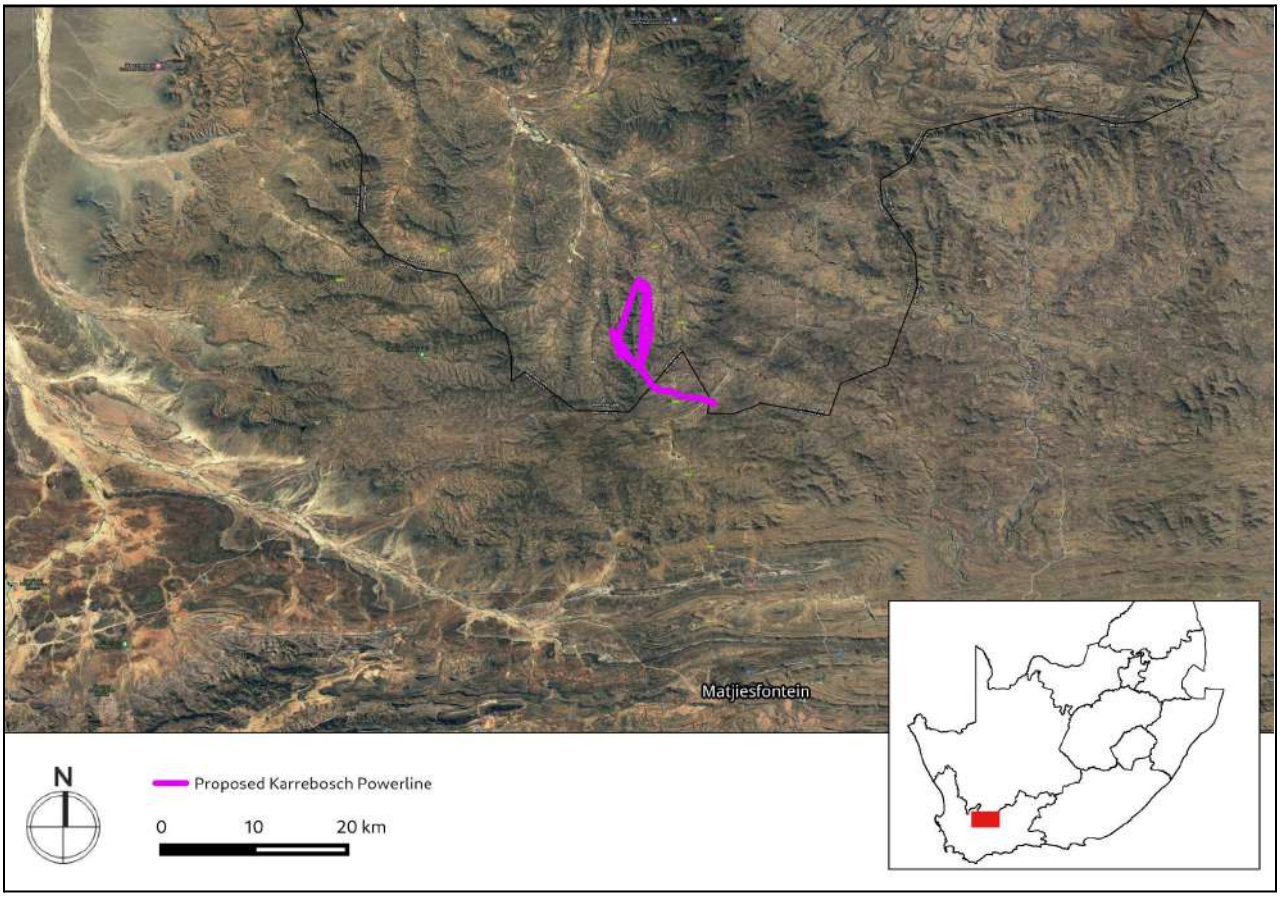

Figure A: Location of the proposed study area

4. Description of Proposed Development:

This application is for the proposed development of a 132kV twin tern double circuit OHL, 33/132 kV substation and associated infrastructure which will evacuate power from the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing subject of a Part 2 EA amendment, final layout and EMPr approval process) and connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.. The powerline is approximately 20 km long.

5. Heritage Resources Identified in the broader study area:

POINT ID	Site Name	Description	Co-ordinates		Grading	Mitigation
Archaeology						
KRB017	Karrebosch 017	Quartzite flakes, thinly struck, prep. Platforms, MSA. Near valley floor; cores and flakes, knapping and production site	-32.85936	20.47184	NCW	NA
KRB018	Karrebosch 018	Chert flake, LSA. On top of ridge.	-32.84809	20.44152	NCW	NA
KRB019	Karrebosch 019	Quartzite flake, MSA	-32.84897	20.44073	NCW	NA
KRB020	Karrebosch 020	Quartzite flake, MSA	-32.86418	20.43635	NCW	NA
KRB021	Karrebosch 021	Chert and quartz flakes, lower grindstone near wind pump, LSA	-32.90585	20.44082	NCW	NA
KRB022	**Karrebosch 022**	**Chert flake, LSA**	**-32.88297**	**20.517862**	**NCW**	**NA**
Palaeontology						
PAL_KRB 001	Palaeo Karreebosch 001	Extensive exposure of SSE-dipping sandstone bed top with sets of small-scale wave ripples and meandering epichnial invertebrate burrows that were probably generated on the margins of a shallow floodplain pond or playa lake. Sharply overlying grey-green mudrocks show numerous ball-and-pillow load structures	32°52'37.22"S	20°29'19.68"E	IIIC	None
PAL_KRB 002	**Palaeo Karreebosch 002**	**Small (c. 6 cm wide), angular block of pale grey phosphatic concretion containing comminuted vertebrate bone and perhaps bony spines or teeth (pearly grey to black). Possibly of bony fish or – more likely - amphibian (i.e. temnospondyl) affinity. Block in surface float along shallow drainage line running along top of well-exposed grey-green mudrock package.**	**32°52'37.45"S**	**20°29'22.32"E**	**IIIB**	**Collection under workplan application of Option 1B is developed**
PAL_KRB 003	**Palaeo Karreebosch 003**	**Probably part of the same fossiliferous concretion**	**32°52'37.61"S**	**20°29'21.97"E**	**IIIB**	**Collection under workplan application of Option 1B is developed**

POINT ID	Site Name	Description	Co-ordinates		Grading	Mitigation
PAL_KRB 004	**Palaeo Karreebosch 004**	**As above (2 blocks). Probably part of the same fossiliferous concretion.**	**32°52'36.97"S**	**20°29'23.42"E**	**IIIB**	**Collection under workplan application of Option 1B is developed**
PAL_KRB 005	Palaeo Karreebosch 005	Hillslope exposure of steeply dipping, SE-facing current-rippled bed top with sparse epichnial invertebrate burrows up to c. 2 cm wide, subhorizontal with central convex core (possibly segmented) and shallow marginal grooves	32°52'39.07"S	20°29'29.12"E	IIIC	None
PAL_KRB 006	Palaeo Karreebosch 006	Dense mat of reworked reedy sphenophyte stems (horsetail ferns) preserved as compressions within dark grey siltstones, shallow stream bed exposure.	32°52'31.51"S	20°29'23.81"E	IIIC	None
PAL_KRB 007	**Palaeo Karreebosch 007**	**Stream bed and bank exposure of grey-green mudrocks of Abrahamskraal Fm with horizon containing several subcylindrical, vertical lungfish burrow casts up to 9 cm in diameter**	**32°54'53.65"S**	**20°30'56.37"E**	**IIIB**	**No impact anticipated**
PAL_KRB 008	Palaeo Karreebosch 008	Stream bed exposure of grey-green siltstone or fine-grained wacke covered by purple-brown siltstone veneer and with dense assemblage of rounded traces between 0.5 to 1 cm in diameter – probably reedy plant stem casts (e.g. sphenophytes)	32°54'52.93"S	20°30'58.94"E	IIIC	None
PAL_KRB 009	Palaeo Karreebosch 009	Stream gulley exposure of mottled grey-green to purple-brown sandstone with assemblage of rounded, oval to irregular sand-infilled casts with reduction haloes, either of plant stems or invertebrate burrows	32°54'41.76"S	20°31'10.35"E	IIIC	None
PAL_KRB 010	Palaeo Karreebosch 010	Sandstone bed top with possible effaced desiccation crack infills, assemblage of reedy plant stem casts.	32°55'11.03"S	20°31'54.90"E	IIIC	None

6. Anticipated Impacts on Heritage Resources:

The findings of this field assessment largely correlate with the findings of the ACO Associates in the HIA completed for the Karreebosch WEF (Kendrick, 2015, SAHRIS Ref 183350) and the Roggeveld WEF (Hart and Webley, 2013, SAHRIS Ref 152531). The archaeological resources identified were all *ex situ* and are of limited scientific and heritage significance.

Based on the findings of this and other assessments completed in the area, it is unlikely that the proposed development of all alternatives of the Karreebosch 132kV OHL, 33/132kV on site substation alternatives and associated infrastructure will negatively impact significant resources. This is due to the fact that 132kV lines typically have a very small development footprint and can be constructed without the large roads needed to build the WEFs. The routes chosen by the engineers for the various alternatives follow very rugged, mid-slope paths

where almost no archaeological material or ruins were found. No significant heritage resources were identified within the areas proposed for the substation alternatives. It is possible, although unlikely, that archaeological resources may be located beneath the ground surface which may be impacted during the course of development. Recommendations in this regard are included below.

In terms of impacts to palaeontological heritage, Almond (2021) concludes that "*There are no objections on palaeontological grounds to authorisation of the proposed 132 kV powerline and there is no preference on palaeontological heritage grounds for any particular on-site substation site or powerline route option among those currently under consideration. If powerline Option 1B is selected for construction, vertebrate fossil material at or in the vicinity of Locs. 454-456 on Rietfontein RE/197 must be collected by a professional palaeontologist before construction of the powerline. No further specialist palaeontological studies or mitigation are recommended for this electrical infrastructure project. These recommendations and the Chance Fossil Finds Protocol appended to this report should be included in the EMPr for the development.*" It is further recommended that, should Alternative 1B be developed, a walkdown of final alignment must be conducted by a palaeontologist with an approved workplan for the collection of sensitive fossil resources that are at risk. It is further recommended that the attached Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development.

7. Recommendations:

There is no objection to the proposed development of the Karreebosch OHL and onsite substation in terms of impacts to heritage resources and there is no preferred alternative for the OHL route or onsite substation on condition that:

- Should OHL Alternative 1B be developed, a walkdown of final alignment must be conducted by a palaeontologist with an approved workplan for the collection of sensitive fossil resources that are at risk.
- The attached Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development
- The mitigation measures proposed in section 9 of the VIA are implemented
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The relevant heritage authority (the South African Heritage Resources Agency (SAHRA) in the Northern Cape and Heritage Western Cape (HWC) in the Western Cape) must be contacted immediately in order to determine an appropriate way forward.

8. Author/s and Date:

Jenna Lavin and Nic Wiltshire, July 2022

Details of Specialist who prepared the HIA

Jenna Lavin, an archaeologist with an MSc in Archaeology and Palaeoenvironments, and currently completing an MPhil in Conservation Management , heads up the heritage division of the organisation, and has a wealth of experience in the heritage management sector. Jenna's previous position as the Assistant Director for Policy, Research and Planning at Heritage Western Cape has provided her with an in-depth understanding of national and international heritage legislation. Her 8 years of experience at various heritage authorities in South Africa means that she has dealt extensively with permitting, policy formulation, compliance and heritage management at national and provincial level and has also been heavily involved in rolling out training on SAHRIS to the Provincial Heritage Resources Authorities and local authorities.

Jenna is a member of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has been a member of the Association of Southern African Professional Archaeologists (ASAPA) since 2009. Recently, Jenna has been responsible for conducting training in how to write Wikipedia articles for the Africa Centre's WikiAfrica project.

Since 2016, Jenna has drafted over 100 Heritage Impact Assessments throughout South Africa.

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CONTENTS

APPENDICES

1. INTRODUCTION

1.1 Background Information on Project

PERMITTING PROCESS

The entire extent of the proposed 132kV Karreebosch Overhead Powerline (OHPL), 33/132kV Substation and associated infrastructure is located within one (1) of the Strategic Transmission Corridors, namely the Central Corridor, as defined in and in terms of the procedures laid out in Government Notice (GN) No. 113. The proposed OHPL project will therefore be subject to a Basic Assessment (BA) Process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 1 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this BA process is the national Department of Forestry, Fisheries and Environment (DFFE).

PROJECT LOCATION

The proposed 132kV Karreebosch OHPL, 33/132kV Substation and associated infrastructure is located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The proposed Karreebosch OHPL will evacuate power from the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), located in the Northern Cape Province, and will connect to the existing Komsberg substation.

PROJECT INFRASTRUCTURE

OVERHEAD POWERLINE

The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures. Figure 1.1 below provides an example of a conventional lattice tower compared with a monopole structure. Pole positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). However, a 400m wide assessment corridor is being considered and has been walked down by the specialists for approval to allow for micro siting of tower positions once the detailed design has been completed. It is anticipated that towers will be located on average 200m to 250m apart; however, longer spans may be needed due to terrain and watercourse crossings.

SERVITUDE

A 400m wide OHPL corridor (200m on either side of the centre line) has been assessed by the specialists for the purposes of the Basic Assessment Report (BAR). The registered servitude will fall within this 400m wide assessment corridor and will be 31m wide (15.5 m on either side of the centre line). The Right of Way servitude (servitude road) will be up to 14m wide (7m on either side of the centre line), resulting in a total servitude width of 45m in total. The length of the longest powerline route alternative (Option 2C – see "Alternatives" section 5.3) is 20.52 km, which will result in a servitude area of up to 92.3 ha.

The servitude is required to ensure safe construction, maintenance and operation of the powerline. Registration of the servitude grants the operator the right to erect, operate and maintain the powerline and to access the land to carry out such activities, but it does not constitute full ownership of the land. It should be noted that the OHPL will be ceded to Eskom post-construction.

Construction and operation activities and access to the powerline will be carried out with due respect to the affected landowners. The servitude required for the Project will be registered at the Deeds Office and will form part of the title deed of the relevant properties once the environmental authorisation has been obtained.

SUBSTATIONS

The Karreebosch OHPL will be routed from the proposed onsite Karreebosch 33/132kV substation (associated with the approved Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3 which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process)) to the existing Bon Espirange substation, after which it will connect to the existing 400kV Komsberg substation. Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site have been assessed as part of this BAR, each with a 200m x 150m (3 ha) footprint. A 200m assessment area surrounding the proposed substation alternatives have been included as part of this assessment for micro siting, with a slight funnel leading into the existing Bon Espirange and Komsberg substations to allow for greater flexibility for micro siting for incoming proposed line connections. The proposed Karreebosch OHPL may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed as part of this BAR.

SITE ACCESS

The OHPL and associated infrastructure will be accessed via roads forming part of the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3) which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), where possible. The preferred OHPL routing will require an associated servitude road (following beneath the proposed OHPL) to be constructed which will be used to construct, operate and maintain

the powerline. Existing roads will be used as much as possible, where feasible. However, additional access roads may be required to provide access to sections of the powerline route.

New sections of access roads will deviate off existing roads (within the 400m wide assessment corridor), as needed to access tower positions. Access roads will be mostly two-track gravel roads up to 14m in width following beneath the OHPL in order to access tower structures for construction and maintenance purposes.

ALTERNATIVES

Only one (1) OHPL route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Espirange Substation and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg Route), which is approximately 9.2 km in length. ***No alternatives can therefore be provided for these two sections of the OHPL (Route 3 and Bon Espirange to Komsberg Route).***

Six (6) OHPL route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the Karreebosch WEF onsite 33/132kV substation (with substation alternatives: Option 1 and Option 2) and Route 3 preceding the existing Bon Espirange Substation. As noted above, all of the six OHPL route alternatives follow the same routing from their point of convergence on Remainder of farm Ek Kraal No.199, approximately 3.1 km before the Bon Espirange Substation, to the Komsberg Substation situated on Portion 2 of Farm Standvastigheid No. 210.

These alternatives, as depicted in the figures included in this report are described below:

- **OHPL Route Option 1:** Three (3) OHPL route alternatives are being considered for the link between Substation Option 1 and the Bon Espirange Substation and Komsberg Substation:
    - Option 1A (approximately 14.51 km in length in its entirety from Substation Option 1 to the Komsberg Substation);
    - Option 1B (approximately 17.28 km in length in its entirety from Substation Option 1 to the Komsberg Substation); and
    - Option 1C (approximately 13.91 km in length in its entirety from Substation Option 1 to the Komsberg Substation).
- **OHPL Route Option 2:** Three (3) powerline corridor route alternatives were considered for the link between Substation Option 2 and the Bon Espirange Substation and Komsberg Substation:
    - Option 2A (approximately 20.47 km in length in its entirety from Substation Option 1 to the Komsberg Substation);
    - Option 2B (approximately 16.63 km in length in its entirety from Substation Option 1 to the Komsberg Substation); and

- Option 2C (approximately 20.52 km in length in its entirety from Substation Option 1 to the Komsberg Substation).

Alternatives 1A-C feed out of Substation Option 1 proposed in the south-central portion of the Farm Klipbanksfontein 198/1. Alternatives 2A-C feed out of Substation Option 2 proposed in the south-eastern corner of Wilgebosch Rivier 188/RE.

1.2 Description of Property and Affected Environment

The proposed routes for the Karreebosch powerline connect up to the Komsberg substation in the east and traverse through sections of the now operational Roggeveld WEF before following one of two valleys that run in a north to south direction that are separated by a prominent ridge containing a number of proposed turbines for the Karreebosch WEF. Ek Kraal farm lies in much of the eastern valley and Klipbanks Fontein lies in the western valley in a more rugged area than Ek Kraal. Only very short sections of the OHL alternative route alignments cross the valley floor and tend to follow the slopes of the ridges that dominate the area. Ek Kraal has small-scale farming activities with very small patches of ground dedicated to crop agriculture along the Tankwarivier in addition to providing grazing for sheep. The valley on the western route over Klipbanks Fontein is largely vacant as most of the primary farming occurs in the next valley further west where water supplies are more predictable. Water was running in most of the rivers and streams at the time of the survey (August 2021), but the previous extended drought brought almost all farming activities in the area to the point of closure. A number of abandoned farmhouses and ruins have been documented in the area from previous surveys which confirms the rather precarious state that these farms are in due to the environment.

The region is regarded as semi-arid as it receives limited precipitation. It is located on the border of the summer and winter rainfall regions. Precipitation is in the form of snow and rain in winter, with occasional thunderstorms during the summer. The vegetation cover falls within the Roggeveld Shale Renosterveld of the Karoo Renosterveld Bioregion and consists predominantly of low shrubs and very few trees in this area.

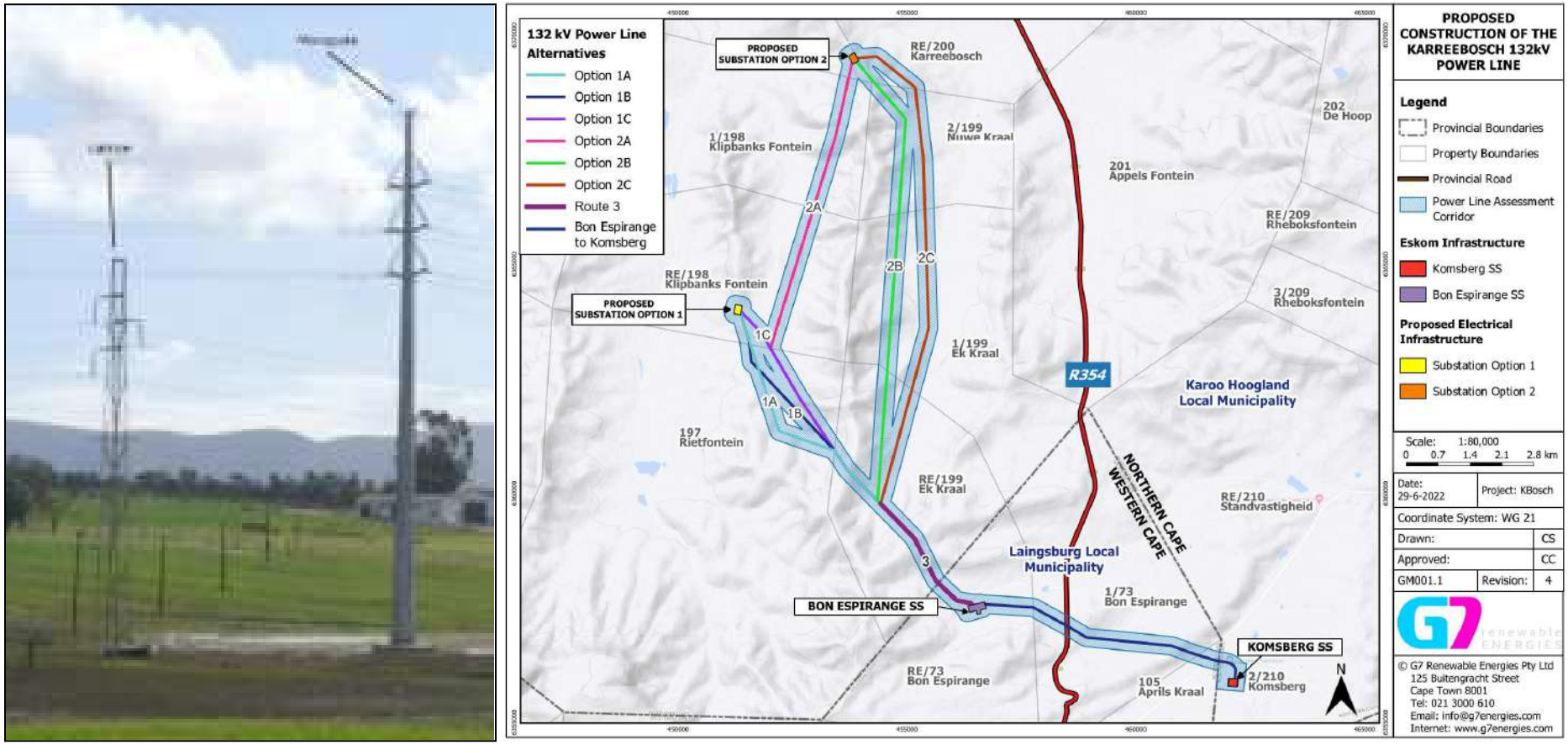

Figure 1.1 Conventional lattice powerline tower compared with a steel monopole structure and map of Powerline Route and Substation Alternatives for the Karreebosch OHPL

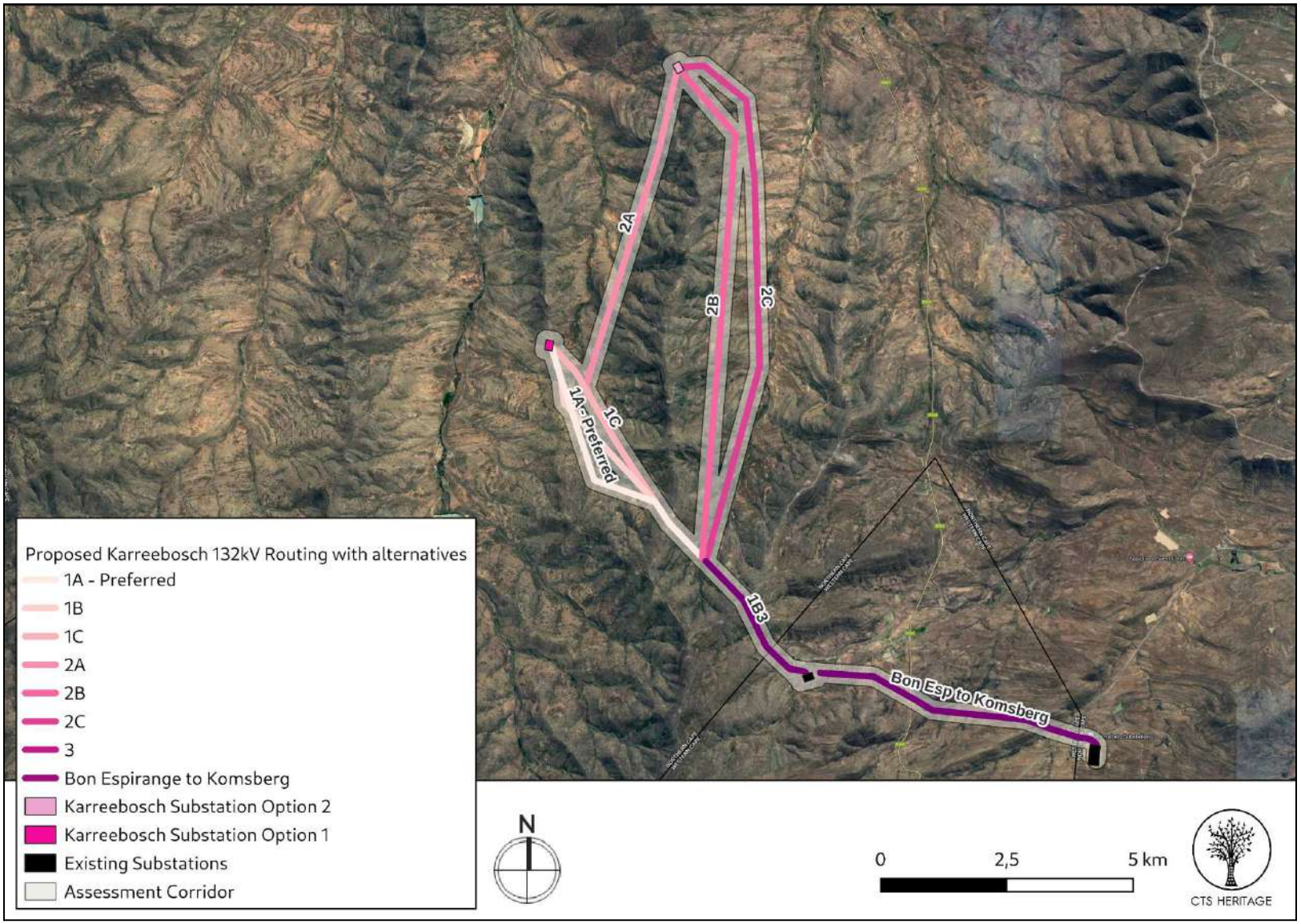

Figure 1.2: The proposed study area within which the 132kV OHL will be located

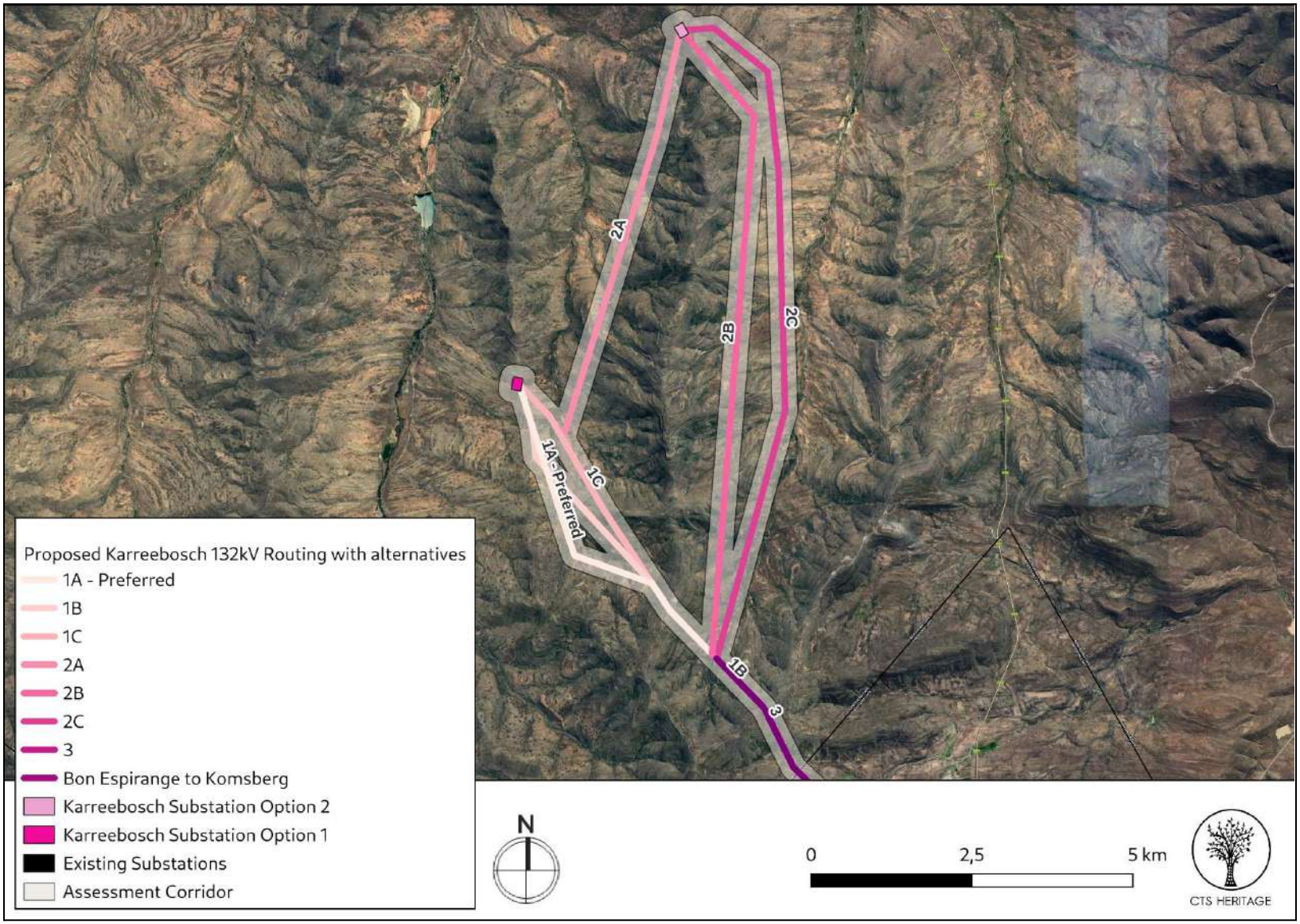

Figure 1.3: Study Area in the Northern Cape

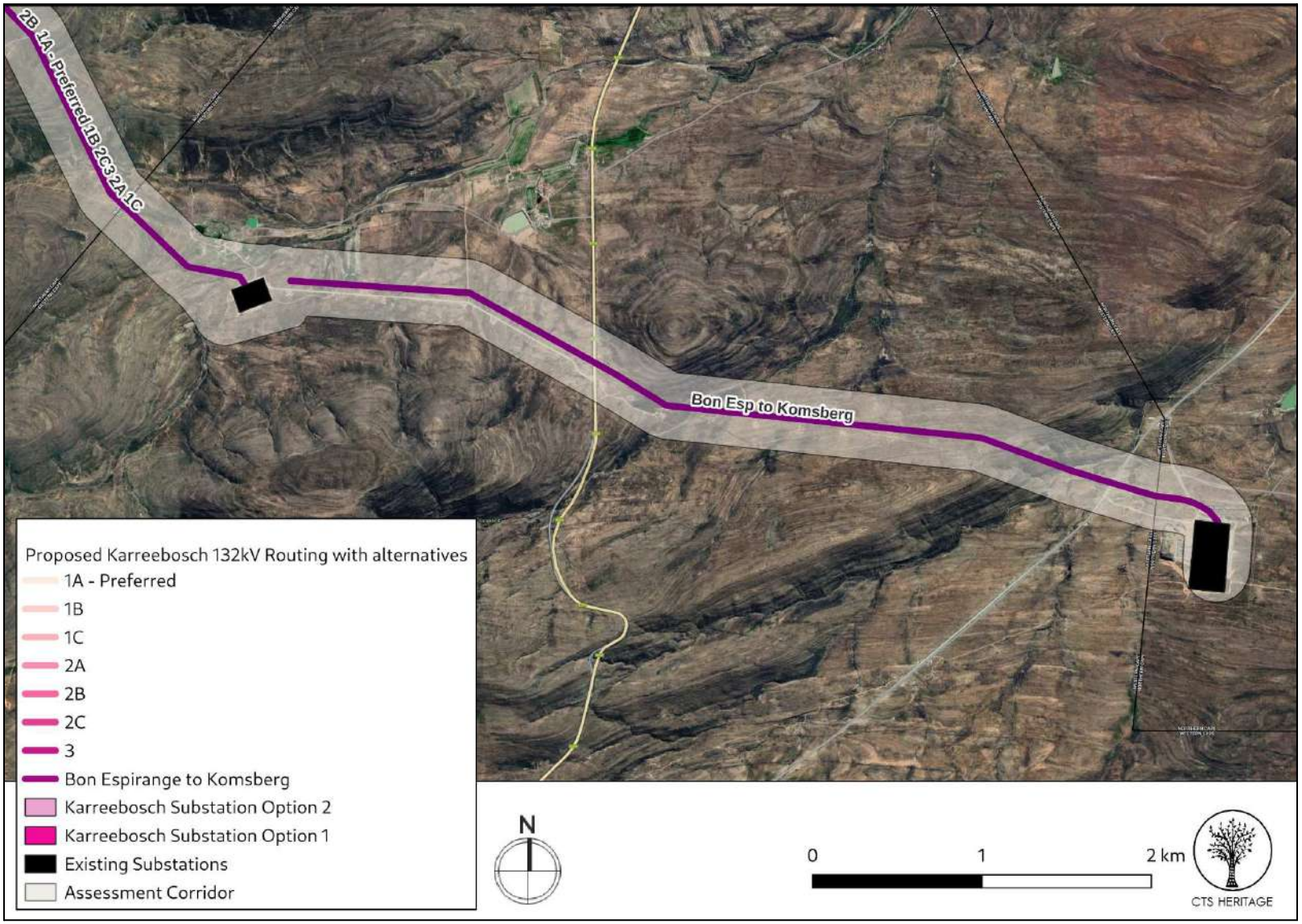

Figure 1.4: Study Area in the Western Cape (although the shapefile provided indicates that the line does not connect to the substation, this is incorrect and the line does in fact connect)

2. METHODOLOGY

2.1 Purpose of HIA

The purpose of this Heritage Impact Assessment (HIA) is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999).

2.2 Summary of steps followed

- A Desktop Study was conducted of relevant reports previously written (please see the reference list for the age and nature of the reports used).
- An archaeologist conducted an assessment of the broader study area in order to determine the archaeological resources likely to be disturbed by the proposed development. The archaeologist conducted his site visit on 13 August 2021.
- The AIA was updated to reflect the amended alignment in July 2022
- A palaeontologist conducted an assessment of the broader study area in order to determine the palaeontological resources likely to be disturbed by the proposed development. The palaeontologist conducted his site visit on 23-24 and 29 September 2021.
- The PIA was not updated to reflect the amended alignment. Due to the similarities in the 2021 and 2022 alignments, the impacts to palaeontological resources remain the same and an updated impact assessment is undertaken in this HIA report.
- The VIA completed for this project was integrated into the HIA
- The identified resources were assessed to evaluate their heritage significance.
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.

2.3 Assumptions and uncertainties

- The *significance* of the sites and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.
- It should be noted that archaeological and palaeontological deposits often occur below ground level. Should artefacts or skeletal material be revealed at the site during construction, such activities should be halted, and it would be required that the heritage consultants are notified for an investigation and evaluation of the find(s) to take place.

However, despite this, sufficient time and expertise was allocated to provide an accurate assessment of the heritage sensitivity of the area.

2.4 Constraints & Limitations

The vegetation did not pose any challenges to the archaeological survey but much of the ground was covered in broken rock and stone eroding down the slopes of the ridges. The placement of the OHL footings predominantly lie along the middle of the slopes enroute to and from the tops of the ridges and this resulted in very few heritage observations.

2.5 Impact Assessment Methodology

Assessments of Impacts and Mitigation

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria presented in Table 1 below.

Table 1: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
impact on a given environmental receptor					boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria:	S=(E+D+R+M) x P Significance=(Extent+Duration+Reversibility+Magnitude) x Probability				

IMPACT SIGNIFICANCE RATING			
Total Score	**0 – 30**	**31 to 60**	**61 – 100**
Environmental Significance Rating (Negative (-))	**Low (-)**	**Moderate (-)**	**High (-)**
Environmental Significance Rating (Positive (+))	**Low (+)**	**Moderate (+)**	**High (+)**

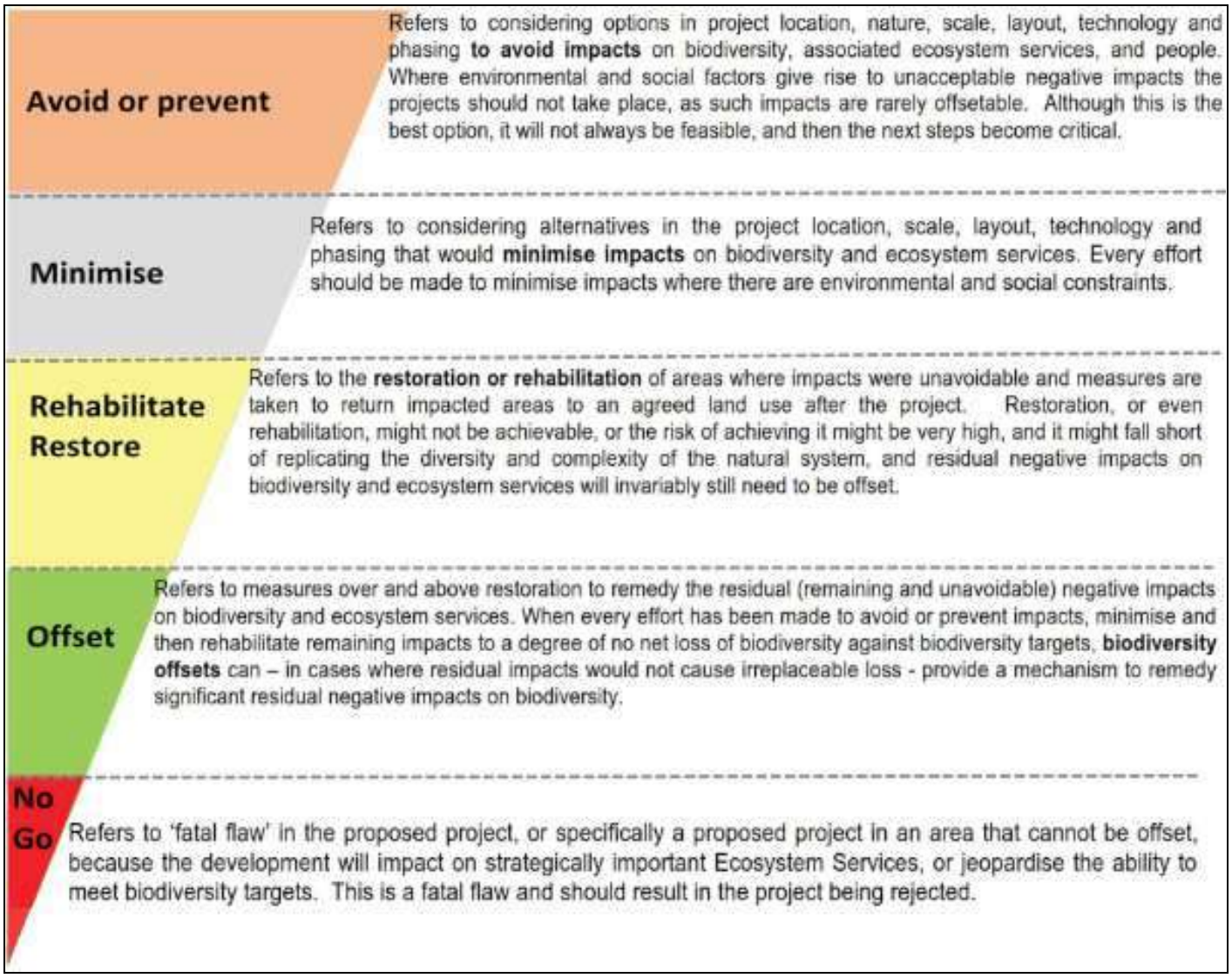

Figure 2: Mitigation Sequence Hierarchy

Impact Mitigation

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Background

The Karreebosch WEF was previously referred to as Phase 2 of the Roggeveld WEF (EA Ref: 12/12/20/1988/1/AM6). SAHRA has made numerous comments on both the Roggeveld WEF and the Karreebosch WEF from 2013 with the last comment issued on 26 September 2018 (attached). EA was granted for the Karreebosch WEF on 29 January 2016. In the EA, various requirements were stipulated in terms of impacts to Historical, Cultural and Palaeontological sites. Much of the area proposed for the development of the powerline and onsite substation was assessed as part of the HIA completed for the Karreebosch WEF (Figure 3.1) drafted by the ACO (Kendrick, 2015, SAHRIS Ref 183350). The remaining sections of the proposed powerline were assessed in the Heritage Assessments completed for the Roggeveld WEF (Hart and Webley, 2013, SAHRIS Ref 152531). The heritage information identified in these reports have been extracted and are mapped in Figure 3.2 to 3.4. These reports are also referred to below in order to provide a contextual analysis of the heritage sensitivity of the area proposed for development.

3.2 Archaeology and Built Environment Heritage

The area proposed for development has been previously assessed more than once (ACO 2013, 2015). In addition, the proposed powerline routes lie immediately adjacent to existing grid infrastructure. The original fieldwork conducted for the Roggeveld WEF HIA (2013) which covered the area proposed for development was comprehensive and remains relevant, similarly the fieldwork conducted for the Karreebosch WEF (2015).

The Karreebosch HIA (2015) "*revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area. There are a number of existing farm houses that contain 19th century fabric, however very few of these have anything more than moderate heritage significance. Parts of the study area enjoy very high aesthetic qualities with the area known by locals as "Gods Window" having grade II aesthetic qualities, hence the significance of the study area lies mainly with its undeveloped wilderness qualities. Interestingly, pre-colonial or stone age heritage and archaeology is extremely scarce in the areas that were searched. Very few archaeological sites of these kinds were recorded despite the fact that overall 9 experienced archaeologists were involved in scouring the landscape*."

The HIA for the Karreebosch WEF notes that "*The most important colonial archaeological sites in the study area are associated with Ekkraal Valley, the Rietfontein-Wilgebosch River valley and the Krans Kraal-Karrekraal valley. The valley bottoms are archaeologically sensitive…*". Similar findings were made by ACO in their report (2010,

SAHRIS Ref: 53187) over the development area. As the proposed powerline alternatives traverse the valley areas which have been determined to be archaeologically sensitive, it is likely that significant archaeological heritage resources may be impacted by the proposed development.

According to the ACO reports (2011, 2013 and 2015), parts of the study area enjoy very high aesthetic qualities hence the significance of the study area lies mainly with its undeveloped wilderness qualities which may be negatively impacted by the development of the proposed powerline. However, it must be noted that the proposed powerline is located within a Renewable Energy Development Zone (REDZ), which has been identified for this kind of development. In REDZ areas, there is a reasonable expectation that the cultural landscape of an area will be changed to be dominated, or at least heavily altered, by renewable energy development and its associated infrastructure. In fact, this is the intention of the REDZ areas. Furthermore, the proposed powerline is located within a suite of authorised and some operational renewable energy facilities (Figure 7) and as such, the impact of this proposed powerline on the cultural landscape is likely to be negligible. No further specialist cultural landscape assessment is therefore recommended.

Table 2: Sites previously identified in and near the broader study area

SAHRIS ID	Site No.	Site Name	Site Type	Grading
35222	ROG037	Roggeveld 037	Building	Grade IIIb
35135	ROG005	Roggeveld 005	Building	Grade IIIc
35138	ROG008	Roggeveld 008	Stone walling	Grade IIIc
35152	ROG012	Roggeveld 012	Building	Grade IIIc
35154	ROG013	Roggeveld 013	Stone walling	Grade IIIc
35157	ROG014	Roggeveld 014	Transport infrastructure	Grade IIIc
35159	ROG015	Roggeveld 015	Building	Grade IIIc
35171	ROG016	Roggeveld 016	Stone walling	Grade IIIc
35172	ROG017	Roggeveld 017	Stone walling	Grade IIIc
35174	ROG019	Roggeveld 019	Stone walling	Grade IIIc
35175	ROG020	Roggeveld 020	Stone walling	Grade IIIc
35177	ROG021	Roggeveld 021	Stone walling	Grade IIIc
35178	ROG022	Roggeveld 022	Conservation Area	Grade IIIc
35191	ROG025	Roggeveld 025	Ruin> 100 years, Artefacts	Grade IIIc

SAHRIS ID	Site No.	Site Name	Site Type	Grading
35202	ROG028	Roggeveld 028	Artefacts	Grade IIIc
35204	ROG029	Roggeveld 029	Cultural Landscape	Grade IIIc
35208	ROG030	Roggeveld 030	Stone walling	Grade IIIc
35215	ROG033	Roggeveld 033	Cultural Landscape	Grade IIIc
35137	ROG007	Roggeveld 007	Burial Grounds & Graves	Grade IIIc
35201	ROG027	Roggeveld 027	Burial Grounds & Graves	Grade IIIc
35226	ROG038	Roggeveld 038	Burial Grounds & Graves	Grade IIIa
137190	KWF-005	KAREEBOSCH WIND FARM	Building	
137192	KWF-007	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137193	KWF-008	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137194	KWF-009	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137195	KWF-010	KAREEBOSCH WIND FARM	Structures	
137196	KWF-011	KAREEBOSCH WIND FARM	Structures	
137197	KWF-012	KAREEBOSCH WIND FARM	Structures	
137198	KWF-013	KAREEBOSCH WIND FARM	Structures	
137202	KWF-017	KAREEBOSCH WIND FARM	Building	
137203	KWF-018	KAREEBOSCH WIND FARM	Stone walling	
137204	KWF-019	KAREEBOSCH WIND FARM	Archaeological	
137205	KWF-020	KAREEBOSCH WIND FARM	Building	
137233	KWF-021	KAREEBOSCH WIND FARM	Stone walling	
137234	KWF-022	KAREEBOSCH WIND FARM	Stone walling	
137236	KWF-024	KAREEBOSCH WIND FARM	Stone walling	
137237	KWF-025	KAREEBOSCH WIND FARM	Stone walling	
137238	KWF-026	KAREEBOSCH WIND FARM	Stone walling	
137239	KWF-027	KAREEBOSCH WIND FARM	Structures	
137240	KWF-028	KAREEBOSCH WIND FARM	Structures	
137241	KWF-029	KAREEBOSCH WIND FARM	Structures	

SAHRIS ID	Site No.	Site Name	Site Type	Grading
137242	KWF-030	KAREEBOSCH WIND FARM	Structures	
137243	KWF-031	KAREEBOSCH WIND FARM	Structures	
137244	KWF-032	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137245	KWF-033	KAREEBOSCH WIND FARM	Structures, Artefacts	
137246	KWF-034	KAREEBOSCH WIND FARM	Structures	
137247	KWF-035	KAREEBOSCH WIND FARM	Structures	
137248	KWF-036	KAREEBOSCH WIND FARM	Stone walling	
137249	KWF-037	KAREEBOSCH WIND FARM	Stone walling	
137250	KWF-038	KAREEBOSCH WIND FARM	Structures	
137259	KWF-046	KAREEBOSCH WIND FARM	Structures	Ungraded
137260	KWF-047	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137137	BWE-048	Brandvalley Wind Energy	Deposit	
137138	BWE-049	Brandvalley Wind Energy	Deposit	
137139	BWE-050	Brandvalley Wind Energy	Deposit	
137140	BWE-051	Brandvalley Wind Energy	Deposit	

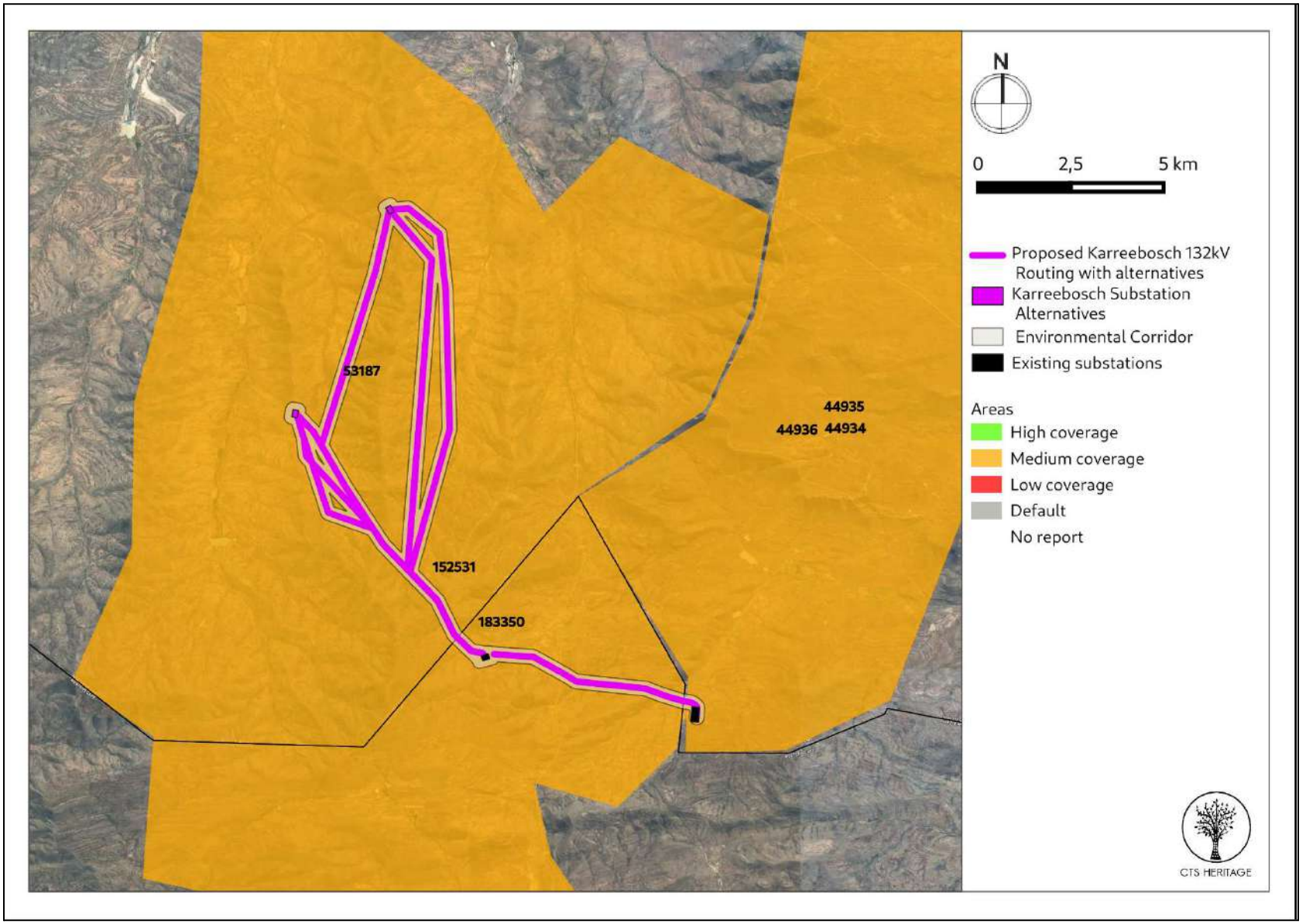

Figure 3.1: Spatialisation of heritage assessments conducted in proximity to the broader study area

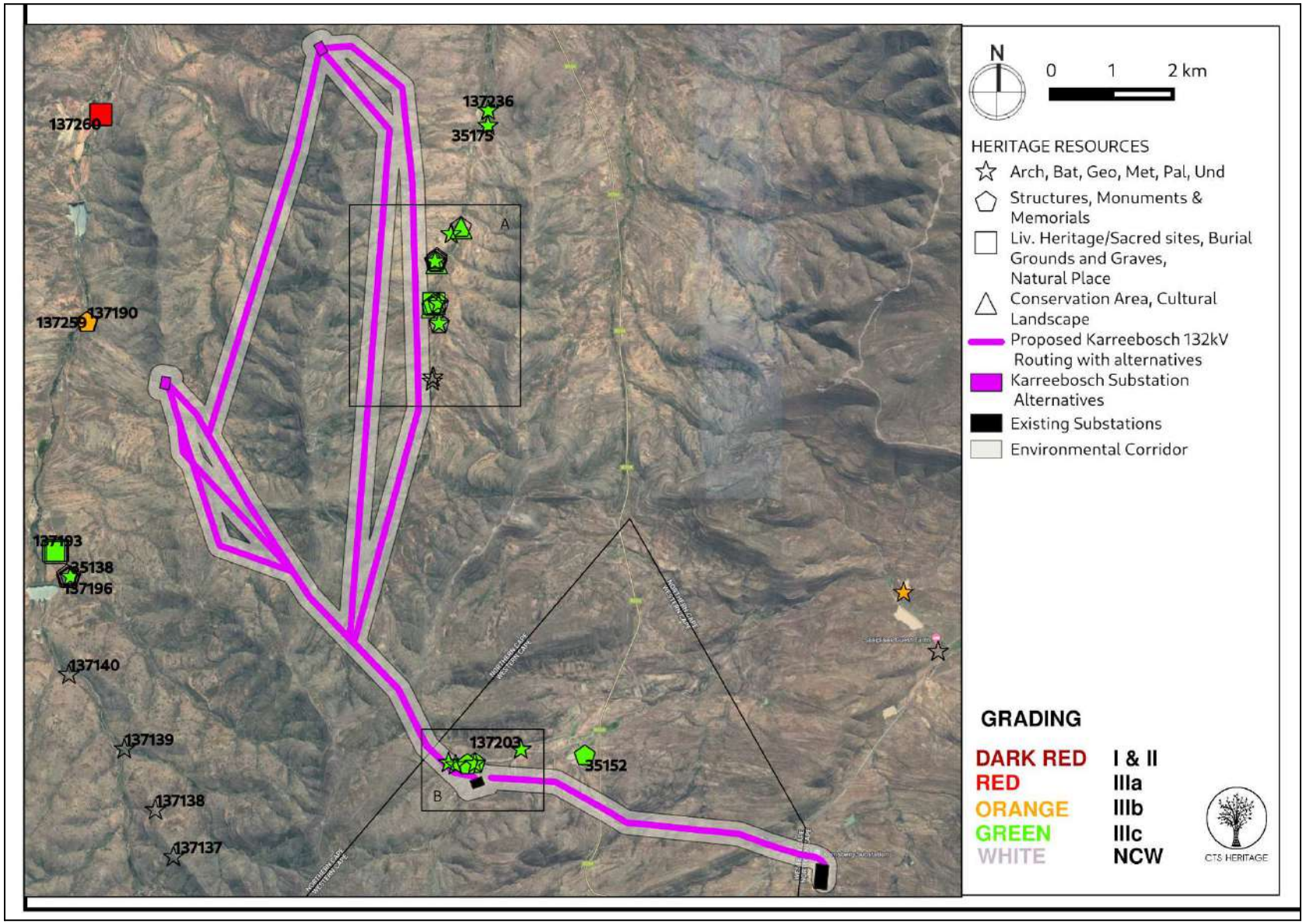

Figure 3.2: Spatialisation of heritage resources known in proximity to the broader study area

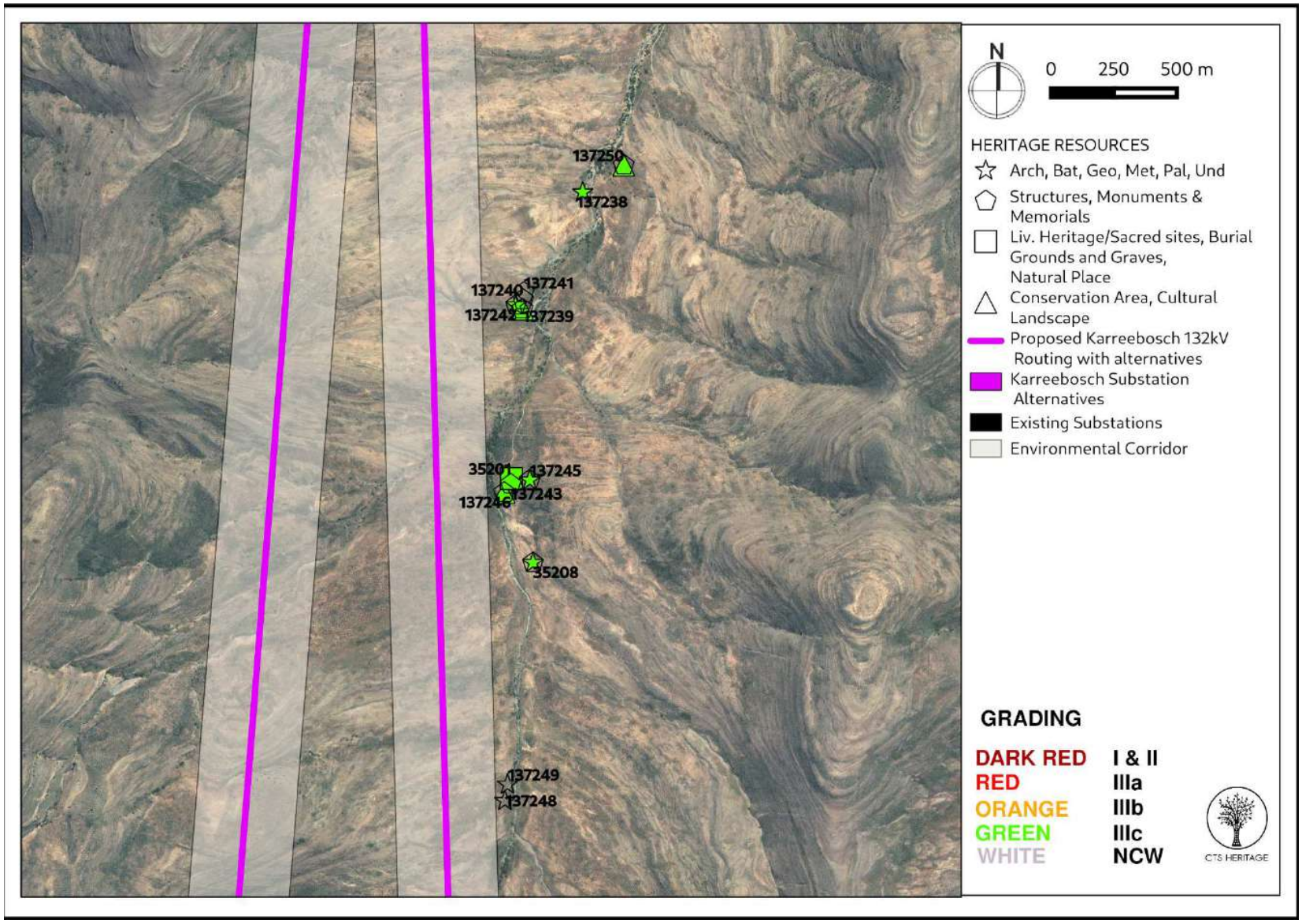

Figure 3.3: Spatialisation of heritage resources known in proximity to the broader study area - inset A

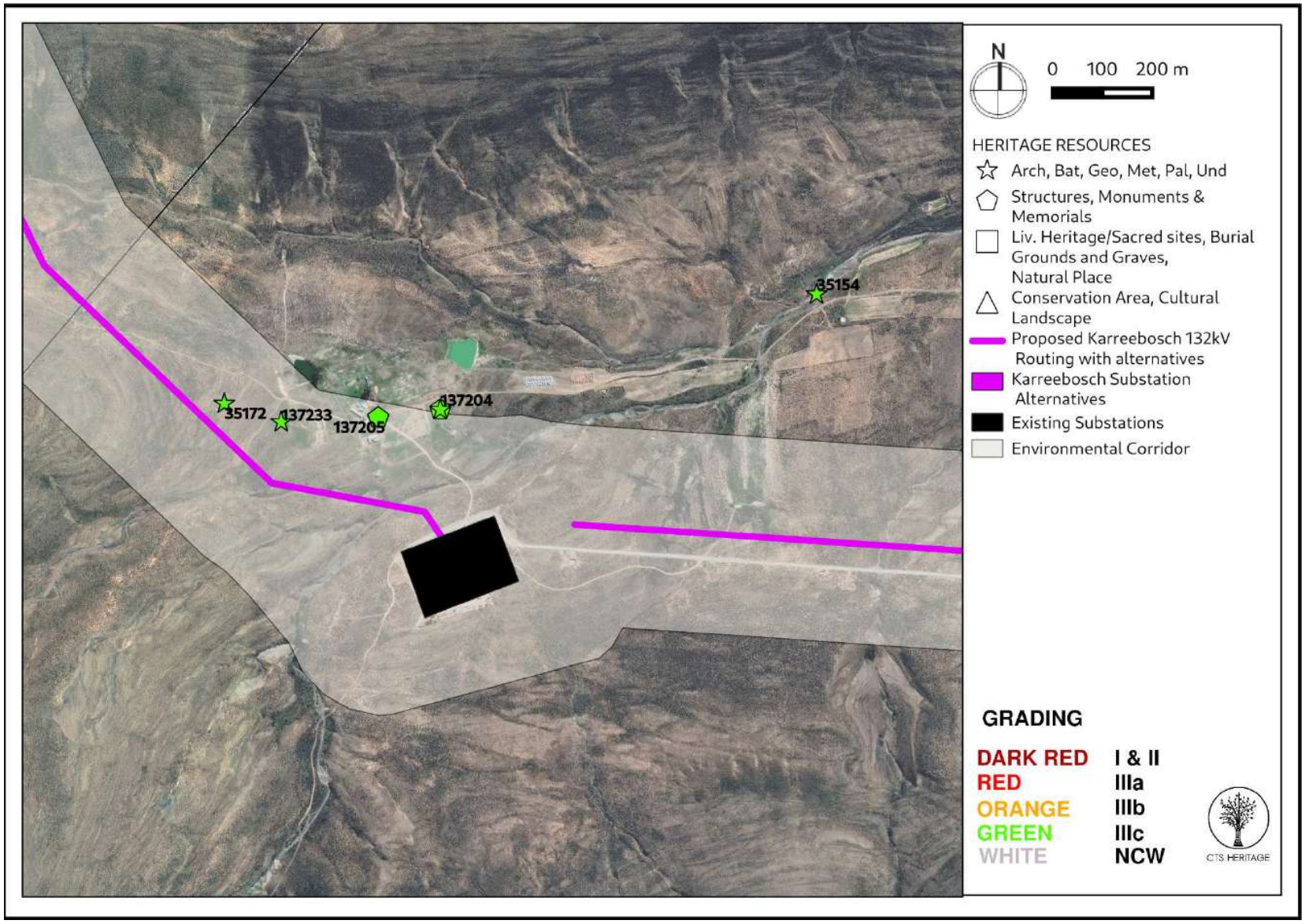

Figure 3.4: Spatialisation of heritage resources known in proximity to the broader study area - inset B

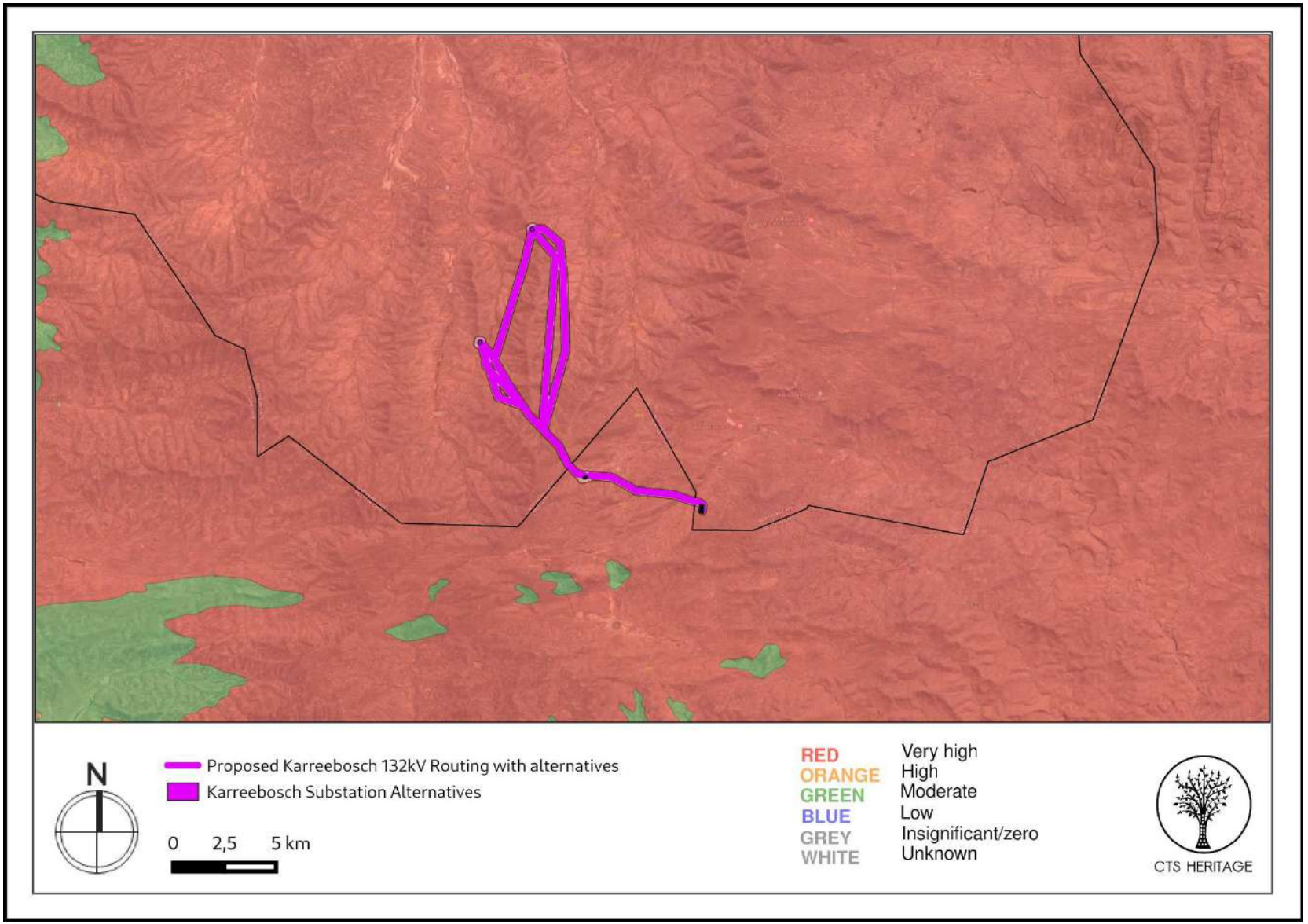

Figure 4: Palaeontological sensitivity of the area surrounding the broader study area

3.3 Palaeontology

According to the SAHRIS Palaeosensitivity Map (Figure 4 above), the area proposed for the powerline development is underlain by sediments of very high palaeontological sensitivity belonging to the Abrahamskraal Formation of the Beaufort Group. A Palaeontological Assessment was conducted by Almond (2015) for the Karreebosch WEF which covers a larger portion of the area proposed for the powerline development, and covered the proposed powerline alternatives specifically (Figure 2b, Appendix to the ACO Report 2015, SAHRIS Ref 183350).

According to Almond (2015), "*The fluvial Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) that underlies almost the entire wind farm study area is known for its diverse fauna of Permian fossil vertebrates - notably various small- to large-bodied therapsids and reptiles - as well as fossil plants of the Glossopteris Flora and low diversity trace fossil assemblages. However, desktop analysis of known fossil distribution within the Main Karoo Basin shows a marked paucity of fossil localities in the study region between Matjiesfontein and Sutherland where sediments belonging only to the lower part of the thick Abrahamskraal Formation succession are represented.*

Bedrock exposure levels in the Karreebosch Wind Farm study area are generally very poor due to the pervasive cover by superficial sediments (colluvium, alluvium, soils, calcrete) and vegetation. Nevertheless, a sufficiently large outcrop area of Abrahamskraal Formation sediments, exposed in stream and riverbanks, borrow pits, erosion gullies as well as road cuttings along the R354, has been examined during the present fieldwork to infer that macroscopic fossil remains of any sort are very rare indeed here. Exceptions include common trace fossil assemblages (invertebrate burrows) and occasional fragmentary plant remains (horsetail ferns). Levels of tectonic deformation of the bedrocks are generally low and baking by dolerite intrusions (Early Jurassic Karoo Dolerite Suite) is very minor. It is concluded that the Lower Beaufort Group bedrocks in the study area are generally of low palaeontological sensitivity and this also applies to the overlying Late Caenozoic superficial sediments (colluvium, alluvium, calcrete, soils etc)."

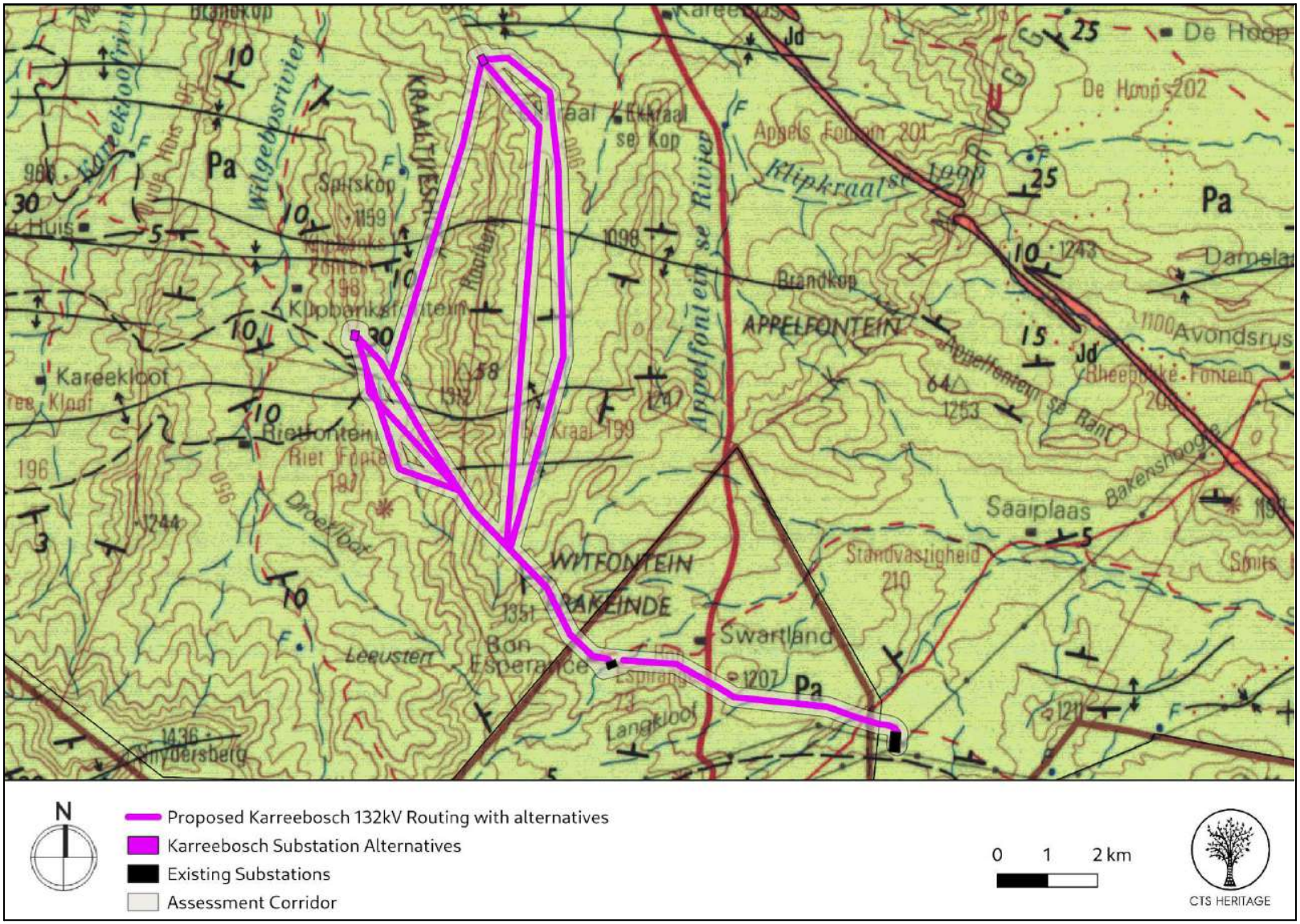

Figure 4.2 Geology Map. Extract from the CGS 3220 Sutherland Map indicating that the development area for the proposed Karreebosch Powerline is underlain by the Pa: Abrahamskraal Formation of the Beaufort Group

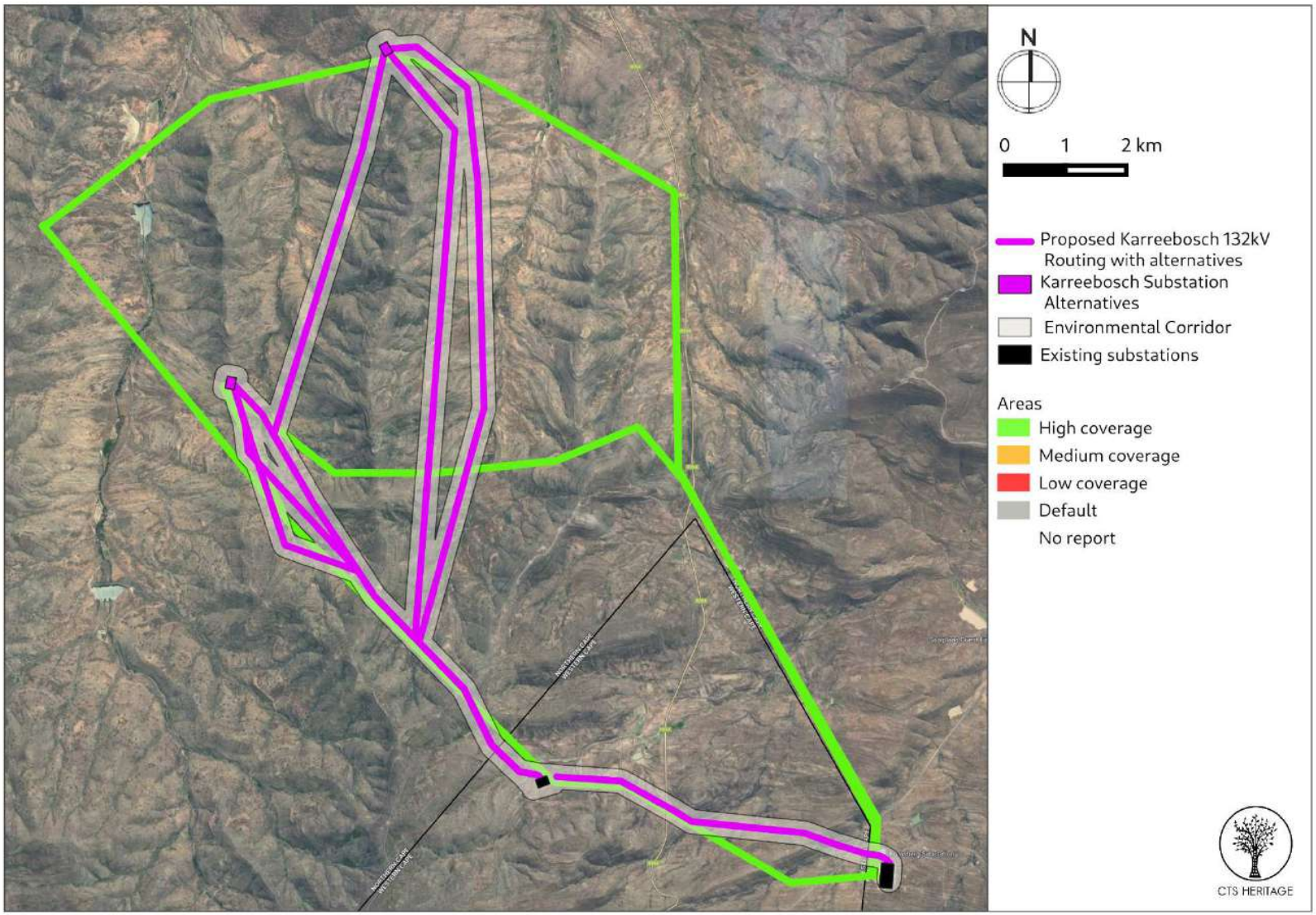

Figure 4.3 The HIA conducted by the ACO (2015) including the PIA by Dr Almond covered a powerline in the area proposed for development (SAHRIS Ref 183350).

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

Archaeology

Very few archaeological resources were identified during the archaeological field assessment completed for the proposed Karreebosch OHL and substation development. The resources that were identified were all single artefact occurrences or low density artefact scatters, none of which were determined to have any scientific cultural value.

While the survey of the Karreebosch OHL and substation must be taken in context with the broader assessments of the wind farms that have necessitated the development of the OHL, the findings were particularly limited due to the route taken for the OHL. 132kV lines typically have a very small development footprint and can be constructed without the large roads needed to build the WEFs. The routes chosen by the engineers for the various alternatives follow very rugged, mid-slope paths where almost no archaeological material or ruins were found. Where archaeological material was found, lithics consisted of local quartzites used to manufacture Middle and Later Stone Age flakes as well as cherts that were sourced in the more general region such as the Tanqua and Ceres Karoo by people in the Later Stone Age.

Palaeontology

The Karreebosch OHL and substation area is underlain at depth by potentially fossiliferous continental sediments within the lower part of the Abrahamskraal Formation (Lower Beaufort Group / Adelaide Subgroup, Karoo Supergroup) of Middle Permian age. Sparse fossil assemblages in this sector of the Klein-Roggeveldberge region - including extremely rare vertebrate skeletal remains, tetrapod and lungfish burrows, invertebrate traces and vascular plants - are inferred to belong to the Eodicynodon Assemblage Zone and contribute to our understanding of the earliest terrestrial biotas that colonised the Main Karoo Basin in Middle Permian times (c. 270 Ma / million years ago). The palaeosensitivity of the project area is provisionally rated as High, based on the Lower Beaufort Group bedrocks (SAHRIS website / DFFE screening tool).

However, previous field-based palaeontological surveys in the Roggeveld WEF project area have only yielded scrappy plant remains as well as low-diversity trace fossils. With the exception of fragmentary fossil remains of very rare temnospondyl amphibians found on Rietfontein RE/197, close to the powerline Option 1B, additional fossil sites recorded during a recent 2-day palaeontological site visit to the Roggeveld WEF grid connection project area are mostly of low scientific / conservation value and lie outside or on the margins of the grid corridors under investigation.

Visual Impact Assessment

The VIA completed for this project notes that "The study area has a largely natural, untransformed visual character with some elements of rural /pastoral infrastructure and as such, the proposed powerline and substation development could potentially alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area. The level of contrast is however reduced by the presence of the Roggeveld Wind Energy Facility (WEF), associated grid connection infrastructure, Komsberg substation and existing high voltage powerlines located in the central and southern sectors of the study area.

A broad-scale assessment of landscape sensitivity, based on the physical characteristics of the study area, economic activities and land use that predominates, determined that the area would have a low visual sensitivity. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that would potentially be impacted by a proposed development. The area is not typically valued for its tourism significance and no formal protected areas were identified within the study area. In addition, there is limited human habitation resulting in relatively few sensitive or potentially sensitive receptors across the entire extent of the study area. The area is however traversed by a recognised scenic route, namely the R354 main road, although visual impacts on travellers using this route will be considerably reduced by distance from the proposed powerline and the hilly terrain that screens views from much of this road."

The VIA goes on to note that "the proposed development will have a low level of impact on the only sensitive receptor (Saaiplaas Guest Farm). Five (5) potentially sensitive receptors will be subjected to moderate levels of visual impact as a result of the proposed powerline development, while one (1) receptor will be subjected to low levels of visual impact. It was noted however, that most of these receptors are located on farms which are within the project areas for approved renewable energy projects. As such the owners / occupants are not expected to perceive the proposed powerline and substation in a negative light.

The overall impact rating revealed that the proposed development is expected to have a negative low visual impact rating during construction, operation and decommissioning phases with a number of mitigation measures available to prevent any additional visual impacts."

4.2 Heritage Resources identified

Table 3: Heritage resources identified in the broader study area

POINT ID	Site Name	Description	Co-ordinates		Grading	Mitigation
Archaeology						
KRB017	Karrebosch 017	Quartzite flakes, thinly struck, prep. Platforms, MSA. Near valley floor; cores and flakes, knapping and production site	-32.85936	20.47184	NCW	NA
KRB018	Karrebosch 018	Chert flake, LSA. On top of ridge.	-32.84809	20.44152	NCW	NA
KRB019	Karrebosch 019	Quartzite flake, MSA	-32.84897	20.44073	NCW	NA
KRB020	Karrebosch 020	Quartzite flake, MSA	-32.86418	20.43635	NCW	NA
KRB021	Karrebosch 021	Chert and quartz flakes, lower grindstone near wind pump, LSA	-32.90585	20.44082	NCW	NA
KRB022	**Karrebosch 022**	**Chert flake, LSA**	**-32.88297**	**20.517862**	**NCW**	**NA**
Palaeontology						
PAL_KRB 001	Palaeo Karreebosch 001	Extensive exposure of SSE-dipping sandstone bed top with sets of small-scale wave ripples and meandering epichnial invertebrate burrows that were probably generated on the margins of a shallow floodplain pond or playa lake. Sharply overlying grey-green mudrocks show numerous ball-and-pillow load structures	32°52'37.22"S	20°29'19.68"E	IIIC	None
PAL_KRB 002	**Palaeo Karreebosch 002**	**Small (c. 6 cm wide), angular block of pale grey phosphatic concretion containing comminuted vertebrate bone and perhaps bony spines or teeth (pearly grey to black). Possibly of bony fish or – more likely - amphibian (i.e. temnospondyl) affinity. Block in surface float along shallow drainage line running along top of well-exposed grey-green mudrock package.**	**32°52'37.45"S**	**20°29'22.32"E**	**IIIB**	**Collection under workplan application of Option 1B is developed**
PAL_KRB 003	**Palaeo Karreebosch 003**	**Probably part of the same fossiliferous concretion**	**32°52'37.61"S**	**20°29'21.97"E**	**IIIB**	**Collection under workplan application of Option 1B is developed**
PAL_KRB 004	**Palaeo Karreebosch 004**	**As above (2 blocks). Probably part of the same fossiliferous concretion.**	**32°52'36.97"S**	**20°29'23.42"E**	**IIIB**	**Collection under workplan application of Option 1B is developed**
PAL_KRB 005	Palaeo Karreebosch 005	Hillslope exposure of steeply dipping, SE-facing current-rippled bed top with sparse epichnial invertebrate burrows up to c. 2 cm wide, subhorizontal with central convex core (possibly segmented) and shallow marginal grooves	32°52'39.07"S	20°29'29.12"E	IIIC	None
PAL_KRB 006	Palaeo Karreebosch 006	Dense mat of reworked reedy sphenophyte stems (horsetail ferns) preserved as compressions within dark grey siltstones, shallow stream bed exposure.	32°52'31.51"S	20°29'23.81"E	IIIC	None

POINT ID	Site Name	Description	Co-ordinates		Grading	Mitigation
PAL_KRB 007	**Palaeo Karreebosch 007**	**Stream bed and bank exposure of grey-green mudrocks of Abrahamskraal Fm with horizon containing several subcylindrical, vertical lungfish burrow casts up to 9 cm in diameter**	**32°54'53.65"S**	**20°30'56.37"E**	**IIIB**	**No impact anticipated**
PAL_KRB 008	Palaeo Karreebosch 008	Stream bed exposure of grey-green siltstone or fine-grained wacke covered by purple-brown siltstone veneer and with dense assemblage of rounded traces between 0.5 to 1 cm in diameter – probably reedy plant stem casts (e.g. sphenophytes)	32°54'52.93"S	20°30'58.94"E	IIIC	None
PAL_KRB 009	Palaeo Karreebosch 009	Stream gulley exposure of mottled grey-green to purple-brown sandstone with assemblage of rounded, oval to irregular sand-infilled casts with reduction haloes, either of plant stems or invertebrate burrows	32°54'41.76"S	20°31'10.35"E	IIIC	None
PAL_KRB 010	Palaeo Karreebosch 010	Sandstone bed top with possible effaced desiccation crack infills, assemblage of reedy plant stem casts.	32°55'11.03"S	20°31'54.90"E	IIIC	None

4.3 Mapping and spatialisation of heritage resources

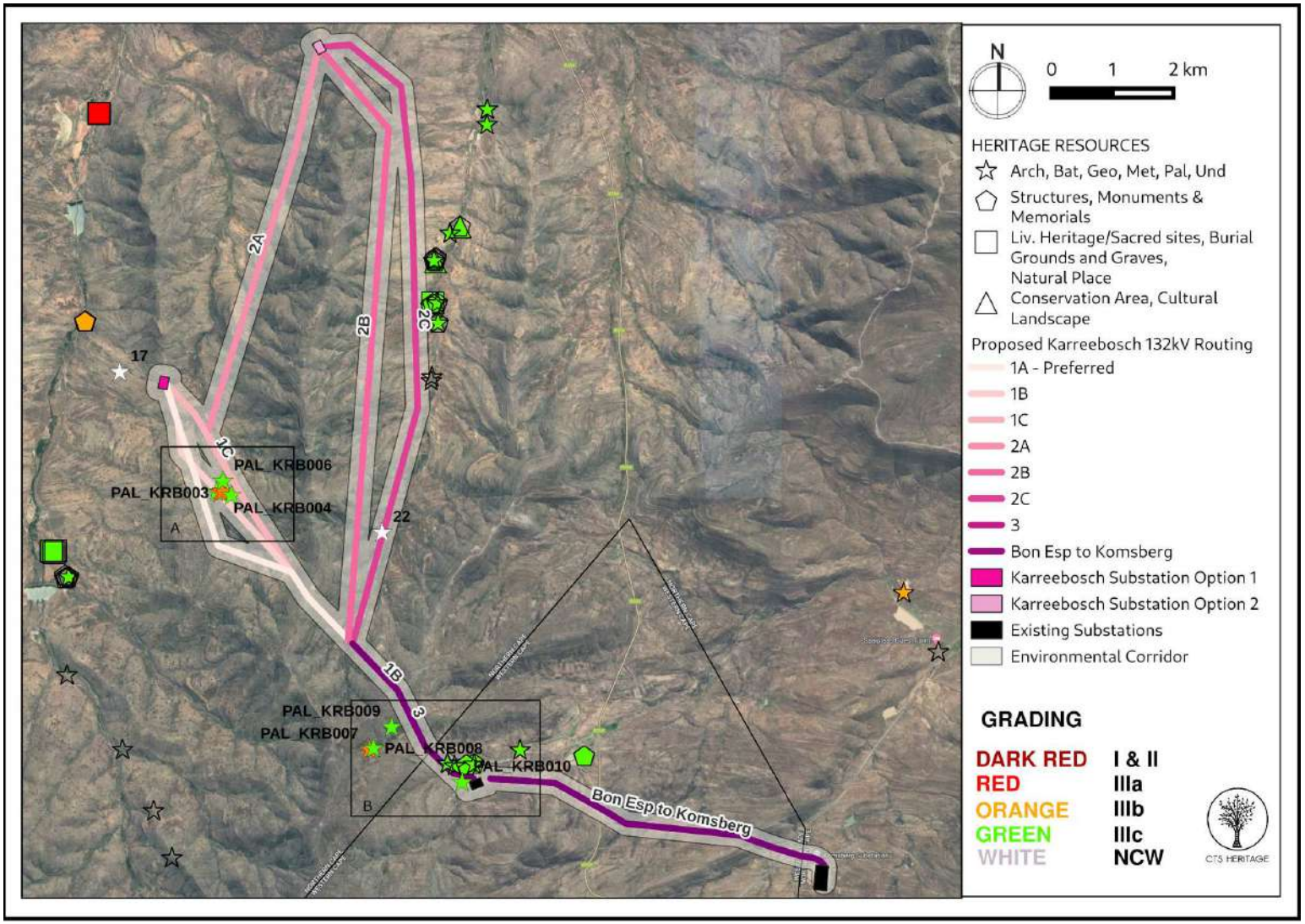

Figure 5.1: Map of heritage resources identified during the field assessment, relative to the broader study area

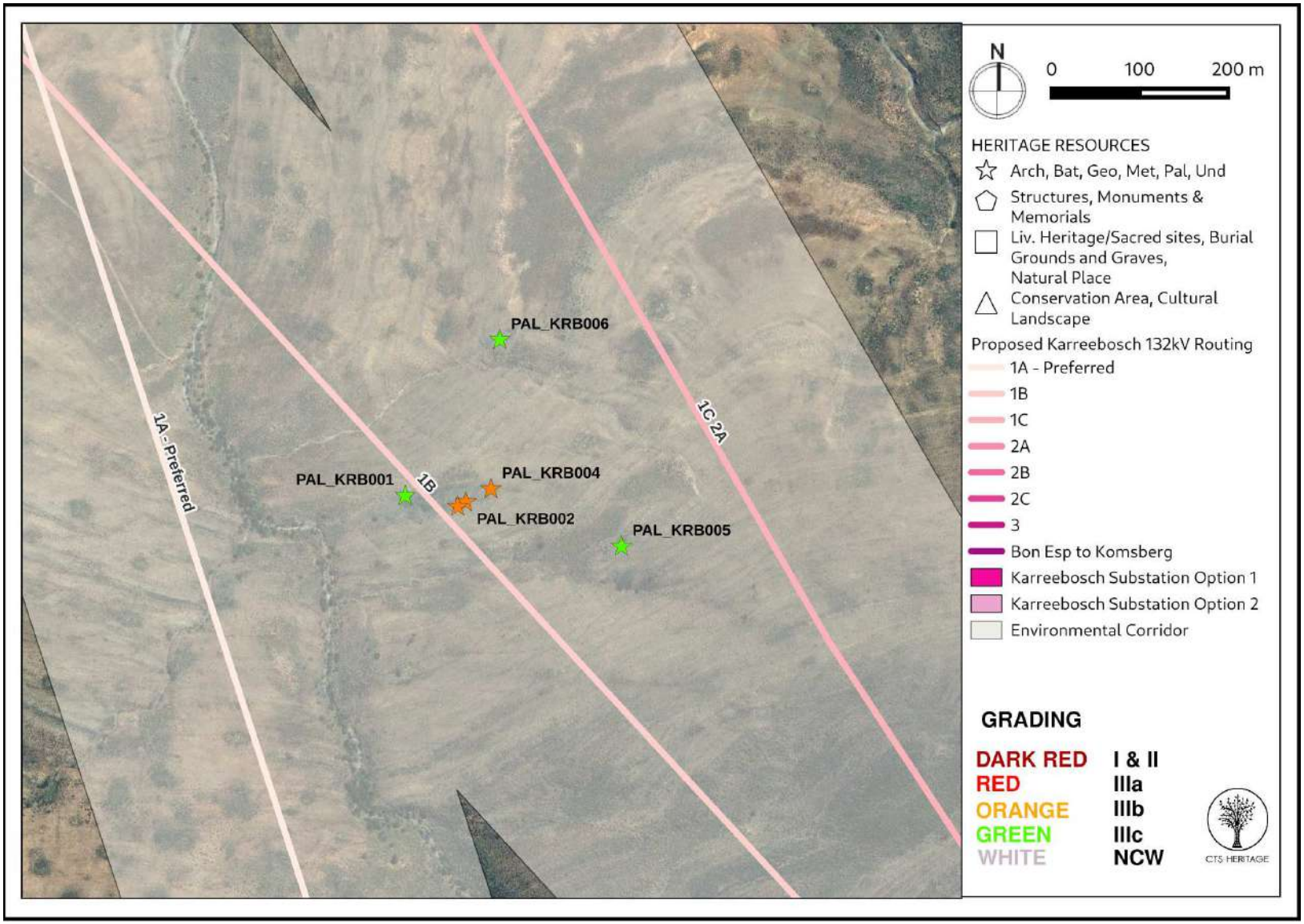

Figure 5.2: Inset A

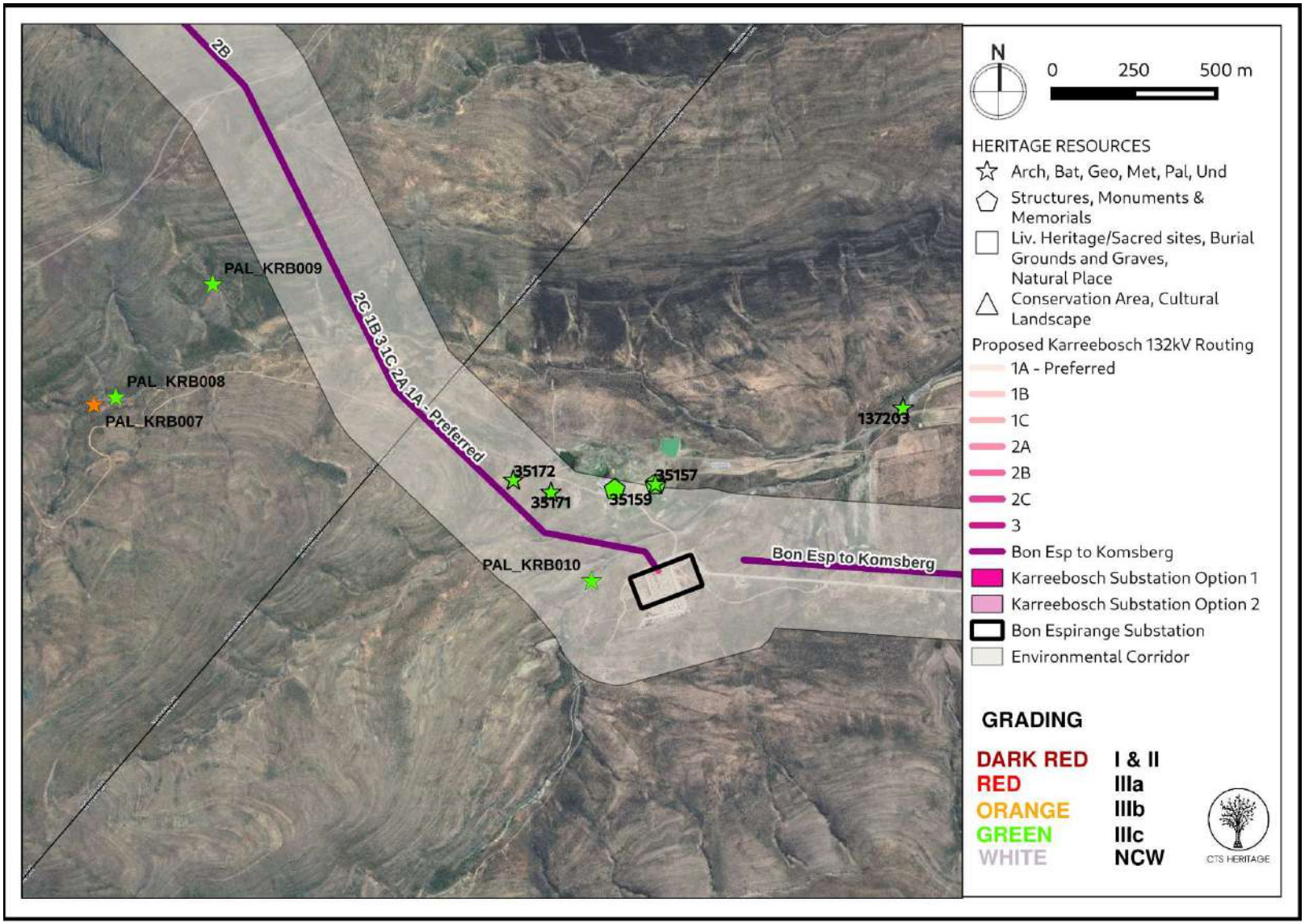

Figure 5.3: Inset B

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

Archaeology

The findings of this field assessment largely correlate with the findings of the Karreebosch HIA (2015) which "*revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area.*"

No significant heritage resources were identified in any of the proposed alignment alternatives, with only one LSA chert flake (KRB022) identified within the alignment for Alternative Option 2C. This is likely due to the placement of the proposed powerline alternatives on ridgelines or slopes. It has been previously noted that in this area, it is the valley bottoms that are sensitive in terms of archaeology and heritage resources.

As such, no negative impact to significant archaeological heritage is anticipated and there is no preferred OHL alternative alignment or substation alternative in terms of impacts to archaeological resources.

Palaeontology

Dr Almond notes that "*No fossils were recorded within the Late Caenozoic superficial deposits in the region (colluvium, alluvium etc). The overall palaeosensitivity of the grid connection project area is inferred to be Low. However, the potential for isolated vertebrate and other fossil finds of high scientific interest – as recorded elsewhere in the Klein-Roggeveldberge region - cannot be completely discounted.*

There are no objections on palaeontological grounds to authorisation of the proposed 132 kV powerline and there is no preference on palaeontological heritage grounds for any particular on-site substation option or powerline route option among those currently under consideration. If powerline Option 1B is selected for construction, vertebrate fossil material at or in the vicinity of Locs. 454-456 on Rietfontein RE/197 must be collected by a professional palaeontologist before construction of the powerline. No further specialist palaeontological studies or mitigation are recommended for this electrical infrastructure project. These recommendations and the Chance Fossil Finds Protocol appended to this report should be included in the EMPr for the development."

Dr Almond concludes that "*Based on combined desktop and field-based palaeontological data an overall LOW palaeosensitivity for the Kareebosch WEF and grid connection project areas is inferred here. However, the potential for isolated vertebrate and other fossil finds of high scientific interest - as occasionally recorded elsewhere in the Klein-Roggeveldberge region - cannot be completely discounted.*"

Table 4: Heritage resources impact assessment table for archaeology and palaeontology

	Archaeology		Palaeontology	
CRITERIA	**Before Mitigation**	**After Mitigation**	**Before Mitigation**	**After Mitigation**
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	1	1	4	1
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	1	1	1	1
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	5	5	5	5
Impact Duration (D) The length of permanence of the impact on the environmental receptor	5	5	5	5
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	1	1	3	1
Significance (S) is determined by combining the above criteria: S=(E+D+R+M)xP	**12 Very Low**	**12 Very Low**	**45 Moderate**	**12 Very Low**
Mitigation Recommendations	None		Walkdown of final alignment with approved workplan for collection of sensitive fossil resources that are at risk if Option 1 B is developed Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development	

5.2 Sustainable Social and Economic Benefit

According to the Social Impact Assessment (Barbour and van der Merwe, 2021) completed for the proposed development of the Karreebosch OHL and substation, the primary positive impact anticipated from the approval of the Karreebosch OHL and associated infrastructure is the creation of employment and business opportunities, and the opportunity for skills development and on-site training.

"*The construction phase will extend over a period of approximately 3-6 months and create in the region of 20-30 employment opportunities. The total wage bill will be in the region of R 1.5 million (2021 Rand values). Most of the low and semi-skilled employment opportunities are likely to benefit residents from local towns in the area, including Matjiesfontein, Laingsburg and Sutherland. Most the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a short term positive social benefit in an area with limited employment opportunities. A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in KH and LM.*

The capital expenditure associated with the construction of the power line will be ~18 million (2021 Rand values) and will create opportunities for the local and regional and local economy. The sector of the local economy most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site. However, given the relatively small scale of the development and short construction period the benefits will be limited."

Additional impacts to be derived include:

- Improve energy security and establishment of energy infrastructure.
- Creation of employment opportunities.
- Generate income for landowners.

The SIA (2021) concludes that "*The energy security benefits associated with the proposed Karreebosch WEF are dependent upon it being able to connect to the national grid via the establishment of grid connection infrastructure. The findings of the SIA indicate that the significance of the potential negative social impacts for both the construction and operational phase of the proposed 132 kV Karreebosch overhead power line are Low Negative with mitigation.*"

Based on the available information, and the finding of this assessment that the impact to heritage resources is likely to be LOW NEGATIVE after mitigation, and acknowledging that the transition to renewable energy is one of South Africa's and UNESCOs Sustainable Development Goals, it is noted that the anticipated negative impacts to

heritage resources resulting from the development, which are negligible, do not outweigh the anticipated socio-economic benefits to be derived from the approval of the project.

5.3 Proposed development alternatives

In terms of impacts to heritage resources, OHL Route Option 1B is NOT preferred from a heritage perspective due to the likely impacts to palaeontological heritage that are anticipated. There are no other OHL or substation alternative preferences from a heritage perspective on condition that the recommendations outlined below are implemented.

There is no objection to the client's preferred alternative of Option 1A and it is supported in terms of impacts to heritage resources. There are no specific mitigation measures that need to flow into the EMPr other than:

- The attached Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The relevant heritage authority (the South African Heritage Resources Agency (SAHRA) in the Northern Cape and Heritage Western Cape (HWC) in the Western Cape) must be contacted immediately in order to determine an appropriate way forward.

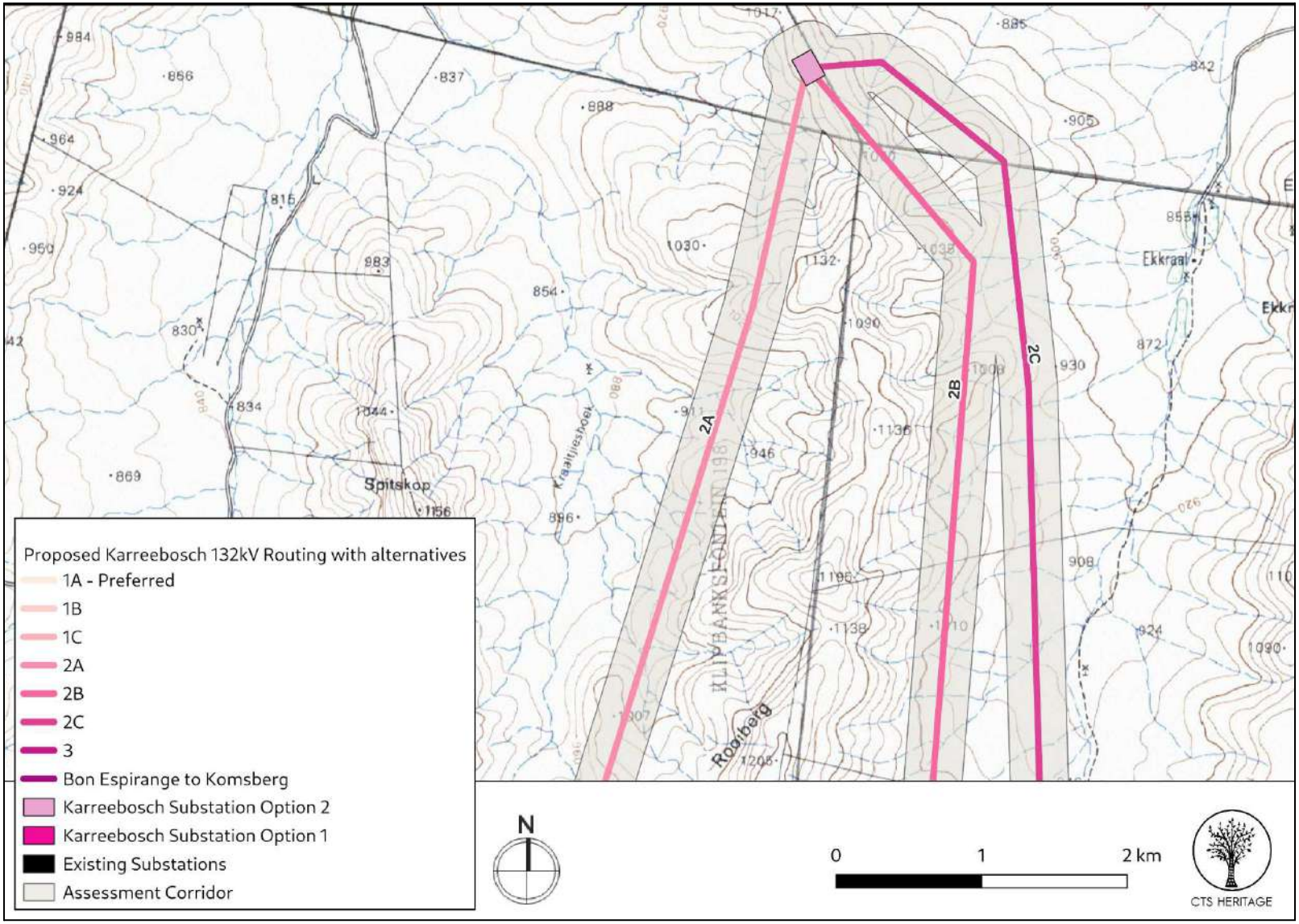

Figure 6.1 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives

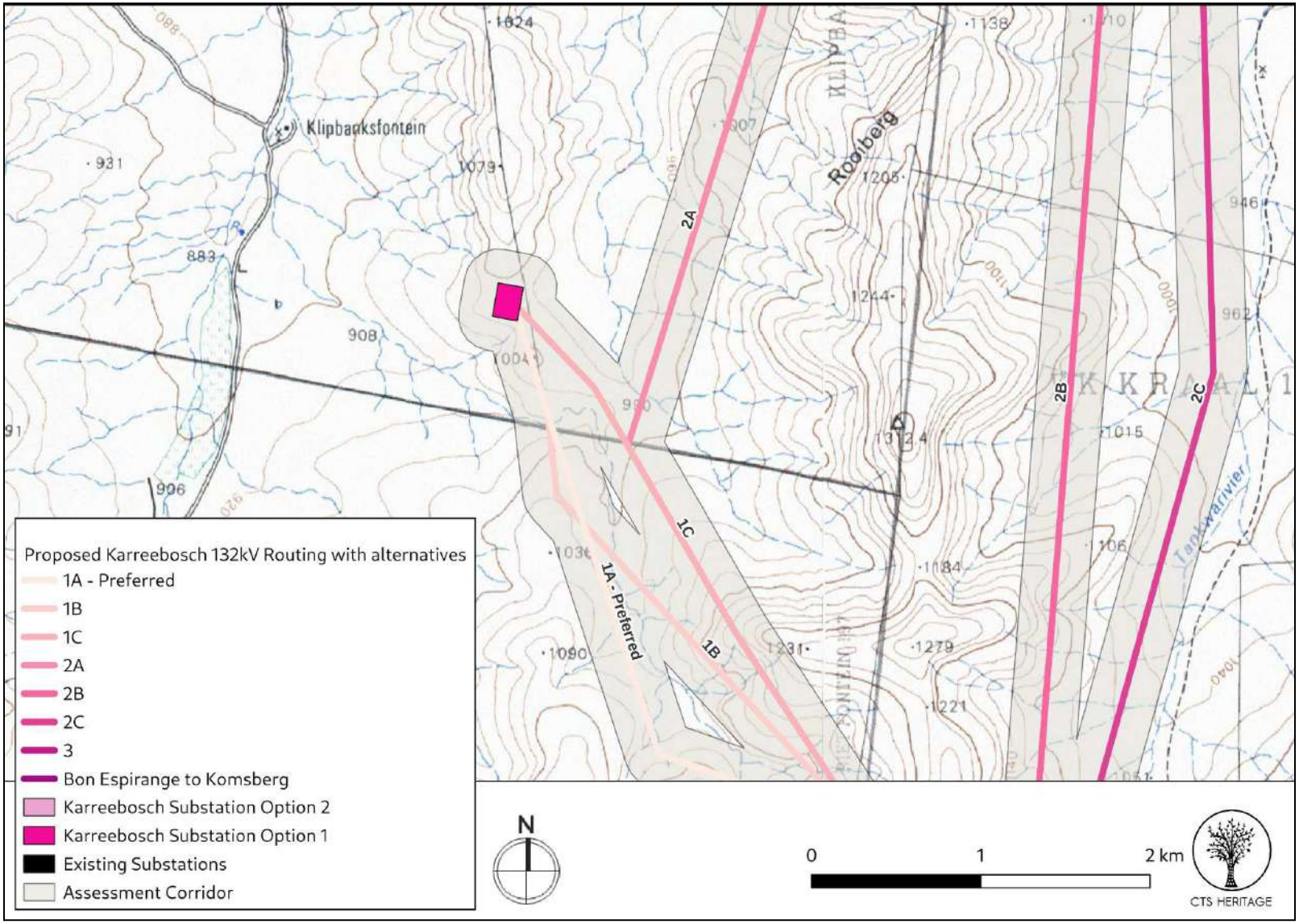

Figure 6.2 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives

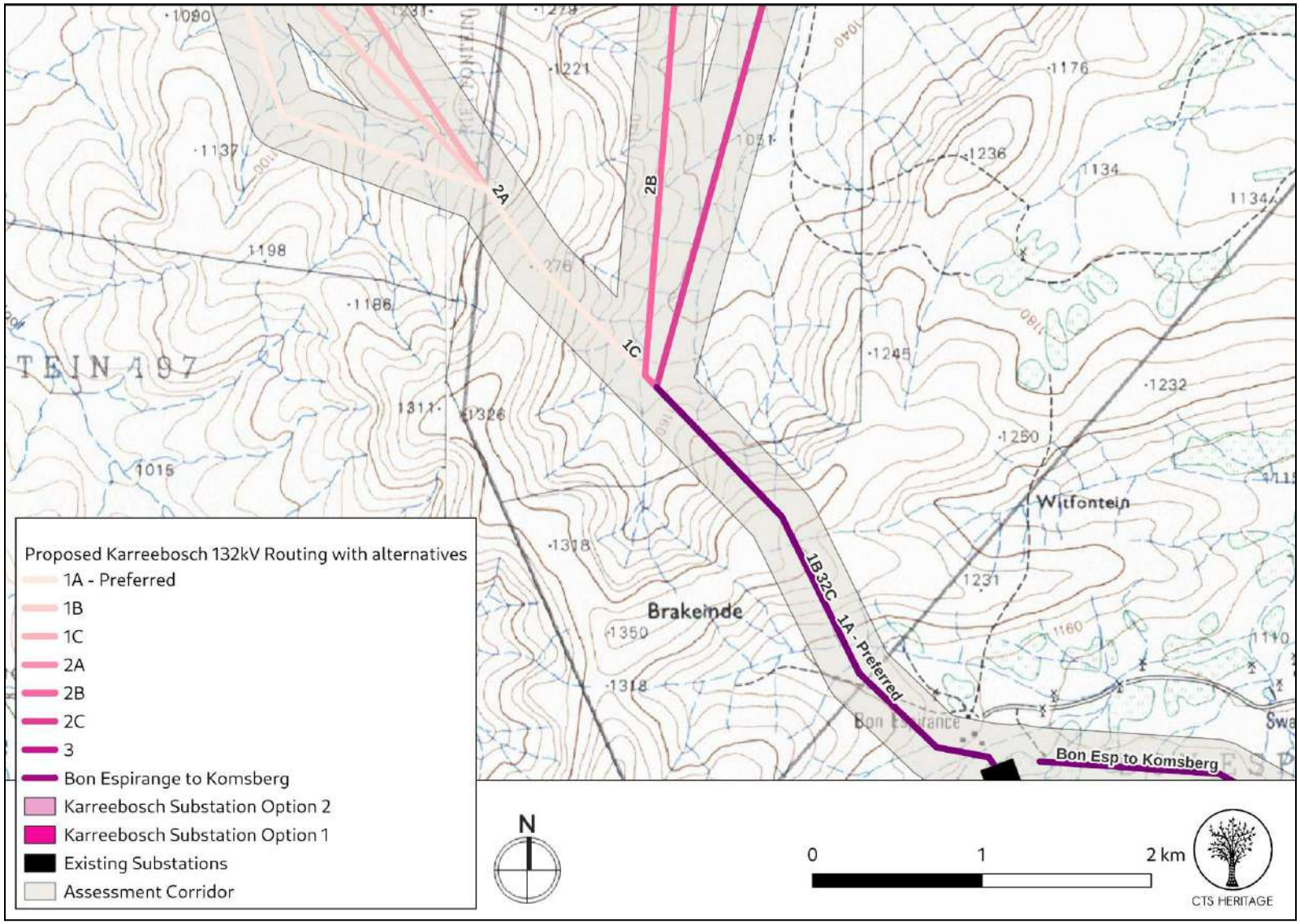

Figure 6.3 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives

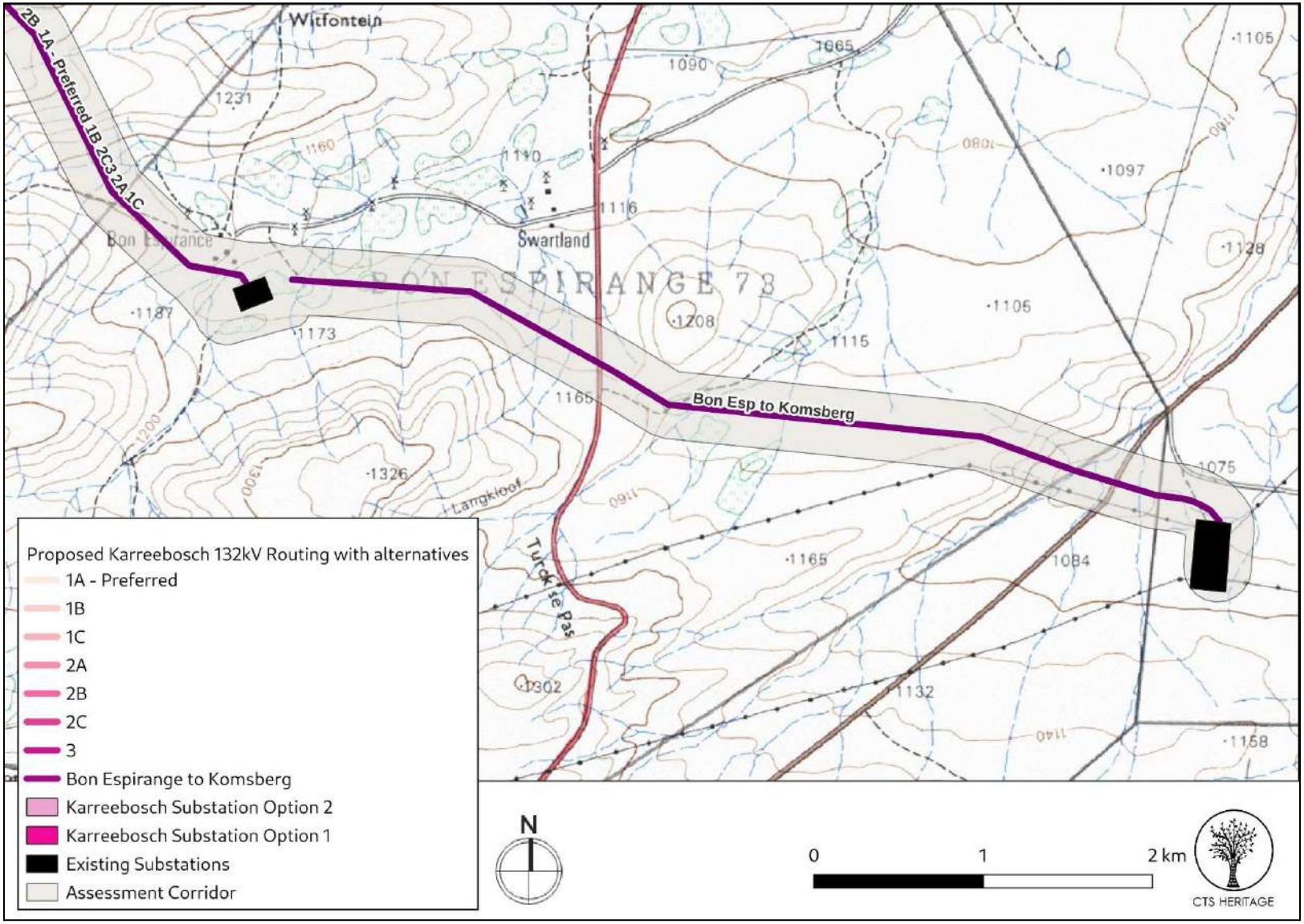

Figure 6.4 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives

5.4 Cumulative Impacts

The proposed Karreebosch OHL and substation will form part of the grid infrastructure required for the approved Karreeboosch WEF development. Furthermore, the proposed grid corridor is located within a belt of approved renewable energy facilities (Figure 7). In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise culturally significant landscape.

The VIA completed for this project notes that "Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 30km radius of the proposed development, it was determined that only 2 of these would have any significant impact on the landscape within the visual assessment zone. These facilities are the authorised Karreeboch WEF (14/12/16/3/3/2/807/AM3) and the operational Roggeveld WEF (12/12/20/1988/1). These facilities and the associated grid connection infrastructure will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, pastoral landscape, thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area however, cumulative impacts have been rated as medium.

It is important to note that the study area is located within the Renewable Energy Development Zone (REDZ) 2, namely the Komsberg REDZ , and also within the Central Strategic Transmission Corridor, and thus the relevant authorities support the concentration of renewable energy developments and associated grid connection infrastructure in this area. In addition, it is possible that the renewable energy facilities and associated grid connection elements located in close proximity to each other could be seen as one large facility rather than separate developments. Although this will not necessarily reduce impacts on the visual character of the area, it could potentially reduce the cumulative impacts on the landscape."

The proposed grid infrastructure is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact.

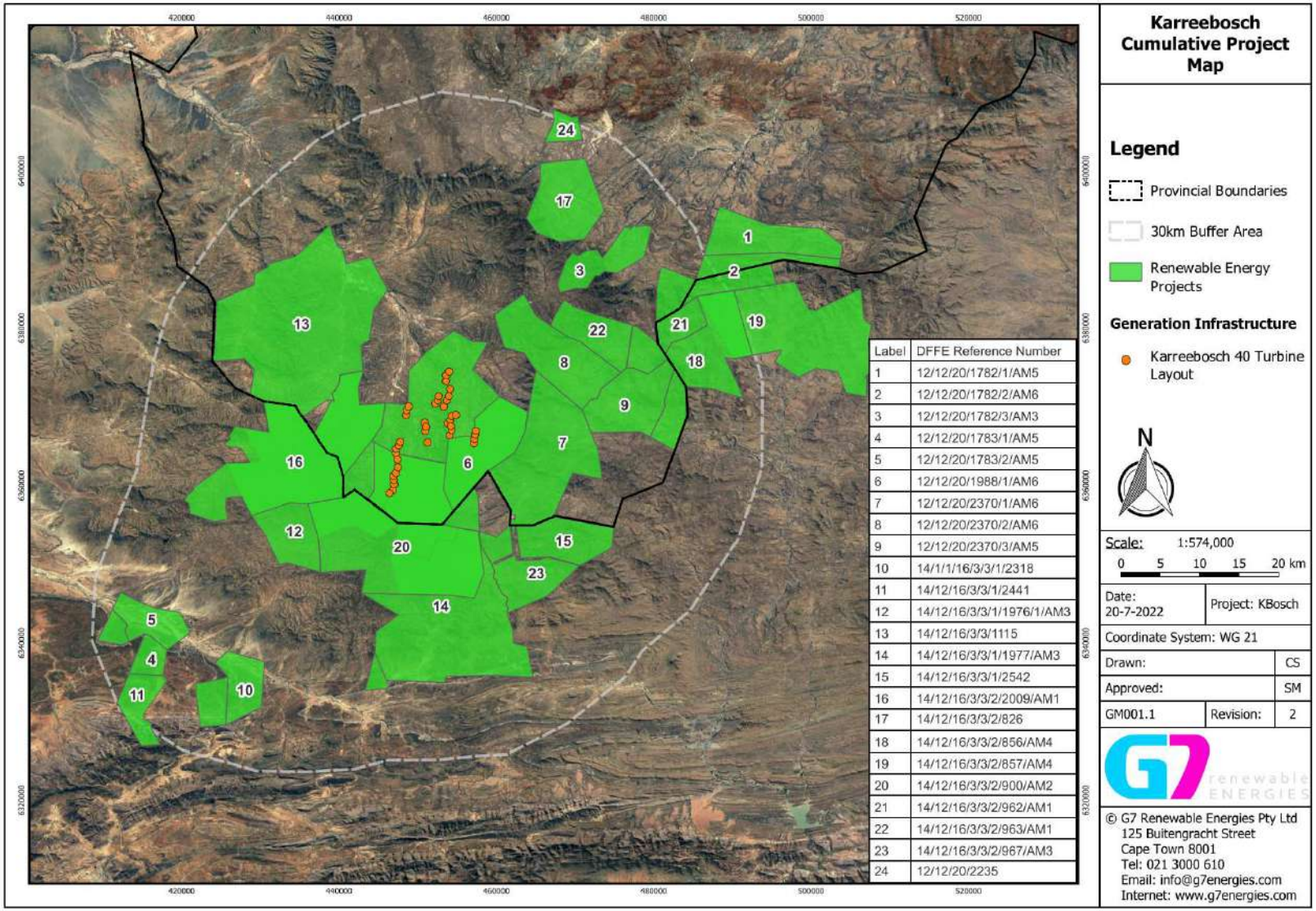

Figure 7: Map indicating renewable energy facilities that have existing environmental authorisation in proximity to the proposed development

6. RESULTS OF PUBLIC CONSULTATION

There are no registered conservation bodies for this area according to the list on the HWC Website (www.hwc.org.za checked September 2021). The local authority will be engaged with as part of the public participation required in terms of NEMA.

The public consultation process will be undertaken by the EAP during the Basic Assessment. No heritage-related comments have been received to-date. HWC is required to comment on this HIA and make recommendations prior to the granting of the Environmental Authorisation. All heritage-related comments will be included in the Comments and Responses Report of the Basic Assessment Report.

7. CONCLUSION

The findings of this field assessment largely correlate with the findings of the ACO in the HIA completed for the Karreebosch WEF (Kendrick, 2015, SAHRIS Ref 183350) and the Roggeveld WEF (Hart and Webley, 2013, SAHRIS Ref 152531). The archaeological resources identified were all *ex situ* and are of limited scientific and heritage significance.

Based on the findings of this and other assessments completed in the area, it is unlikely that the proposed development of the Karreebosch 132kV OHL, 33/132kV on site substation and associated infrastructure will negatively impact significant resources. This is due to the fact that 132kV lines typically have a very small development footprint and can be constructed without the large roads needed to build the WEFs. The routes chosen by the engineers for the various alternatives follow very rugged, mid-slope paths where almost no archaeological material or ruins were found. No significant heritage resources were identified within the areas proposed for the substation alternatives.

It is possible, although unlikely, that archaeological resources may be located beneath the ground surface which may be impacted during the course of development. Recommendations in this regard are included below.

In terms of impacts to palaeontological heritage, Almond (2021) concludes that "*There are no objections on palaeontological grounds to authorisation of the proposed 132 kV powerline and there is no preference on palaeontological heritage grounds for any particular on-site substation site or powerline route option among those currently under consideration. If powerline Option 1B is selected for construction, vertebrate fossil material at or in the vicinity of Locs. 454-456 on Rietfontein RE/197 must be collected by a professional palaeontologist before construction of the powerline. No further specialist palaeontological studies or mitigation are*

recommended for this electrical infrastructure project. These recommendations and the Chance Fossil Finds Protocol appended to this report should be included in the EMPr for the development." It is further recommended that, should Alternative 1B be developed, a walkdown of final alignment must be conducted by a palaeontologist with an approved workplan for the collection of sensitive fossil resources that are at risk. It is further recommended that the attached Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development.

8. RECOMMENDATIONS

There is no objection to the proposed development of the Karreebosch OHL and onsite substation in terms of impacts to heritage resources and there is no preferred alternative for the OHL route or onsite substation on condition that:

- Should OHL Alternative 1B be developed, a walkdown of final alignment must be conducted by a palaeontologist with an approved workplan for the collection of sensitive fossil resources that are at risk.
- The attached Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development
- The mitigation measures proposed in section 9 of the VIA are implemented
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The relevant heritage authority (the South African Heritage Resources Agency (SAHRA) in the Northern Cape and Heritage Western Cape (HWC) in the Western Cape) must be contacted immediately in order to determine an appropriate way forward.

9. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
44934	AIA Desktop	Celeste Booth	01/08/2011	An archaeological desktop study for the proposed establishment of the Hidden Valley wind energy facility and associated infrastructure on a site south of Sutherland, Northern Cape Province
44935	AIA Phase 1	Celeste Booth	01/02/2012	A Phase 1 AIA for the proposed HIdden Valley Wind Energy Facility, near Sutherland, Northern cape Province
44936	PIA Desktop	Lloyd Rossouw	01/03/2012	Palaeontological desktop assessment of the proposed Hidden Valley Wind Energy Facility near Sutherland, Northern Cape Province
53187	HIA Phase 1	Timothy Hart, Lita Webley	01/03/2011	HERITAGE IMPACT ASSESSMENT PROPOSED WIND ENERGY FACILITY
152531	HIA Phase 1	Timothy Hart, Lita Webley	20/12/2013	Heritage Impact Assessment Report for the Phase 1 Roggeveld Wind Farm
	PIA Phase 1	John Almond	20/12/2013	Palaeontology Impact Assessment Report for the Phase 1 Roggeveld Wind Farm
183350	HIA Phase 1	Natalie Kendrick	27/10/2014	Heritage Impact Assessment for the Karreebosch Wind Farm (Phase 2 Roggeveld Wind Farm)
	PIA Phase 1	John Almond	27/10/2014	Palaeontology Impact Assessment for the Karreebosch Wind Farm (Phase 2 Roggeveld Wind Farm)
353483	AIA Phase 1	Jonathan Kaplan	1/12/2015	ARCHAEOLOGICAL IMPACT ASSESSMENT Proposed borrow pit (Karusa R354) on the Farm Karreebosch 200/1 near Sutherland, Northern Cape Assessment conducted under Section 38 (3) of the National Heritage Resource Act (No. 25 of 1999)

APPENDICES

APPENDIX 1: Archaeological Assessment (2021, updated July 2022)

ARCHAEOLOGICAL SPECIALIST STUDY

In terms of Section 38(8) of the NHRA for a

Proposed establishment of 132kV powerline and substation to evacuate power from the Karreebosch Wind Energy Facility to the National Grid in the Western and Northern Cape

Prepared by

CTS HERITAGE

In Association with

WSP

August 2021

Updated July 2022

CTS HERITAGE

EXECUTIVE SUMMARY

This application is for the proposed development of a 132kV overhead power line, onsite 33/132kV substation and associated service infrastructure which will connect to the Karreebosch Wind Energy Facility (WEF) to the national grid via the existing Eskom Komsberg substation. The powerline is approximately 20 km long. The project is situated north of the town of Matjiesfontein in the Karoo Hoogland Local Municipality and the Laingsburg Local Municipality in the Northern Cape Province and Western Cape Province.

The findings of this field assessment largely correlate with the findings of the Karreebosch HIA (2015) which "*revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area.*"

No significant heritage resources were identified in any of the proposed alignment alternatives, with only one LSA chert flake (KRB022) identified within the alignment for Powerline Alternative Option 2C. This is likely due to the placement of the proposed powerline alternatives on ridgelines or slopes. It has been previously noted that in this area, it is the valley bottoms that are sensitive in terms of archaeology and heritage resources.

As such, no negative impact to significant archaeological heritage is anticipated and there is no preferred alternative alignment or substation in terms of impacts to archaeological resources.

Recommendations

There is no objection to the proposed development of the Karreebosch overhead powerline, substation and associated service infrastructure in terms of impacts to archaeological heritage and there is no preferred alternative on condition that:

- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The relevant heritage authority (the South African Heritage Resources Agency (SAHRA) in the Northern Cape and Heritage Western Cape (HWC) in the Western Cape) must be contacted immediately in order to determine an appropriate way forward.

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CONTENTS

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1. INTRODUCTION

1.1 Background Information on Project

PERMITTING PROCESS

The entire extent of the proposed 132kV Karreebosch Overhead Powerline (OHPL), 33/132kV Substation and associated infrastructure is located within one (1) of the Strategic Transmission Corridors, namely the Central Corridor, as defined in and in terms of the procedures laid out in Government Notice (GN) No. 113. The proposed OHPL project will therefore be subject to a Basic Assessment (BA) Process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 1 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this BA process is the national Department of Forestry, Fisheries and Environment (DFFE).

PROJECT LOCATION

The proposed 132kV Karreebosch OHPL, 33/132kV Substation and associated infrastructure is located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The proposed Karreebosch OHPL will evacuate power from the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), located in the Northern Cape Province, and will connect to the existing Komsberg substation.

PROJECT INFRASTRUCTURE

OVERHEAD POWERLINE

The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures. Pole positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). However, a 400m wide assessment corridor is being considered and has been walked down by the specialists for approval to allow for micro siting of tower positions once the detailed design has been completed. It is anticipated that towers will be located on average 200m to 250m apart; however, longer spans may be needed due to terrain and watercourse crossings.

SERVITUDE

A 400m wide OHPL corridor (200m on either side of the centre line) has been assessed by the specialists for the purposes of the Basic Assessment Report (BAR). The registered servitude will fall within this 400m wide assessment corridor and will be 31m wide (15.5 m on either side of the centre line). The Right of Way servitude (servitude road) will be up to 14m wide (7m on either side of the centre line), resulting in a total servitude width of 45m in total. The length of

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the longest powerline route alternative (Option 2C – see "Alternatives" section 5.3) is 20.52 km, which will result in a servitude area of up to 92.3 ha.

The servitude is required to ensure safe construction, maintenance and operation of the powerline. Registration of the servitude grants the operator the right to erect, operate and maintain the powerline and to access the land to carry out such activities, but it does not constitute full ownership of the land. It should be noted that the OHPL will be ceded to Eskom post-construction.

Construction and operation activities and access to the powerline will be carried out with due respect to the affected landowners. The servitude required for the Project will be registered at the Deeds Office and will form part of the title deed of the relevant properties once the environmental authorisation has been obtained.

SUBSTATIONS

The Karreebosch OHPL will be routed from the proposed onsite Karreebosch 33/132kV substation (associated with the approved Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3 which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process)) to the existing Bon Espirange substation, after which it will connect to the existing 400kV Komsberg substation. Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site have been assessed as part of this Basic Assessment process, each with a 200m x 150m (3 ha) footprint. A 200m assessment area surrounding the proposed substation alternatives has been included as part of this assessment for micro siting, with a slight funnel leading into the existing Bon Espirange and Komsberg substations to allow for greater flexibility for micro siting for incoming proposed line connections. The proposed Karreebosch OHPL may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed as part of this Basic Assessment Process.

SITE ACCESS

The OHPL and associated infrastructure will be accessed via roads forming part of the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3 which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), where possible. The preferred OHPL routing will require an associated servitude road (following beneath the proposed OHPL) to be constructed which will be used to construct, operate and maintain the powerline. Existing roads will be used as much as possible, where feasible. However, additional access roads may be required to provide access to sections of the powerline route.

New sections of access roads will deviate off existing roads (within the 400m wide assessment corridor), as needed to access tower positions. Access roads will be mostly two-track gravel roads up to 14m in width following beneath the OHPL in order to access tower structures for construction and maintenance purposes.

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1.2 Description of Property and Affected Environment

The proposed routes for the Karreebosch powerline connect up to the existing Komsberg substation in the east and traverse through much of the now complete Roggeveld WEF before following one of two valleys that run in a north to south direction that are separated by a prominent ridge containing a number of proposed turbines for the Karreebosch WEF. Ek Kraal farm lies in much of the eastern valley and Klipbanksfontein lies in the western valley in a more rugged area than Ek Kraal. Only very short sections of the alternatives cross the valley floor and tend to follow the slopes of the ridges that dominate the area. Ek Kraal has small-scale farming activities with very small patches of ground dedicated to crop agriculture along the Tankwarivier in addition to providing grazing for sheep. The valley on the western route over Klipbanksfontein is largely vacant as most of the primary farming occurs in the next valley further west where water supplies are more predictable. Water was running in most of the rivers and streams at the time of the survey but the previous extended drought brought almost all farming activities in the area to the point of closure. A number of abandoned farmhouses and ruins have been documented in the area from previous surveys which confirms the rather precarious state that these farms are in due to the environment.

The region is regarded as semi-arid as it receives limited precipitation. It is located on the border of the summer and winter rainfall regions. Precipitation is in the form of snow and rain in winter, with occasional thunderstorms during the summer. The vegetation cover falls within the Roggeveld Shale Renosterveld of the Karoo Renosterveld Bioregion and consists predominantly of low shrubs and very few trees in this area.

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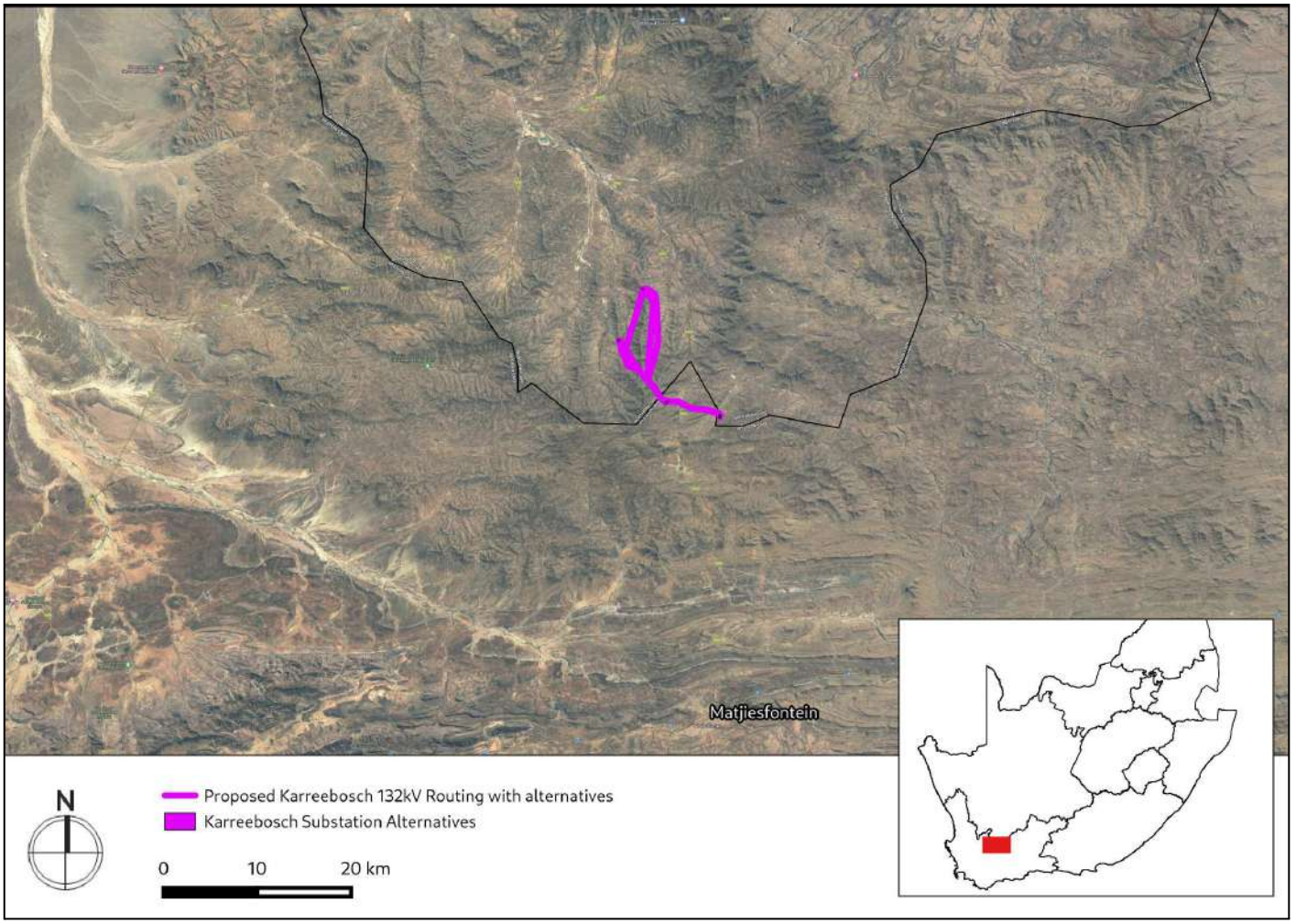

Figure 1.1: Close up satellite image indicating proposed location of study area

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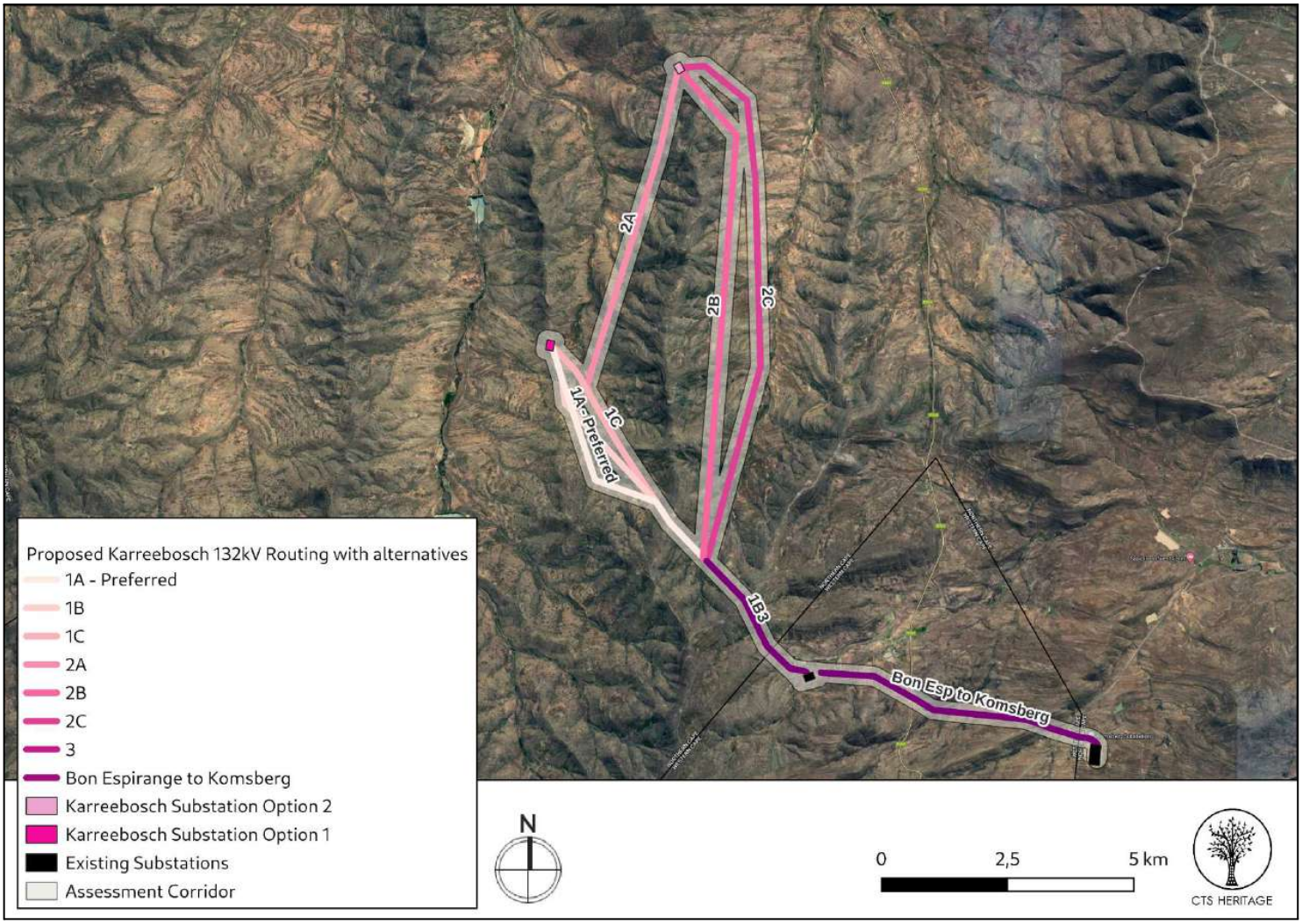

Figure 1.2: Study Area with alternatives indicated

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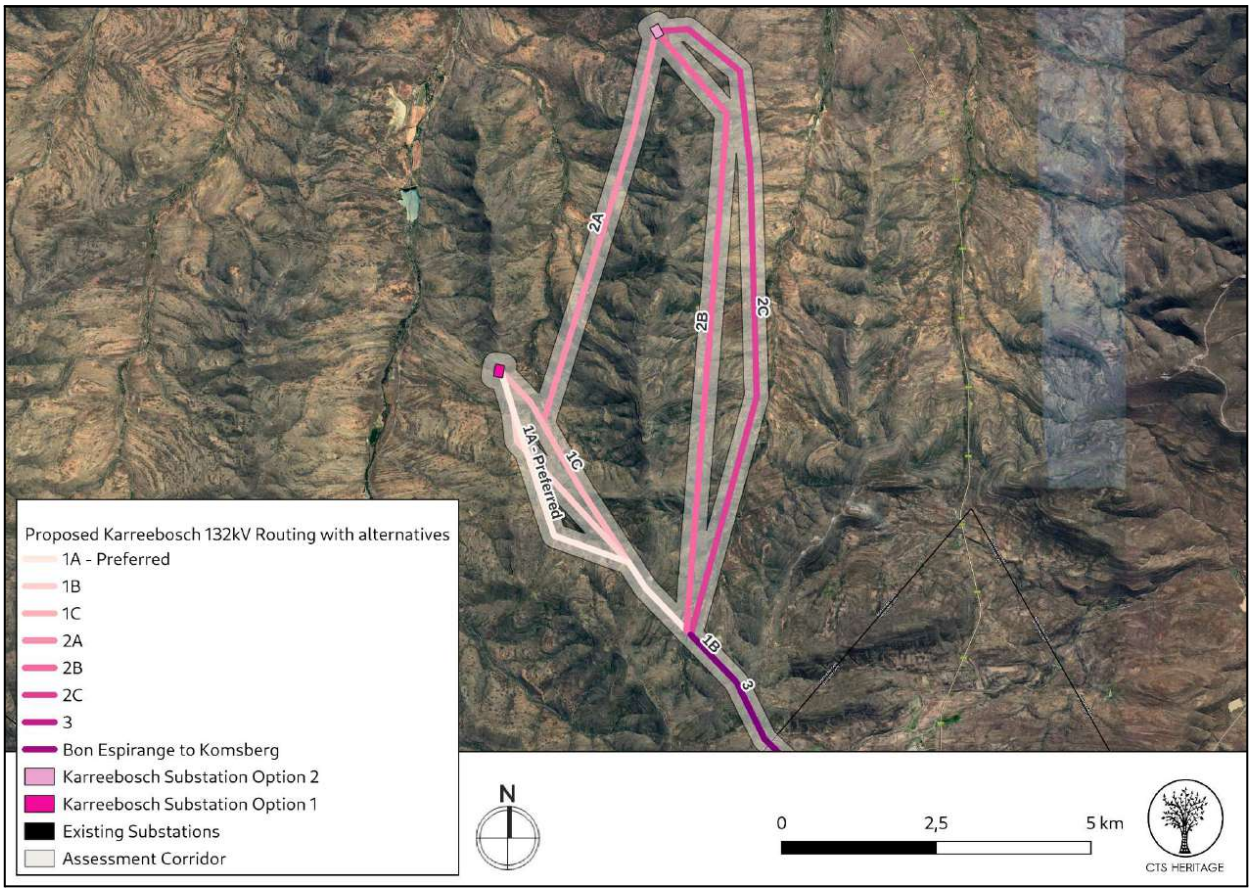

Figure 1.3: Study Area in the Northern Cape

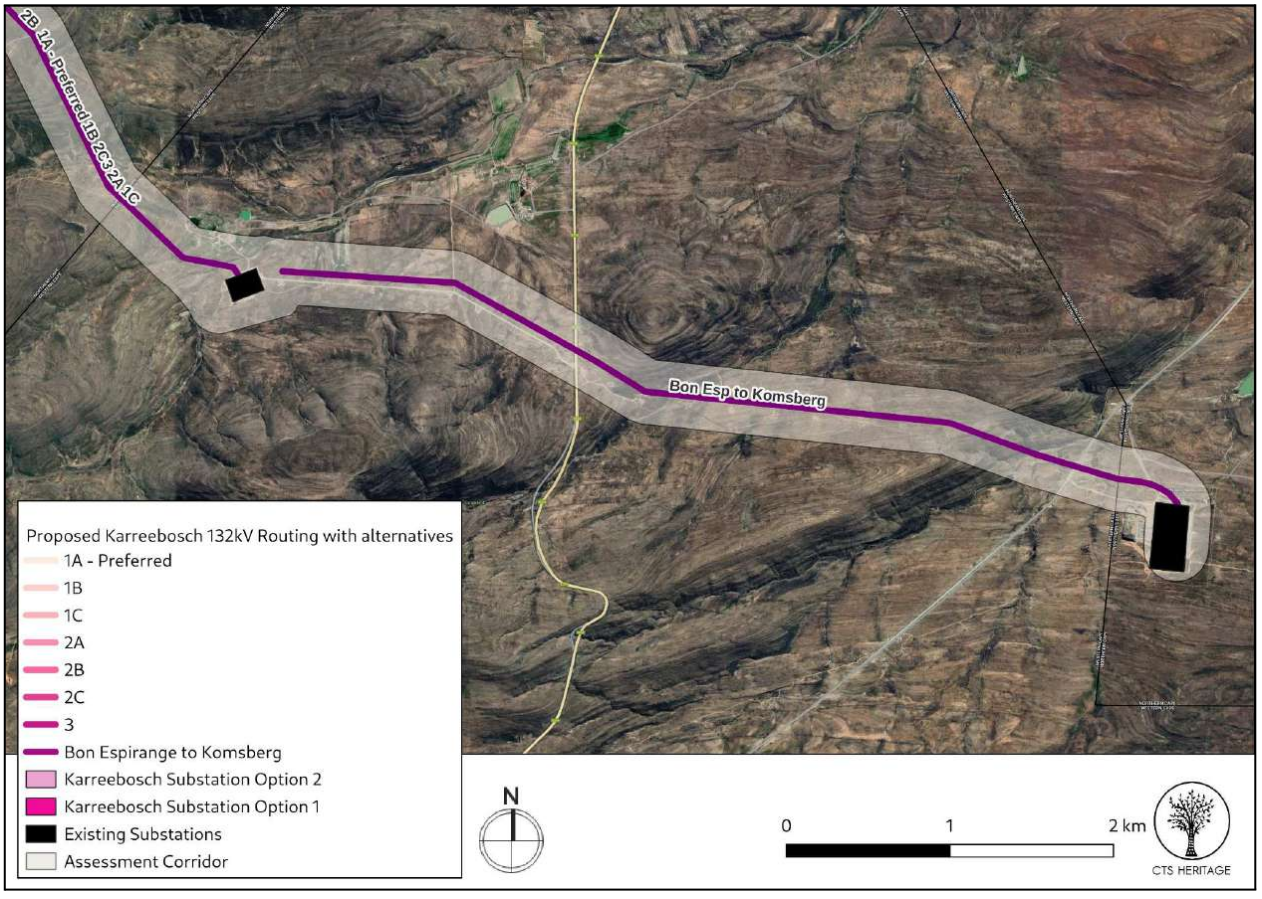

Figure 1.4: Study Area in the Western Cape

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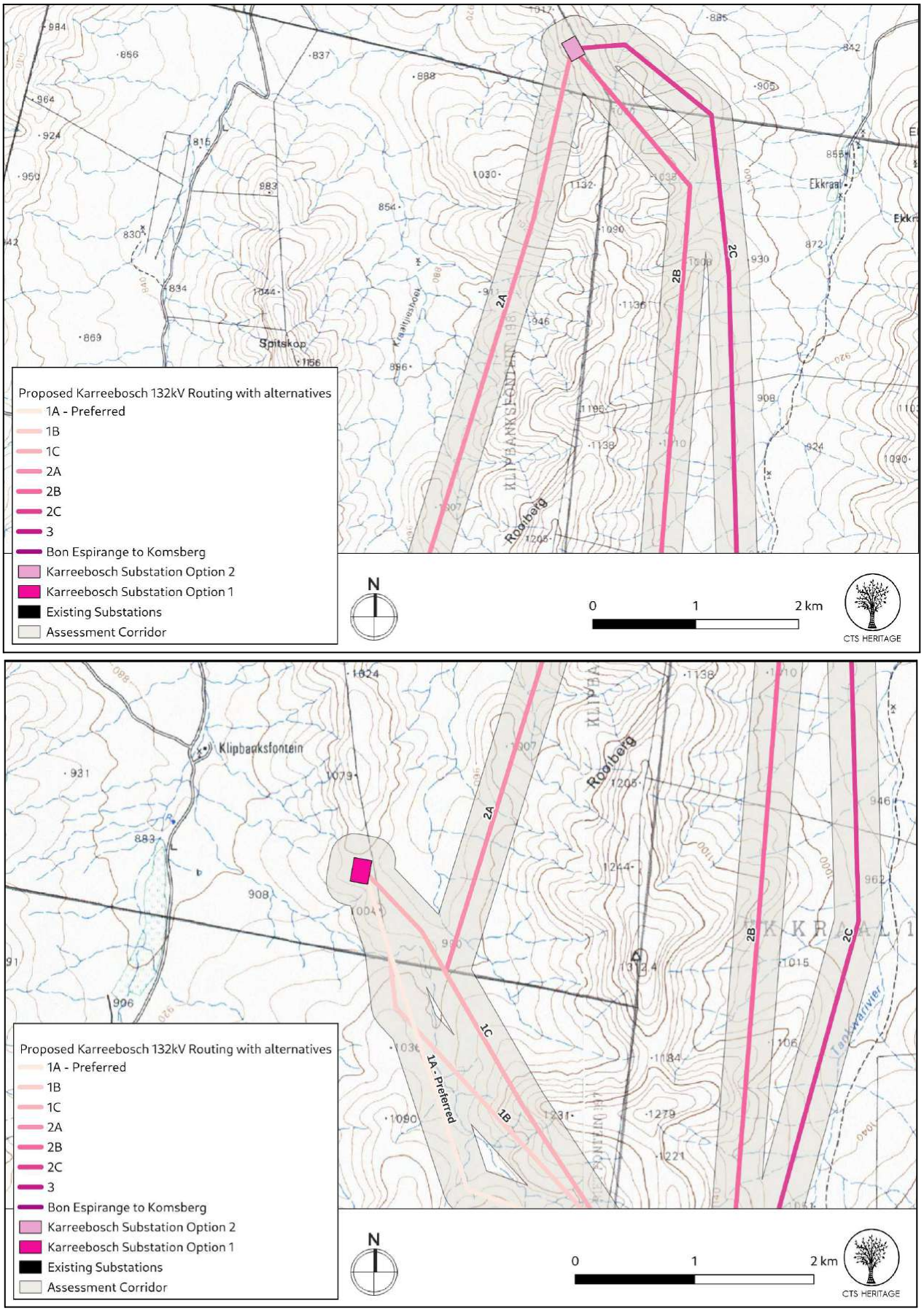

Figure 1.5: Topographic Map of the Study Area 1:50 000 (AZ08)

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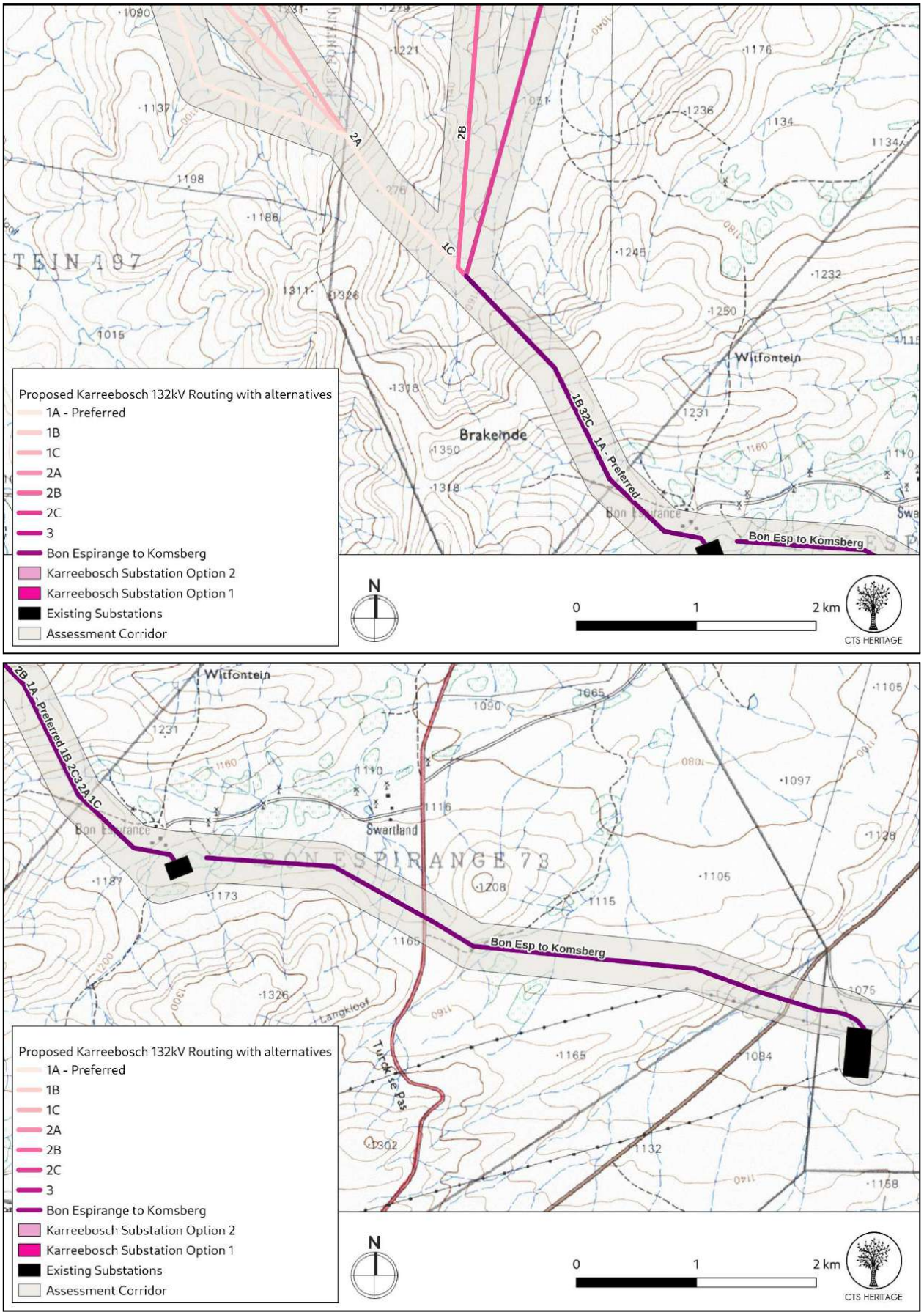

Figure 1.6: Topographic Map of the Study Area 1:50 000 (AZ08)

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2. METHODOLOGY

2.1 Purpose of Archaeological Study

The purpose of this archaeological study is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999) in terms of impacts to archaeological resources.

2.2 Summary of steps followed

- An archaeologist conducted a survey of the site and its environs on 13 August 2021 to determine what archaeological resources are likely to be impacted by the proposed development.
- The study area was assessed on foot in transects, photographs of the context and finds were taken, and tracks were recorded using a GPS.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.

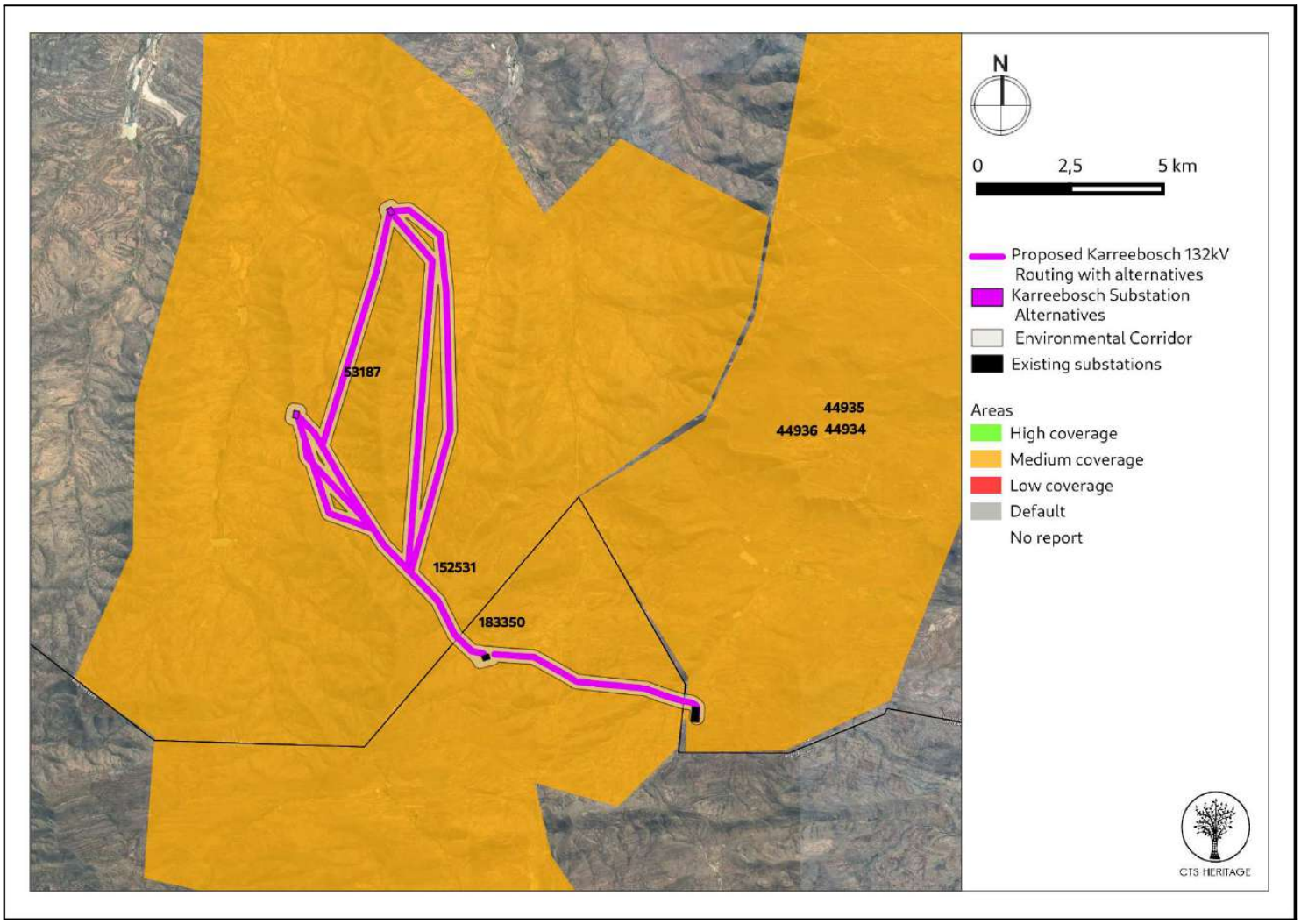

Figure 2: Close up satellite image indicating proposed location of the study area in relation to heritage studies previously conducted

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2.3 Constraints & Limitations

The vegetation did not pose any challenges to the archaeological survey but much of the ground was covered in broken rock and stone eroding down the slopes of the ridges. The placement of the OHL footings predominantly lie along the middle of the slopes en route to and from the tops of the ridges and this resulted in very few archaeological observations.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

This application is for a proposed powerline associated with the approved Karreebosch Wind Energy Facility (WEF) located in both the Western and Northern Cape Provinces (14/12/16/3/3/2/807/AM3). The Karreebosch WEF was previously referred to as Phase 2 of the Roggeveld WEF. SAHRA has made numerous comments on both the Roggeveld WEF and the Karreebosch WEF from 2013 with the last comment issued on 26 September 2018 (Case 7379 on SAHRIS). EA was granted for the Karreebosch WEF on 29 January 2016. In the EA, various requirements were stipulated in terms of impacts to Historical, Cultural and Palaeontological sites. Much of the area proposed for the development of the powerline was assessed as part of the HIA completed for the Karreebosch WEF (Figure 2 above) drafted by the ACO (Kendrick, 2015, SAHRIS Ref 183350). The remaining sections of the proposed powerline were assessed in the Heritage Assessments completed for the Roggeveld WEF (Hart and Webley, 2013, SAHRIS Ref 152531). The heritage information identified in these reports has been extracted and are mapped in Figure 3 below. These reports are also referred to below in order to provide a contextual analysis of the heritage sensitivity of the area proposed for development.

Archaeology and Built Environment Heritage

The area proposed for development has been previously assessed, more than once. In addition, the proposed powerline routes lie immediately adjacent to existing grid infrastructure. The original fieldwork conducted for the Roggeveld WEF HIA (Hart and Webley, 2013) which covered the area proposed for development was comprehensive and remains relevant, similarly the fieldwork conducted for the Karreebosch WEF (2015).

The Karreebosch HIA (2015) "*revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area. There are a number of existing farm houses that contain 19th century fabric, however very few of these have anything more than moderate heritage significance. Parts of the study area enjoy very high aesthetic qualities with the area known by locals as "Gods Window" having grade II aesthetic qualities, hence the significance of the study area lies mainly with its undeveloped wilderness qualities. Interestingly, pre-colonial or stone age heritage and archaeology is extremely scarce in the areas that were searched. Very few archaeological sites of these kinds were recorded despite the fact that overall 9 experienced archaeologists were involved in scouring the landscape.*"

The HIA for the Karreebosch WEF (2015) notes that "*The most important colonial archaeological sites in the study area*

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are associated with Ekkraal Valley, the Rietfontein-Wilgebosch River valley and the Krans Kraal-Karrekraal valley. The valley bottoms are archaeologically sensitive…". As the proposed powerline alternatives traverse the valley areas which have been determined to be archaeologically sensitive, it is likely that significant archaeological heritage resources may be impacted by the proposed development.

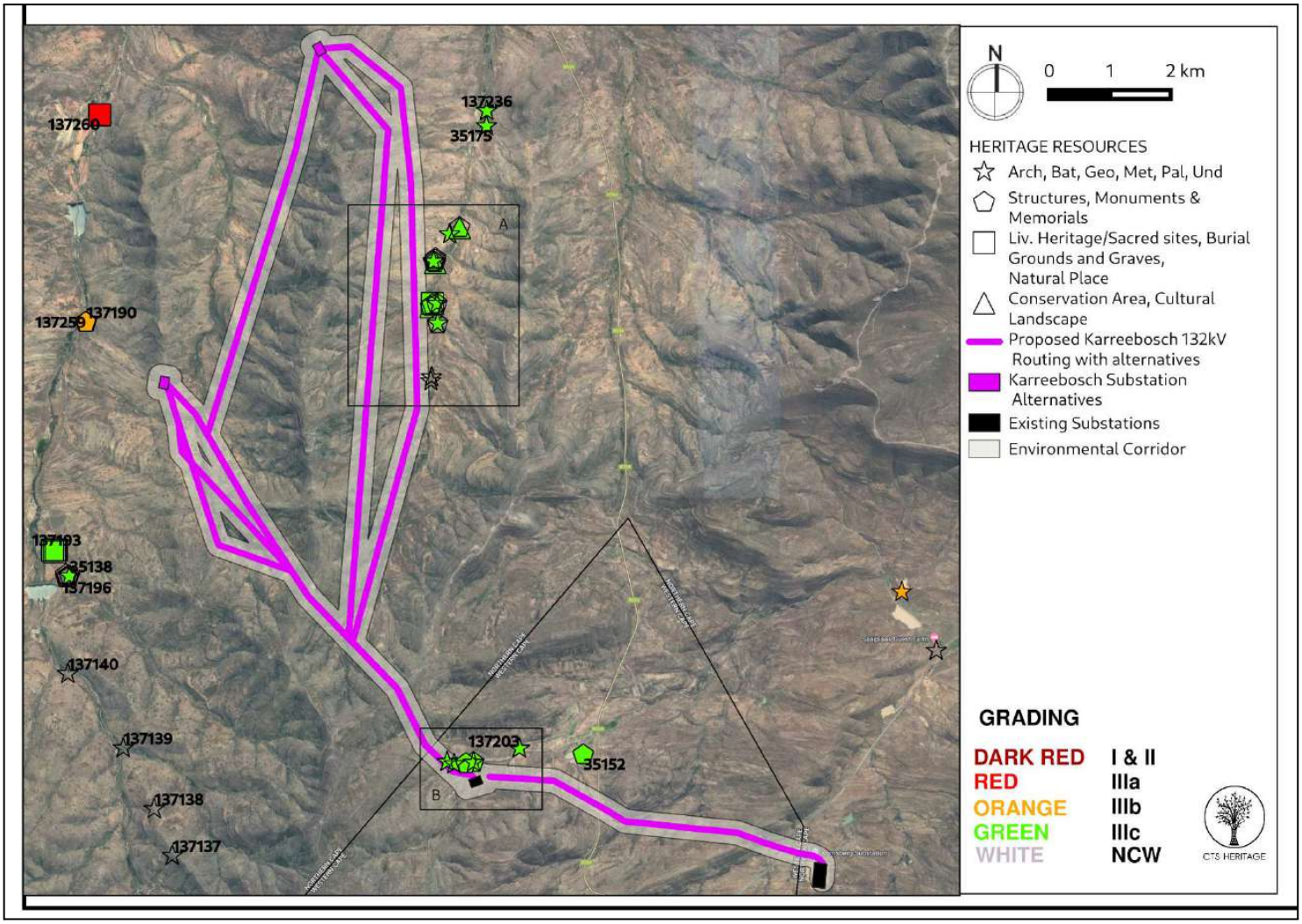

Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Heritage Screening Assessment for insets)

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Field Assessment

Very few archaeological resources were identified during the archaeological field assessment completed for the proposed OHL and substation development. The resources that were identified were all single artefact occurrences or low density artefact scatters, none of which were determined to have any scientific cultural value.

While the survey of the Karreebosch OHL and substation must be taken in context with the broader assessments of the wind farm that has necessitated the development of the OHL and substations, the findings were particularly limited due to the alignment of the OHL. 132kV lines which typically have a very small development footprint and can be constructed without the large roads needed to build the WEFs. The routes chosen by the engineers for the various alternatives follow very rugged, mid-slope paths where almost no archaeological material or ruins were found. Where archaeological material was found, lithics consisted of local quartzites used to manufacture Middle and Later Stone Age flakes as well as cherts that were sourced in the more general region such as the Tanqua and Ceres Karoo by people in the Later Stone Age.

There have now been a rather large number of studies conducted for the various WEFs between Sutherland, Matjiesfontein, Laingsburg and the Ceres Karoo which have greatly improved our understanding of the Stone Age and historical settlement patterns in this area. Rock art sites are rare where suitable surfaces are not found in abundance near the valley floors. Isolated Stone Age material from the Middle to the Later Stone Age is found in very low numbers on the ridges, particularly the more accessible ones. We hypothesize that these were used as lookout/observation areas by hunter-gatherers as no evidence of larger campsites were found on the ridges. The historical farms have left a more obvious trace on the valley floors where arable land was taken up for agriculture during the last couple of hundred years. This is also the ground where most of the evidence for Later and Middle Stone Age occupation areas were found.

Figure 4.1: Contextual Images taken from the northern-most point of the proposed line alternatives

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Figure 4.2: Contextual Images taken from the northern-most point of the proposed line alternatives

Figure 4.3: Contextual Images taken from the ridge between Options 2A and 2B

Figure 4.4: Contextual Images taken from the substation location in the west (Option 1) with existing turbines visible on the ridgeline

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Figure 4.5: Contextual Images taken from the farm werf at Figure 3 inset B and Figure 8.3

Figure 4.6: Contextual Images taken from the alignment running north-west to south-east indicating turbines under construction

Figure 4.7: Contextual Images taken from the alignment running north-west to south-east indicating existing turbines at Roggeveld WEF

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Figure 4.8: Contextual Images taken from the alignment running north-west to south-east indicating existing turbines at Roggeveld WEF

Figure 4.9: Contextual Images taken from the alignment running north-west to south-east indicating existing powerlines

Figure 4.9: Contextual Images taken from the alignment running north-west to south-east indicating existing powerline infrastructure

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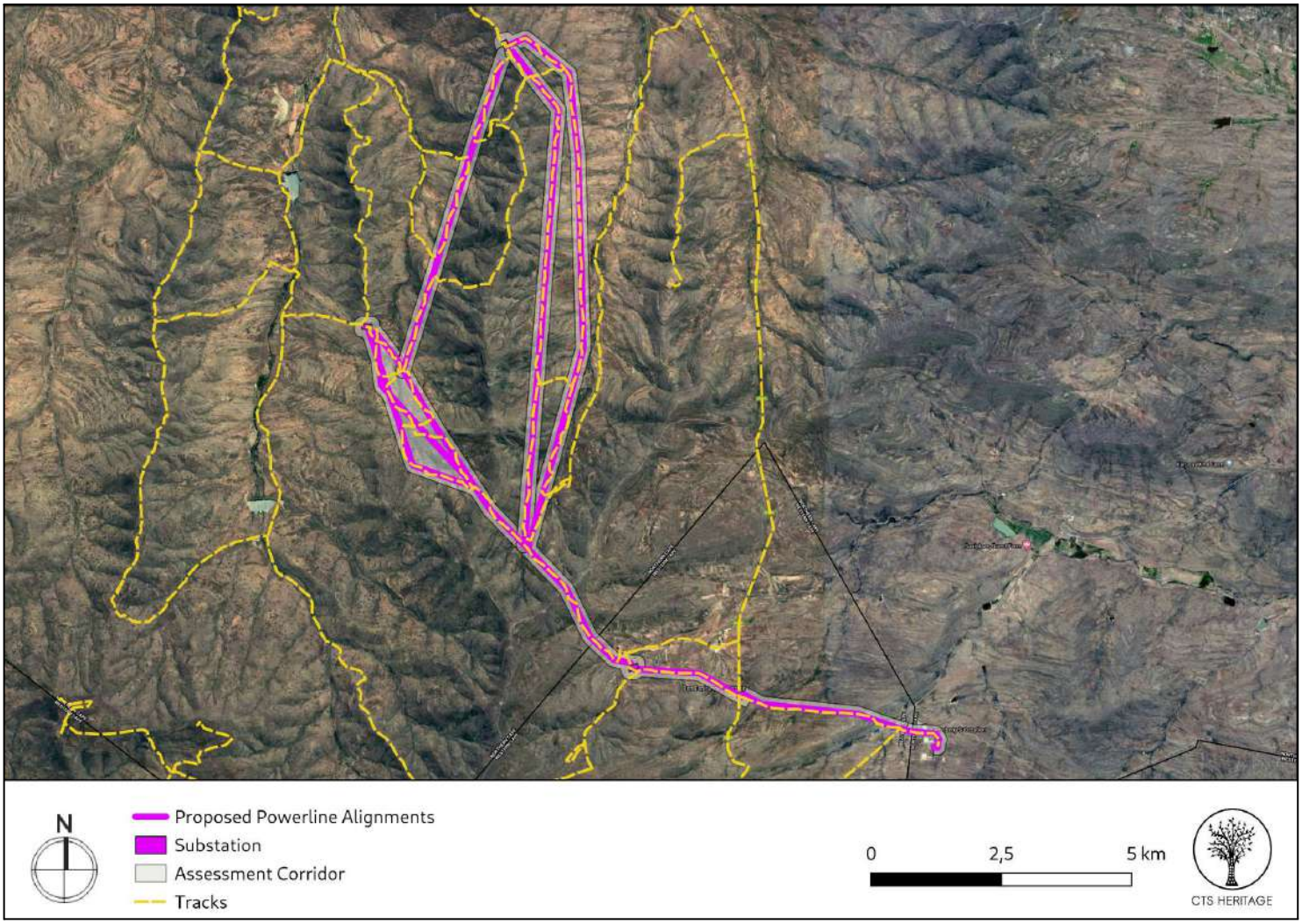

Figure 5: Overall track paths of foot survey

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4.2 Archaeological Resources identified

Table 2: Observations noted during the field assessment

Site No.	Site Name	Description	Co-ordinates		Grading	Mitigation
KRB017	Karrebosch 017	Quartzite flakes, thinly struck, prep. Platforms, MSA. Near valley floor; cores and flakes, knapping and production site	-32.85936	20.47184	NCW	NA
KRB018	Karrebosch 018	Chert flake, LSA. On top of ridge.	-32.84809	20.44152	NCW	NA
KRB019	Karrebosch 019	Quartzite flake, MSA	-32.84897	20.44073	NCW	NA
KRB020	Karrebosch 020	Quartzite flake, MSA	-32.86418	20.43635	NCW	NA
KRB021	Karrebosch 021	Chert and quartz flakes, lower grindstone near wind pump, LSA	-32.90585	20.44082	NCW	NA
KRB022	**Karrebosch 022**	**Chert flake, LSA**	**-32.88297**	**20.517862**	**NCW**	**NA**

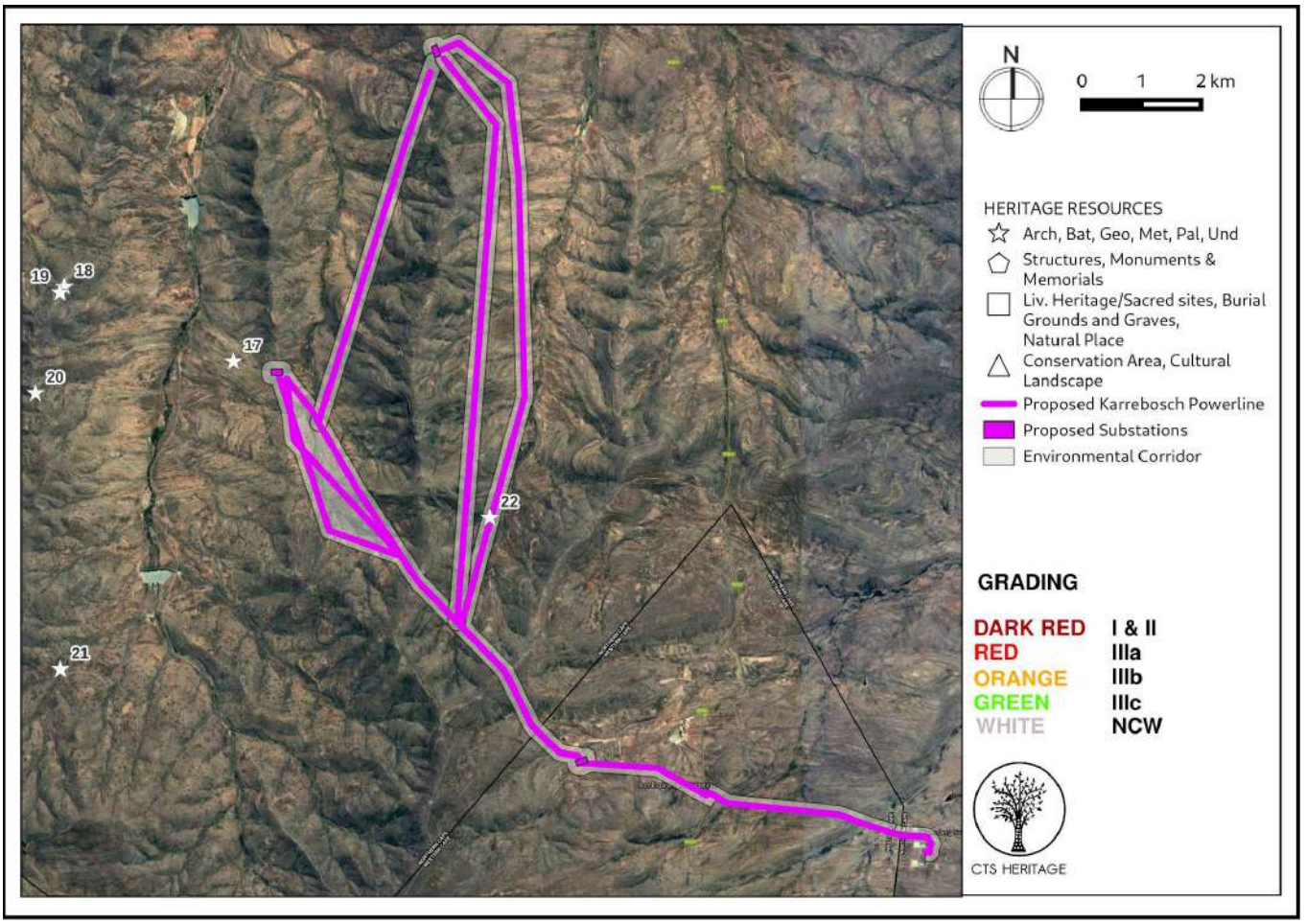

Figure 6: Map of field observations relative to the proposed development

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4.3 Selected photographic record

(a full photographic record is available upon request)

Figure 7.1: KRB017

Figure 7.2: KRB017

Figure 7.3: KRB017

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Figure 7.4: KRB018

Figure 7.5: KRB019

Figure 7.6: KRB020

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Figure 7.7: KRB021

Figure 7.8: KRB022

Figure 7.9: KRB022

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The findings of this field assessment largely correlate with the findings of the Karreebosch HIA (2015) which "*revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area.*"

No significant heritage resources were identified in any of the proposed OHL alignment alternatives or substation alternatives, with only one LSA chert flake (KRB022) identified within the alignment for OHL Alternative Option 2C. This is likely due to the placement of the proposed powerline alternatives on ridgelines or slopes. It has been previously noted that in this area, it is the valley bottoms that are sensitive in terms of archaeology and heritage resources.

As such, no negative impact to significant archaeological heritage is anticipated and there is no preferred OHL alternative alignment or substation in terms of impacts to archaeological resources.

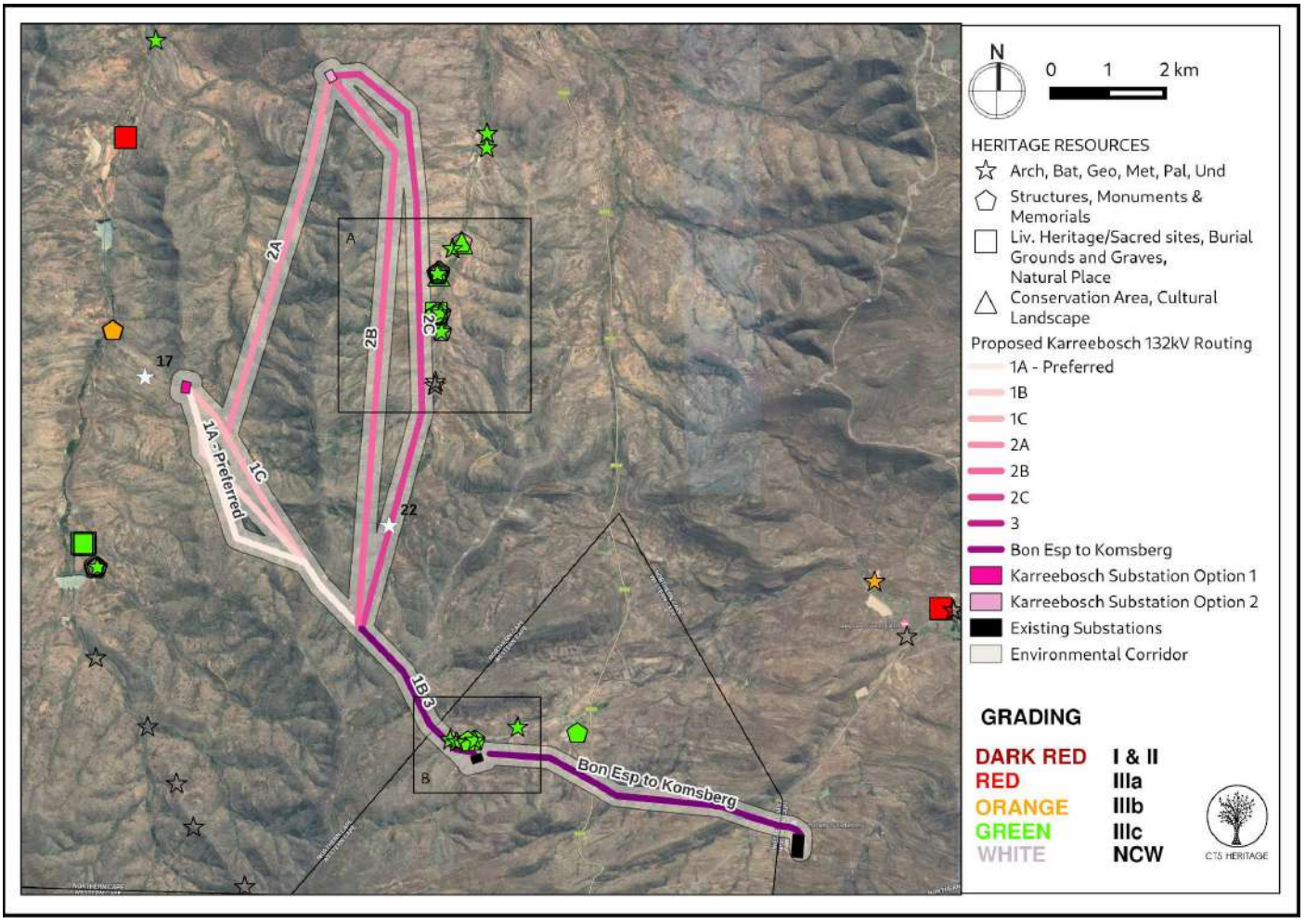

Figure 8.1: Map of all known heritage resources relative to the study area and associated archaeological sensitivity

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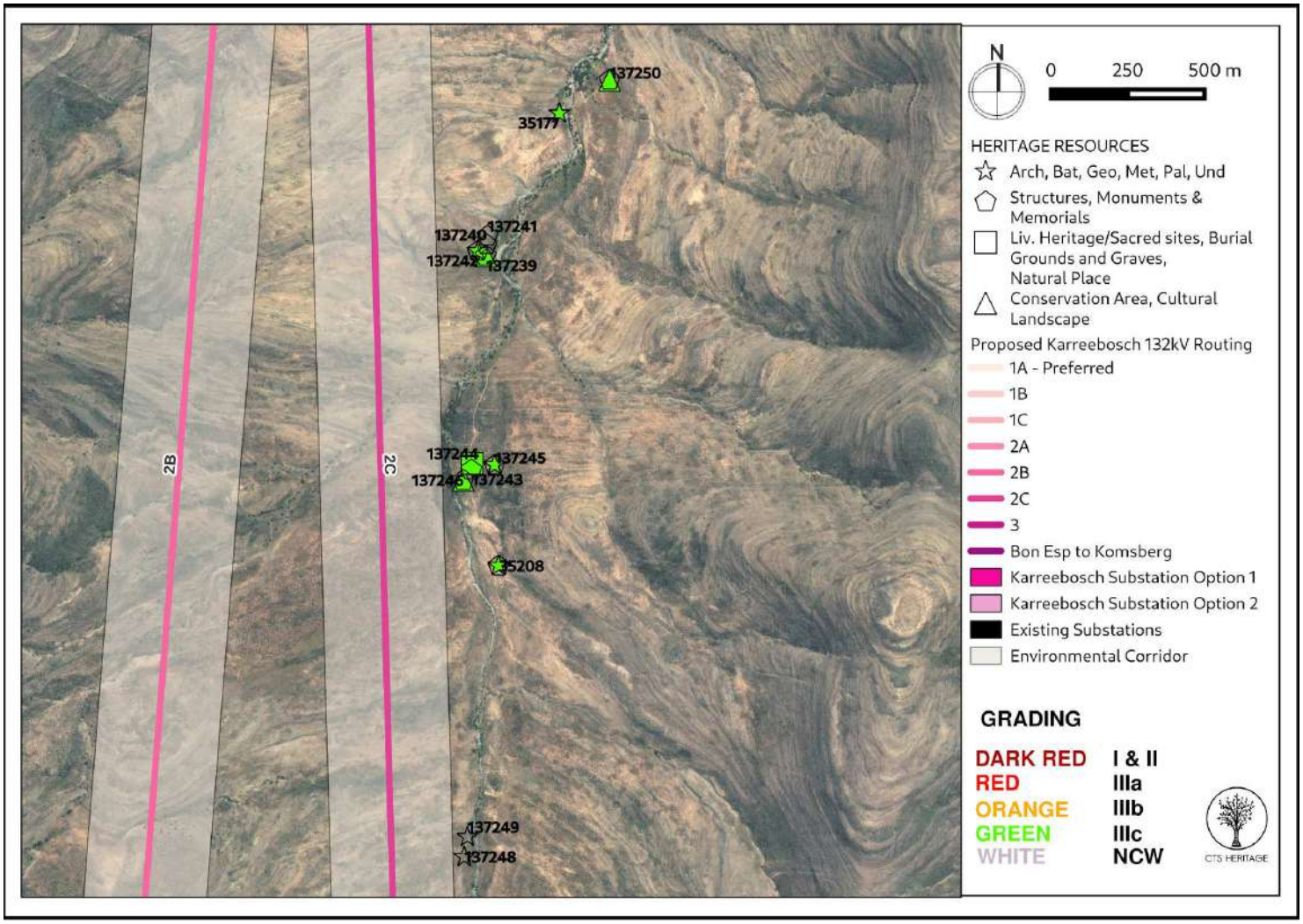

Figure 8.2: Inset A

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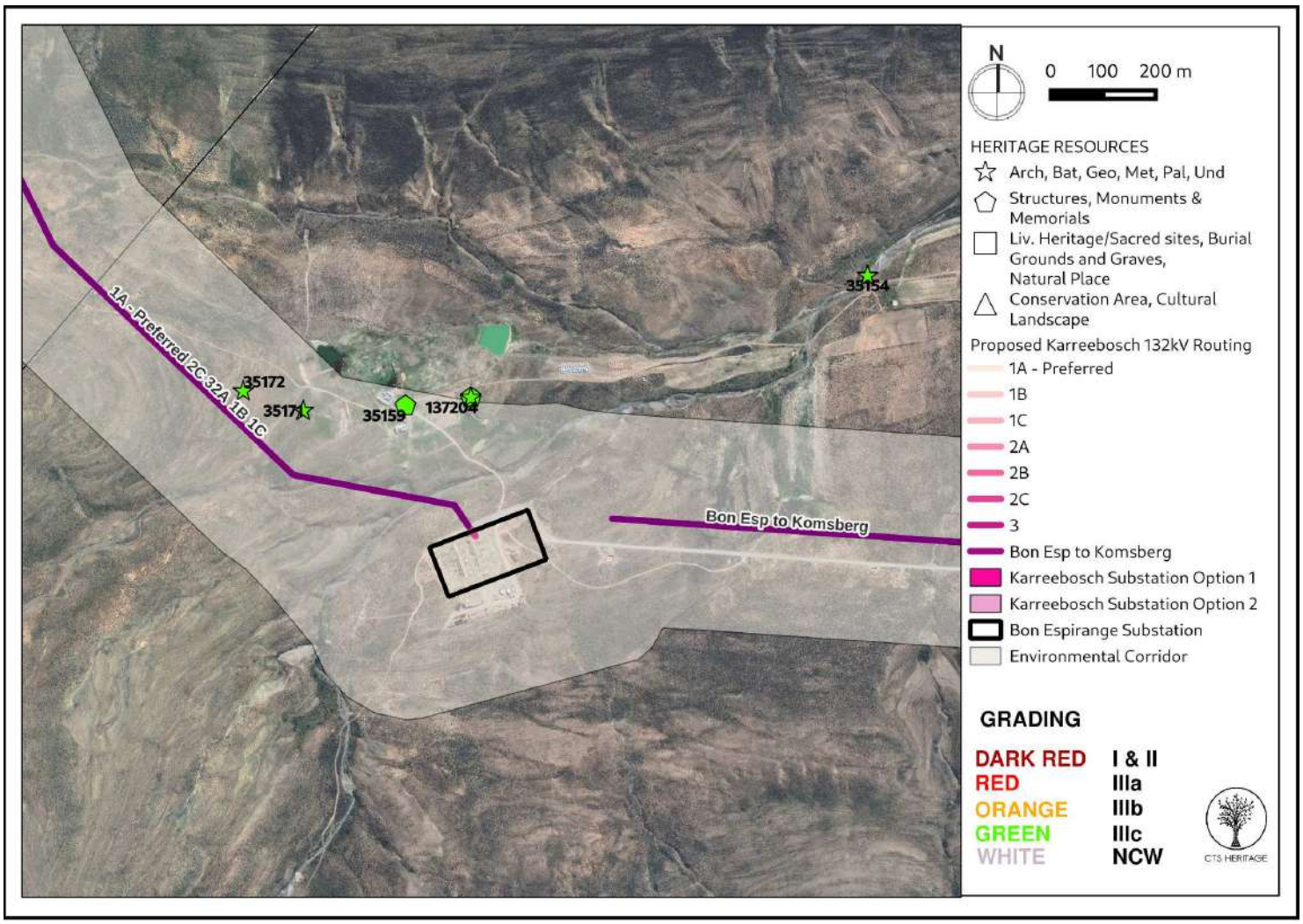

Figure 8.3: Inset B

6. CONCLUSION AND RECOMMENDATIONS

The findings of this field assessment largely correlate with the findings of the ACO in the HIA completed for the Karreebosch WEF (Kendrick, 2015, SAHRIS Ref 183350) and the Roggeveld WEF (Hart and Webley, 2013, SAHRIS Ref 152531). The archaeological resources identified were all *ex situ* and are of limited scientific and heritage significance.

Based on the findings of this and other assessments completed in the area, it is unlikely that the proposed development of the OHL, substation and associated road infrastructure will negatively impact significant resources. This is due to the fact that 132kV lines typically have a very small development footprint and can be constructed without the large roads needed to build the WEFs. The routes chosen by the engineers for the various alternatives follow very rugged, mid-slope paths where almost no archaeological material or ruins were found.

It is possible, although unlikely, that archaeological resources may be located beneath the ground surface which may be impacted during the course of development. Recommendations in this regard are included below.

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Recommendations

There is no objection to the proposed development of the Karreebosch overhead powerline, substation and associated road infrastructure in terms of impacts to archaeological heritage and there is no preferred alternative for both the OHL or substation on condition that:

- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The relevant heritage authority (the South African Heritage Resources Agency (SAHRA) in the Northern Cape and Heritage Western Cape (HWC) in the Western Cape) must be contacted immediately in order to determine an appropriate way forward.

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7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
44934	AIA Desktop	Celeste Booth	01/08/2011	An archaeological desktop study for the proposed establishment of the Hidden Valley wind energy facility and associated infrastructure on a a site south of Sutherland, Northern Cape Province
44935	AIA Phase 1	Celeste Booth	01/02/2012	A Phase 1 AIA for the proposed HIdden Valley Wind Energy Facility, near Sutherland, Northern cape Province
44936	PIA Desktop	Lloyd Rossouw	01/03/2012	Palaeontological desktop assessment of the proposed Hidden Valley Wind Energy Facility near Sutherland, Northern Cape Province
53187	HIA Phase 1	Timothy Hart, Lita Webley	01/03/2011	HERITAGE IMPACT ASSESSMENT PROPOSED WIND ENERGY FACILITY
152531	HIA Phase 1	Timothy Hart, Lita Webley	20/12/2013	Heritage Impact Assessment Report for the Phase 1 Roggeveld Wind Farm
183350	HIA Phase 1	Natalie Kendrick	27/10/2014	Heritage Impact Assessment for the Karreebosch Wind Farm (Phase 2 Roggevelt Wind Farm)
353483	AIA Phase 1	Jonathan Kaplan	1/12/2015	ARCHAEOLOGICAL IMPACT ASSESSMENT Proposed borrow pit (Karusa R354) on the Farm Karreebosch 200/1 near Sutherland, Northern Cape Assessment conducted under Section 38 (3) of the National Heritage Resource Act (No. 25 of 1999)

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APPENDIX 2: Palaeontology Heritage Report (2021)

PALAEONTOLOGICAL HERITAGE: COMBINED DESKTOP & FIELD-BASED REPORT

PROPOSED DEVELOPMENT OF A 132kV OVERHEAD POWERLINE FOR THE KAREEBOSCH WIND ENERGY FACILITY TO THE EXISITING KOMSBERG MTS, KAROO HOOGLAND LOCAL MUNICIPALITY (NORTHERN CAPE PROVINCE) AND LAINGSBURG LOCAL MUNICIPALITY (WESTERN CAPE PROVINCE)

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September 2021

EXECUTIVE SUMMARY

The proposed 132kV overhead powerline to connect the authorised Karreebosch Wind Energy Facility (WEF) to the national grid *via* the existing Eskom Komsberg Main Transmission Substation (MTS) will be *c*. 20 km long and will traverse several properties within the Karoo Hoogland Local Municipality (Northern Cape Province) and the Laingsburg Local Municipality (Western Cape Province). Two on-site substation sites and several powerline corridors are currently under consideration.

The grid connection project area is underlain at depth by potentially fossiliferous continental sediments within the lower part of the Abrahamskraal Formation (Lower Beaufort Group / Adelaide Subgroup, Karoo Supergroup) of Middle Permian age. Sparse fossil assemblages in this sector of the Klein-Roggeveldberge region - including extremely rare vertebrate skeletal remains, tetrapod and lungfish burrows, invertebrate traces and vascular plants - are inferred to belong to the *Eodicynodon* Assemblage Zone and contribute to our understanding of the earliest terrestrial biotas that colonised the Main Karoo Basin in Middle Permian times (*c*. 270 Ma / million years ago). The palaeosensitivity of the project area is provisionally rated as High to Very High based on the Lower Beaufort Group bedrocks (SAHRIS website / DFFE screening tool). However, previous field-based palaeontological surveys in the Roggeveld WEF project area have only yielded scrappy plant remains as well as low-diversity trace fossils. With the exception of fragmentary fossil remains of very rare temnospondyl amphibians found on Rietfontein RE/197, close to the powerline Option 1B, additional fossil sites recorded during a recent 2-day palaeontological site visit to the Roggeveld WEF grid connection project area are mostly of low scientific / conservation value and lie outside or on the margins of the grid corridors under investigation. No fossils were recorded within the Late Caenozoic superficial deposits in the region (colluvium, alluvium *etc*). The overall palaeosensitivity of the grid connection project area is inferred to be Low. However, the potential for isolated vertebrate and other fossil finds of high scientific interest – as recorded elsewhere in the Klein-Roggeveldberge region - cannot be completely discounted.

There are no objections on palaeontological grounds to authorisation of the proposed 132 kV powerline and there is no preference on palaeontological heritage grounds for any particular on-site substation site or powerline route option among those currently under consideration. If powerline Option 1B is selected for construction, vertebrate fossil material at or in the vicinity of Locs. 454-456 on Rietfontein RE/197 must be collected by a professional palaeontologist before construction of the powerline (See Appendix 1, Fig. A2). No further specialist palaeontological studies or mitigation are recommended for this electrical infrastructure project. These recommendations and the Chance Fossil Finds Protocol appended to this report (Appendix 2) should be included in the EMPr for the development.

1. INTRODUCTION

It is proposed to construct a 132kV overhead powerline to connect the authorised Karreebosch Wind Energy Facility (WEF) to the national grid *via* the existing Eskom Komsberg Main Transmission Substation (MTS) situated towards the southeast. The proposed powerline will be approximately 20 km long. The overhead line will be a 132kV steel single or double structure with a kingbird conductor (between 15 and 20m in height above ground level). Standard overhead line construction methodology will be employed involving drill holes (typically 2 to 3m in depth), plant poles and a string conductor. It is not envisaged that any substantial excavations or stabilized backfill will be required; however, this will only be verified on site once geotechnical studies have been undertaken at each pole position during the construction phase.

The Kareebosch WEF grid connection project area is situated in the Klein-Roggeveldberge subregion of the Great Karoo, some 40 km north of the small village of Matjiesfontein and *c*. 50 km SSW of Sutherland (Fig. 1). It spans the border between the Karoo Hoogland Local Municipality in the Northern Cape Province and the Laingsburg Local Municipality in the Western Cape Province. Several route options for the grid connection running between an on-site substation (2 site options) and the Komsberg MTS are currently under consideration. The 132kV grid connection corridor options traverse the following properties:

- Wilgebosch Rivier 188 Remainder
- Ekkraal (Nuwekraal) 199 Portion 2
- Klipbanksfontein 198 Portion 1 and Remainder
- Bon Espirange 73 Portion 1 and Remainder
- Rietfontein 197
- Ekkraal (Nuwekraal) 199 Portion 1 and Remainder
- Standvastigheid 210 Portion 2 (Komsberg Substation)

The internal lines from the Karreebosch onsite substation to the Bon Espirange substation will be for Karreebosch WEF, however the line from Bon Espirange substation to the Komsberg substation will be for all three Euronotus projects.

The present combined desktop and field-based palaeontological heritage report contributes to the consolidated Heritage Basic Assessment report for the Kareebosch WEF grid connection that is being compiled by CTS Heritage, Cape Town (Contact details: Ms Jenna Lavin. CTS Heritage. 16 Edison Way, Century City, RSA. Tel: +27 (0)87 073 5739. Cell: +27 (0)83 619 0854. E-mail: info@ctsheritage.com).

2. INFORMATION SOURCES

The information used in this palaeontological heritage study was based on the following:

1. A short project outline, maps and kmz files provided by CTS Heritage, Cape Town;

2. A review of the relevant scientific literature, including published geological maps (1: 250 000 geology sheet 3220 Sutherland) and accompanying sheet explanations (*e.g.* Theron 1983);

3. Previous field-based palaeontological heritage studies within the Kareebosch WEF / Komsberg MTS project areas by Miller (2011) and Almond (2014, 2015b) as well as several further desktop and field-based palaeontological assessment studies in the broader Klein-Roggeveldberge region of the Great Karoo by the author and others (See References). It is noted that coverage of upland areas during these earlier field studies was very limited indeed;

3. Examination of relevant topographical maps (*e.g.* 1: 250 000 sheet 3220 Sutherland, 1: 50 000 sheets 3220CD Oliviersberg and 3220DC Swartland) and Google Earth© satellite images;

4. A two-day palaeontological site visit by the author and an experienced assistant during 23-24 and 29 September 2021. Given the generally limited bedrock exposure within the Klein-Roggeveldberge project area as well as access constraints in mountainous terrain, palaeontological fieldwork focused on a representative sample (*c*. 50 localities) of potentially-fossiliferous exposures of bedrock units (especially good Beaufort Group mudrock exposures) as well as of Late Caenozoic alluvial and eluvial deposits close to or within the grid connection corridor route options.

5. The author's previous field experience with the formations concerned and their palaeontological heritage (See References and also reviews of Western and Northern Cape fossil heritage by Almond & Pether 2008a, 2008b respectively).

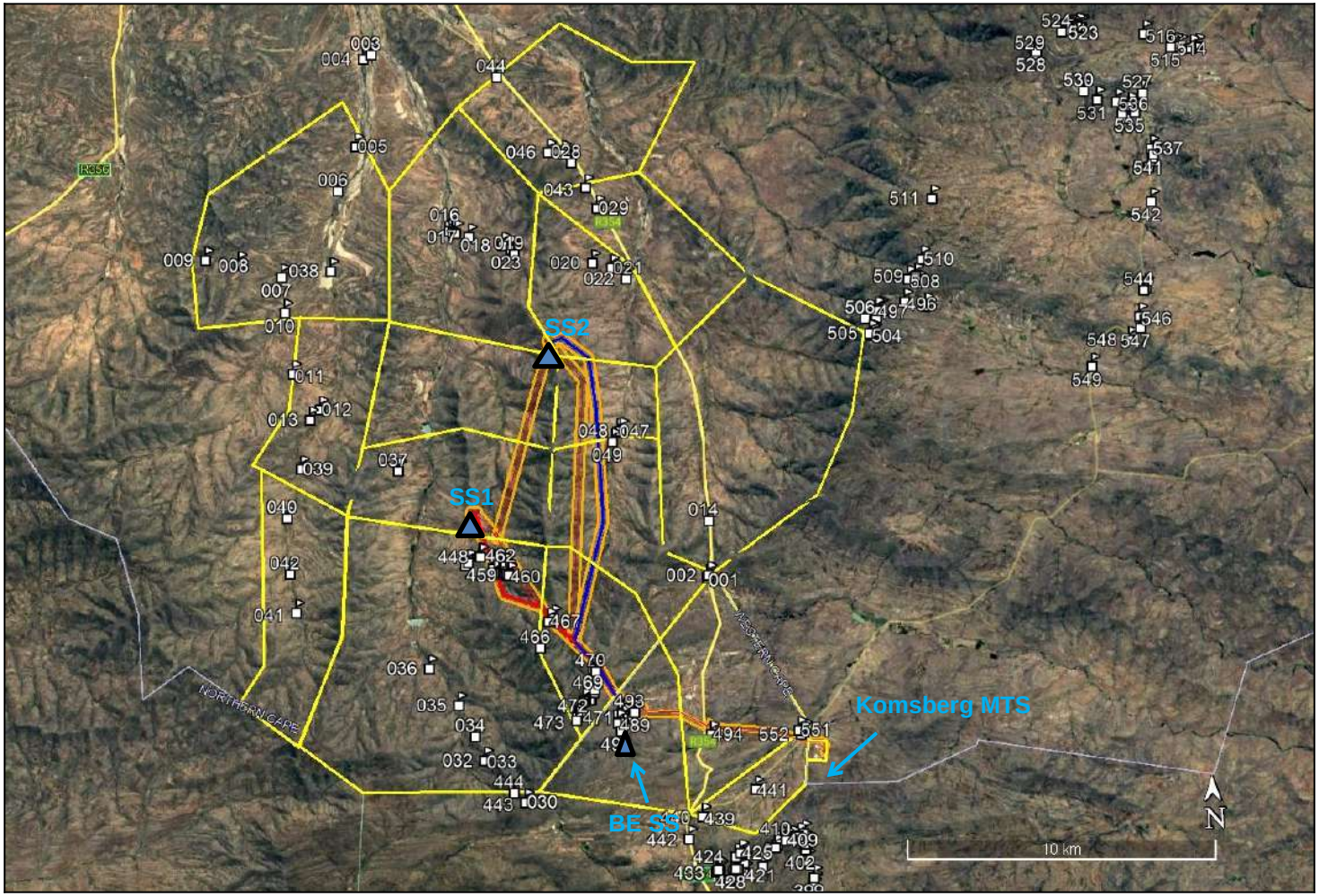


Figure 1: Google Earth© satellite image of the Klein-Roggeveldberge region between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces. The yellow polygons show land parcels concerned in the original Kareebosch WEF project area. Corridor options under consideration for the 132 kV grid connection between the Kareebosch WEF (on-site substation options SS1 & SS2) and the existing Komsberg MTS *via* the existing Eskom Bon Espirange Substation (BE SS) are shown in orange. The blue line shows the currently preferred grid connection route and the red line shows the preferred alternative route. Numbered sites in white indicate representative exposures of potentially fossiliferous bedrocks and superficial sediments examined during palaeontological fieldwork in 2014 (Almond 2014) and 2021 (present report).

John E. Almond (2021) ***Natura Viva* cc**

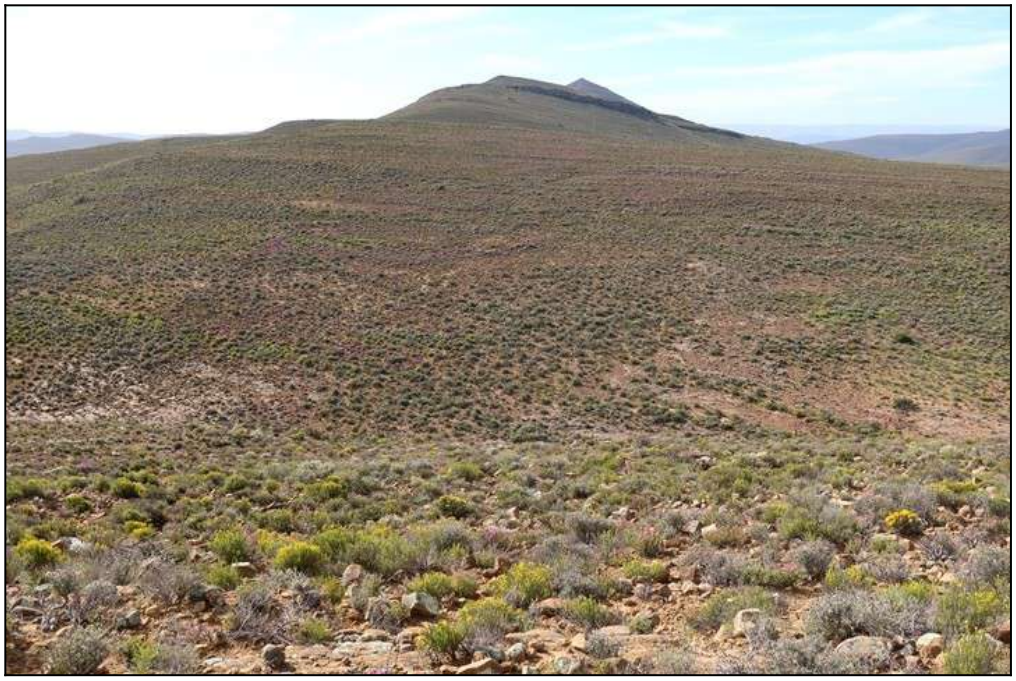


Figure 2: View NNW towards the proposed Substation Option 1 site on Klipbanksfontein 198. Note the lack of potentially fossiliferous mudrock exposures in this upland area which is largely mantled by colluvial / eluvial gravels, skeletal soils and *bossieveld* vegetation.

Figure 3: View towards the NW along the powerline route options 1A-1C across Rietfontein 197 showing the dissected mountainous terrain of the Klein-Roggeveldberge with gentle hillslopes and occasional prominent-weathering *kranzes* of sandstone. Otherwise, bedrock exposure is generally very poor in the region, especially regarding the recessive weathering mudrock facies.

Figure 4: Apart from occasional small stream gullies, the Beaufort Group bedrocks underlying most of the hilly terrain in the grid connection project area are mantled by rubbly colluvial or eluvial gravels and skeletal soils as well as karroid *bossieveld* vegetation.

Figure 5: View from the Brakeinde ridge into next valley to the north, Ekkraal 199. Bedrocks are exposed along deeper stream gullies but these will be spanned by the proposed 132 kV powerline. Anticipated impacts along drainage lines will be mainly attributable to any associated new access roads.

Figure 6: View from the SW towards the new Eskom electrical substation on Bon Espirance 73 with an existing powerline heading eastwards towards the Komsberg MTS adjacent to an upgraded access road.

Figure 7: Extensive streambed and bank exposures of Lower Abrahamskraal Formation sediments just west of the new Eskom substation on Bon Espirance 73. Bedrocks on steep south-facing slopes (cliff in background) are often partially obscured by epilithic lichens.

Figure 8: New wind farm infrastructure on Ekkraal 199, some 2 km west of the new Eskom substation on Bon Espirance 93, showing the substantial area of surface disturbance associated with even small-scale overhead powerlines (middle ground). Sectors of wind turbine access road also require the excavation of major new road cuttings into Abrahamskraal Formation bedrocks.

Figure 9: New road cuttings into maroon mudrocks along the access road to the Eskom substation on Bon Espirance 73. In practice, the recognition, sampling and recording of fossils within freshly-exposed bedrock sections is often highly problematic due to soils / dust cover and fragmentation during excavation.

Figure 10: View eastwards along the recently constructed powerline between the new substation on Bon Espirance 73 and the Komsberg MTS. Bedrock exposure in the low relief terrain here is very limited. Any palaeontological impacts are more likely to be attributable to surface clearance than to excavations for electrical pylon footings.

Figure 11: Occasional good exposures of Abrahamskraal Formation bedrocks are seen in stream gullies incising steep, SE-facing slopes to the NW of Komsberg Substation, as here on the eastern edge of Bon Espirance 73 (Hammer = 30 cm).

3. GEOLOGICAL CONTEXT

The geology of the Karreebosch WEF grid connection project area is covered by 1: 250 000 geology sheet 3220 Sutherland (Council for Geoscience, Pretoria; Theron 1983) (Fig. 12). The grid connection project area is entirely underlain at depth by Middle Permian (Wordian – Capitanian) continental sediments of the **Lower Beaufort Group** (Adelaide Subgroup, Karoo Supergroup). These predominantly fine-grained (muddy to sandy) sediments were deposited in a range of fluvial, alluvial and lacustrine (playa lake) settings within the Main Karoo Basin of South Africa. They are assigned to the lower part of the exceedingly thick **Abrahamskraal Formation** (Pa) at the base of the Lower Beaufort Group succession (Johnson *et al.* 2006, Day and Rubidge 2014, Cole *et al.* 2016 and references therein). In the Kareebosch WEF project area that is situated well to the south of the Great Escarpment the only major dolerite intrusions are a set of laterally persistent, NW-SE trending dykes of the **Karoo Dolerite Suite** that transect the eastern portion of the area. The Lower Beaufort Group bedrocks in the study area are very extensively overlain by **Late Caenozoic superficial deposits** such as scree and other slope deposits (colluvium, eluvium and hillwash), stream alluvium, down-wasted surface gravels, minor calcretes and various, predominantly skeletal soils. These geologically youthful sediments are generally of low palaeontological sensitivity. Levels of bedrock deformation within the project area are generally low. A number of E-W orientated fold axes related to the Permo-Triassic orogeny influence the Palaeozoic bedrocks while locally the finer-grained mudrocks show a well-developed tectonic cleavage.

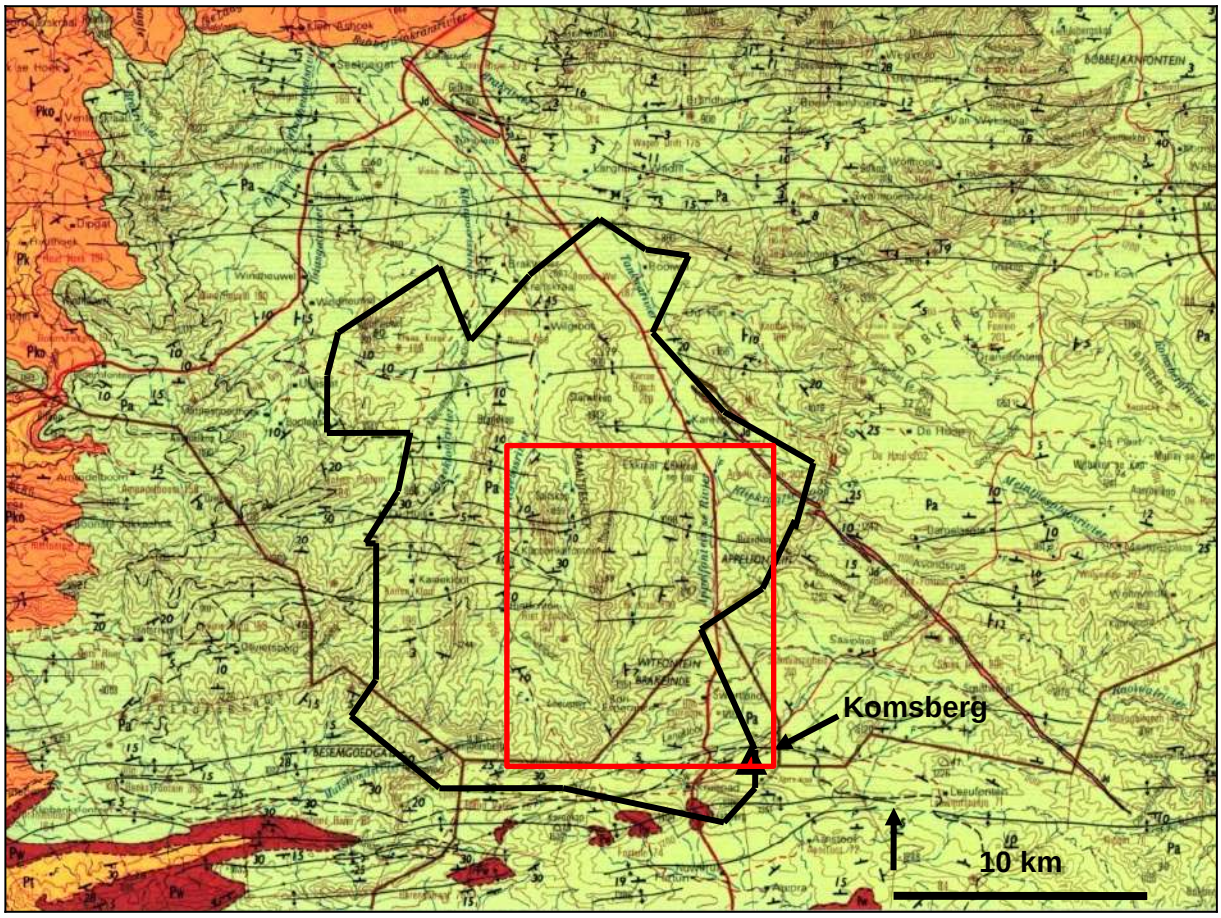
The sedimentology and lithostratigraphy of the Abrahamskraal Formation beds in the Kareebosch WEF project area have been described in some detail in the PIA report for the WEF by Almond (2014; see also Almond 2015f for the Komsberg MTS area). It is inferred that the bedrocks here are restricted to the lower part of the Abrahamskraal Formation, as indicated in the stratigraphic table in Figure 13. This is based on (1) the proximity to outcrops of the underlying deltaic Waterford Formation (uppermost Ecca Group) as well as (2) the presence of dark grey to grey-green mudrock-dominated beds lower in the succession (*e.g.* east of Rietfontein farmstead) with maroon mudrocks only appearing higher in the sequence, and generally at higher elevations, as well as (3) the presence of at least one sandstone-dominated package - possibly the Grootfontein Member of Day & Rubidge (2014) (*e.g.* turbine ridges on Ekkekraal 199, Bon Espirance 73). However, detailed field mapping would be required to confirm or refute this.

The majority of the grid connection project area comprises mountainous terrain with gentle, rocky hillslopes, broad valleys and occasional prominent-weathering, subhorizontal to dipping sandstone *kranzes* (Figs. 2 to 11). Bedrock exposure apart from the thicker channel sandstones is largely limited to stream and erosion gullies as well as the banks and beds of more deeply-incised streams along the valley bottoms. Elsewhere the Beaufort Group beds are obscured by a thin to several meter-thick mantle of rubbly colluvial, eluvial and alluvial deposits (with clasts mainly composed of Beaufort Group wacke, with minor vein quartz) as well as gravelly soils and karroid *bossieveld* vegetation. Near-surface mudrocks are often highly weathered and friable.

Typical features of the Middle Permian continental sediments of the Lower Abrahamskraal Formation within the project are illustrated in Figures 14 to 28 with explanatory figure legends. Episodes of wetter, pluvial and drier, semi-arid palaeoclimates are reflected in the Abrahamskraal sedimentological record. Wetter depositional settings on the ancient floodplain or delta platform are suggested by intervals of dark grey massive to laminated mudrocks with horizons of abundant rusty-brown, large spheroidal to irregular concretions and lenses of diagenetic ferruginous carbonate, ball-and-pillow load structures in crevasse-splay or deltaic sandstones, upward-coarsening sedimentary packages, gradational channel sandstone bases without calcrete-rich basal breccias or gullying, wave-rippled sandstone bed tops with epichnial trace fossils and crinkly microbial mat textures as well as horizons of abundant reedy plant stem casts, sphenophyte (horsetail fern) debris and lungfish burrow casts. More arid palaeoclimatic intervals are indicated by thick packages of maroon mudrocks, palaeosol horizons marked by pale grey, sphaeoidal palaeocalcrete concretions, deep sand-infilled desiccation cracks, abundant gypsum crystal pseudomorphs (“desert roses”) and sharp, gullied channel sandstone bases with well-developed basal channel breccias rich in reworked mudflakes and calcrete glaebules.

It is notable that, with the exception of minor basal channel breccias, the clastic sediments making up the Lower Abrahamskraal bedrocks are predominantly fine-grained, *viz*. claystones, siltstones and fine- to occasionally medium-grained wackes (impure, clay-rich sandstones). This reflects the very low relief of the Mid-Permian Karoo delta platform / distal alluvial floodplain as well as the considerable transport distance from the sediment source area (*i.e.* Cape Fold Belt). The rare occurrence of isolated, large clasts or *lonestones* of exotic rock types (granites / andesites / schists *etc*) within the Beaufort Group bedrocks is therefore of note (*cf* Almond 2010a, 2015e, 2017 and references therein). In some cases, petrified wood has been recorded in association with the lonestones. A single, isolated subrounded cobble of quartzitic schist or gneiss recorded on Rietfontein RE/197 is an interesting example from the present study area (Fig. 47). Plausible explanations as to how such exotic “lonestones” were introduced so far out into the Beaufort Group depository include rocks entangled among the roots of uprooted trees that were transported during major river floods or alternatively downstream ferrying by floating river ice during winter (see discussions in Broom 1912, Jordaan 1990, Loock *et al.,* 1994, p. 190).

A range of Late Caenozoic cover sediments encountered in the project area are shown in Figures 4 and 29 to 32. An interesting sedimentological feature in the present study area is the frequent occurrence of thin to thick (few dm to several meters), rubbly debris flow deposits (debrites) on lower hillslopes where they are exposed by gullying (Figs. 29 & 32). In this region they are typically pale brown and comprise poorly-sorted angular clasts of wacke suspended within a sandy to gritty or fine gravelly matrix which may show polygonal cracking (perhaps a permafrost feature). The age of the debrites is uncertain, but possibly Quaternary.


Komsberg
10 km

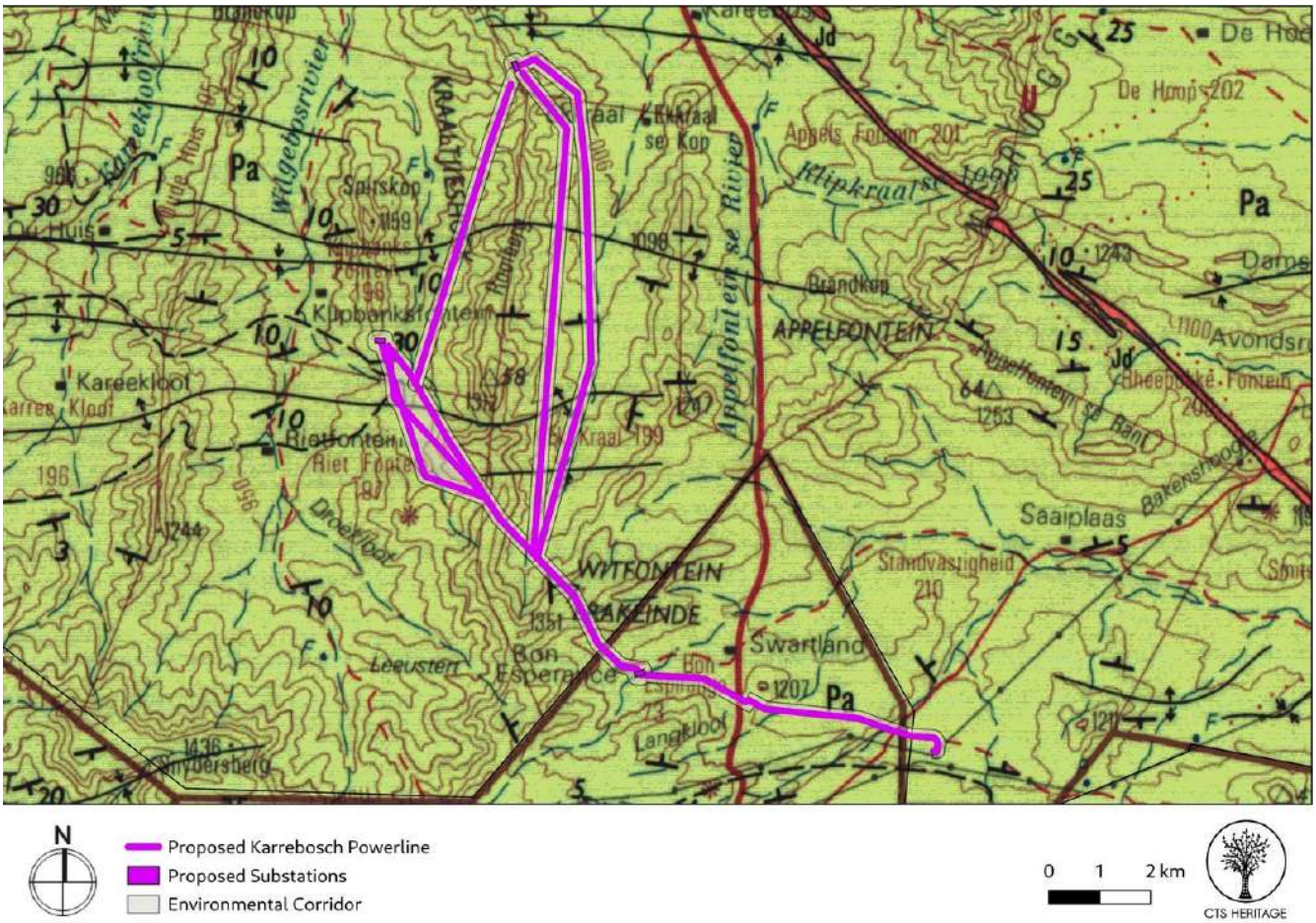


Figure 12. Extract from the 1: 250 000 scale geology sheet 3220 Sutherland (Council for Geoscience, Pretoria, 1999) showing the Karreebosch Wind Farm grid connection project area *c*. 50 km SSW of Sutherland, Northern Cape and Western Cape Provinces (Image prepared by CTS). The project area (here showing all powerline route options under consideration) is entirely underlain by Middle Permian sediments within the lower part of the Abrahamskraal Formation, Lower Beaufort Group / Adelaide Subgroup (Pa, pale green). A narrow NW-SE trending Early Jurassic dolerite dyke of the Karoo Dolerite Suite (Jd, pink) crosses the eastern portion of the WEF area but lies outside the present study area. The black dashed line marks the first appearance of maroon mudrocks within the Abrahamskraal Formation. Note also several W-E trending fold axes as well as a fault line (f-f) mapped within the study area.

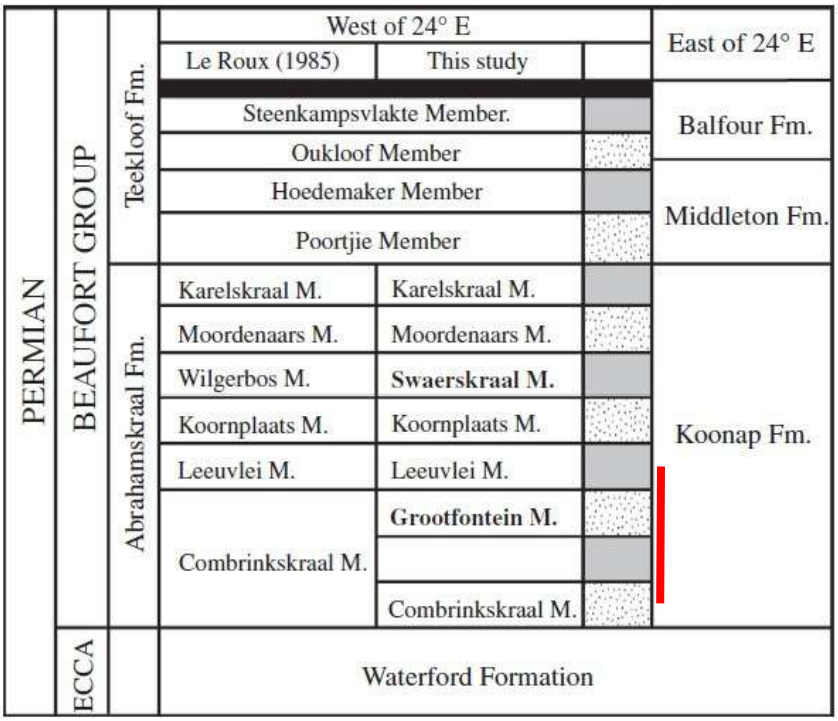


Figure 13: Revised subdivision of the Abrahamskraal Formation by Day and Rubidge (2014). The red bar indicated stratigraphic members that are probably represented within the Kareebosch WEF and grid connection project areas (This requires confirmation through further fieldwork).

Figure 14: Good stream gulley and hillslope exposure of very dark grey siltstones and thin-bedded wackes of the lower Abrahamskraal Formation, Rietfontein 197. They probably belong to the mudrock-dominated interval between the Combrinkskraal and Grootfontein Members (See Figure 13).
John E. Almond (2021) ***Natura Viva* cc**

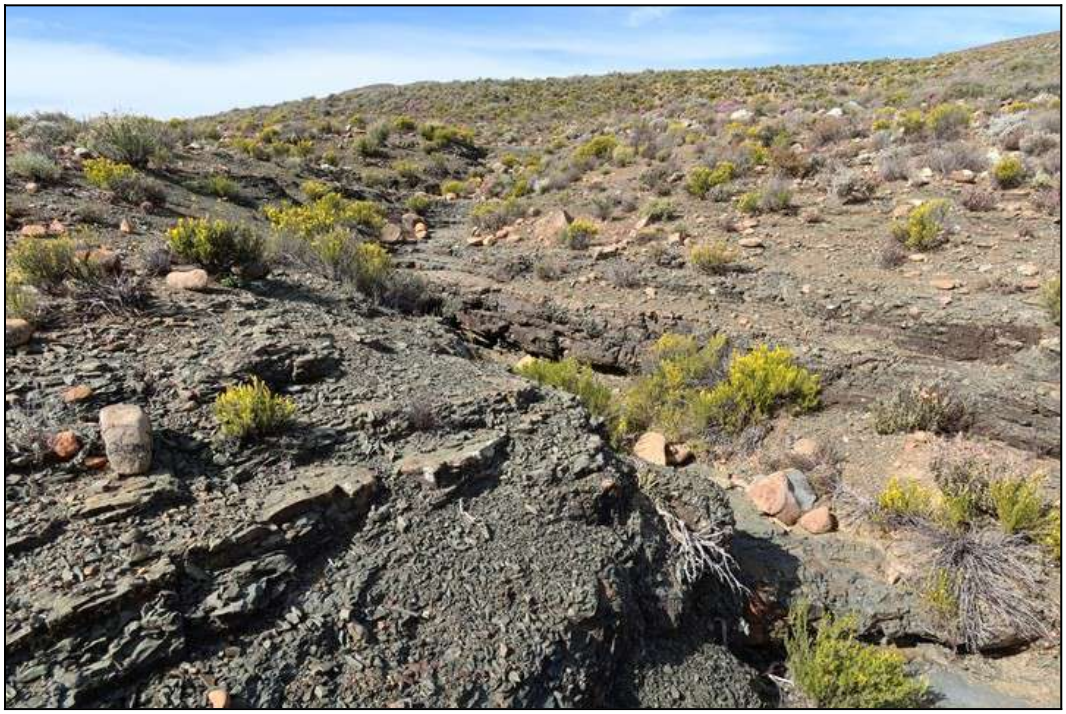


Figure 15: Stream gulley exposure through dark grey mudrocks and thin wackes of the lower Abrahamskraal Formation on Rietfontein 197. These beds contain occasional horizons rich in vascular plant compressions (Figure 46).

Figure 16: Dark overbank lower Abrahamskraal Formation siltstones with load structures overlain by dark grey-green, fine-grained channel wackes with a gradational contact, Rietfontein 197 (Hammer = 30 cm).

Figure 17: Vertically elongate clusters of pale silicified gypsum crystals within massive grey-green mudrocks at the locality illustrated above (Scale in cm). The gypsum pseudomorphs indicate episodes of high evaporation on the otherwise waterlogged floodplain or delta platform.

Figure 18: Horizons of large spheroidal concretions and lenses of diagenetic ferruginous carbonate within the Abrahamskraal overbank mudrocks (Rietfontein 197) suggest protracted waterlogging of the substratum. These larger concretionary bodies are rarely fossiliferous.

Figure 19: Horizons of small, sphaeroidal pedogenic carbonate concretions within Lower Abrahamskraal overbank mudrocks on Rietfontein 197 (Hammer = 30 cm). These brownish-weathering concretions with a greyish, micritic interior mark palaeosols and are a primary focus for vertebrate fossil recording.

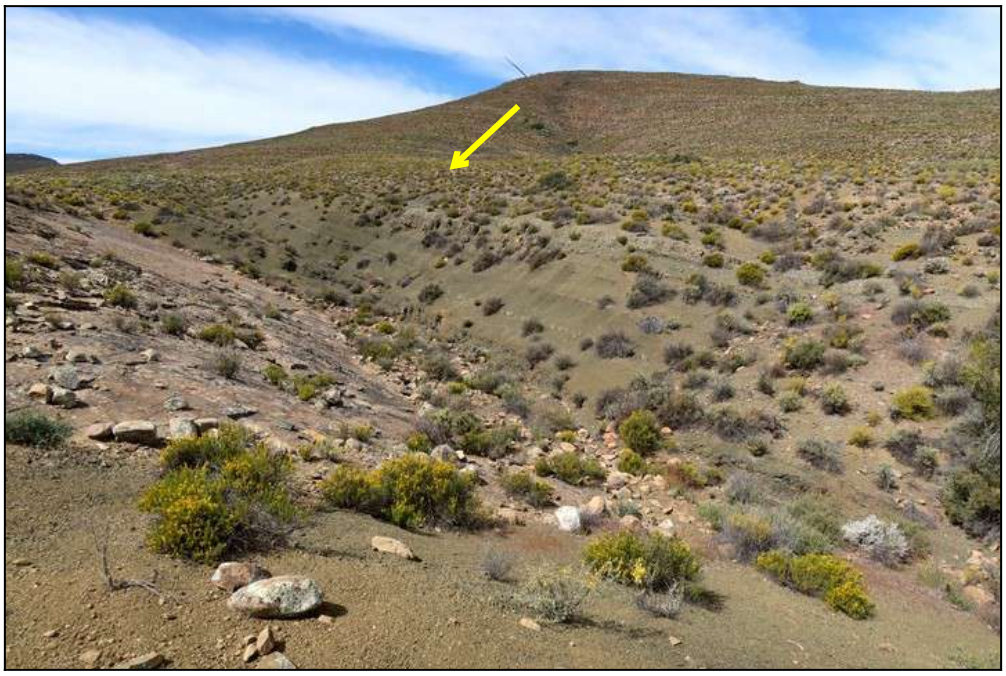


Figure 20: Exceptionally good gully exposure of a thick, grey-green Lower Abrahamskraal Formation mudrock package overlying a well-exposed, wave-rippled sandstone bed top (on LHS), Rietfontein 197. The probable temnospondyl amphibian fossils shown in Figure 37 were recorded in shallow erosion gulley just above the mudrock cliff (arrow).

Figure 21: Detail of the wave-rippled sandstone bed top surface seen in the previous figure, probably situated on the margins of a shallow floodplain pond. The invertebrate traces shown in Figure 43 were recorded from the same locality.

Figure 22: Dark, fine-grained mudrocks of probable lacustrine origin overlying the rippled sandstone surface shown above, here containing horizons of numerous rounded ball-and-pillow structures due to sediment loading within soft, waterlogged bottom sediments (Hammer = 30 cm).

Figure 23: Prominent-weathering, thick tabular channel sandstone body of the Abrahamskraal Formation (possibly the Grootfontein Member package) on Ekkraal 199. The underlying mudrock-dominated succession is rich in maroon mudrocks, as seen in the following two figures.

Figure 24: Series of thin (1-2 m), upward-coarsening cycles of grey-green or purple-brown mudrock capped by brownish-weathering, fine-grained wackes, Ekkraal 199. The thick channel sandstone body at the head of the gulley is shown in the previous figure.

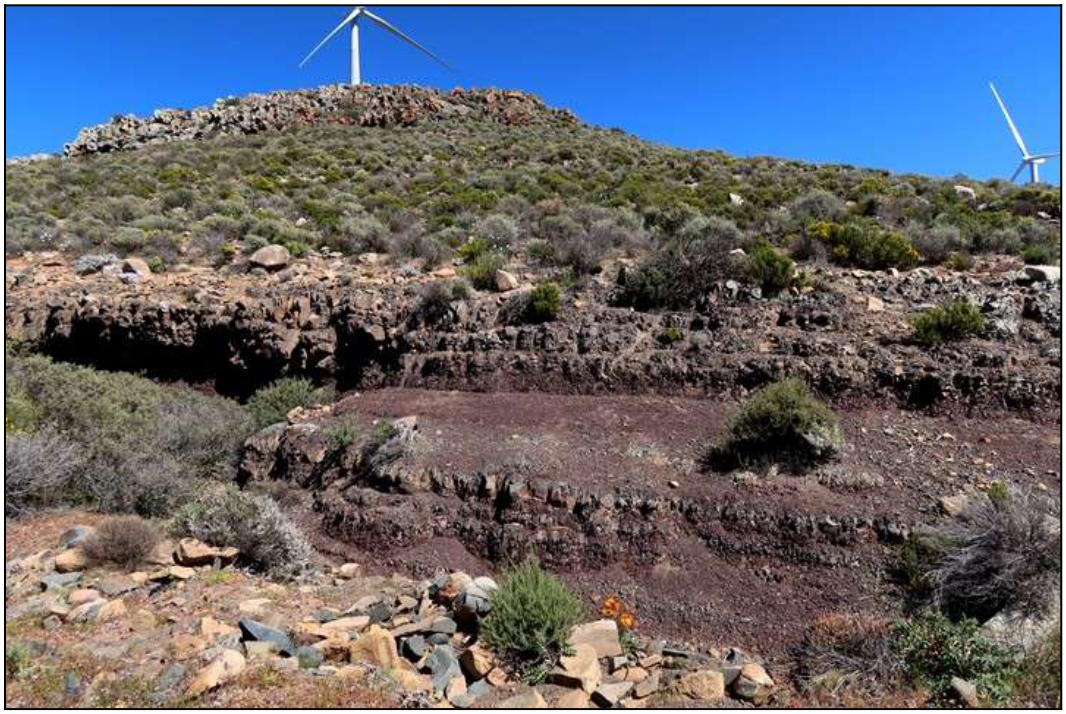


Figure 25: Close-up of upward-coarsening cycles in the same gulley on Ekkraal 199. The maroon mudrocks here may belong to the interval between the Combrinkskraal Member and Grootfontein Member sandstone packages.

Figure 26: Good erosion gulley exposures of Abrahamskraal Formation maroon mudrocks with thin crevasse-splay sandstones on Bon Espirance 73, just NW of the new substation (Hammer = 30 cm). The reddish siltstones and deep, sand-infilled desiccation cracks (arrowed) seen here indicate periods of aridity on the Middle Permian floodplain.

Figure 27: Gulley exposure of Abrahamskraal Formation beds on Bon Espirance 73, less than 1 km west of the the new substation. The pale upper mudrocks show high levels of near-surface weathering which does not favour fossil preservation or recording.

Figure 28: Several stream gullies incising steep hillslopes due west of the new substation on Bon Espirance 73 expose good sections through thin- to medium-bedded sediments of the Abrahamskraal Formation. Mottled mudrocks and wackes here commonly contain casts of reedy plant stems and rarer lungfish burrows, suggesting swampy wetland settings.

Figure 29: Thick rubbly debrite (debris flow deposit) composed of dispersed, "floating" clasts of wacke embedded within a pale brown sandy to fine gravelly matrix, stream bank exposure on Bon Espirance 73 (Hammer -= 30 cm).

Figure 30: Very thick (several meters) wedges of coarse, poorly-sorted colluvial and alluvial deposits have accumulated along valley floors in the project area, seen here on Bon Espirance 73.

Figure 31: Good streambank section through a Late Caenozoic erosional gulley incised up to several meters deep into gently dipping Abrahamskraal Formation bedrocks and infilled with a range of coarse colluvial, alluvial and debrite deposits, Bon Espirance 73.

Figure 32: Gullied hillslopes of crumbly, weathered Abrahamskraal Formation mudrocks near the Komsberg MTS are locally mantled by pale brown, gravelly debris deposits (upper LHS), eastern edge of Bon Espirance 73.

4. PALAEONTOLOGICAL HERITAGE CONTEXT

According to the latest Karoo fossil biozonation maps the lower Abrahamskraal Formation beds in the present study area, located on the south-western margins of the Lower Beaufort Group outcrop area, probably lie within the ***Eodicynodon* Assemblage Zone** of Middle Permian (Wordian) age (*c*. 268-265 Ma) (Lanci *et al.* 2013, Day & Rubidge 2014, Rubidge & Day 2020 and refs. therein) (Fig. 33). However, due to the great scarcity of fossil tetrapod records in the Klein-Roggeveldberge region as a whole, this has yet to be firmly established.

Fossil biotas of the *Eodicynodon* Assemblage Zone have been summarized by Rubidge (1995) and more recently by Smith *et al.* (2012) as well as Rubidge and Day (2020). This Middle Permian biota is characterized by a limited variety of primitive therapsids, most notably the small dicynodont *Eodicynodon* (by far the commonest taxon), very rare large-bodied herbiovorous and carnivorous dinocephalians such as *Tapinocaninus* and anteosaurids, as well as equally rare gorgonopsians and scylacosaurid therocephalians (Fig. 34). The fauna is of considerable palaeobiological significance in that it includes some of the earliest and most primitive examples of several therapsid subgroups recorded anywhere in the world. Associated fossils include disarticulated palaeoniscoid fish and amphibians (rhinesuchid temnospondyls), freshwater bivalves *plus* a small range of invertebrate ichnogenera such as the arthropod trackway *Umfolozia* and various simple horizontal burrows. Vertebrate trace fossils include horizons with subcylindrical sandstone casts of lungfish burrows as well as very occasional tetrapod burrow casts. Records of vascular plants include glossopterid “seed ferns” and the widely occurring sphenophyte ferns *Equisetum* and *Schizoneura* (Anderson & Anderson 1985, Rubidge *et al.* 2000) as well as rare lycopods *cf Cyclodendron* (Almond 2018). Dense assemblages of reedy plant stem casts (commonly mistaken for invertebrate burrows) are common in wetland deposits such as swampy lake and river margins. Petrified wood is apparently - and perhaps surprisingly - absent or very rare in the lower Abrahamskraal Formation, in contrast to the underlying Waterford Formation where well-preserved silicified logs are well-known; it is unclear why this is so. However, large linear drag marks on the tops of channel sandstones that were probably generated by sizeable floating logs have been recorded locally, close to the lower contact with the Waterford Formation (*cf* Almond 2010a).

Vertebrate skeletal fossils – especially identifiable, articulated specimens - tend to be very rare indeed in this biozone (“extremely scarce” according to Rubidge & Day 2020). This is indicated by the fossil chart of Loock *et al.* (1994) as well as the fossil site maps of Keyser & Smith (1977-78) and of Nicolas (2007) (Fig. 35). The fossils are also typically difficult to extract from their resistant rock matrix. They are mainly found within overbank, lake margin mudrocks in association with brownish-weathering pedogenic calcrete nodules or - in the case of the dinocephalians - within or at the base of channel sandstones (Smith *et al.* 2012, Rubidge & Day 2020). Several casts of large (*c*. 15 cm wide), subhorizontal to gently-inclined, straight tetrapod burrows, in one case associated with unidentified, scrappy postcranial and tooth material, are reported by Almond (2016c) from the *Eodicynodon* AZ in the Brandvalley WEF project area situated just southwest of

the present study area. The burrows reported there occur within the sandstone package along the crest of the Klein-Roggeveld Escarpment on Muishond Rivier 161 (possibly the Grootfontein Member of Day & Rubidge 2014). They may represent the oldest known tetrapod burrows reported from the Karoo Supergroup of South Africa (and even perhaps from Gondwana), although this claim remains to be confirmed. Poorly-preserved dinocephalian cranial remains (mainly preserved as moulds) have recently been reported within thick basal channel breccio-conglomerates on the farm Gats Rivier 156 some 30 km west of the present study area (Almond 2020).

These new fossils, in conjunction with spectacularly rich plant-insect Lagerstätte discovered within lacustrine deposits of the underlying Waterford Formation (Middle Permian / Roadian) near Sutherland (Moyo *et al.* 2018, Prevec & Matiwane 2018, Davids *et al.* 2018) as well as well-preserved petrified logs in the same formation, contribute to our understanding of the earliest terrestrial biotas that colonised the Main Karoo Basin in Middle Permian times (*c*. 270 Ma / million years ago).

The diverse Late Caenozoic superficial deposits within the South African interior, including the Great Karoo region, have been comparatively neglected in palaeontological terms. However, sediments associated with ancient drainage systems, springs and pans in particular may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals as well as remains of reptiles like tortoises. Other late Caenozoic fossil biotas that may occur within these superficial deposits include non-marine molluscs (bivalves, gastropods), ostrich egg shells, trace fossils (*e.g.* calcretised termitaria, coprolites, invertebrate burrows, rhizocretions), and plant material such as peats or palynomorphs (pollens) in organic-rich alluvial horizons and diatoms in pan sediments. In Quaternary deposits, fossil remains may be associated with human artefacts such as stone tools and are also of archaeological interest.

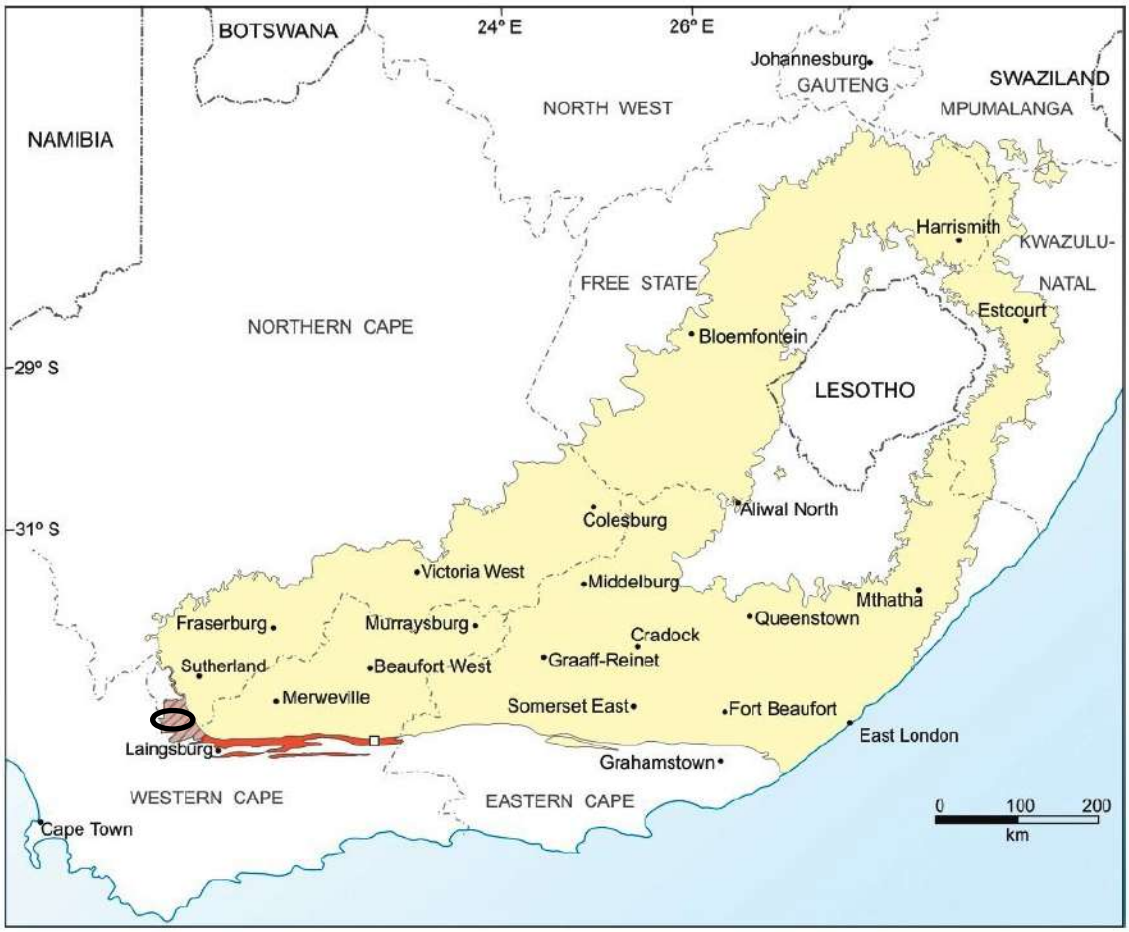


Figure 33: Distribution of the *Eodicynodon* Assemblage Zone (AZ) within the Main Karoo Basin of the RSA (Rubidge & Day 2020). The Kareebosch WEF and grid connection project area (black ellipse) to the NW of Laingsburg falls within the SW corner of the basin (area cross-hatched in red) where fossils of this assemblage zone are suspected to occur but this has not yet been firmly established.

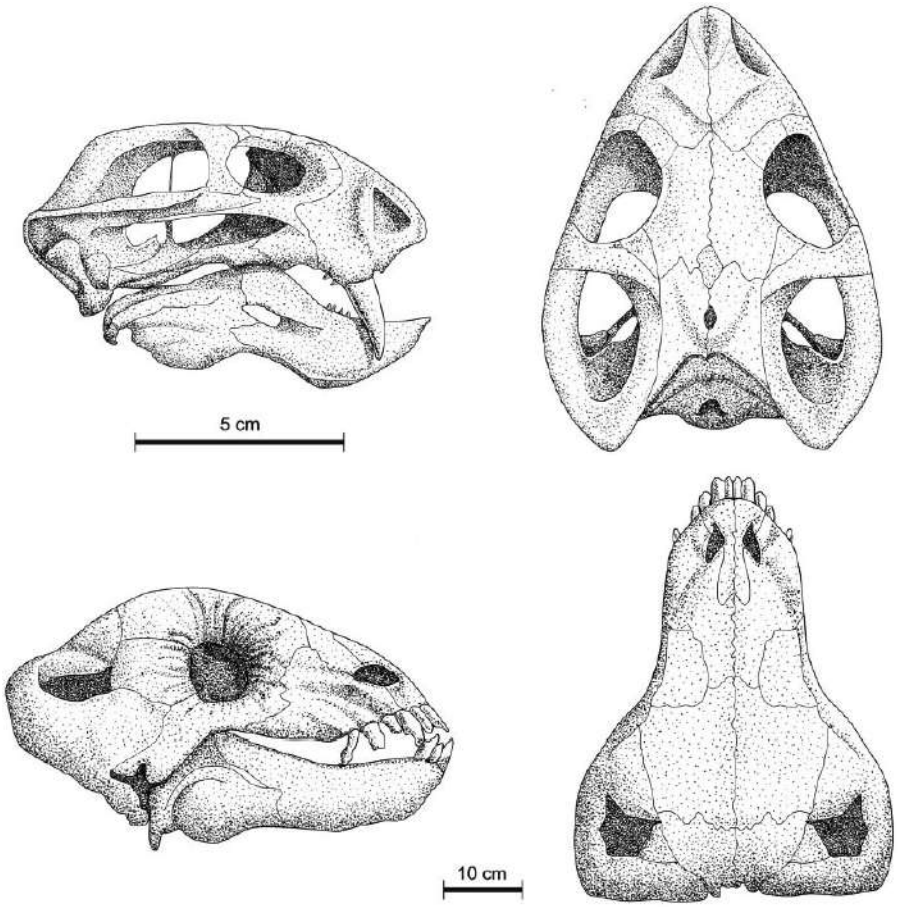


Figure 34: Key tetrapod taxa, both herbivorous therapsids, from the Middle Permian (Wordian) *Eodicynodon* Assemblage Zone of the Main Karoo Basin (from Rubidge & Day 2020). The small-bodied, toothed dicynodont *Eodicynodon* (above) is by far the commonest fossil tetrapod while rhino-sized primitive dinocephalians like *Tapinocaninus* (below) are far rarer. Occasional fossil tetrapod burrow casts in this AZ may be attributable to the former.

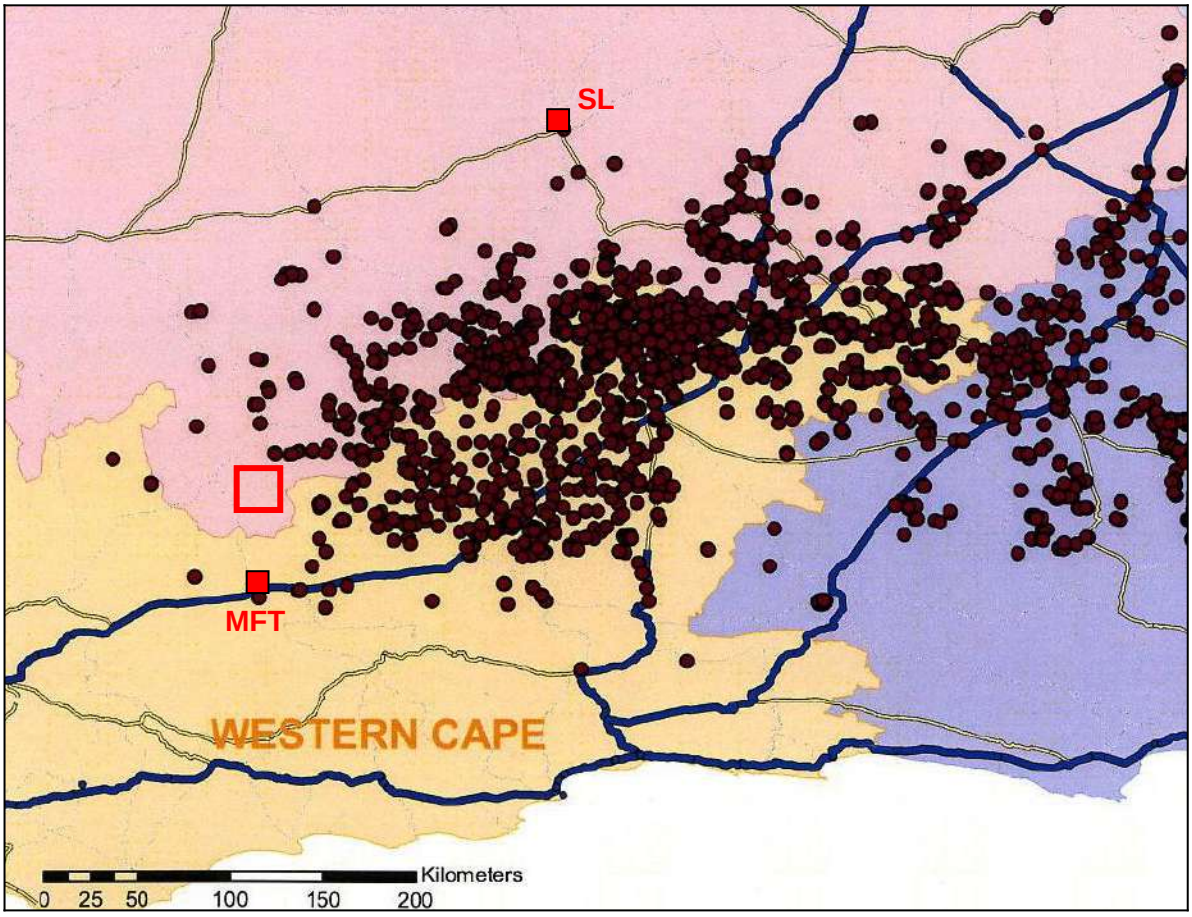


Figure 35: Distribution of recorded vertebrate fossil sites within the south-western portion of the Main Karoo Basin (modified from Nicolas 2007). The approximate location of the Kareebosch WEF and grid connection project area is indicated by the open red square. Note the paucity of known vertebrate fossil sites in this part of the Great Karoo. SL = Sutherland. MFT = Matjiesfontein.

5. RESULTS FROM PALAEONTOLOGICAL SITE VISIT, CONCLUSIONS & RECOMMENDATIONS FOR EMPR

Previous field-based PIA studies in the Kareebosch WEF project area by Miller (2011) and Almond (2014) only yielded sparse records of low diversity invertebrate trace fossil assemblages and scrappy vascular plant remains within the Abrahamskraal Formation bedrocks, with no fossils recorded within the Late Caenozoic superficial sediments. A limited number of new Abrahamskraal Formation fossil sites have been recorded during the recent site visit to the Kareebosch grid connection project area (Figs. 37 to 46). GPS locality details of the new fossil sites (see satellite maps in Appendix 1, Figures A1 & A2) are tabulated in Appendix 1 with a short description and indication of their palaeontological heritage significance (Provisional Field Rating).

Most of the new fossil material from the lower Abrahamskraal Formation comprises low diversity invertebrate trace fossil assemblages (Figs. 41 to 43), sphenophyte (reedy horsetail fern) plant debris (Fig. 46) or stem casts (Figs. 44 & 45) and lungfish burrow casts (Figs. 39 & 40), all of which are associated with swampy wetland habitats on the Middle Permian delta platform or alluvial plain. None of this material is of high scientific or conservation significance while many of the sites lie outside the grid connection project footprint (see satellite map Fig. A1 in Appendix 1), so no mitigation measures are proposed in their regard. No fossil material has been recorded within the Late Caenozoic superficial deposits.

Several small blocks of fossiliferous phosphatic concretion on Rietfontein RE/197 (Locs. 454-456, Figs. 20, 37 & 38) contain probable temnospondyl (amphibian) remains that are of considerable palaeontological interest given their low stratigraphic position within the Abrahamskraal Formation and the rarity of temnospondyl remains in the *Eodicynodon* Assemblage Zone (Prof. Bruce Rubidge, pers. comm., 2021). This material must be collected by a professional palaeontologist before construction of the powerline if Grid Option 1B is selected.

An isolated cobble of extra-basinal metamorphic rock recorded from the Abrahamskraal Fiormation outcrop area on Rietfontein RE/197 (Fig. 47) is potentially of paleobiological significance since such outsized exotic lonestones may have been transported downstream by floods in Middle Permian times, entangled among tree roots. In this case, no fossil wood was recorded in the vicinity of the lonestone site.

Given the very sparse occurrence of recorded fossils of scientific and / or conservation value in the Kareebosch WEF and grid connection project area, and their unpredictable occurrence, it is concluded that the Kareebosch grid connection project area is of LOW palaeosensitivity overall. Impacts on local palaeontological heritage resources due to the construction of the proposed *c*. 20 km long powerline are anticipated to be LOW to VERY LOW and insignificant compared with potential impacts due to construction of the WEF itself. It is noted that surface disturbance associated with any new powerline access roads in mountainous terrain is likely to have greater impact than excavations for electrical pylon footings. The potential for isolated vertebrate fossil finds of high scientific

interest - as occasionally recorded elsewhere in the Klein-Roggeveldberge region - cannot be completely discounted.

There are no objections on palaeontological grounds to authorisation of the proposed 132 kV powerline and there is no preference for any particular on-site substation site or powerline route option among those currently under consideration. If powerline Option 1B is selected for construction, vertebrate fossil material at, or in the vicinity of, Locs. 454-456 on Rietfontein RE/197 must be collected by a professional palaeontologist before construction of the powerline (See Appendix 1, satellite map Fig. A2). No further specialist palaeontological studies or mitigation are recommended for this electrical infrastructure project. These recommendations and the Chance Fossil Finds Protocol appended to this report (Appendix 2) should be included in the EMPr for the development.

5.1. Site Sensitivity Verification

Preliminary palaeosensitivity mapping suggests that the Kareebosch grid connection project area is of potentially of Very High Sensitivity on the basis of the potentially fossiliferous Lower Beaufort Group bedrocks mapped here (*e.g.* SAHRIS / DFFE palaeosensitivity maps, largely based on 1: 250 000 geological mapping; Fig. 36). Previous PIA reports for the Kareebosch WEF / Roggeveld WEF / Komsberg MTS project areas by Miller (2011) and Almond (2014, 2015b) as well as several other PIA reports by the author for renewable energy projects in the Klein-Roggeveldberge region (see References) suggest that scientifically or conservation-worthy fossil remains are, in practice, very scarce and unpredictably distributed here, even where bedrock exposure is locally good. However, a small number of important fossil sites – including exceptionally rare tetrapod skeletal remains, tetrapod burrows, amphibian trackways and swimming trails as well as vascular plant assemblages - have been recorded from the lower Abrahamskraal Formation in the Klein-Roggeveld region as a result of recent PIA field studies, including the recent visit to the Kareebosch WEF grid connection project area. Late Caenozoic superficial deposits (colluvium, alluvium, soils *etc*) that mantle most of the Lower Beaufort Group outcrop area are generally of Low to Very Low sensitivity and so far no fossils have been recorded from these younger deposits in the project area.

Based on combined desktop and field-based palaeontological data an overall LOW palaeosensitivity for the Kareebosch WEF and grid connection project areas is inferred here. However, the potential for isolated vertebrate and other fossil finds of high scientific interest - as occasionally recorded elsewhere in the Klein-Roggeveldberge region - cannot be completely discounted.

As motivated above, the provisional palaeosensitivity mapping for the Kareebosch WEF and associated grid connection corridors, based on the DFFE Screening Tool and SAHRIS website, is *contested* here.

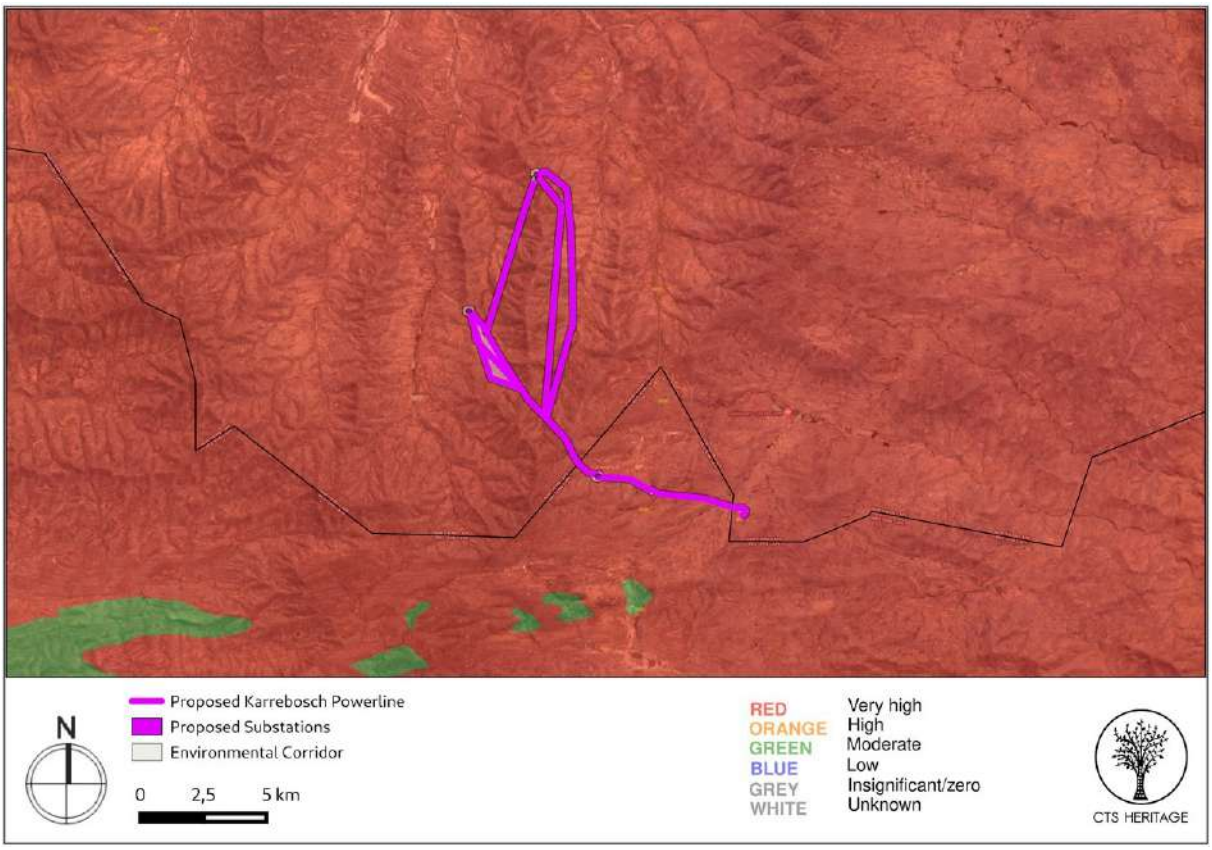


Figure 36: Palaeontological sensitivity map for the Kareebosch WEF grid connection project area (Image prepared by CTS). The provisional Very High Palaeosensitivity inferred on the map is *contested* here; in practice the area is largely of Low Palaeosensitivity, although the potential for rare, isolated occurrences of scientifically important vertebrate and other fossils cannot be discounted.

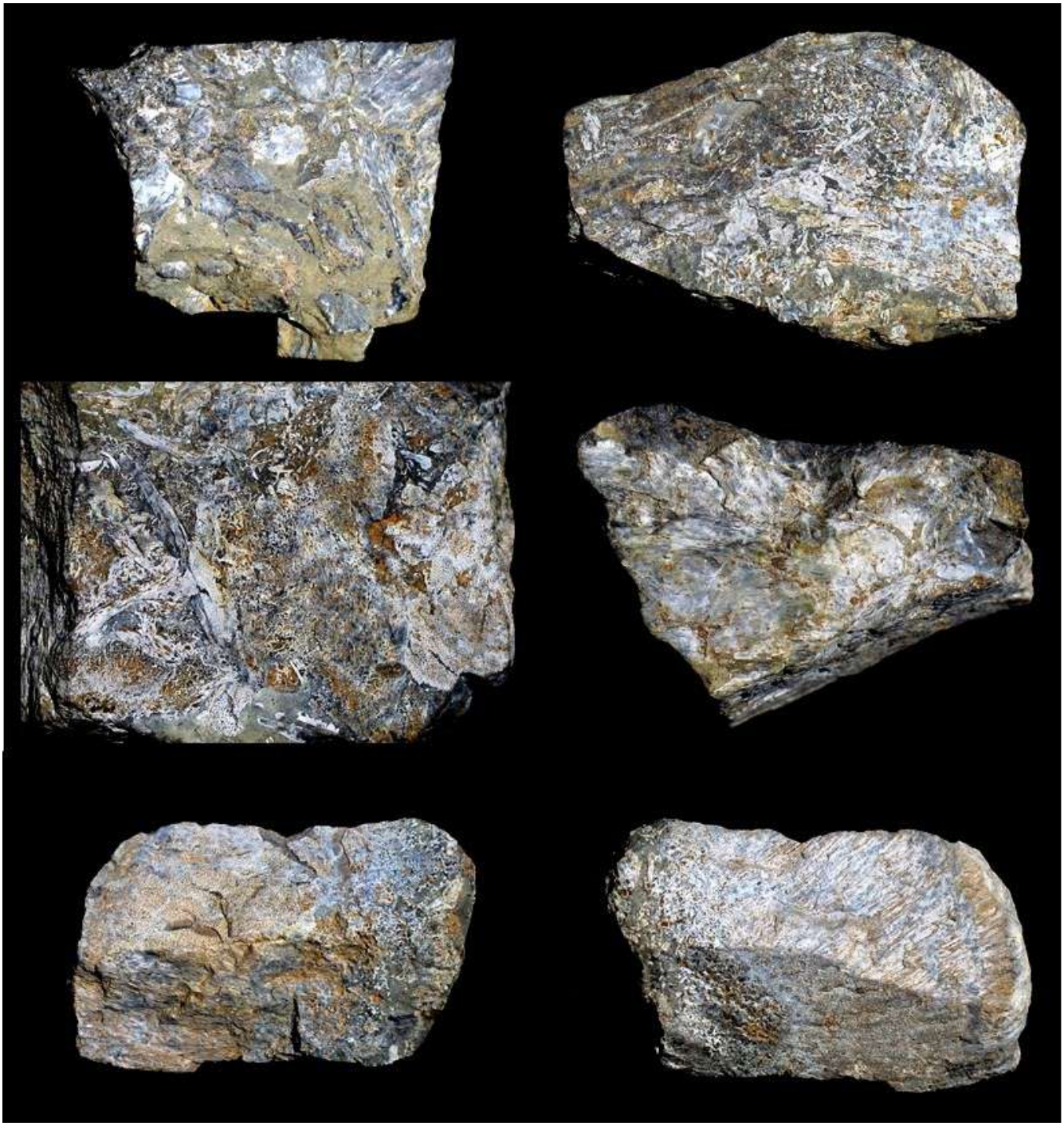


Figure 37: Several small blocky fragments (each *c*. 6 cm in maximum width) of a pale grey phosphatic concretion containing comminuted bone fragments with a dense, cancellous fabric, including possible scutes and teeth. The material probably belongs to a sizeable temnospondyl amphibian and represents one of the very few tetrapod body fossils recorded from the lowermost Abrahamskraal Formation of the Klein-Roggeveldberge region (Rietfontein RE/197, Locs. 454-456). Rare temnospondyl dermal scutes and jaws have been recorded previously from the *Eodicynodon* Assemblage Zone (Rubidge & Day 2020). See Figure 20 for setting of the fossil locality.

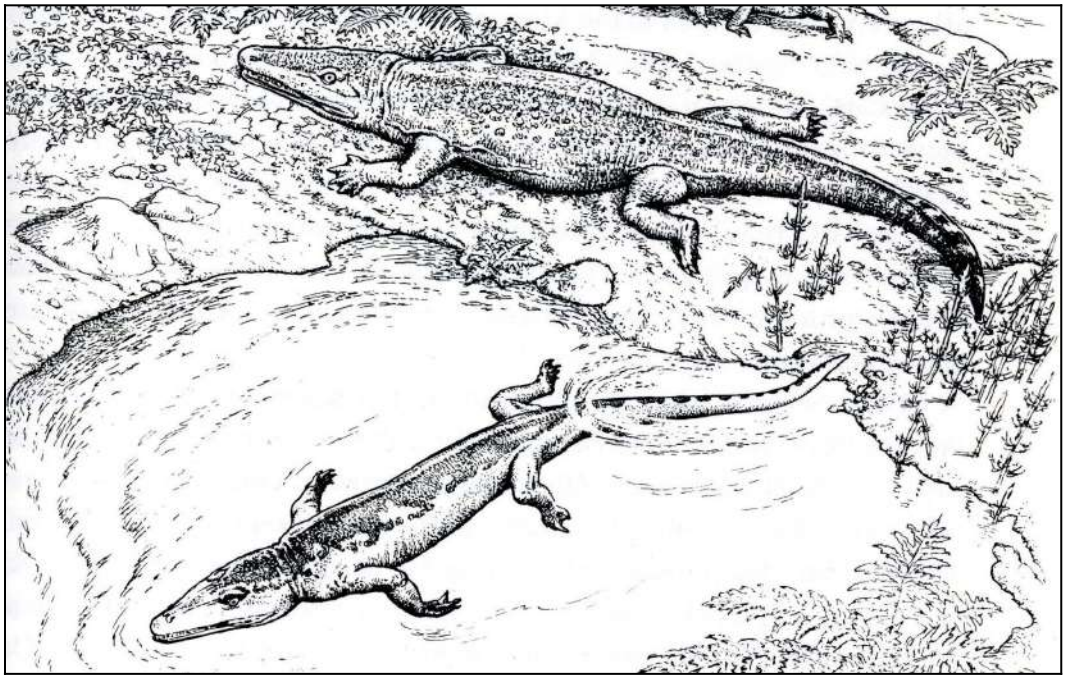


Figure 38: Temnospondyls were an important group of carnivorous, aquatic or amphibious tetrapods in the Permo-Triassic Main Karoo Basin (Modified from Benton 2003 *When life nearly died*). They are related to modern amphibians rather than crocodilian reptiles.

Figure 39: Several sandstone casts of vertical lungfish burrows embedded within crumbly, grey-green mudrocks of probable lacustrine or riverine pond origin (Scale = 15 cm) (Loc. 478, Ekkraal 199).

Figure 40: Two adjacent lungfish burrow casts weathering out to show their subcylindrical geometry (Loc. 478, Ekkraal 199). The largest cast in the assemblage is 9 cm in diameter.

Figure 41: Steeply dipping, current-rippled channel sandstone with sparse epichnial invertebrate burrows (see following figure), Rietfontein RE/197 (Loc. 460) (Hammer = 30 cm).

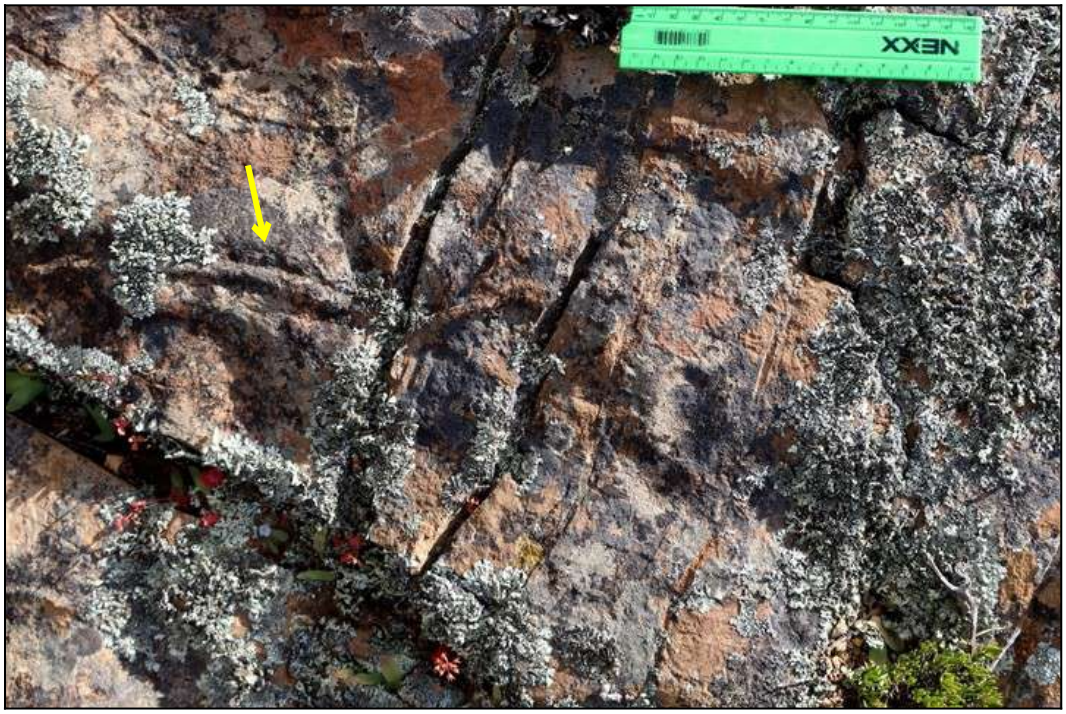


Figure 42: Close-up of one of the epichnial invertebrate burrows (arrowed) shown in the previous figure (Scale in cm).

Figure 43: Rippled sandstone surface with meandering epichnial furrows attributed to burrowing invertebrates in a shallow pond or playa lake setting (Scale in cm and mm), Rietfontein RE/197 (Loc. 453; see Figure 21 for context).

Figure 44: Mottled purple-brown and grey-green siltstone bedding plane containing cm-scale pale rounded sandstone casts, probably of reedy plant stems but possibly invertebrate burrows (scale in cm and mm), Ekkraal 199 (Loc. 484).

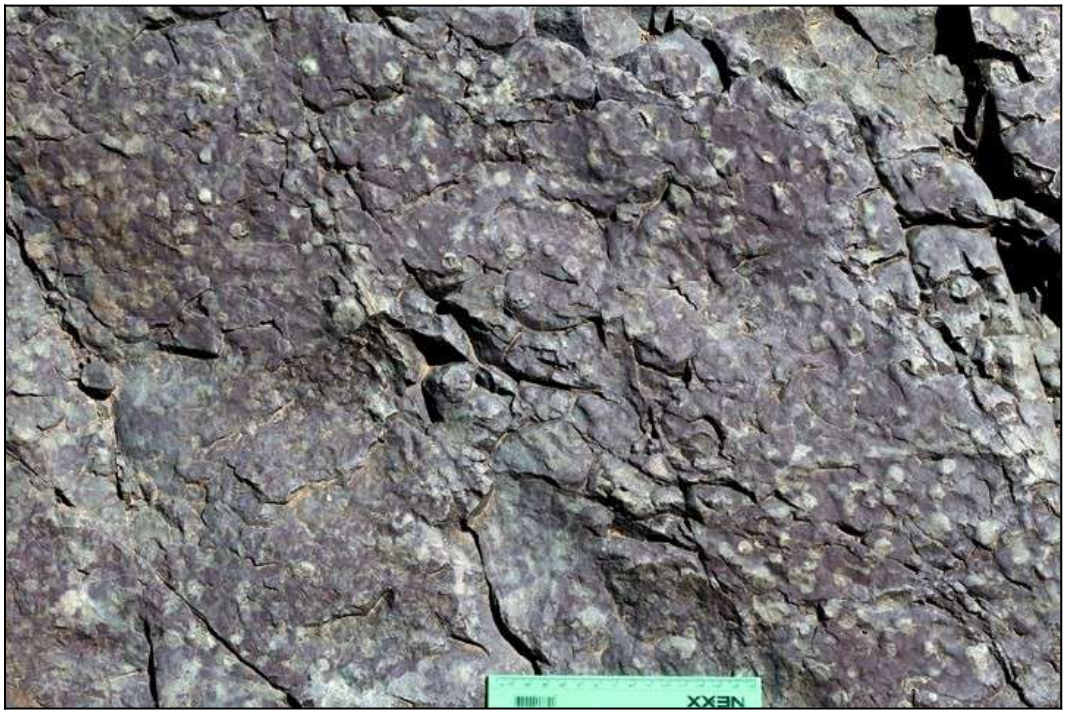


Figure 45: Dense assemblage of probable plant stems casts (*e.g.* equisetaleans) within a grey-green wacke veneered by purple-brown mudrock (Scale = 15 cm), Ekkraal 199 (Loc. 480).

Figure 46: Dense mat of reworked reedy sphenophyte stems (horsetail ferns) preserved as compressions within dark grey siltstones, shallow stream bed exposure on Rietfontein RE/197 (Loc. 463).

Figure 47: Cobble-sized exotic cobble of quartzitic schist or gneiss found in surface float on Rietfontein RE/197 (32 52 31.6 S, 20 29 23.2 E) (scale in cm). Such rare extra-basinal clasts in the Abrahamskraal Formation are potentially of paleobiological significance since they may have been transported downstream from a mountainous source area by floods in Middle Permian times, perhaps entangled among tree roots.

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7. ACKNOWLEDGEMENTS

Ms Jenna Lavin and Mr Nic Wiltshire of CTS Heritage, Cape Town are thanked for commissioning this study as well as for providing the necessary project information and for ably facilitating the field study and subsequent reporting. I am also grateful to Ms Ashlea Strong of WSP in Africa for helpful discussions on grid connection projects in the Karoo. Professor Bruce Rubidge (Wits University, Johannesberg) generously provided helpful input into the palaeontology of the Lower Beaufort Group in the Klein-Roggeveldberge Region. The companionship in the field, substantial palaeontological contributions as well as logistical backup kindly provided by Ms Madelon Tusenius are all highly appreciated, as always.

8. SHORT CV OF AUTHOR

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 and APHP (Association of Professional Heritage Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Dr John E. Almond
Palaeontologist
***Natura Viva* cc**

APPENDIX 1: KAREEBOSCH WEF GRID CONNECTION FOSSIL SITE DATA – SEPTEMBER 2021

All GPS readings were taken in the field using a hand-held Garmin GPSmap 64s instrument. The datum used is WGS 84.

Please note that:

- Locality data for South African fossil sites in *not* for public release, due to conservation concerns.
- The table does *not* represent all potential fossil sites within the project area but only those sites recorded during the field survey. The absence of recorded fossil sites in any area therefore does *not* mean that no fossils are present there.
- The detailed stratigraphic data for each site is provisional and has yet to be confirmed.

Loc.	GPS data	Comments
453	32°52'37.22" S 20°29'19.68" E	Rietfontein RE/197. Extensive exposure of SSE-dipping sandstone bed top with sets of small-scale wave ripples and meandering epichnial invertebrate burrows that were probably generated on the margins of a shallow floodplain pond or playa lake. Sharply overlying grey-green mudrocks show numerous ball-and-pillow load structures. Proposed Field Rating IIIC Local Resource. No mitigation recommended.
454	32°52'37.45" S 20°29'22.32" E	Rietfontein RE/197. Small (c. 6 cm wide), angular block of pale grey phosphatic concretion containing comminuted vertebrate bone and perhaps bony spines or teeth (pearly grey to black). Possibly of bony fish or – more likely - amphibian (*i.e.* temnospondyl) affinity. Block in surface float along shallow drainage line running along top of well-exposed grey-green mudrock package. Proposed Field Rating IIIB Local Resource. This material must be collected by a professional palaeontologist before construction of the powerline if Grid Option 1B is selected.
455	32°52'37.61" S 20°29'21.97" E	As above. Probably part of the same fossiliferous concretion. Proposed Field Rating IIIB Local Resource. This material must be collected by a professional palaeontologist before construction of the powerline if Grid Option 1B is selected.
456	32°52'36.97" S 20°29'23.42" E	As above (2 blocks). Probably part of the same fossiliferous concretion. Proposed Field Rating IIIB Local Resource. This material must be collected by a professional palaeontologist before construction of the powerline if Grid Option 1B is selected.
460	32°52'39.07" S 20°29'29.12" E	Rietfontein RE/197. Hillslope exposure of steeply dipping, SE-facing current-rippled bed top with sparse epichnial invertebrate burrows up to *c*. 2 cm wide, subhorizontal with central convex core (possibly segmented) and shallow marginal grooves. Proposed Field Rating IIIC Local Resource. No mitigation recommended.
463	32°52'31.51" S 20°29'23.81" E	Rietfontein RE/197. Dense mat of reworked reedy sphenophyte stems (horsetail ferns) preserved as compressions within dark grey siltstones, shallow stream bed exposure. Proposed Field Rating IIIC Local Resource. No mitigation recommended.
478	32°54'53.65"	Ekkraal 199. Stream bed and bank exposure of grey-green mudrocks of

	S 20°30'56.37" E	Abrahamskraal Fm with horizon containing several subcylindrical, vertical lungfish burrow casts up to 9 cm in diameter. Proposed Field Rating IIIB Local Resource. No mitigation recommended since site lies outside grid corridor.
480	32°54'52.93" S 20°30'58.94" E	Ekkraal 199. Stream bed exposure of grey-green siltstone or fine-grained wacke covered by purple-brown siltstone veneer and with dense assemblage of rounded traces between 0.5 to 1 cm in diameter – probably reedy plant stem casts (*e.g.* sphenophytes). Proposed Field Rating IIIC Local Resource. No mitigation recommended. Site lies outside grid corridor.
484	32°54'41.76 20°31'10.35" E"S	Ekkraal 199. Stream gulley exposure of mottled grey-green to purple-brown sandstone with assemblage of rounded, oval to irregular sand-infilled casts with reduction haloes, either of plant stems or invertebrate burrows. Proposed Field Rating IIIC Local Resource. No mitigation recommended. Site lies outside grid corridor.
492	32°55'11.03" S 20°31'54.90" E	Bon Espirange 73. Sandstone bed top with possible effaced desiccation crack infills, assemblage of reedy plant stem casts. Proposed Field Rating IIIC Local Resource. No mitigation recommended. Site lies outside grid corridor.

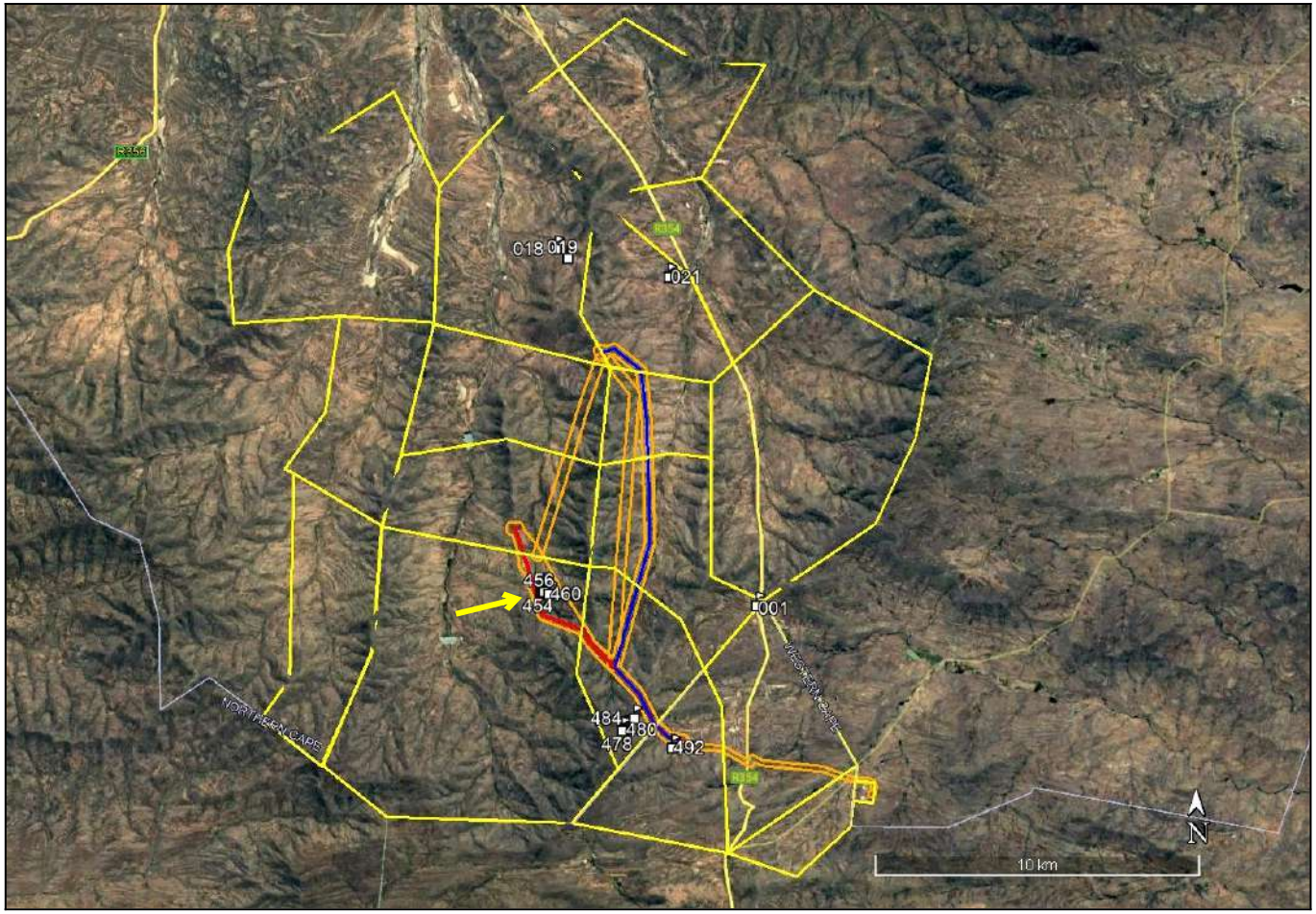

Figure A1: Google Earth© satellite image of the Kareebosch WEF (yellow polygons) and grid connection (orange corridors) project areas (See also Fig.1 for details). The sparse fossil sites recorded during the palaeontological site visit are indicated by the white numbered squares (See table above for details). Several of the fossil sites lie on the margins of, or shortly outside, the powerline corridor options and no mitigation in their regard is recommended here. A small cluster of potentially important vertebrate fossil sites lies close to the powerline option 1B (Locs. 454-456, arrowed; see also Figure A2 below). This material must be collected by a professional palaeontologist before construction of the powerline if Grid Option 1B is selected.

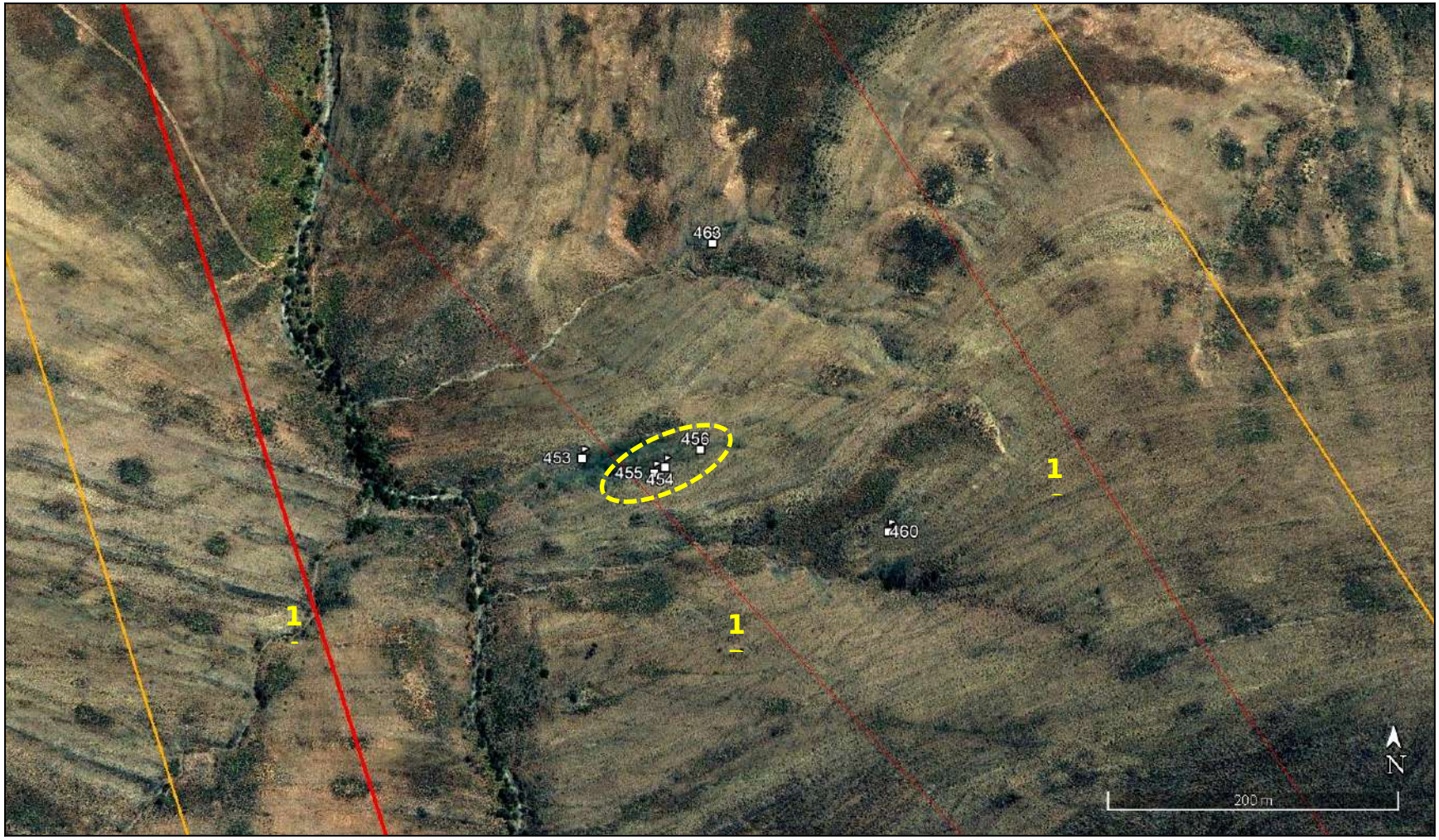

Figure A2: Detail of powerline route options 1A, 1B and 1C on part of Rietfontein RE/197 showing recorded fossil sites. If powerline Option 1B is selected for construction, vertebrate fossil material at or in the vicinity of Locs. 454-456 (yellow dashed ellipse) on Rietfontein RE/197 must be collected by a professional palaeontologist before construction of the powerline.

APPENDIX 2: CHANCE FOSSIL FINDS PROTOCOL: Kareebosch WEF grid connection to the Komsberg MTS between Matjiesfontein and Sutherland

<table>
<tr><td>Province & region:</td><td colspan="2">Western Cape (Laingsburg Local Municipality) and Northern Cape (Karoo Hoogland Local Municipality)</td></tr>
<tr><td>Responsible Heritage Resources Agency</td><td colspan="2">Heritage Western Cape for the 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)
SAHRA for the Northern Cape (Contact details: South African Heritage Resources Agency. 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel : 021 462 4502).</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup), Late Caenozoic alluvium, colluvium, eluvium</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Fossil vertebrate bones, teeth, large burrow casts, trackways, petrified wood, plant-rich beds in the Abrahamskraal Fm bedrocks.
Fossil mammal bones, teeth, horncores, freshwater molluscs, plant material, calcretised termitaria in Late Caenozoic alluvium.</td></tr>
<tr><td rowspan="4">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</td></tr>
</table>

	appointed as soon as possible by the developer.
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency
Specialist palaeontologist	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 Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.

APPENDIX 3: Visual Impact Assessment 2022

VISUAL IMPACT ASSESSMENT FOR THE PROPOSED KARREEBOSCH 132KV POWERLINE AND SUBSTATION

Prepared for: WSP Group Africa (Pty) Ltd

TBA:

SLR Project No.: 720.23017.00006
Report No.: 1
Revision No.: 1
July 2022

DOCUMENT INFORMATION

Title	Visual Impact Assessment for the Proposed Karreebosch 132kV Powerline and substation
Project Manager	Kerry Schwartz
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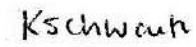
Author	Kerry Schwartz
Reviewer	Liandra Scott-Shaw
Keywords	
Status	Draft
Report No.	1
SLR Company	SLR Consulting (South Africa) (Pty) Ltd

DOCUMENT REVISION RECORD

Rev No.	Issue Date	Description	Issued By
A			

REPORT SIGN OFF AND APPROVALS



Kerry Schwartz
(Project Manager)

Liandra Scott-Shaw
(Reviewer)

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EXECUTIVE SUMMARY

Karreebosch Wind Farm RF (Pty) Ltd, (hereafter referred to as “Karreebosch'') is proposing to construct a 132 kilovolt (kV) overhead powerline (OHPL) and 33/132kV substation near Matjiesfontein in the Western and Northern Cape Provinces (hereafter referred to as the “proposed development”). The overall objective of the proposed development is to feed the electricity generated by the proposed Karreebsoch Wind Energy Facility (WEF) (authorized under DFFE Ref No.: 14/12/16/3/3/2/807/AM3) into the national grid. The grid connection and substation (this application) require a separate Environmental Authorisation (EA), in order to allow the EA to be handed over to Eskom.

The proposed OHPL and substation project will be subject to a Basic Assessment (BA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 1 of the Environmental Impact Assessment (EIA) Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. This visual impact assessment (VIA) is being undertaken as part of the BA process.

The study area has a largely natural, untransformed visual character with some elements of rural / pastoral infrastructure and as such, the proposed powerline and substation development could potentially alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area. The level of contrast is however reduced by the presence of the Roggeveld Wind Energy Facility (WEF), associated grid connection infrastructure, Komsberg substation and existing high voltage powerlines located in the central and southern sectors of the study area.

A broad-scale assessment of landscape sensitivity, based on the physical characteristics of the study area, economic activities and land use that predominates, determined that the area would have a low visual sensitivity. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that would potentially be impacted by a proposed development.

The area is not typically valued for its tourism significance and no formal protected areas were identified within the study area. In addition, there is limited human habitation resulting in relatively few sensitive or potentially sensitive receptors across the entire extent of the study area. The area is however traversed by a recognised scenic route, namely the R354 main road, although visual impacts on travelers using this route will be considerably reduced by distance from the proposed powerline and the hilly terrain that screens views from much of this road.

The Visual Impact Assessment (VIA) identified 12 potentially sensitive receptors in the study area, i.e. within 5kms from the outer boundary of the combined powerline assessment corridor and substation sites. One of these receptors is considered to be a sensitive receptor as they are linked to leisure/nature-based tourism activities in the area. The remaining 11 receptors are all farmsteads that are regarded as potentially sensitive visual receptors as they are located within a mostly natural setting and the proposed development will likely alter natural vistas experienced from these dwellings. Five of these potentially sensitive receptor locations were however found to be outside the

viewshed of the proposed development and thus are not expected to experience any visual impacts as a result of the proposed development. These receptors were therefore removed from the assessment, leaving only 6 potentially sensitive receptors.

The VIA determined that the proposed development will have a low level of impact on the only sensitive receptor (Saaiplaas Guest Farm). Five (5) potentially sensitive receptors will be subjected to moderate levels of visual impact as a result of the proposed powerline development, while one (1) receptor will be subjected to low levels of visual impact. It was noted however, that most of these receptors are located on farms which are within the project areas for approved renewable energy projects. As such the owners / occupants are not expected to perceive the proposed powerline and substation in a negative light.

The overall impact rating revealed that the proposed development is expected to have a negative low visual impact rating during construction, operation and decommissioning phases with a number of mitigation measures available to prevent any additional visual impacts.

Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 30km radius of the proposed development, it was determined that only 2 of these would have any significant impact on the landscape within the visual assessment zone. These facilities are the authorised Karreeboch WEF (14/12/16/3/3/2/807/AM3) and the operational Roggeveld WEF (12/12/20/1988/1). These facilities and the associated grid connection infrastructure will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, pastoral landscape, thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area however, cumulative impacts have been rated as medium.

It is important to note that the study area is located within the Renewable Energy Development Zone (REDZ) 2, namely the Komsberg REDZ , and also within the Central Strategic Transmission Corridor, and thus the relevant authorities support the concentration of renewable energy developments and associated grid connection infrastructure in this area. In addition, it is possible that the renewable energy facilities and associated grid connection elements located in close proximity to each other could be seen as one large facility rather than separate developments. Although this will not necessarily reduce impacts on the visual character of the area, it could potentially reduce the cumulative impacts on the landscape.

A comparative assessment of alternatives was undertaken in order to determine which of the substation sites and powerline corridor alternatives would be preferred from a visual perspective. No fatal flaws were identified for either of the substation site alternatives or any of the proposed powerline corridor alternatives and all alternatives were found to be favourable.

From a visual perspective therefore, the proposed Karreebosch 132kV powerline and associated substation project is deemed acceptable and the Environmental Authorization (EA) should be granted. SLR Consulting (South Africa) (Pty) Ltd (SLR) is of the opinion that the visual impacts associated with

the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of 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 1.2** Specialist CV's are included in **Appendix A**
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** Error! Reference source not found.
(cA) an indication of the quality and age of base data used for the specialist report;	**Section 1.3**
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**Section 6, 7 & 9**
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Section 1.3**
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	**Section 1.3**
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 site alternatives;	**Section 6.3**
g) an identification of any areas to be avoided, including buffers;	**Section 6.3**
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 6.3**
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, (including identified alternatives on the environment) or activities;	**Section** Error! Reference source not found.
k) any mitigation measures for inclusion in the EMPr;	**Section 9**
l) any conditions for inclusion in the environmental authorisation;	No specific conditions relating to the visual environment need to be

	included in the environmental authorisation (EA)
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**Section 9**
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	**Section 11.1**
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	**N/A** - No feedback has yet been received from the public participation process regarding the visual environment
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	**N/A** - No feedback has yet been received from the public participation process regarding the visual environment
q) any other information requested by the competent authority.	N/A - No information regarding the visual study has been requested from the competent authority to date.
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	**N/A**

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

Glossary of Terms

Definitions

Anthropogenic feature: An unnatural feature resulting from human activity.

Cultural landscape: A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (World Heritage Committee, 1992).

Sense of place: The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

Scenic route: A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

Sensitive visual receptors: An individual, group or community that is subject to the visual influence of the proposed development and is adversely impacted by it. They will typically include locations of human habitation and tourism activities.

Slope Aspect: Direction in which a hill or mountain slope faces.

Study area / Visual assessment zone; The study area or visual assessment zone is assumed to encompass a zone of 5km from the outer boundary of the proposed Solar PV Facility application site.

Viewpoint: A point in the landscape from where a particular project or feature can be viewed.

Viewshed / Visual Envelope: The geographical area which is visible from a particular location.

Visual character: The pattern of physical elements, landforms and land use characteristics that occur consistently in the landscape to form a distinctive visual quality or character.

Visual contrast: The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.

Visual exposure: The relative visibility of a project or feature in the landscape.

Visual impact: The effect of an aspect of the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.

Visual receptors: An individual, group or community that is subject to the visual influence of the proposed development but is not necessarily adversely impacted by it. They will typically include commercial activities, residents and motorists travelling along routes that are not regarded as scenic.

Visual sensitivity: The inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (visual character), spatial distribution of potential receptors, and the likely value judgements of these receptors towards the new development, which are usually based on the perceived aesthetic appeal of the area.

ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BA	Basic Assessment
DBAR	Draft Basic Assessment Report
DEDECT	Department of Economic Development, Environment, Conservation and Tourism
DEFF	Department of Environment, Forestry and Fisheries
DM	District Municipality
DoE	Department of Mineral Resources and Energy
DTM	Digital Terrain Model
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EMP	Environmental Management Plan
FBAR	Final Basic Assessment Report
GIS	Geographic Information System
HA	Hectares
I&AP	Interested and/or Affected Party
IPP	Independent Power Producer
LM	Local Municipality
kV	Kilovolt
MW	Megawatt
NEMA	National Environmental Management Act
NGI	National Geo-Spatial Information
O&M	Operation and Maintenance
PPA	Power Purchase Agreement
PV	Photovoltaic
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SANBI	South African National Biodiversity Institute
SPEF	Solar Photovoltaic Energy Facility
VIA	Visual Impact Assessment
VR	Visual Receptor
WEF	Wind Energy Facility

Visual Impact Assessment for the Proposed Karreebosch 132kV Powerline

1. INTRODUCTION

Karreebosch Wind Farm RF (Pty) Ltd, (hereafter referred to as "Karreebosch'') is proposing to construct a 132 kilovolt (kV) OHPL and substations near Matjiesfontein in the Western and Northern Cape Provinces (hereafter referred to as the "proposed development"). The overall objective of the proposed development is to feed the electricity generated by the authorised Karreebosch Wind Energy Facility (WEF) (authorized under DFFE Ref No.: 14/12/16/3/3/2/807/AM3) into the national grid. The grid connection and substations (this application) require a separate Environmental Authorisation (EA) to allow the EA to be handed over to Eskom for operation and maintenance purposes.

The entire extent of the proposed 132kV OHPL is located within one of the Strategic Transmission Corridors as defined and in terms of the procedures laid out in Government Notice (GN) No. 113[1], namely the Central Corridor. The proposed overhead powerline and substation project will be subject to a Basic Assessment (BA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 1 of the Environmental Impact Assessment (EIA) Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this BA is the national Department of Forestry, Fisheries and the Environment (DFFE). Specialist studies have been commissioned to assess and verify the proposed OHPL and substations under the new Gazetted specialist protocols[2].

1.1 SCOPE AND OBJECTIVES

This visual impact assessment (VIA) is being undertaken as part of the BA process. The aim of the VIA is to identify potential visual issues associated with the proposed 132kV powerline and substations, as well as to determine the potential extent of visual impacts. This is done by characterising the visual environment of the area and identifying areas of potential visual sensitivity that may be subject to visual impacts. This visual assessment focuses on the potential sensitive visual receptor locations and provides an assessment of the magnitude and significance of the visual impacts associated with the proposed development.

1.2 SPECIALIST CREDENTIALS

This VIA was undertaken by Kerry Schwartz, a GIS specialist with more than 20 years' experience in the application of GIS technology in various environmental, regional planning and infrastructural projects. Kerry's GIS skills have been extensively utilised in projects throughout South Africa and in other Southern African countries. In recent years, Kerry has become increasingly involved in the compilation of VIA reports. Kerry's relevant VIA project experience is listed in the table below.

Table 1: Specialist Credentials and Project Experience

Environmental Practitioner	SLR Consulting (South Africa) (Pty) Ltd – Kerry Schwartz

[1] Formally gazetted on 16 February 2018 (GN No. 113)
[2] Formally gazetted on 20 March 2020 (GN No. 320)

Contact Details	**klschwartz@slrconsulting.com**
Qualifications	BA (Geography), University of Leeds 1982
Expertise to carry out the Visual Impact Assessment.	**Visual Impact Assessments:** • VIA (BA) for the proposed construction of the Oya 132kV powerline near Matjiesfontein, Northern and Western Cape Provinces; • VIA (BA) for the proposed construction of 132kV powerlines to serve the authorised Loeriesfontein 3 PV Solar Energy Facility near Loeriesfontein, Northern Cape Province; • VIAs (BA) for the proposed Gromis WEF and associated Grid Connection Infrastructure, near Komaggas, Northern Cape Province. • VIAs (BA) for the proposed Komas WEF and associated Grid Connection Infrastructure, near Komaggas, Northern Cape Province. • VIAs (Scoping and Impact Phase) for the proposed Mooi Plaats, Wonderheuvel and Paarde Valley solar PV plants near Noupoort in the Northern and Eastern Cape Provinces. • VIAs (Scoping and Impact Phase) for the proposed Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province. • VIAs (Scoping and Impact Phase) for the proposed Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province. • VIA for the proposed Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province. • VIAs (Scoping and Impact Phase) for the proposed Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province. • VIA (EIA) for the proposed Paulputs WEF near Pofadder in the Northern Cape Province. • VIA (EIA) for the proposed development of the Rondekop WEF near Sutherland in the Northern Cape Province. • VIA (BA) for the proposed development of the Tooverberg WEF near Touws Rivier in the Western Cape Province. • VIA (BA) for the proposed development of the Kudusberg WEF near Sutherland, Northern and Western Cape Provinces. • VIA (Scoping and Impact Phase) for the proposed development of the Kuruman Wind Energy Facility near Kuruman, Northern Cape Province. • VIA (Scoping and Impact Phase) for the proposed development of the Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province. • VIA (Scoping and Impact Phase) for the proposed development of the San Kraal Wind Energy Facility near Noupoort, Northern Cape Province. • VIAs (Scoping and Impact Phase) for the proposed Graskoppies Wind Farm near Loeriesfontein, Northern Cape Province. • VIAs (Scoping and Impact Phase) for the proposed Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province. • VIAs (Scoping and Impact Phase) for the proposed Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.

	• VIAs (Scoping and Impact Phase) for the proposed Xha! Boom Wind Farm near Loeriesfontein, Northern Cape Province • Visual Impact Assessments for 5 Solar Power Plants in the Northern Cape • Visual Impact Assessments for 2 Wind Farms in the Northern Cape • Visual Impact Assessment for Mookodi Integration Project (132kV distribution lines) • Landscape Character Assessment for Mogale City Environmental Management Framework

A full CV is attached as **Appendix A** and a signed specialist declaration of independence is included in **Appendix B** of this specialist assessment**.**

1.3 ASSESSMENT METHODOLOGY

This VIA has been based on a desktop-level assessment supported by field-based observation drawn from a site visit undertaken between 30th August and 1st September 2021.

1.3.1 Physical landscape characteristics

Physical landscape characteristics such as topography, vegetation and land use are important factors influencing the visual character and visual sensitivity of the study area. Baseline information about the physical characteristics of the study area was initially sourced from spatial databases provided by NGI, the South African National Biodiversity Institute (SANBI) and the South African National Land Cover Dataset (Geoterraimage – 2020). The characteristics identified via desktop analysis were later verified during the site visit.

1.3.2 Identification of sensitive receptors

Visual receptor locations and routes that are sensitive and/or potentially sensitive to the visual intrusion of the proposed development were assessed in order to determine the impact of the proposed development on each of the identified receptor locations.

1.3.3 Fieldwork and photographic review

A three (3) day site visit was undertaken between the 30th August and 1st of September 2021 (late winter). The aim of the site visit was to:

- verify the landscape characteristics identified via desktop means;
- conduct a photographic survey of the study area;
- verify, where possible, the sensitivity of visual receptor locations identified via desktop means;
- eliminate receptor locations that are unlikely to be influenced by the proposed development;
- identify any additional visually sensitive receptor locations within the study area; and
- inform the impact rating assessment of visually sensitive receptor locations (where possible).

1.3.4 Visual Sensitivity

Areas of potential visual sensitivity along the powerline assessment corridors were demarcated, these being areas where the establishment of a powerline or other associated infrastructure would result in the greatest probability of visual impacts on potentially sensitive visual receptors. GIS-based visibility analysis was used to determine which route alternatives would be visible to the highest numbers of receptors in the study area.

In addition, the National Environmental Screening Tool[3] was examined to determine any relative landscape sensitivity in respect of the proposed development.

1.3.5 Impact Assessment

A rating matrix was used to provide an objective evaluation of the significance of the visual impacts associated with the proposed development, both before and after implementing mitigation measures. Mitigation measures were identified (where possible) to minimise the visual impact of the proposed development. The rating matrix made use of several different factors including geographical extent, probability, reversibility, irreplaceable loss of resources, duration and intensity, in order to assign a level of significance to the visual impact of the project.

A separate rating matrix was used to assess the visual impact of the proposed development on each visual receptor location (both sensitive and potentially sensitive), as identified. This matrix is based on three (3) parameters, namely the distance of an identified visual receptor from the proposed development, the presence of screening factors and the degree to which the proposed development would contrast with the surrounding environment.

1.3.6 Consultation with I&APs

Continuous consultation with Interested and Affected Parties (I&APs) undertaken during the public participation process will be used (where available) to help establish how the proposed development will be perceived by the various receptor locations and the degree to which the impact will be regarded as negative. Although I&APs have not yet provided any feedback in this regard, the report will be updated to include relevant information as and when it becomes available. If no relevant comments are received requiring the report to be updated, the report will automatically inform the final BA report.

1.4 SOURCES OF INFORMATION

The main sources of information utilized for this VIA included:

- Project description for the proposed powerline and substation development provided by Karreebosch;
- Elevation data from 25m Digital Elevation model (DEM) from the National Geo-Spatial Information (NGI);
- 1:50 000 topographical maps of South Africa from the NGI;

[3] https://screening.environment.gov.za/screeningtool/

- Land cover and land use data extracted from the 2020 South African National Land-Cover Dataset provided by GEOTERRAIMAGE;
- Vegetation classification data extracted from the South African National Biodiversity Institute's (SANBI's) VEGMAP 2018 dataset;
- Google Earth Satellite imagery 2021;
- South African Renewable Energy EIA Application Database from Department of Environmental Affairs (incremental release Quarter 2 2021);
- The National Web-Based Environmental Screening Tool, DFFE;
- VIA for the proposed Karreebosch WEF, MetroGIS 2015; and
- VIA for the proposed Kudusberg WEF, SiVEST 2019;

2. ASSUMPTIONS AND LIMITATIONS

- Substations and powerlines are very large structures by nature and could impact on receptors that are located relatively far away, particularly in areas of very flat terrain. Given the nature of the receiving environment and the height of the various components of the proposed development, the study area or visual assessment zone is assumed to encompass a zone of 5 km from the outer boundary of the combined powerline assessment corridors and substation sites. This 5 km limit on the visual assessment zone relates to the importance of distance when assessing visual impacts. Although the proposed development may still be visible beyond 5 km, the degree of visual impact would diminish considerably and as such the need to assess the impact on potential receptor locations beyond this distance would not be warranted.

- The identification of visual receptors involved a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potential receptors within the study area. Where possible, these receptor locations were verified and assessed during a site visit which was undertaken between the 30th August and the 1st of September 2021.

- Due to the extent of the respective study area and the nature of the terrain, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, several broad assumptions have been made in terms of the likely sensitivity of the receptors to the proposed development. It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility, the economic dependency of the occupants on the scenic quality of views from the facility and on people's perceptions of the value of "Green Energy". Sensitive receptor locations typically include sites such as tourism facilities and scenic locations within natural settings which are likely to be adversely affected by the visual intrusion of the proposed development. Thus, the presence of a receptor in an area potentially affected by the proposed development does not necessarily mean that any visual impact will be experienced.

- The potential visual impact at each visual receptor location was assessed using a matrix developed for this purpose. The matrix is based on three main parameters relating to visual impact and,

although relatively simplistic, it provides a reasonably accurate indicative assessment of the degree of visual impact likely to be experienced at each receptor location as a result of the proposed development. It is however important to note the limitations of quantitatively assessing a largely subjective or qualitative type of impact and as such the matrix should be seen merely as a representation of the likely visual impact at a receptor location.

- As stated above, the exact status of all the receptors could not be verified during the field investigation and as such the receptor impact rating was largely undertaken via desktop means.

- Receptors that were assumed to be farmsteads were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were thus assessed as part of the VIA.

- Based on the project description provided by Karreebosch, all analysis undertaken for this VIA is based on a worst-case scenario where the maximum height of the powerline tower structures is assumed to be 40m. Substation facilities are assumed to be less than 25m in height.

- Due to the varying scales and sources of information; maps may have minor inaccuracies. Terrain data for the study area derived from the National Geo-Spatial Information (NGI)'s 25m DEM is fairly coarse and somewhat inconsistent and as such, localised topographic variations in the landscape may not be reflected on the Digital Elevation Model (DEM) used to generate the viewsheds and visibility analyses conducted in respect of the proposed development.

- In addition, the viewshed / visibility analysis does not take into account any existing vegetation cover or built infrastructure which may screen views of the proposed development. This analysis should therefore be seen as a conceptual representation or a worst-case scenario.

- No feedback regarding the visual environment has been received from the public participation process to date. Any feedback from the public during the review period of the Draft Basic Assessment Report (DBAR) will however be incorporated into further drafts of this report, if relevant.

- At the time of undertaking the visual study no information was available regarding the type and intensity of lighting required for the proposed development and therefore the potential impact of lighting at night has not been assessed at a detailed level. It is however assumed that operational and security lighting will be required for the proposed substations and general measures to mitigate the impact of additional light sources on the ambient nightscape have been provided accordingly.

- This study includes an assessment of the potential cumulative impacts of other renewable energy developments on the existing landscape character and on the identified sensitive receptors. This assessment is based on the information available at the time of writing the report and where information has not been available, broad assumptions have been made as to the likely impacts of these developments.

- Information for the surrounding planned renewable energy developments, provided by the Environmental Assessment Practitioner (EAP), was factored into the cumulative impact assessment (**Section** Error! Reference source not found.).

- No visualisation modelling was undertaken for the proposed development as this is not normally required for linear infrastructure. This can however be provided should the Public Participation Process identify the need for this exercise.

- It should be noted that the site visits were undertaken during late winter (30th August to 1st September 2021). The study area is however typically characterised by low levels of rainfall all year round and therefore the season is not expected to affect the significance of the visual impact of the proposed development.

- Clear weather conditions tend to prevail throughout most of the year in this area, and in these clear conditions, powerlines and associated infrastructure would present a greater contrast with the surrounding landscape than they would on a cloudy overcast day. Both clear and cloudy weather conditions were experienced during the field investigation and these factors were taken into consideration when undertaking this VIA.

3. TECHNICAL DESCRIPTION

3.1 PROJECT LOCATION

The proposed OHPL and substation project area is located approximately 34 km north of Matjiesfontein, originating in the Karoo Hoogland Local Municipality in the Northern Cape, extending into the Laingsburg Local Municipality in the Western Cape Province before linking in to the Komsberg substation. (**Figure 1**).

The proposed overhead powerline corridors and substations will affect the following properties:

- Portion 2 (Nuwe Kraal) of Farm Ek Kraal No. 199
- Remainder of Farm Wilgebosch Rivier No. 188
- Remainder of Farm Klipbanks Fontein No. 198
- Portion 1 of Farm Klipbanks Fontein No. 198
- Remainder of Farm Karreebosch No. 200
- Portion 1 of Farm Ek Kraal No. 199
- Remainder of Farm Ek Kraal No.199
- Remainder of Farm Bon Espirange No. 73
- Farm Rietfontein No. 197
- Portion 1 of Farm Bon Espirange No. 73
- Farm Aprils Kraal No. 105
- Portion 2 of Farm Standvastigheid No. 210
- Remainder of Farm Standvastigheid No. 210

As previously stated, the entire extent of the proposed 132kV OHPL is located within a Strategic Transmission Corridor as defined and in terms of the procedures laid out in Government Notice (GN) No. 113, namely the Central Corridor.

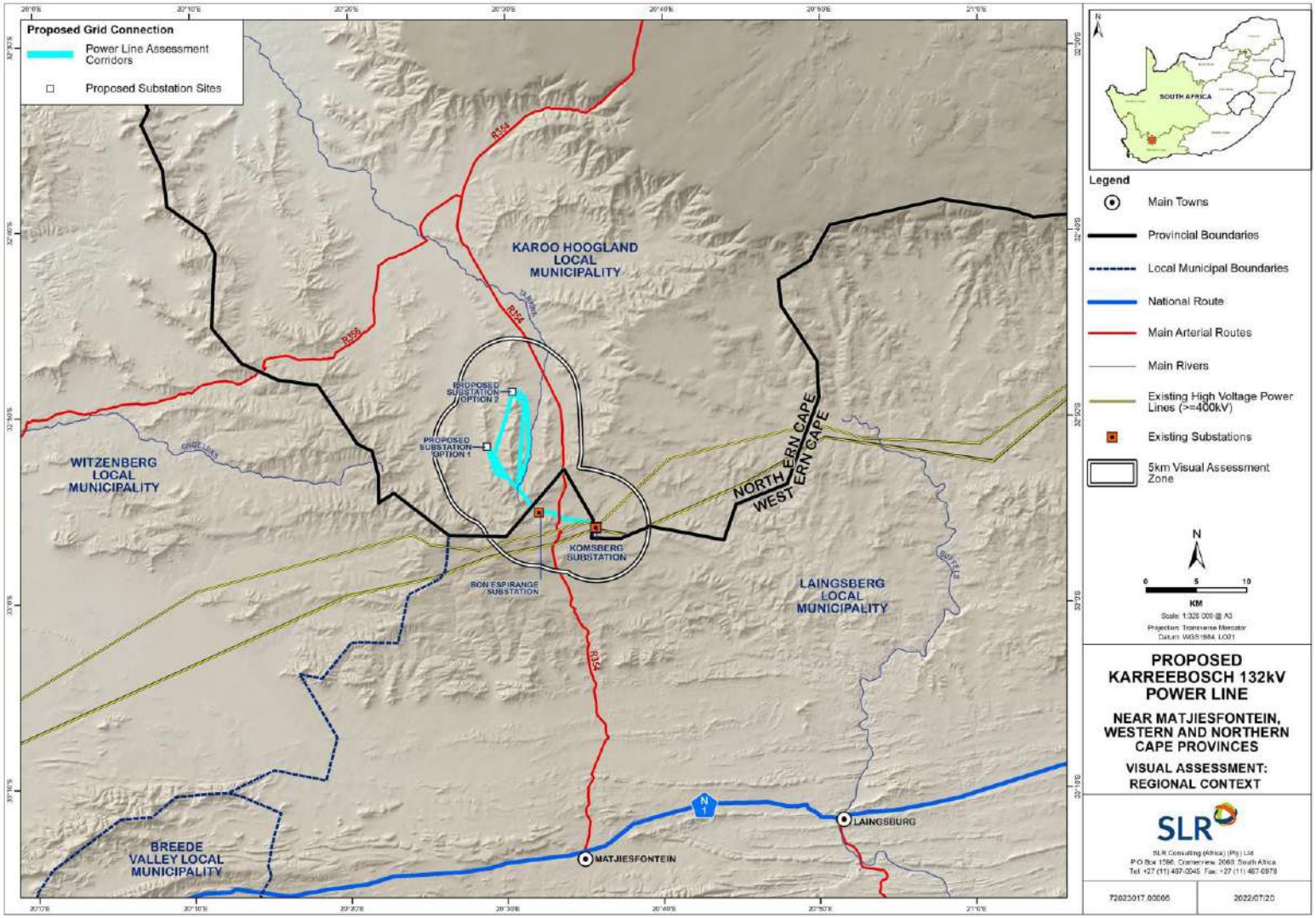

Figure 1: Proposed Powerline Route Alternatives and Substation in the Regional Context

3.2 PROJECT TECHNICAL DETAILS

At this stage, it is anticipated that the proposed development will include a 132kV OHPL and a 33/132kV substation (and associated internal access roads) to feed electricity generated by the Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), into the national grid at the existing Komsberg substation via the existing Bon Espirange substation.

The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures, which will be up to 40m in height. Towers are expected to be located on average 200m to 250m apart, although longer spans may be needed due to terrain and watercourse crossings. Pole positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). However, a 400m wide assessment corridor is being considered and has been walked down by the specialists for approval to allow for micro siting of tower positions once the detailed design has been completed.

3.2.1 Substation and Route Alternatives

Two substation alternatives with associated route alternatives are being assessed for the section of the OHPL connecting the proposed on-site Karreebosch substation to the authorised and existing Bon Espirange Substation (DFFE Ref. 14/12/16/3/3/1/1544). This grid infrastructure will specifically serve the Karreebosch WEF.

Only 1 OHPL route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Espirange Substation (Route 3) and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg Route), which is approximately 9.2 km in length. No alternatives can therefore be provided for these two sections of the OHPL (Route 3 and Bon Espirange to Komsberg Route, as per Error! Reference source not found. below).

Six (6) OHPL route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the Karreebosch WEF onsite 33/132kV substation (substation alternatives: Option 1 and Option 2) and Route 3 preceding the existing Bon Espirange Substation. As noted above, all of the six OHPL route alternatives follow the same routing from their point of convergence on Remainder of farm Ek Kraal No.199, approximately 3.1 km before the Bon Espirange Substation, to the Komsberg Substation situated on Portion 2 of Farm Standvastigheid No. 210.

These alternatives, as depicted in Error! Reference source not found., are described below:

- **OHPL Route Option 1:** Three (3) OHPL route alternatives are being considered for the link between Substation Option 1 and the Bon Espirange Substation and Komsberg Substation, these being:
  - Option 1A (approximately 14.51 km in length in its entirety from Substation Option 1 to the Komsberg Substation);
  - Option 1B (approximately 17.28 km in length in its entirety from Substation Option 1 to the Komsberg Substation); and

- Option 1C (approximately 13.91 km in length in its entirety from Substation Option 1 to the Komsberg Substation).
- Option 1B (approximately 11.4 km in length); and
- Option 1C (approximately 8.2 km in length).

- **OHPL Route Option 2:** Three (3) OHPL route alternatives are being considered for the link between Substation Option 2 and the Bon Espirange Substation and Komsberg Substation, these being:
  - Option 2A (approximately 20.47 km in length in its entirety from Substation Option 2 to the Komsberg Substation);
  - Option 2B (approximately 16.63 km in length in its entirety from Substation Option 2 to the Komsberg Substation); and
  - Option 2C (approximately 20.52 km in length in its entirety from Substation Option 2 to the Komsberg Substation).

Alternatives 1A-C feed out of Substation Option 1 proposed in the south-central portion of the Farm Klipbanks Fontein 198/1.

Alternatives 2A-C feed out of Substation Option 2 proposed in the south-eastern corner of Wilgebosch Rivier 188/RE.

3.2.2 No-Go Alternative

The 'no-go' alternative is the option of not developing the proposed project, thus preventing the proposed Karreebosch WEF from feeding electricity into the national grid. This alternative would not result in any environmental impacts within the assessment corridors or in the surrounding local area and the status quo would remain. This scenario provides the baseline against which other alternatives are compared and will be considered throughout the report.

While the 'no-go' option is a feasible option, it would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

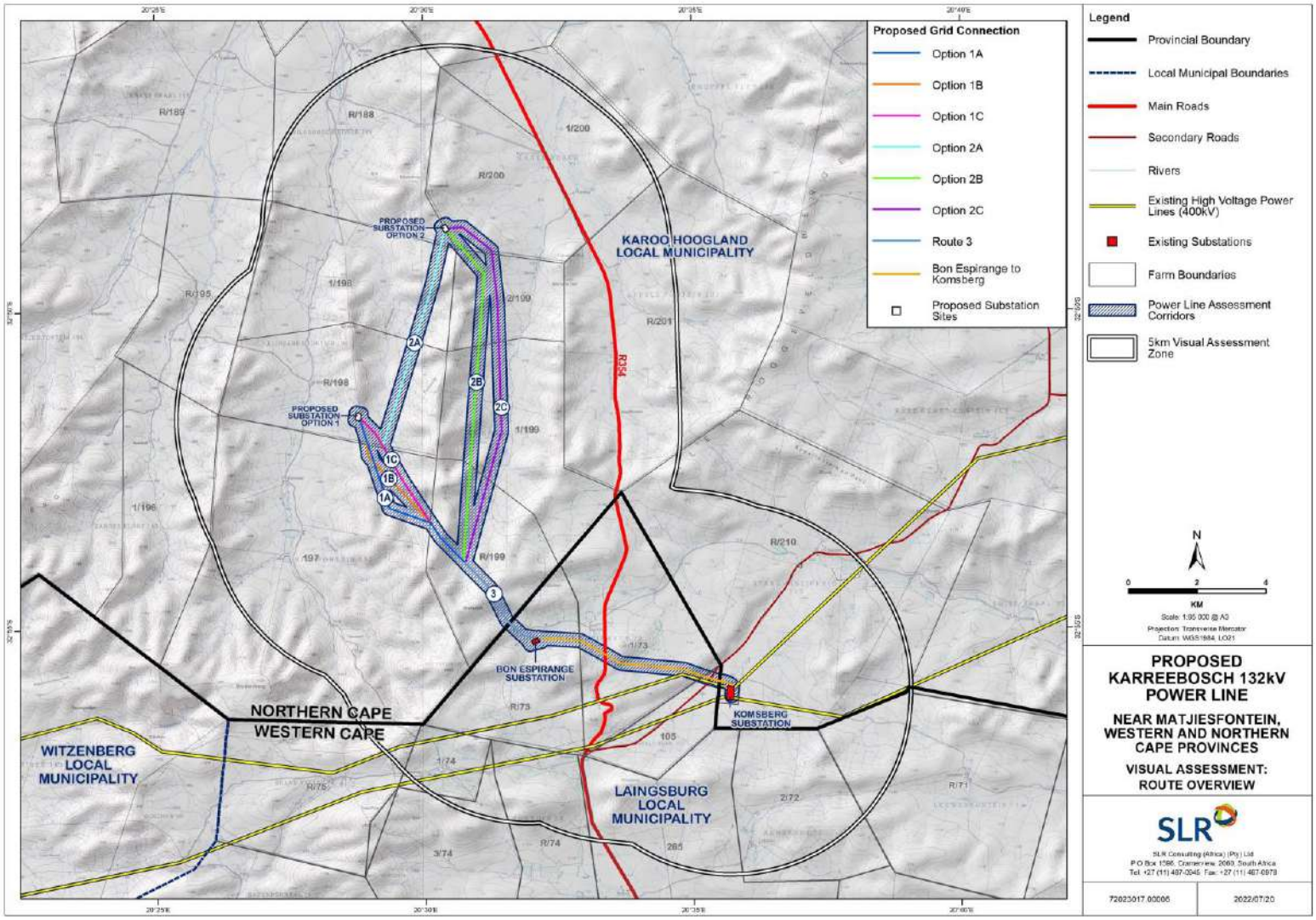

Figure 2: Overview of Powerline Route Alternatives

4. LEGAL REQUIREMENT AND GUIDELINES

Key legal requirements pertaining to the proposed development are outlined below.

In terms of the NEMA and the EIA Regulations 2014 (as amended), the proposed development includes listed activities which require a BA to be undertaken. As previously stated, the entire extent of the proposed 132kV overhead powerline is located within one of the Strategic Transmission Corridors as defined and in terms of the procedures laid out in Government Notice (GN) No. 113, namely the Central Corridor. The proposed overhead powerline and substation project irrespective would be subject to a BA process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 1 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this BA is the National Department of Environment, Forestry and Fisheries (DEFF).

As part of this BA process, the need for a VIA to be undertaken has been identified in order to assess the visual impact of the proposed grid connection infrastructure. The VIA must adhere to the requirements for specialist studies as stipulated in Appendix 6 of the NEMA EIA Regulations, 2014, as amended;

There is currently no legislation within South Africa that explicitly pertains to the assessment of visual impacts, however, in addition to the NEMA the following legislation has relevance to the protection of scenic resources:

- National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003); and
- National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

Based on these Acts, protected or conservation areas and sites or routes with cultural or symbolic value have been taken into consideration when identifying sensitive and potentially sensitive receptor locations and rating the sensitivity of the study area. It should be noted however that these aspects have been considered in the Terrestrial Biodiversity and Heritage Impact Assessments undertaken in respect of the proposed development.

5. FACTORS INFLUENCING VISUAL IMPACT

5.1 SUBJECTIVE EXPERIENCE OF THE VIEWER

The perception of the viewer/receptor toward an impact is highly subjective and involves 'value judgements' on behalf of the receptor. It is largely based on the viewer's perception and is usually dependent on the age, gender, activity preferences, time spent within the landscape and traditions of the viewer (Barthwal, 2002). Thus, certain receptors may not consider powerlines and associated infrastructure to be a negative visual impact as they are often associated with employment creation, social upliftment and the general growth and progression of an area, and thus the development could even have positive connotations.

5.2 VISUAL ENVIRONMENT

Powerlines and substations are not features of the natural environment but are rather a representation of human (anthropogenic) alteration. As such, this type of development is likely to be perceived as visually intrusive when placed in a largely undeveloped landscape that has a natural scenic quality and where tourism activities, based upon the enjoyment of (or exposure to) the scenic or aesthetic character of the area, are practiced. Residents and visitors to these areas could perceive the powerlines, substations and associated infrastructure to be highly incongruous in this context and may regard these features as an unwelcome intrusion which degrade the natural character and scenic beauty of the area, and which could potentially even compromise the practising of tourism activities in the area. The experience of the viewer is however highly subjective and there are those who may not perceive features such as powerlines and substations as a visual intrusion.

The presence of other anthropogenic features associated with the built environment may not only obstruct views but also influence the perception of whether a development is a visual impact. In industrial areas for example, where other infrastructure and built form already exists, the visual environment could be considered to be 'degraded' and thus the introduction of a new powerline or substation into this setting may be considered to be less visually intrusive than if there was no existing built infrastructure visible.

5.3 TYPE OF VISUAL RECEPTOR

Visual impacts can be experienced by different types of receptors, including people living, working or driving along roads within the viewshed of the proposed development. The receptor type in turn affects the nature of the typical 'view', with views being permanent in the case of a residence or other places of human habitation, or transient in the case of vehicles moving along a road. The nature of the view experienced affects the intensity of the visual impact experienced.

It is important to note that visual impacts are only experienced when there are receptors present to experience this impact. Thus, where there are no human receptors or viewers present there are not likely to be any visual impacts experienced.

5.4 VIEWING DISTANCE

Viewing distance is a critical factor in the experiencing of visual impacts, as beyond a certain distance, even large developments tend to be much less visible, and difficult to differentiate from the surrounding landscape. The visibility of an object is likely to decrease exponentially as one moves away from the source of impact, with the impact at 1 000m being considerably less than the impact at a distance of 500m (**Figure** 3).

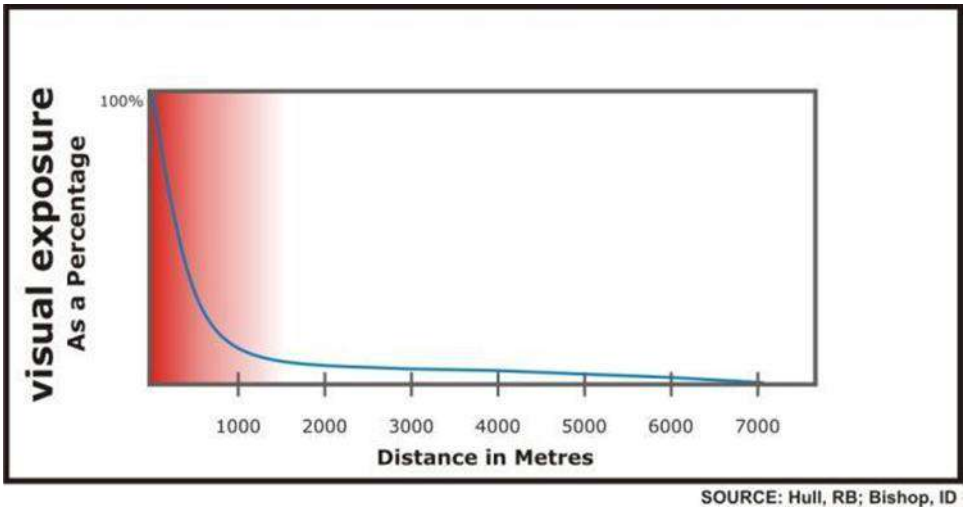

Figure 3: Conceptual representation of diminishing visual exposure over distance

6. VISUAL CHARACTER AND SENSITIVITY OF THE STUDY AREA

Defining the visual character of an area is an important factor in the assessment of visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured by establishing the degree to which the development would contrast with, or conform to, the visual character of the surrounding area. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, the economic importance of the scenic quality of the area, inherent cultural value of the area and the presence of visual receptors.

Physical and land use related characteristics, as outlined below, are important factors contributing to the visual character of an area

6.1 PHYSICAL AND LAND USE CHARACTERISTICS

6.1.1 Topography

The proposed powerline and substation are located in the scenic Karoo region of the Western / Northern Cape which is generally associated with wide vistas and mountainous landscapes. The topography in the broader study area is largely dominated by the mountains/hills at the southern end of the Klein Roggeveld range. Much of the study area is therefore dominated by the steep slopes and broad ridges of these mountains and escarpments (**Figure 4**, **Figure 5** and **Figure 6**).

Maps showing the topography and slopes within and in the immediate vicinity of the combined assessment area are provided in **Figure 7** and **Figure 8** below.

Figure 4: View (SE) from R354 main road (-32.818506; 20.553465E) showing mountainous terrain associated with the Klein Roggeveld range to the east.

Figure 5: View (SSE) from the farmstead on Portion 1 of Klipbanks Fontein No 198 (- 32.826638; 20.466372E), showing the relatively hilly terrain across the study area.

Figure 6: View (WNE) from R354 (-32.853703; 20.559532).

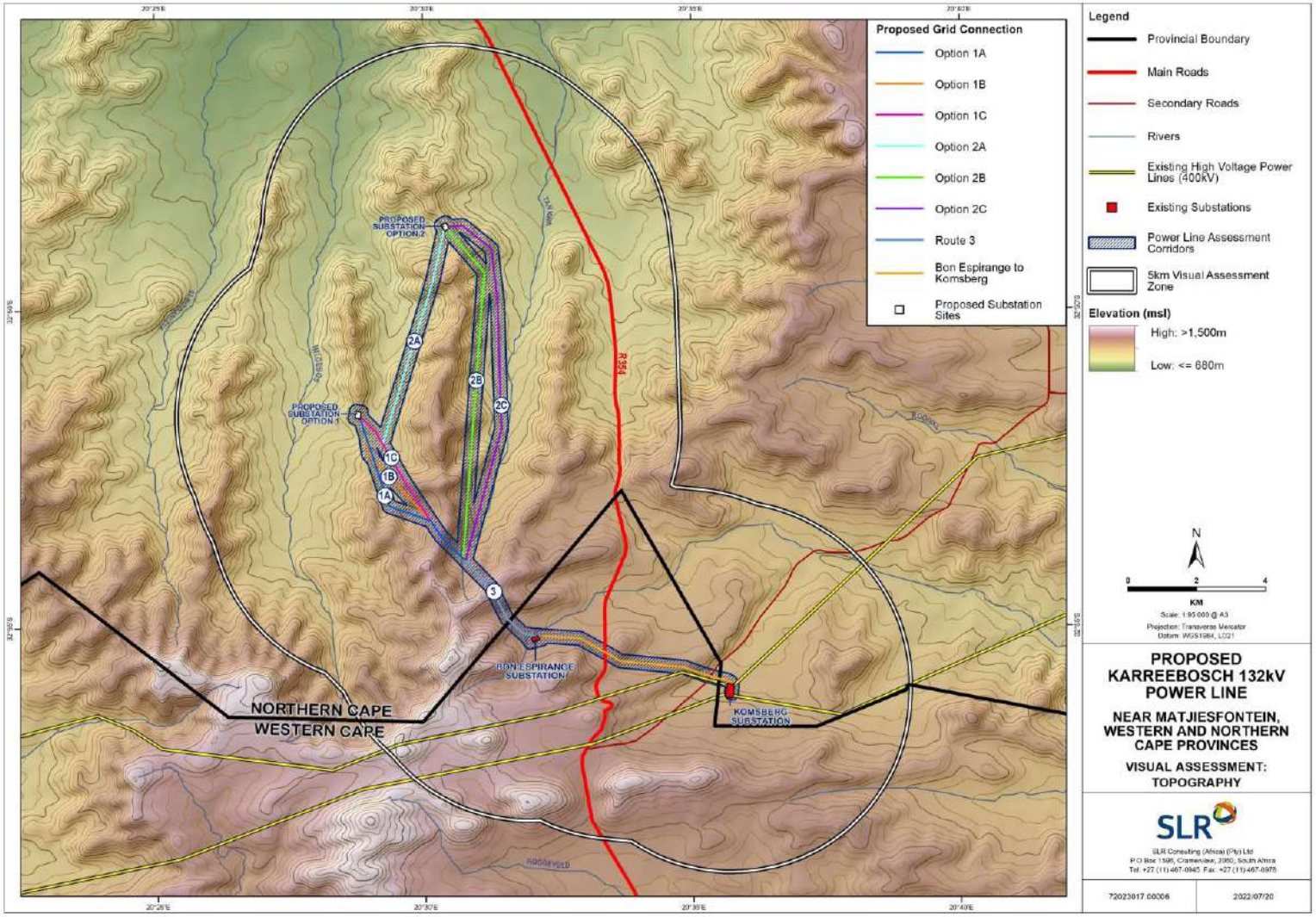

Figure 7: Topography of the study area

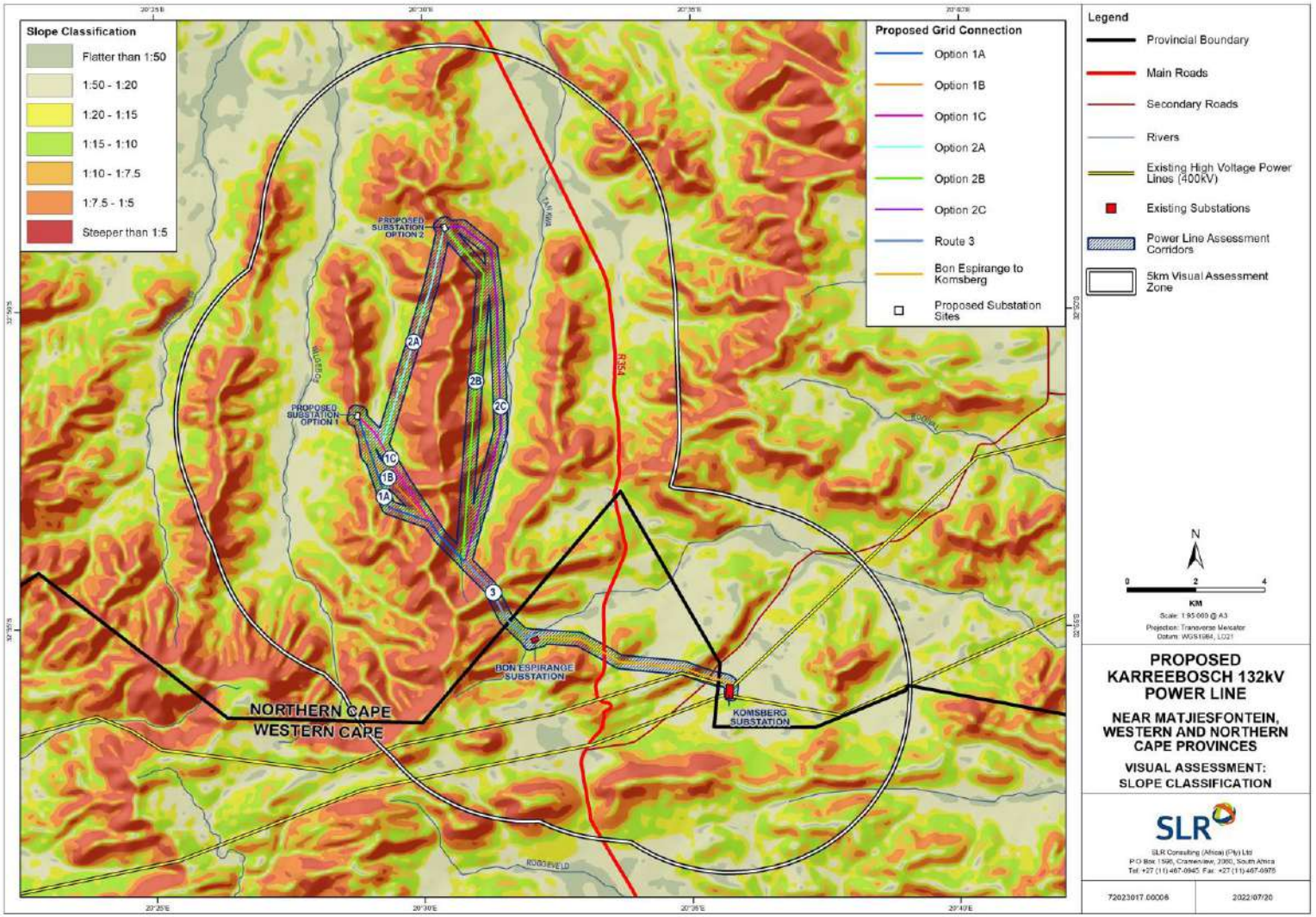

Figure 8: Slope classification of the study area

Visual Implications

Areas of flatter relief, including plains and higher-lying plateaus, are characterised by wide ranging vistas (**Figure 9**), although views from the east and south will be somewhat constrained by the hilly terrain in these sectors of the study area which enclose the visual envelope. In the hillier and higher-lying terrain, the vistas will depend on the position of the viewer. Viewers located within some of the more incised valleys for example, would have limited vistas, whereas much wider vistas would be experienced from higher-lying ridge tops or slopes. Importantly in the context of this study, the same is true of objects placed at different elevations and within different landscape settings. Objects placed on high-elevation slopes or ridge tops would be highly visible, while those placed in valleys or on enclosed plateaus would be far less visible.

Bearing in mind that powerline towers and substations are large structures (towers could potentially be up to 20 m in height), these elements of the grid connection infrastructure could be visible from a relatively extensive area around the grid connection infrastructure. However, topographic shielding provided by the hills and prominent ridges across the study area would reduce the visibility of the powerlines and substations from many of the locally occurring receptor locations, and also from much of the R354 main road.

Figure 9: View (N) from the farm Rietfontein No 197 in south-western section of the study area (-32.939518S; 20.490003E) showing wide-ranging vistas experienced from higher elevations.

GIS technology was used to undertake a preliminary visibility analysis for the proposed powerline route alignments and substation sites. This analysis was based on points at 250 m intervals along the centre line of the corridor alternatives, and assumes a tower height of 40 m. The resulting viewshed indicates the geographical area from where the proposed powerlines and substation sites would theoretically be visible, i.e. the zone of visual influence or viewshed. This analysis is based entirely on topography (relative elevation and aspect) and does not take into account any existing vegetation cover or built infrastructure which may

screen views of the proposed development. In addition, detailed topographic data was not available for the broader study area and as such the viewshed analysis does not take into account any localised topographic variations which may constrain views. This analysis should therefore be seen as a conceptual representation or a worst-case scenario.

The results of this analysis, as per **Figure 10** below, show that although elements of the proposed grid connection infrastructure would be visible from many parts of the study area, the prominent ridges on the site provide a degree of topographic screening, resulting in significant portions of the study area being outside the combined viewshed for the proposed powerline and substation sites.

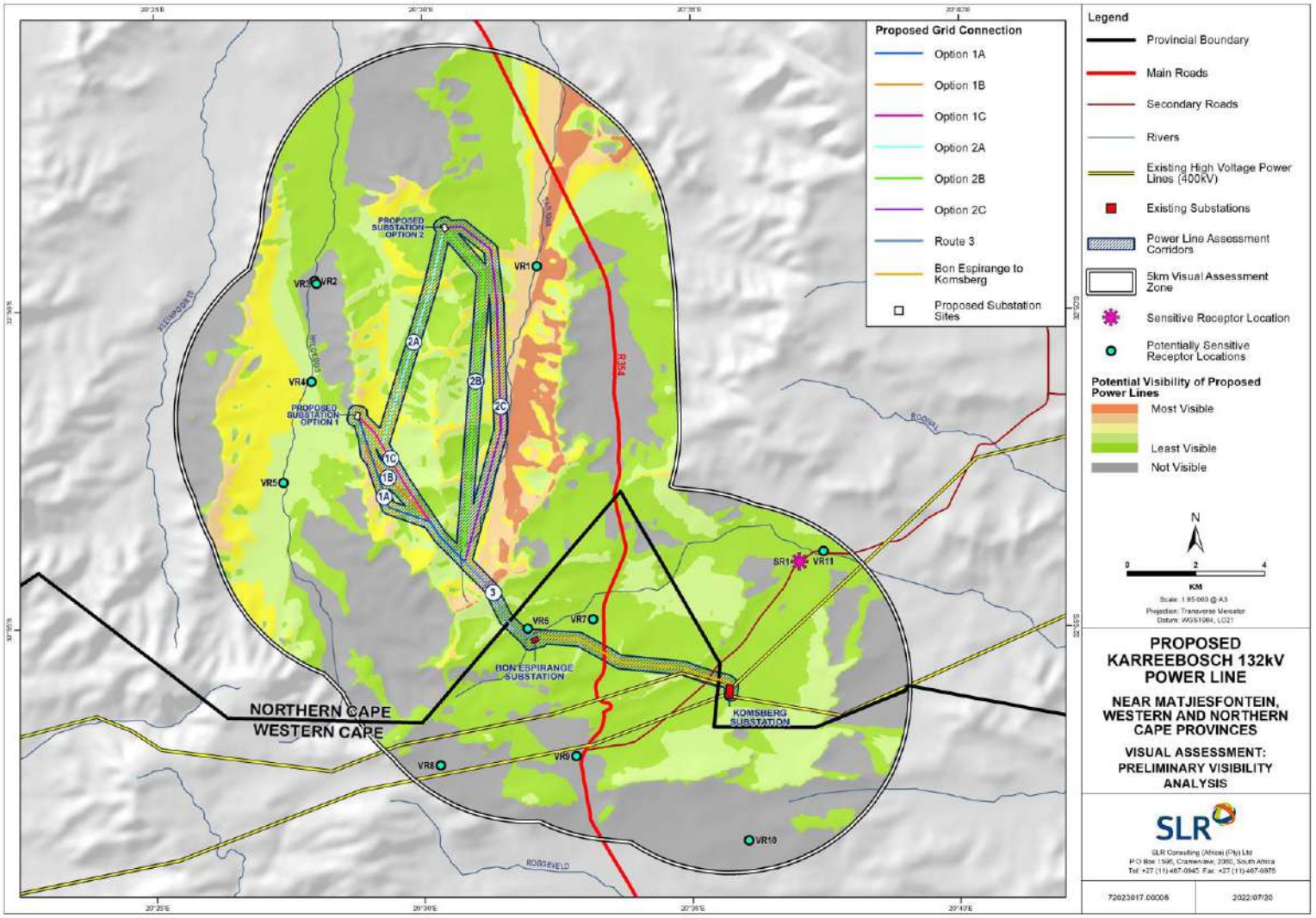

Figure 10: Preliminary visibility analysis of proposed development

6.1.2 Vegetation

According to Mucina and Rutherford (2018), much of the northern and eastern sectors of the study area are covered by the Koedoesberge – Moordenaars Karoo vegetation type, which tends to occur on slightly undulating to hilly landscapes. This vegetation type comprises low succulent scrubs, scattered tall shrubs and patches of "white" grass visible on plains (Figure 11). The dwarf shrubs include *Pteronia, Drosanthemum* and *Galenia*.

Figure 11: View from the R354 main road of typical vegetation cover prevalent across the northern sector of study area

The southern section of the study area which is dominated by high mountains / hills, is however associated with Central Mountain Shale Renosterveld. This vegetation type is typically found on slopes and broad ridges of low mountains and escarpments, with taller shrubland dominated by renosterbos and large areas of mainly non-succulent karoo shrubs and with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats (**Figure 12**).

Figure 12: View from the R354 main road of typical vegetation cover found in the southern sector of the study area.

Small patches of the Tanqua Escarpment Shrubland type occur along the eastern boundary of the study area, on the slopes of the Klein-Roggeveldberge range. This vegetation type is typically characterised by succulent shrubland of medium height.

Much of the study area however is still characterised by natural low shrubland with transformation limited to patches of cultivation and a few isolated areas where pastoral activities such as livestock rearing are taking place.

Vegetation classifications across the study area are shown in **Figure 14** below.

Visual Implications

Vegetation cover across the study area is predominantly short and sparse and thus will not provide any visual screening. In some instances, however, taller trees have been planted around farmhouses, possibly restricting views from these receptor locations to some degree (**Figure 13**).

Figure 13: Trees planted around Saaiplaas farmstead (Remainder of the Farm Standvastigheid No 210) in the south-eastern sector of the study area

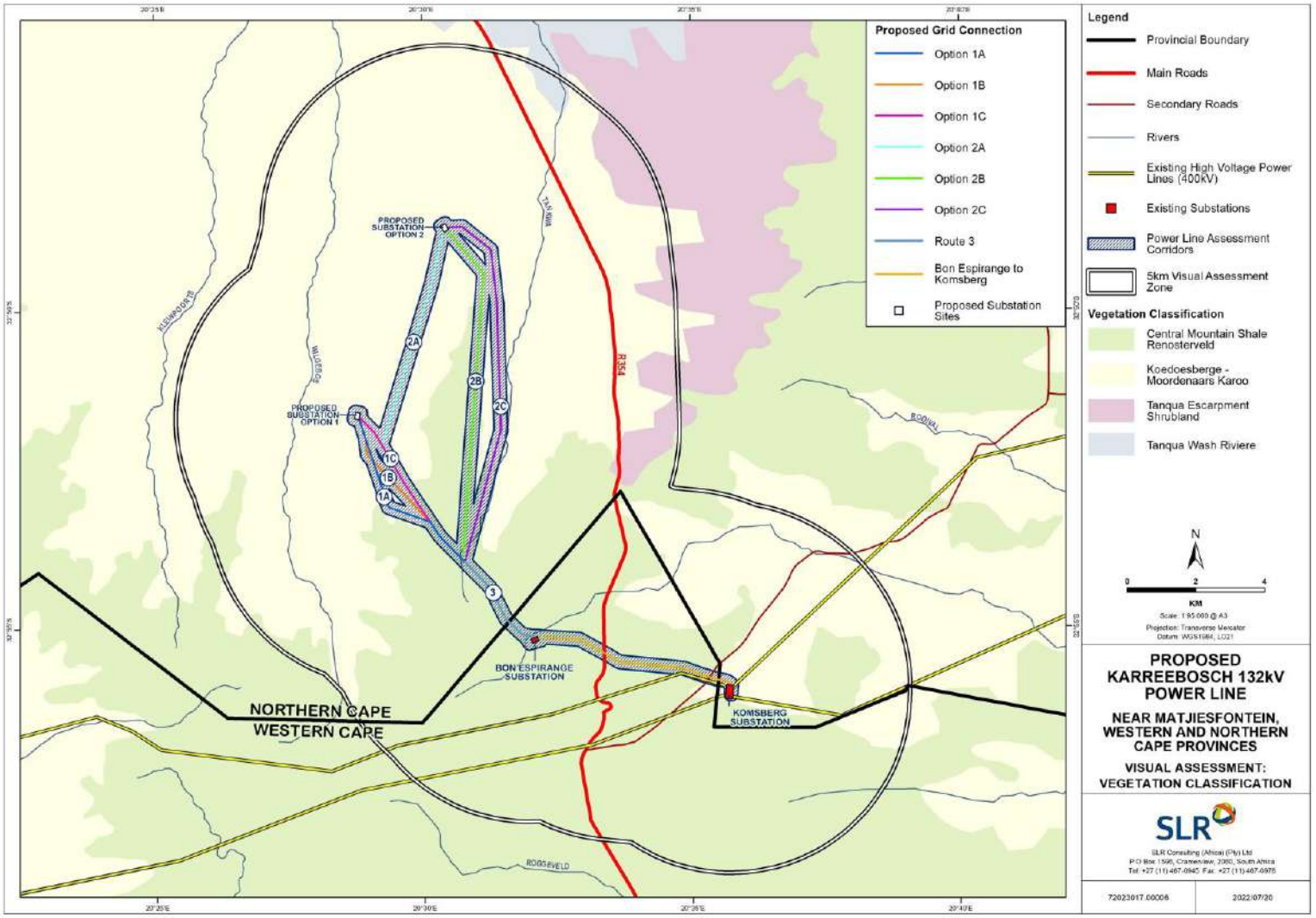

Figure 14: Vegetation Classification in the Study Area

6.1.3 Land Use

According to the South African National Land Cover dataset (GeoTerra Image 2020), much of the visual assessment area is characterised by natural vegetation which is dominated by Karoo and Fynbos shrubland interspersed with natural grassland (**Figure 15**).

Agricultural activity in the area is restricted by the arid nature of the local climate and areas of cultivation are largely confined to relatively small patches of land distributed along drainage lines. As such, the natural vegetation has been retained across much of the study area. Livestock farming (mostly sheep) is the dominant activity, although the climatic and soil conditions have resulted in low densities of livestock and relatively large farm properties across the area. Thus, the area has a very low density of rural settlement, with relatively few scattered farmsteads in evidence (**Figure 16**). Built form in much of the study area is limited to isolated farmsteads, including farm worker's dwellings and ancillary farm buildings, gravel access roads, telephone lines, fences and windmills (**Figure 17**).

High voltage (400Kv and above) powerlines in the study area (**Figure 18**) however form significant man-made features in an otherwise undeveloped landscape. These powerlines bisect the southern sector of the study area in a south-west to north-east alignment, linking in to the Komsberg 400kV substation, situated at the southern end of the powerline assessment corridors. This substation is a substantial anthropogenic feature with a distinctly more industrial character, resulting in a significant degree of transformation in the landscape (**Figure 19**). Further human influence is visible in the area in the form of the R354 man road which traverses the study area in a north to south direction (**Figure 20**).

Much of the central portion of the study area lies within the project area for the Roggeveld WEF (**Figure 21**). This facility, including wind turbines located along ridge-tops, access roads, powerlines and the recently constructed Bon Espirange substation (**Figure 22**) has resulted in significant transformation of the landscape.

The closest built-up area is the small town, Matjiesfontein, which is situated approximately 34km south of Komsberg Substation while Laingsburg is some 37kms to the south-east. These small towns are well outside the visual assessment zone and thus not expected to have an impact on the visual character of the study area.

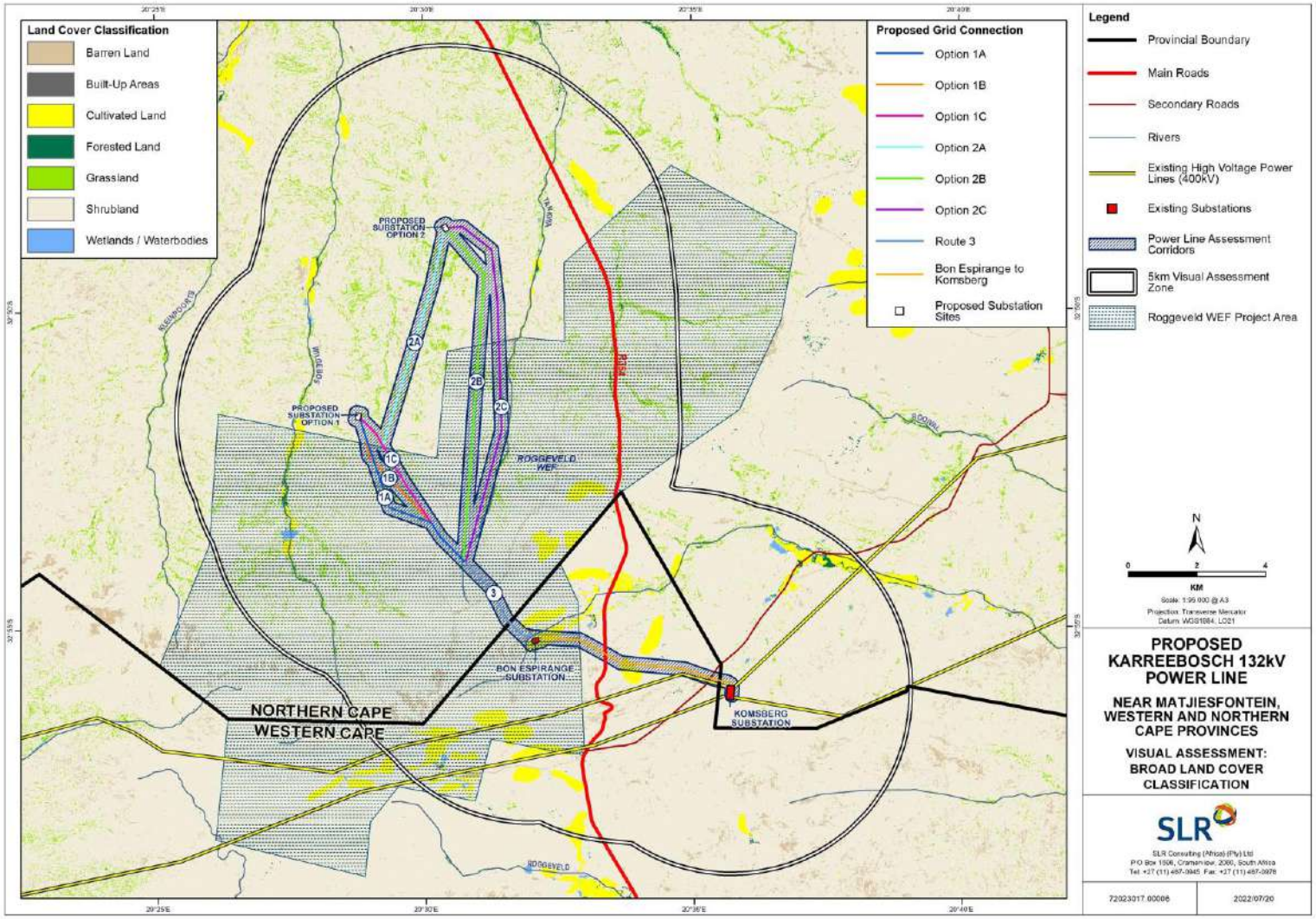

Figure 15: Land Cover Classification of the study area.

Figure 16: Isolated farmstead on Portion 1 of the Farm Klipbanks Fontein No 198

Figure 17: Typical view of built form in the study area, including farmhouses, telephone poles and a windmill.

Figure 18: View of high voltage powerlines in the study area.

Figure 19: Komsberg Substation

Figure 20: R354 main road is a prominent feature in the landscape.

Figure 21: Roggeveld WEF

Figure 22: Bon Espirange Substation.

Visual Implications

Sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. In addition, there are no towns or settlements in the study area and thus, there are very low levels of human transformation and visual degradation across much of the study area.

Significant elements of human transformation are however present in the central and southern sectors of the study area, including the Roggeveld WEF, high voltage powerlines and the Bon Espirange and Komsberg Substations. These elements are considered to have degraded the visual character of the study area to some degree.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

6.2 VISUAL CHARACTER AND CULTURAL VALUE

The above physical and land use-related characteristics of the study area contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as telephone or electricity infrastructure. The visual character of an area largely determines the sense of place relevant to the area. This is the unique quality or character of a place, whether natural, rural or urban which results in a uniqueness, distinctiveness or strong identity.

Agricultural activities in the area have not transformed the natural landscape to any significant degree and there are no towns or built-up areas in the study area influencing the overall visual character. Hence the natural character has been retained across much of the study area.

Prominent anthropogenic elements in the study area however include a large electrical substation (Komsberg), associated high voltage powerlines and the Roggeveld WEF and associated infrastructure. The presence of this infrastructure is an important factor in this context, as the introduction of the proposed powerline and substation infrastructure would result in less visual contrast where other anthropogenic elements are already present.

The construction of the Roggeveld WEF and the associated 132kV powerline and substation is a significant factor in the visual character of the study area. WEFs and their associated infrastructure typically consist of very large structures which are highly visible. As such, this facility has already significantly altered the visual character and baseline across the central sector of the study area, resulting in a more industrial-type visual character.

It is important to note that several renewable energy facilities (solar and wind) are proposed within relatively close proximity to the proposed powerline. These facilities and their associated infrastructure, typically consist of very large structures which are highly visible. As such, if these facilities are constructed they will further alter the visual character and baseline in the study area towards a more industrial-type visual character. Although this will lessen the degree to which the proposed powerline would contrast with the elements and form in the surrounding environment, the cumulative impact on each sensitive receptor location would increase. This is discussed in more detail in Section 8.4 below.

The scenic quality of the landscape is also an important factor contributing to the visual character of an area or the inherent sense of place. Visual appeal is often associated with unique natural features or distinct variations in landform. As such, the hilly / mountainous terrain which occurs across much of the study area

is considered to be an important feature that increases the scenic appeal and visual interest in the area. The R354 Main Road is in fact considered to have high scenic and rural value.

The greater area surrounding the proposed development is an important component when assessing visual character. The area can be considered to be typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa’s dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by scattered farmsteads and small towns. Over the last couple of decades an increasing number of tourism routes have been established in the Karoo and in a context of increasing urbanisation in South Africa’s major centres, the Karoo is being marketed as an undisturbed getaway.

The typical Karoo landscape can be considered a valuable ‘cultural landscape’ in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

The Karoo landscape, consisting of wide-open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Matjiesfontein, engulfed by an otherwise rural, almost barren environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context.

In light of this, it is important to assess whether the introduction of a new powerline and associated infrastructure into the study area would be a degrading factor in the context of the natural Karoo character of the landscape. Broadly speaking, visual impacts on the cultural landscape in the area around the proposed development would be reduced by the fact that the area is very remote and there are few significant tourism enterprises attracting visitors into the study area. In addition, although a recognised scenic route (R354) traverses the study area, visual impacts on travelers using this route will be considerably reduced by distance from the proposed powerline and the hilly terrain across the study area. In addition, it could be argued that this type of development is not considered to be a significant degrading factor in the context of the natural Karoo character of the study area, due to the fact that electrical infrastructure is frequently part of the typical form present within the Karoo landscape

A detailed assessment of the potential impacts of the proposed powerline and substation development on the cultural landscape has been included in the Heritage Impact Assessment (HIA) undertaken in respect of the proposed project.

6.3 VISUAL SENSITIVITY

Visual sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), the spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually shaped by the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area, a matrix has been developed based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (Error! Reference source not found.), the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High** - The introduction of a new development such as a powerline and/or substation would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors.
ii) **Moderate** – Receptors are present, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.
iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 2: Environmental factors used to define visual sensitivity of the study area

FACTORS	DESCRIPTION	RATING									
		LOW									*HIGH*
		1	2	3	4	5	6	7	8	9	10
Pristine / natural / scenic character of the environment	Study area is largely natural with areas of scenic value and some pastoral elements.										
Presence of potentially sensitive visual receptors	Relatively few sensitive receptors have been identified in the study area.										
Aesthetic sense of place / visual character	Visual character is typical of Karoo Cultural landscape.										
Irreplaceability / uniqueness / scarcity value	Although there are areas of scenic value within the study area, these are not rated as highly unique.										
Cultural or symbolic meaning	Much of the area is typical of a Karoo Cultural landscape.										
Protected / conservation areas in the study area	No protected or conservation areas were identified in the study area.										
Sites of special interest present in the study area	No sites of special interest were identified in the study area.										
Economic dependency on scenic quality	Few tourism/leisure-based facilities in the area										
International / regional / local status of the environment	Study area is typical of Karoo landscapes										
**Scenic quality under threat / at risk of change	Introduction of grid connection infrastructure will alter the visual character and sense of place. In addition, the development of other renewable energy facilities in the broader area as planned or under construction will introduce an increasingly industrial character, giving rise to significant cumulative impacts										

**Any rating above '5' for this specific aspect will trigger the need to undertake an assessment of cumulative visual impacts.

Low				Moderate					High
10	20	30	40	50	60	70	80	90	100

Based on the matrix above, the total score for the study area is 41, which according to the scale above, would result in the area being rated as having a low visual sensitivity. It should be stressed however that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the landscape is likely to be sensitive to visual impacts. This is based on the physical characteristics of the study area, economic activities and land use that predominates. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs.

No formal protected areas were identified within the study area and relatively few sensitive or potentially sensitive receptors were found to be present.

As part of the visual sensitivity assessment, a screening exercise was undertaken with the aim of indicating any areas that should be precluded from the proposed development footprint. From a visual perspective, these are areas where the establishment of powerlines and/or substations would result in the greatest probability of visual impacts on sensitive or potentially sensitive visual receptors.

Using GIS-based visibility analysis, it was possible to determine which sectors of the application site would be visible to the highest numbers of receptors in the study area (Figure 23). This analysis considered all the sensitive and potentially sensitive receptor locations identified (Section 8.1). Due to hilly terrain and the fact that there are relatively few receptors, widely scattered across the area, sections of Corridor Options 1A, 1B, 1C and 2A are outside the viewshed and none of the remaining sections of the proposed route alignments were found to be significantly more visible than any others. It was however determined that one of the potentially sensitive receptors (VR6) is within 500 m of the combined powerline assessment corridor and could potentially be affected by the proposed development. It has been noted that this farmstead is located within the Roggeveld WEF project area, in close proximity to the Bon Espirange Substation, and as such it is assumed that the occupants have a vested interest in the WEF development. Thus, although a 500m potential visual sensitivity zone has been delineated around this receptor, this zone is not considered to be a “no go area”, but rather should be viewed as a zone where visual impacts could occur, depending on the sentiments of nearby residents.

It should be noted that the visibility analysis is based purely on topographic data available for the broader study area and does not take into account any localised topographic variations or any existing infrastructure and / or vegetation that may constrain views. In addition, the analysis does not consider differing perceptions of the viewer which would largely determine the degree of visual impact being experienced.

The visual sensitivity analysis should therefore be seen as a conceptual representation or a worst-case scenario which rates the visibility of the site in relation to potentially sensitive receptors. These areas of visual sensitivity are shown in **Figure 23** below.

In assessing visual sensitivity, the proposed development was examined in relation to the Landscape Theme of the National Environmental Screening Tool to determine the relative landscape sensitivity for the development of grid connection infrastructure. The tool does not however identify any landscape sensitivities in respect of the proposed powerline or substation.

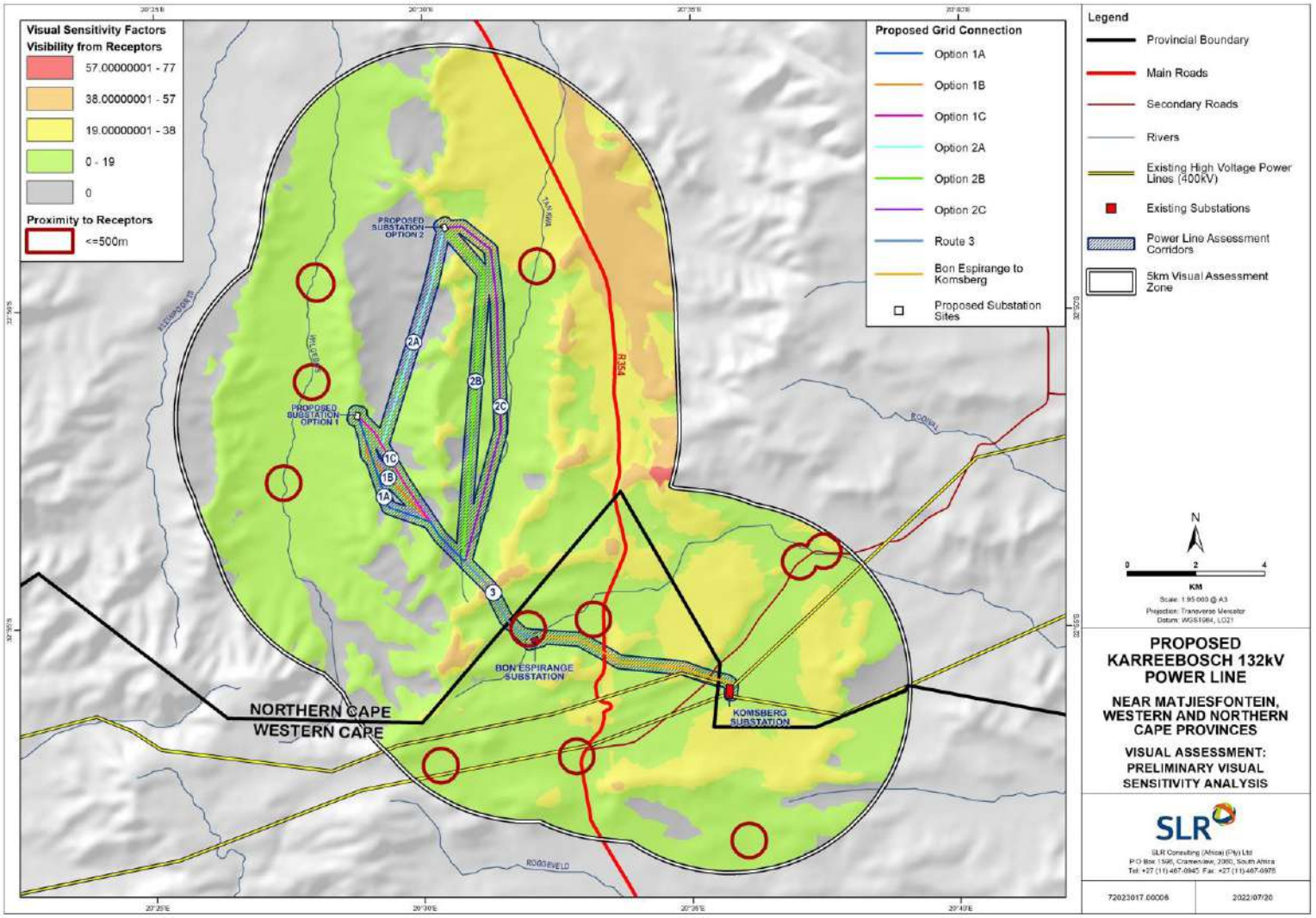

Figure 23: Preliminary visual sensitivity analysis of proposed development.

6.4 VISUAL ABSORPTION CAPACITY

Visual absorption capacity is the ability of the landscape to absorb a new development without any significant change in the visual character and quality of the landscape. The level of absorption capacity is largely based on the physical characteristics of the landscape (topography and vegetation cover) and the level of transformation present in the landscape.

Although the hilly nature of the topography in the study area would increase the visual absorption capacity, this would be offset by the lack of screening provided by the dominant shrubland vegetation. A significant portion of the study area has however already undergone significant transformation as a result of the Komsberg substation and associated high voltage powerlines and further transformation has occurred with the construction of the Roggeveld WEF and the Bon Espirange Substation, thus increasing the visual absorption capacity of the landscape.

Visual absorption capacity in the study area is therefore rated as **moderate**.

7. TYPICAL VISUAL IMPACTS ASSOCIATED WITH ON-SITE SUBSTATIONS AND POWERLINES

In this section, the typical visual issues related to the establishment of a 132kV powerline and substation are discussed.

Powerline towers and substations are very large objects and thus highly visible. According to information provided by Karreebosch, the maximum tower height being considered for the proposed powerline is 40m (approximately equivalent in height to a thirteen-storey building). Although a tower structure would be less visible than a building, the height of the structure means that the tower would still typically be visible from a considerable distance. Visibility would be increased by the fact that the powerline comprises a series of towers typically spaced approximately 200m to 250m apart in a linear alignment.

The degree of visibility of an object informs the level and intensity of the visual impact, but other factors also influence the nature of the visual impact. The landscape and aesthetic context of the environment in which the object is placed, as well as the perception of the viewer are also important factors. In the context of a powerline, the type of tower used as well as the degree to which the towers would impinge upon or obscure a view is also a factor that will influence the experience of the visual impacts.

As described above, a powerline or substation could be perceived to be highly incongruous in the context of a largely natural landscape. The height and linear nature of the powerline will exacerbate this incongruity, as the towers may impinge on views within the landscape. In addition, the practice of clearing any taller vegetation from areas within the powerline servitude can increase the visibility and incongruity of the powerline. In a largely natural, bushier setting, vegetation clearance will cause fragmentation of the natural vegetation cover, thus making the powerline more visible and drawing the viewer's attention to the powerline servitude.

Sensitivity to visual impacts is typically most pronounced in areas set aside for conservation of the natural environment (such as protected natural areas or conservancies), or in areas in where the natural character or scenic beauty of the area attracts visitors (tourists). In this instance however, the area is not typically valued for its tourism significance and no formal protected areas, leisure-based tourism activities were identified in the study area. Although a recognised tourism route (R354) traverses the study area, visual impacts affecting this route are expected to be reduced by the hilly nature of the terrain.

Conversely, the presence of other anthropogenic objects associated with the built environment may "degrade" the visual environment and thus the introduction of a new powerline and substation into this setting may be considered to be less of a visual impact than if there was no existing built infrastructure visible. In this context therefore, the presence of the Komsberg substation and the existing high voltage powerlines traversing the study area, in conjunction with the Roggeveld WEF and the associated Bon Espirange substation, is expected to lessen the visual contrast associated with the introduction of a new powerline and substation.

Other factors, as listed below, can also affect the nature and intensity of a potential visual impact associated with a powerline and substation:

- The location of the development in the landform setting – i.e. in a valley bottom or on a ridge top. In the latter example the development would be much more visible and would "break" the horizon;
- The presence of macro- or micro-topographical features, built form or vegetation that would screen views of the development from a receptor location;
- The presence of existing, similar features in the area and their alignment in relation to the proposed new development; and
- Temporary factors such as weather conditions (presence of haze, rainfall or heavy mist) which would affect visibility.

In this instance, the proposed powerline and substation are intended to serve the proposed Karreebosch WEF and as such, the powerline and substation will only be built if this WEF is developed. The proposed powerline and substation are therefore likely to be perceived to be part of the greater WEF development and the visual impact will be relatively minor when compared to the visual impact associated with the WEF as a whole.

8. SENSITIVE VISUAL RECEPTORS

A sensitive visual receptor location is defined as a location from where receptors would potentially be impacted by a proposed development. Adverse impacts often arise where a new development is seen as an intrusion which alters the visual character of the area and affects the 'sense of place'. The degree of visual impact experienced is however largely based on the viewer's perception and will often vary from one receptor to another.

A distinction must be made between a receptor location and a sensitive receptor location. A receptor location is a site from where the proposed development may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Less sensitive receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. More sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include tourism facilities, scenic sites and residential dwellings in natural settings.

The identification of sensitive receptors is typically based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;
- the presence of sites or routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in a largely natural setting where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the BA study.

Viewing distance is also a critical factor in the experiencing of visual impacts. As the visibility of the development would diminish exponentially over distance (refer to section **5.4** above), receptor locations which are closer to the proposed development would experience greater adverse visual impacts than those located further away.

The degree of visual impact experienced will however vary from one inhabitant to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area.
- The viewer's sentiments toward the proposed structures. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape).
- Degree to which the viewer will accept a change in the typical Karoo character of the surrounding area.

8.1 RECEPTOR IDENTIFICATION

Preliminary desktop assessment of the study area identified 12 potentially sensitive visual receptor locations within the study area, most of which appear to be existing farmsteads (**Figure 24**). These farmsteads are regarded as potentially sensitive visual receptors as they are located within a mostly rural setting and the proposed development will likely alter natural vistas experienced from these locations, although the residents' sentiments toward the proposed development are unknown.

The findings of the desktop assessment were largely confirmed by field assessment conducted in late August / early September 2021, although it was not possible to confirm the presence of farmsteads at all the identified locations due to access restrictions. Notwithstanding this limitation, all the identified receptor locations were assessed as part of this VIA as they are still regarded as being potentially sensitive to the visual impacts associated with the proposed powerline and substation.

One of the identified receptor locations was confirmed to be a sensitive receptor, this being tourism / accommodation facilities at the Saaiplaas Guest Farm (SR1). Although this Guest Farm does not appear to be operating at present, for the purposes of this VIA, it has been assumed that this is a temporary state of affairs and this receptor has been included in the assessment as a "sensitive receptor".

Five identified receptors were found to be outside the viewshed for the combined grid infrastructure proposals and as such, no further assessment of these receptors was undertaken.

In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfare in the broader region is the R354 main road which connects the N1 National Route at Matjiesfontein with Sutherland to the north. This road is considered to have high scenic and rural value and is recognised as an important tourist route to the Sutherland Observatory. As travellers using this route may experience adverse visual impacts as a result of the proposed powerline development, the road has been classified as a "receptor road".

The degree of impact experienced by travellers using this route will however depend on the relative visibility of the powerline from different sections of the road.

Other roads in the study area are primarily farm access roads and do not form part of any scenic tourist routes and are therefore not regarded as visually sensitive.

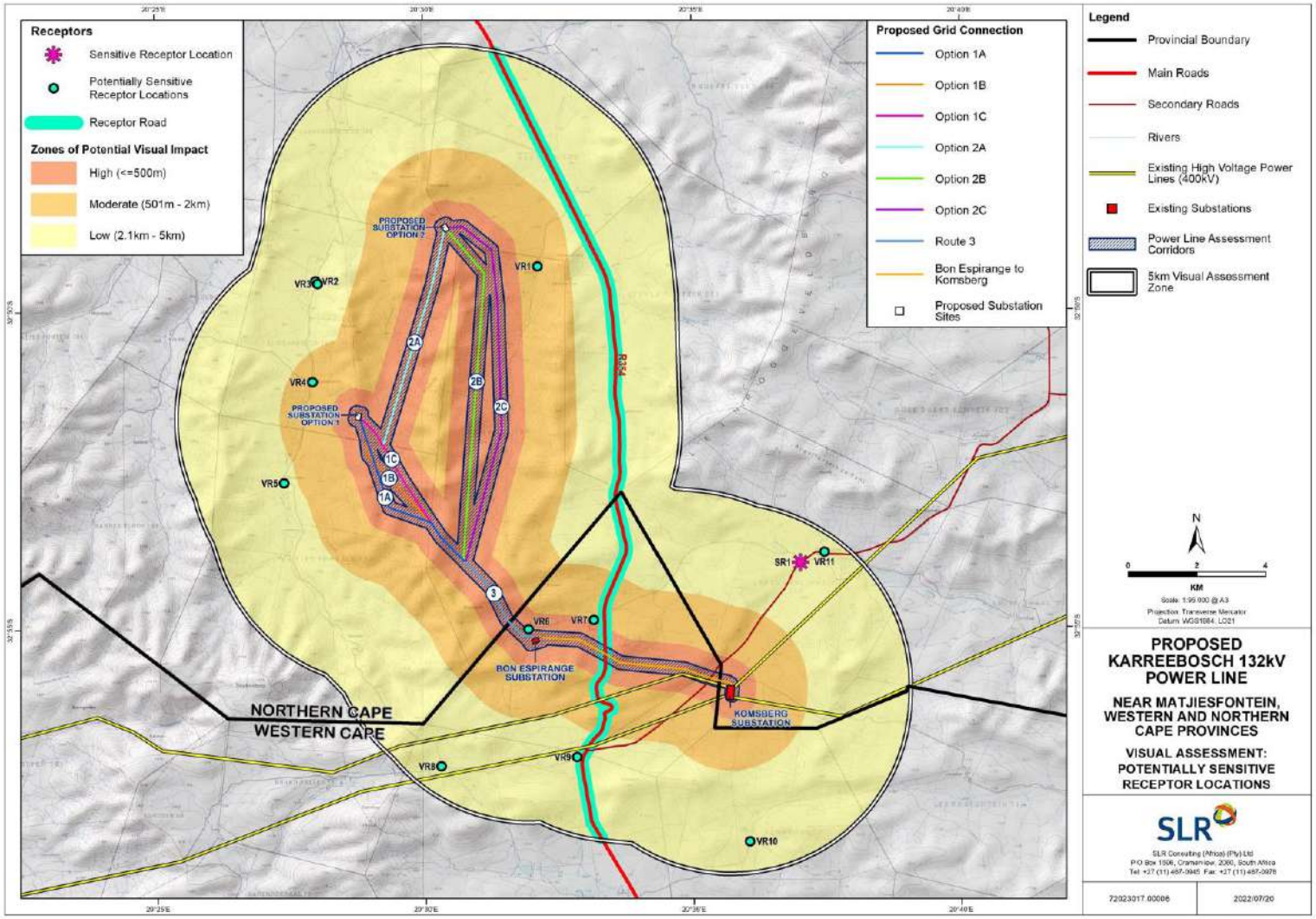

Figure 24: Potentially sensitive receptor locations within 5kms of the proposed Powerline Assessment Corridor.

8.2 RECEPTOR IMPACT RATING

In order to assess the impact of the proposed grid infrastructure development on the identified potentially sensitive receptor locations, a matrix that takes into account a number of factors has been developed and is applied to each receptor location.

The matrix is based on a number of factors as listed below:

- Distance of a receptor location away from the proposed development (zones of visual impact)
- Presence of screening elements (topography, vegetation etc.)
- Visual contrast of the development with the landscape pattern and form

These factors are considered to be the most important factors when assessing the visual impact of a proposed development on a potentially sensitive receptor location in this context. It should be noted that this rating matrix is a relatively simplified way of assigning a likely representative visual impact, which allows a number of factors to be considered. Experiencing visual impacts is however a complex and qualitative phenomenon and is thus difficult to quantify accurately. The matrix should therefore be seen as a representation of the likely visual impact at a receptor location. Part of its limitation lies in the quantitative assessment of what is largely a qualitative or subjective impact.

As described above, the distance of the viewer / receptor location from the development is an important factor in the context of experiencing visual impacts which will have a strong bearing on mitigating the potential visual impact. A high impact rating has been assigned to receptor locations that are located within 500m of the proposed development. Beyond 5km, the visual impact of a powerline and/or substation diminishes considerably, as the development would appear to merge with the elements on the horizon. Any visual receptor locations beyond this distance have therefore not been assessed as they fall outside the study area and would not be visually influenced by the proposed development.

Zones of visual impact for the proposed development were therefore delineated according to distance from the proposed powerline assessment corridors. Based on the height and scale of the project, the distance intervals chosen for the zones of visual impact are as follows:

- 0 - 500m (high impact zone)
- 500m – 2km (moderate impact zone)
- 2km - 5km (low impact zone)

The presence of screening elements is an equally important factor in this context. Screening elements can be vegetation, buildings and topographic features. For example, a grove of trees or a series of low hills located between a receptor location and an object could completely shield the object from the receptor. As such, where views of the proposed development are completely screened, or where the receptor is outside the viewshed for the proposed development, the receptor has been assigned an overriding nil impact rating, as the development would not impose any impact on the receptor.

The visual contrast of a development refers to the degree to which the development would be congruent with the surrounding environment. This is based on whether or not the development would conform to the land use, settlement density, structural scale, form and pattern of natural elements that define the structure of the surrounding landscape. Visual compatibility is an important factor to be considered when assessing the impact of the development on receptors within a specific context. A development that is incongruent with the surrounding area could have a significant visual impact on sensitive receptors as it may change the visual character of the landscape.

In light of the fact that the study area is located within the Central Strategic Transmission Corridor, and also within Renewable Energy Development Zone 2 (Komsberg REDZ), the concentration of renewable energy developments and associated grid connection infrastructure is supported in this area. This could result in an incremental change in the visual character of the area and in the typical land use patterns towards a less rural environment within which powerlines and substations would be less incongruous.

The matrix returns a score which in turn determines the visual impact rating assigned to each receptor location (**Table 3**) below.

Table 3: Rating scores

Rating	Overall Score
High Visual Impact	8-9
Moderate Visual Impact	5-7
Low Visual Impact	3-4
Negligible Visual Impact	(overriding factor)

An explanation of the matrix is provided in **Table 4** below.

Table 4: Visual assessment matrix used to rate the impact of the proposed development on potentially sensitive receptors

VISUAL FACTOR	VISUAL IMPACT RATING			
	HIGH	**MODERATE**	**LOW**	**OVERRIDING FACTOR: NEGLIGIBLE**
Distance of receptor away from proposed development	<= 500m **Score 3**	500m < 2km **Score 2**	2km < 5km **Score 1**	>5km
Presence of screening factors	No / almost no screening factors – development highly visible **Score 3**	Screening factors partially obscure the development **Score 2**	Screening factors obscure most of the development **Score 1**	Screening factors completely block any views towards the development, i.e. the development is not within the viewshed
Visual Contrast	**High contrast** with the pattern and form of the natural landscape elements (vegetation and land form), typical land use and/or human elements (infrastructural form) **Score 3**	**Moderate contrast** with the pattern and form of the natural landscape elements (vegetation and land form), typical land use and/or human elements (infrastructural form) **Score 2**	**Corresponds** with the pattern and form of the natural landscape elements (vegetation and land form), typical land use and/or human elements (infrastructural form) **Score 1**	

Table 5 below presents a summary of the overall visual impact of the proposed 132kV OHPL and substation on each of the potentially sensitive visual receptor locations identified within 5kms of the proposed development.

Table 5: Summary Receptor Impact Rating

Receptor Location	Distance to nearest Corridor Alternative			Screening		Contrast		OVERALL IMPACT RATING	
	KMs	Rating		Rating		Rating		Rating	
SR1 - Saaiplaas Guest Farm	3.9	Low	1	Low	1	Mod	2	LOW	3
VR1 - Farmstead	1.1	Mod	2	Low	1	Mod	2	MODERATE	5
*VR2 - Farmstead**	*NIL*								
*VR3 - Farmstead**	*NIL*								
VR4 - Farmstead	1.3	Mod	2	Low	1	High	3	MODERATE	6
VR5 - Farmstead	2.4	Low	1	Mod	2	Mod	2	MODERATE	5
VR6 – Farmstead^	0.0	High	3	Mod	2	Mod	2	MODERATE	7
VR7 - Farmstead	0.6	Mod	2	Mod	2	Mod	2	MODERATE	6
*VR8 – Farmstead**	*NIL*								
*VR9 – Farmstead**	*NIL*								
*VR10 – Farmstead**	*NIL*								
VR11 - Farmstead	4.5	Low	1	Low	1	Mod	2	LOW	4

**Receptor is outside the preliminary viewshed and as such the overall impact rating is "NIL".*
^Receptor is inside the assessment corridor.

The table above shows that the only sensitive receptor within the study area would experience low levels of visual impact as a result of the proposed development, this being the Saaiplaas Guest Farm. Five (5) potentially sensitive receptors will be subjected to moderate levels of visual impact as a result of the proposed powerline development, while one (1) receptor will be subjected to low levels of visual impact. It should be noted however, that most of these receptors are located on farms which are within the project areas for other approved renewable energy projects. As such the owners / occupants are not expected to perceive the proposed powerline and substation in a negative light.

The remaining five (5) receptors are outside the viewshed of the proposed development and are therefore not expected to be subjected to any visual impacts as a result of the powerline development.

As stated above, the R345 main road could be considered as a potentially sensitive receptor road and sections of the proposed powerline are likely to be visible to motorists travelling along this route. The degree of visibility is restricted to some extent by the topography and the likely visual impacts of the powerline and substation would be reduced where sections of the road are some distance from the powerline or substation. The southern section of this road is traversed by the proposed powerline and is therefore likely to experience the most visual impact, although this would be reduced to some degree by the presence of existing high voltage powerlines. In light of this, visual impacts affecting the R354 are rated as **moderate**.

8.3 NIGHT-TIME IMPACTS

The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely to have a significant impact on the nightscape. In contrast, introducing new light sources into a relatively dark night sky will impact on the visual quality of the area at night. It is thus important to identify a night-time visual baseline before exploring the potential visual impact of the proposed development at night.

Much of the study area is characterised by natural areas with pastoral elements and low densities of human settlement. As a result, relatively few light sources are present in the broader area surrounding the proposed development site. The closest built-up area is the town of Matjiesfontein which is situated approximately 34km south of Komsberg Substation and is thus too far away to have significant impacts on the night scene in the study area. At night, the general study area is characterised by a picturesque dark starry sky and the visual character of the night environment is largely 'unpolluted' and pristine. Sources of light in the area are largely limited to lighting from isolated farmsteads and transient light from the passing cars travelling along the R354 main road and gravel access roads. Some light pollution is however likely to emanate from the operational and security lighting at Komsberg substation, Bon Espirange Substation and Roggeveld WEF and this would reduce the impacts of additional lighting in the area.

Powerlines and associated towers or pylons are not lit up at night and, thus light spill associated with the proposed electrical infrastructure project is only likely to emanate from the proposed substation. Although the lighting required at the substation site would normally be expected to intrude on the nightscape, night time impacts of this lighting will be reduced by the existing light spill emanating from the Komsberg and Bon Espirange substations and Roggeveld WEF. It should also be noted that the powerline and substation will only be constructed if the proposed Karreebosch WEF is also developed. Light sources for this facility will include operational and security lighting and thus the lighting impacts from the proposed substation would be subsumed by the glare and contrast of the lighting associated with the WEF. As such, the substation alone is not expected to result in significant lighting impacts.

8.4 CUMULATIVE IMPACTS

Although it is important to assess the potential visual impacts of the proposed powerline and substations specifically, it is equally important to assess the potential cumulative visual impact that could materialise if other renewable energy facilities (both wind and solar facilities) and associated infrastructure projects are developed in the broader area. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include renewable energy facilities and associated infrastructure development.

Renewable energy facilities have the potential to cause large scale visual impacts and the location of several such developments in close proximity to each other could significantly alter the sense of place and visual character in the broader region. Although powerlines and substations are relatively small developments when compared to renewable energy facilities, they may still introduce a more industrial character into the landscape, thus altering the sense of place.

Twenty three (23) renewable energy projects were identified within a 30 km radius of the proposed development as shown in **Figure 25** below. These projects, as listed in **Table 6** were identified using the DFFE's Renewable Energy EIA Application Database for SA in conjunction with information provided by the Environmental Assessment Practitioner (EAP) and Independent Power Producers (IPPs) operating in the broader region.

It is assumed that all of these renewable energy developments include grid connection infrastructure, although few details of this infrastructure were available at the time of writing this report. It should be noted that this list is based on information available at the time of writing this report and as such there may be several other renewable energy projects proposed within the study area.

The relatively large number of renewable energy facilities within the surrounding area and their potential for large-scale visual impacts could significantly alter the sense of place and visual character in the broader region, as well as exacerbate the visual impacts on surrounding visual receptors, once constructed.

Table 6: Renewable energy developments proposed within a 30km radius of the Karreebosch WEF and Grid Connection Infrastructure

LABEL	DFFE REFERENCE	PROJECT TITLE	STATUS
1	12/12/20/1782/1/AM5	140MW Rietrug Wind Energy Facility near Sutherland, Northern Cape Province.	Preferred Bidder Round 5
2	12/12/20/1782/2/AM6	140MW Sutherland 1 Wind Energy Facility near Sutherland, Northern Cape and Western Cape Provinces	Preferred Bidder Round 5
3	12/12/20/1782/3/AM3	140 MW Sutherland 2 Wind Energy Facility near Sutherland, Northern Cape Provinces.	Preferred Bidder Round 5
4	12/12/20/1783/1/AM5	150MW Perdekraal Site 1 Wind Energy Facility, Western Cape Province.	Approved
5	12/12/20/1783/2/AM5	147MW Perdekraal Site 2 Wind Energy Facility, Western Cape Province.	Preferred Bidder Round 4, Operational
6	12/12/20/1988/1/AM6	140 MW Roggeveld Phase 1 Wind Farm, North of Matjiesfontein, Northern Cape and Western Cape Provinces.	Preferred Bidder Round 4, Operational
7	12/12/20/2370/1/AM6	140 MW Karusa Wind Energy Facility, Phase 1, Karoo Hoogland Municipality, Northern Cape Province.	Preferred Bidder Round 4, Operational
8	12/12/20/2370/2/AM6	140 MW Soetwater Wind Farm Phase 2, Karoo Hoogland Municipality, Northern Cape Province.	Preferred Bidder Round 4, Operational
9	12/12/20/2370/3/AM5	140 MW Great Karoo Wind Energy Facility Phase 3, Karoo Hoogland Municipality, Northern Cape Province.	Approved
10	14/1/1/16/3/3/1/2318	310MW Pienaarspoort Wind Energy Facility Phase 1, Witzenberg local Municipality, Western Cape Province	Approved
11	14/12/16/3/3/1/2441	360MW Pienaarspoort Wind Energy Facility Phase 1, Witzenberg local Municipality, Western Cape Province.	Approved

LABEL	DFFE REFERENCE	PROJECT TITLE	STATUS
12	14/12/16/3/3/1/1976/1/AM3	226 MW Kudusberg Wind Energy Facility between Matjiesfontein and Sutherland in Western and Northern Cape Provinces.	Approved
13	14/12/16/3/3/1115	325 WM Rondekop Wind Energy Facility between Matjiesfontein and Sutherland in Western and Northern Cape Provinces	Approved
14	14/12/16/3/3/1/1977/AM3	183 MW Rietkloof Wind Energy Facility near Matjiesfontein in the Western Cape Province.	Preferred Bidder Round 5
15	14/12/16/3/3/1/2542	200 MW Esizayo Wind Energy Facility Expansion near Laingsburg, Western Cape.	In Process
16	14/12/16/3/3/2/2009/AM1	Oya Energy Facility near Laingsburg, Western Cape.	Preferred Bidder Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP)
17	14/12/16/3/3/2/826	140 MW Gunsfontein Wind Energy Facility Karoo Hoogland Municipality, Northern Cape Province.	Approved
18	14/12/16/3/3/2/856 /AM4	275 MW Komsberg West near Laingsburg, Western Cape Provinces	Approved
20	14/12/16/3/3/2/900/AM2	140 MW Brandvalley Wind Energy Facility, WITHIN THE Laingsburg and Witzenberg Local Municipalities in the Western and Northern Cape Province.	Preferred Bidder Round 5
21	14/12/16/3/3/2/962/AM1	140 MW Maralla East Wind Energy Facility, Namakwa and Central Karoo District Municipalities, Western and Northern Cape Provinces.	Approved
22	14/12/16/3/3/2/963/AM1	140 MW Maralla West Wind Energy Facility, Karoo Hoogland local Municipality, Northern Cape Province.	Approved
23	14/12/16/3/3/2/967/AM3	140 MW Esizayo Wind Farm, Laingsburg Local Municipality Western Cape Province.	Approved

These renewable energy projects include 22 WEFs and one (1) Hybrid Facility. Although the different technologies are expected to have different impacts, all renewable energy developments and associated grid connection infrastructure are relevant as they contribute to the alteration of the visual character of the broader area.

Figure 25 below shows that many of the sites proposed for WEF development are located outside the 5 km visual assessment zone and also more than 30km from the proposed OHPL and substation. Given the distance from the study area and the hilly topography in the broader area, it is not anticipated that these developments will result in any significant cumulative impacts affecting the landscape or the visual receptors within the powerline visual assessment zone.

The study area is however directly affected by 2 renewable energy projects, namely the proposed Karreebosch WEF and the operational Roggeveld WEF. These projects and associated infrastructure will

inevitably introduce an increasingly industrial character into a largely natural, pastoral landscape in this sector of the study area, thus giving rise to significant cumulative impacts. Construction of the Roggeveld WEF and the associated grid connection infrastructure is now complete and the landscape has already undergone noticeable change, which will be exacerbated with further WEF development in the area. Impacts of this transformation will however be reduced by the fact the landscape in the vicinity of these proposed WEF developments has already been disturbed by Komsberg substation and the existing powerlines.

An examination of the literature available for the environmental assessments undertaken for many of these renewable energy applications showed that the visual impacts identified, and the recommendations and mitigation measures provided are largely consistent with those identified in this report. Where additional mitigation measures were provided in respect of the other renewable energy applications, these have been incorporated into this report where relevant.

From a visual perspective, the further concentration of renewable energy facilities with associated grid connection infrastructure as proposed will inevitably change the visual character of the area and alter the inherent sense of place, introducing an increasingly industrial character into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures put forward by the visual specialists in their respective reports.

It is important to note however that the study area is located within the REDZ 2, known as Komsberg REDZ, and also within a Strategic Transmission Corridor and thus the relevant authorities support the concentration of renewable energy developments and associated powerline infrastructure in this area. In addition, it is possible that the renewable energy facilities located in close proximity to each other could be seen as one large facility rather than separate developments. Although this will not necessarily reduce impacts on the visual character of the area, it could potentially reduce the cumulative impacts on the landscape.

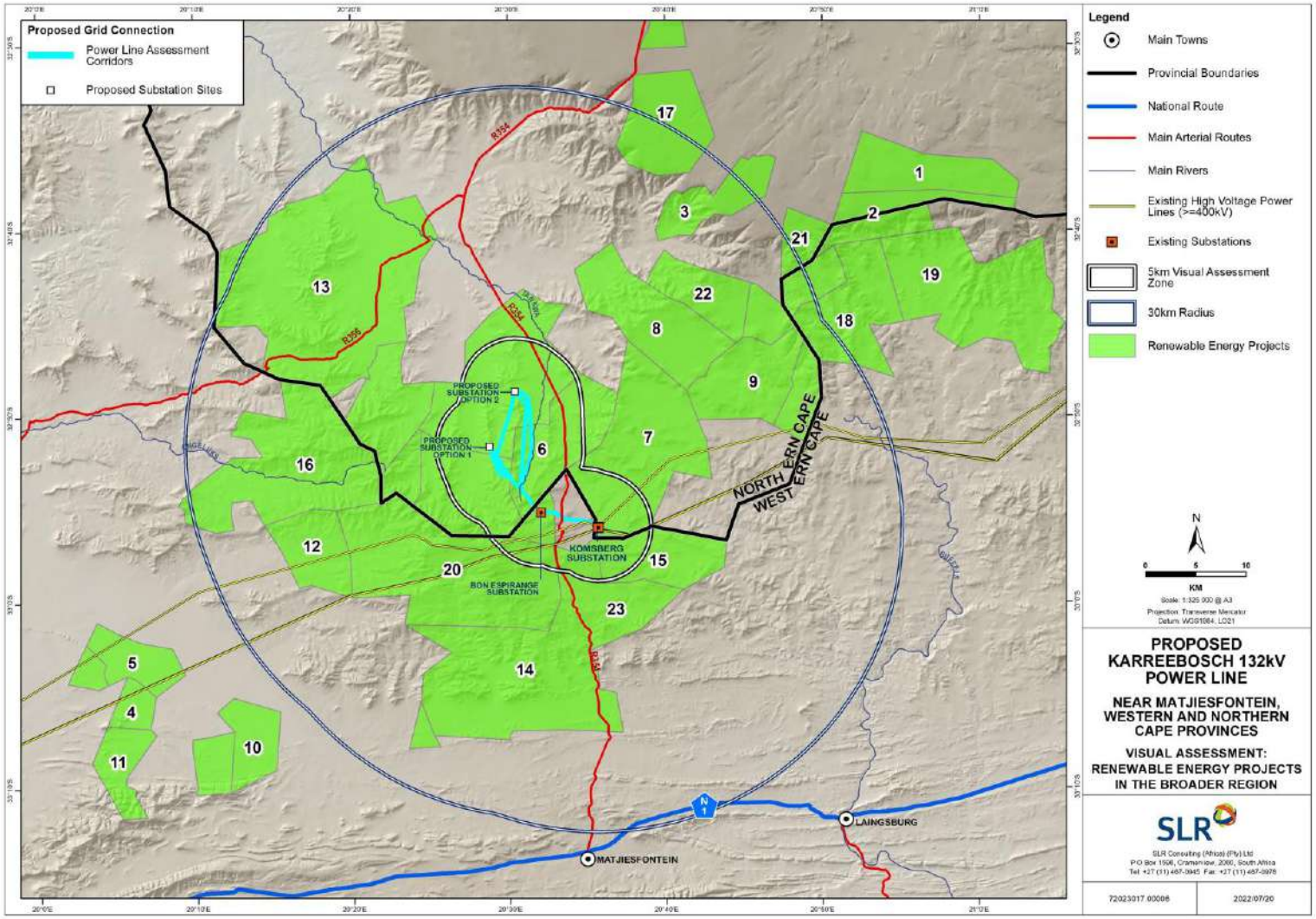

Figure 25: Renewable energy facilities proposed within a 30km radius of the 132kV Karreebosch Powerline

9. OVERALL IMPACT RATING

The EIA Regulations, 2014 (as amended) require that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. The impact matrices for visual impacts associated with the proposed construction, operation and decommissioning of the proposed 132kV powerline and substation are presented below together with preliminary mitigation measures. The mitigation measures have been determined based on best practice and literature reviews.

Please refer to **Appendix D** for an explanation of the impact rating methodology.

9.1 CONSTUCTION PHASE

9.1.1 Impacts

Table 7: Impact Rating for 132kV Karreebosch Powerline and Substation during the construction phase

CONSTRUCTION PHASE: DIRECT IMPACTS																		
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Visual impacts	▪ Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction. ▪ Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment. ▪ Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact. ▪ Litter on the construction site may result in visual pollution.	Construction	Negative	Moderate	3	2	3	2	3	**30**	**N2**	2	2	3	2	2	**18**	**N2**
					Significance	**N2 - Low**							**N2 - Low**						

9.1.2 Mitigation Measures

- Carefully plan to mimimise the construction period and avoid construction delays as much as possible.
- Inform receptors within 500m of the proposed powerline and / or substation of the construction programme and schedules.
- Minimise vegetation clearing and rehabilitate temporary cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Limit the number of vehicles and trucks travelling to and from the construction site, where possible.
- Ensure that dust suppression techniques are implemented as needed:
    - on all access roads;
    - in all areas where vegetation clearing has taken place;
    - on all soil stockpiles.

9.2 OPERATIONAL PHASE

9.2.1 Impacts

Table 8: Impact Rating for 132kV Karreebosch Powerline and Substation during the operational phase

OPERATIONAL PHASE: DIRECT IMPACTS																			
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Visual impacts	▪ The powerline and substation may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ The proposed powerline and substation will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts. ▪ Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. ▪ The night time visual environment will be altered as a result of operational and security lighting at the proposed substation.	▪ Operational	▪ Negative	▪ Moderate	▪ 1	▪ 2	▪ 3	▪ 4	▪ 3	▪ **30**	▪ **N2**	▪ 2	▪ 2	▪ 3	▪ 4	▪ 2	▪ **22**	▪ **N2**
					Significance	**N2 - Low**							**N2 - Low**						

9.2.2 Mitigation Measures

- As far as possible, limit the number of maintenance vehicles using access roads.
- As far as possible, limit the amount of security and operational lighting at the proposed substation.
- Light fittings for security at night should reflect the light toward the ground and prevent light spill.
- Lighting fixtures should make use of minimum lumen or wattage.
- Mounting heights of lighting fixtures should be limited, or alternatively, foot-light or bollard level lights should be used.
- If possible, make use of motion detectors on security lighting.
- Buildings on the substation site should be painted with natural tones that fit with the surrounding environment.
- Non-reflective surfaces should be utilised where possible.

9.3 DECOMMISSIONING PHASE

9.3.1 Impacts

Table 9: Impact Rating for 132kV Karreebosch Powerline and Substation during the decommissioning phase

DECOMISSIONING PHASE: DIRECT IMPACTS																		
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Visual impacts	▪ Potential visual intrusion resulting from vehicles and equipment involved in the decommissioning process; ▪ Potential visual impacts of increased dust emissions from decommissioning activities and related traffic; and ▪ Potential visual intrusion of any remaining infrastructure on the site.	Decommissioning	Negative	Moderate	3	2	3	2	3	**30**	**Rating**	2	2	3	2	2	**18**	**N2**
					Significance	**N2 - Low**							**N2 - Low**						

9.3.2 Mitigation Measures

- All infrastructure that is not required for post-decommissioning use should be removed.
- Carefully plan to minimize the decommissioning period and avoid delays as much as possible.
- Maintain a neat decommissioning site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Limit the number of vehicles and trucks travelling to and from the decommissioning site, where possible.
- Ensure that dust suppression techniques are implemented as needed:
    - on all access roads;
    - in all areas where vegetation clearing has taken place;
    - on all soil stockpiles.
- All cleared areas should be rehabilitated as soon as possible.

9.4 CUMULATIVE IMPACTS

9.4.1 Impacts

Table 10: Cumulative Impacts

CUMULATIVE IMPACTS																		
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Visual impacts	▪ Potential alteration of the visual character and sense of place in the broader area. ▪ Potential visual impact on receptors in the study area. ▪ Potential visual impact on the night time visual environment.	Cumulative	Negative	Moderate	4	3	3	4	3	**42**	**N3**	3	3	3	4	3	**39**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						

9.4.2 Mitigation Measures

- Where possible, limit the number of maintenance vehicles using access roads.
- Non-reflective surfaces should be utilised where possible.
- Where possible, limit the amount of security and operational lighting present at the on-site substation.
- Light fittings for security at night should reflect the light toward the ground and prevent light spill.

10. COMPARATIVE ASSESSMENT OF ALTERNATIVES

As previously mentioned, only one (1) route is technically feasible for the section of the proposed powerline connecting the existing Bon Espirange substation (authorised under 14/12/16/3/3/1/1544) to the Komsberg substation. Accordingly, no comparative assessment is required in respect of this route alignment.

However, two substation alternatives, each with three (3) associated route alternatives are being assessed for the section of the OHPL connecting the on-site substation to the Bon Espirange Substation. These alternatives, as described in Section 3.2.1 and depicted in Figure 2, have been comparatively assessed to determine which of the alternatives would be preferred from a visual perspective.

Preference ratings for each alternative are provided in Table 10 below. The alternatives are rated as "preferred"; "favourable", "least-preferred" or "no-preference". The degree of visual impact and the preference rating has been determined based on the following factors:

- The location of each proposed substation or powerline corridor route alignment alternative in relation to areas of high elevation, especially ridges, koppies or hills;
- The location of each proposed substation or powerline corridor route alternative in relation to sensitive visual receptor locations; and
- The location of each proposed substation or powerline corridor route alternative in relation to areas of natural vegetation (clearing site for the development worsens the visibility).

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 11: Comparative Assessment of Substation and Powerline Corridor Route Alternatives

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
Substation Option 1	Favourable	▪ Substation Option 1 is located at the base of a prominent ridge, in a relatively hilly area. As such, development on this site would not be exposed on the skyline. ▪ This option is approximately 13.5km from the only sensitive receptor in the study area (SR1) and, considering the hilly nature of the terrain, substation development on this site is unlikely to be visible from this receptor location. ▪ The closest potentially sensitive receptor to this alternative is approximately 1.6kms away, this being VR4. The visual impacts from Option 1 affecting this receptor are therefore rated as moderate. Considering the nature of the terrain surrounding this site however, the substation is only expected to be partially visible from this site, thus reducing the degree of visual impact. The remaining

Alternative	Preference	Reasons (incl. potential issues)
		receptors are all more than 2.5kms away and, would only be subjected to low or negligible levels of impact. ▪ Option 1 is located some 7.7km from the nearest section of the R354 receptor road and as such travelers utilising this road would only experience negligible levels of visual impacts from the substation development. These impacts would be further reduced by the hilly terrain across the study area which effectively screens views from much of this road. ▪ In light of the above, there are no fatal flaws associated with Option 1 and this alternative is considered favourable from a visual perspective.
Substation Option 2	Favourable	▪ Substation Option 2 is located on the lower slopes of a prominent ridge, in a relatively hilly area. As such, development on this site would be moderately exposed on the skyline. ▪ This option is approximately 14km from the only sensitive receptor in the study area (SR1) and considering the hilly nature of the terrain, substation development on this site is unlikely to be visible from this receptor location. ▪ The closest potentially sensitive receptor to this alternative is approximately 2.9kms away, this being VR1. The visual impacts from Option 2 affecting this receptor are therefore rated as low. Considering the nature of the terrain surrounding this site however, the substation is not expected to be visible from this site, thus reducing the degree of visual impact. The remaining receptors are all more than 4kms away and would only be subjected to low or negligible levels of impact. In addition, the nature of the terrain is such that this site is only likely to be visible from very few receptor locations. ▪ Option 2 is located some 3.5km from the nearest section of the R354 receptor road and as such travelers utilising this road would only experience low levels of visual impact resulting from the substation development. These impacts would be further reduced by the hilly terrain across the study area which effectively screens views from much of this road. ▪ In light of the above, there are no fatal flaws associated with Option 2 and this alternative is considered favourable from a visual perspective.
POWERLINE CORRIDOR ROUTE ALTERNATIVES		
Powerline Corridor Options 1A, 1B and 1C	Favourable	▪ From a visual impact perspective, there is little difference between Options 1A, 1B and 1C. ▪ For all three options, visibility varies as the route alignments follow valley lines and traverse ridges. Significant sections of each option would not be visible from the surrounding receptors, the least visible section being along Option 1A. Remaining sections of the alignments have been shown to have low to medium-low levels of visibility from the receptor locations. Even where the alignments traverse ridges, the visibility analysis does not indicate that these ridges are highly visible from the surrounding landscape. As such the powerlines would only be moderately exposed on the skyline. ▪ This option is approximately 7.9km from the only sensitive receptor in the study area (SR1) and considering the hilly nature of the terrain, only some sections of the powerlines are expected to be visible from this location. As such, visual impacts of the powerline are expected to be negligible and these would be further reduced by the presence of existing high voltage powerlines and Komsberg substation.

Alternative	Preference	Reasons (incl. potential issues)
		▪ Eight (8) potentially sensitive receptors are located within 5kms of Options 1A, 1B and 1C, although the sections of the proposed powerlines are only expected to be visible from four (4) of these locations. The closest potentially sensitive receptor to this alternative is VR6 which is located inside the assessment corridor. The visual impacts from Options 1A, 1B and 1C affecting this receptor are therefore rated as high. However, this farmstead is located within the Roggeveld WEF project area and in close proximity to the existing Bon Espirange Substation, and the land owner has consented to the proposed development on their property and does not perceive the proposed powerline in a negative light. The remaining receptors are all more than 1.5kms away and, would only be subjected to moderate or low levels of impact. ▪ All three Options are located some 2km from the nearest section of the R354 receptor road and as such travelers utilising this road would only experience moderate to low levels of visual impact resulting from the powerlines. These impacts would be further reduced by the hilly terrain across the study area which effectively screens views from sections of this road. ▪ The major portion of all of these route alignments is located in the project area for the Roggeveld WEF, and as such these sections of the route alignment have undergone some transformation from the natural state. This would lessen the impacts of a new powerline in this area. ▪ In light of the above, there are no fatal flaws associated with Option 1A, Option 1B and Option 1C and all of these alternatives are considered favourable from a visual perspective.
Powerline Corridor Options 2A, 2B and 2C	Favourable	▪ The southern sections of Options 2A, 2B and 2C all follow very similar route alignments to Options 1A, 1B and 1C. The northern sections of these alternatives however run in between ridges which provide a degree of topographic screening. ▪ For all three options, visibility varies as the route alignments follow valley lines and traverse ridges. It should however be noted that much of the northern section of Option 2A is outside the viewshed of the identified receptors. Remaining sections of all three alignments have been shown to have low to medium-low levels of visibility from the receptor locations. Even where the alignments traverse ridges, the visibility analysis does not indicate that these ridges are highly visible from the surrounding landscape. As such the powerlines would only be moderately exposed on the skyline. ▪ This option is approximately 7.9km from the only sensitive receptor in the study area (SR1) and considering the hilly nature of the terrain, only some sections of the powerlines are expected to be visible from this location. As such, visual impacts of the powerline are expected to be negligible and these would be further reduced by the presence of existing high voltage powerlines and Komsberg substation. ▪ Eleven (11) potentially sensitive receptors are located within 5kms of Options 2A, 2B and 2C, although the sections of the proposed powerlines are only expected to be visible from six (6) of these locations. The closest potentially sensitive receptor to this alternative is approximately 30m away, this being VR6. The visual impacts from Options 2A, 2B and 2C affecting this receptor are therefore rated as high. However, this farmstead is located within the Roggeveld WEF project area and in close proximity to the existing Bon Espirange Substation, and the land owner has consented to the proposed development

Alternative	Preference	Reasons (incl. potential issues)
		on their property and does not perceive the proposed powerline in a negative light. The remaining receptors are all more than 1.5kms away and, would only be subjected to moderate or low levels of impact. ▪ All three Options are located some 2km from the nearest section of the R354 receptor road and as such travelers utilising this road would only experience moderate to low levels of visual impact resulting from the powerlines. Although the northern sections of Options 2B and 2C are closer to the road than Option 2A, visibility westwards is reduced by the hilly terrain across the study area which effectively screens views from sections of this road. ▪ The major portion of all of these route alignments is located in the project area for the Roggeveld WEF, and as such these sections of the route alignment have already undergone some transformation from the natural state. This would lessen the impacts of a new powerline in this area. ▪ In light of the above, there are no fatal flaws associated with Option 2A, Option 2B and Option 2C and all of these alternatives are considered favourable from a visual perspective.

10.1 NO-GO ALTERNATIVE

The 'No Go' alternative is essentially the option of not developing powerlines or substations in this area. The area would thus retain its visual character and sense of place and no visual impacts would be experienced by any locally occurring receptors.

11. CONCLUSION

A VIA has been conducted to assess the magnitude and significance of the potential visual impacts associated with the construction of a proposed 132 kV OHPL, 33/132kV substation and associated infrastructure to support the proposed Karreebosch WEF located near Matjiesfontein in the Western Cape Province. Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, the proposed powerline and substation development could potentially alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area. The level of contrast is however reduced by the presence of the Roggeveld WEF, Komsberg substation and existing high voltage powerlines located in the central and southern sectors of the study area.

The area is not however typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. A total of 12 potentially sensitive receptors were identified in the study area, one (1) of which is considered to be a sensitive receptor as it is linked to leisure/nature-based tourism activities in the area.

According to the receptor impact rating undertaken for this VIA, the only sensitive receptor identified within the study area would experience low levels of visual impact as a result of the proposed development, this being the Saaiplaas Guest Farm. Five potentially sensitive receptors will be subjected to moderate levels of visual impact as a result of the proposed powerline and substation development, while one receptor will be subjected to low levels of visual impact. It should be noted however, that most of these receptors are located on farms which are within the project areas for approved renewable energy projects. As such the owners / occupants are not expected to perceive the proposed powerline and substation in a negative light.

The remaining five (5) receptors are outside the viewshed of the proposed development and are therefore not expected to be subjected to any visual impacts as a result of the powerline development.

An overall impact rating was also conducted in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed 132kV powerline and substation will be of low significance during construction, operation and decommissioning phases with a number of mitigation measures available.

Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 30km radius of the proposed development, it was determined that only two (2) of these would have any significant impact on the landscape within the visual assessment zone. These facilities are the authorised Karreebosch WEF (14/12/16/3/3/2/807/AM3) and the operational Roggeveld WEF (12/12/20/1988/1). These facilities and the associated grid connection infrastructure will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, pastoral landscape, thus giving rise to significant cumulative impacts. It is, however, anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and

mitigation measures stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area however, cumulative impacts have been rated as medium.

It is important to note that the study area is located within the Komsberg REDZ, and also within the Central Strategic Transmission Corridor, and thus the relevant authorities support the concentration of renewable energy developments and associated grid connection infrastructure in this area. In addition, it is possible that the renewable energy facilities located in close proximity to each other could be seen as one large facility rather than separate developments. Although this will not necessarily reduce impacts on the visual character of the area, it could potentially reduce the cumulative impacts on the landscape.

A comparative assessment of alternatives was undertaken in order to determine which of the substation options and powerline corridor alternatives would be preferred from a visual perspective. No fatal flaws were identified for either of the substation site alternatives or any of the proposed powerline corridor alternatives and all alternatives were found to be favourable.

11.1IMPACT STATEMENT

It is SLR's opinion that, overall, the visual impacts associated with the proposed Karreebosch 132kV OHPL and associated 33/132kV substation are of moderate significance. Given the low level of human habitation and the relative absence of sensitive receptors, the project is deemed acceptable from a visual impact perspective and the EA should be granted for the EA application. SLR is of the opinion that the visual impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

12. REFERENCES

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RECORD OF REPORT DISTRIBUTION

SLR Reference:	720.23017.00006
Title:	Visual Impact Assessment for the Proposed Karreebosch 132kV Powerline
Report Number:	1
Client:	WSP Group Africa (Pty) Ltd

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APPENDIX 4: Heritage Screening Assessment and NID Submission

APPLICATION FORM
NOTIFICATION OF INTENT TO DEVELOP (NID)
SECTION 38 (1) AND SECTION 38 (8)

Heritage Western Cape Reference No:
To be completed by the applicant

Completion of this form is required by Heritage Western Cape for the initiation of all impact assessment processes under Section 38 (1) & (8) of the National Heritage Resources Act (NHRA)

As per Section 38 (1) (e) of the NHRA, submission of the NID must be initiated at the earliest stage of development. Should the development trigger any other legislation, practitioners may submit the NID without formal submission to other statutory bodies in order to comply with the NHRA.

This form is to be read in conjunction with the HWC Notification of Intent to Develop, Heritage Impact Assessment, (Pre-Application) Basic Assessment Reports, Scoping Reports and Environmental Impact Assessments, Guidelines for Submission to HWC

Whilst it is not a requirement, it may expedite processes and in particular avoid calls for additional information if certain of the information required in this form is provided by a heritage specialist/s with the necessary qualifications, skills and experience. All sections of the form must be completed in order to deem the application to be complete.

Making an incorrect statement or providing incorrect information may result in all or part of the application having to be reconsidered by HWC in the future, or submission of a new application.

The following information is to be included upon submission to HWC:

1. Proof of payment with correct reference number (see Appendix A)
2. Completed and signed application form – the application form must be completed in full in order to be considered
3. Power of Attorney
4. Locality Map (see Appendix B)
5. Images of the site and its context
6. Additional information pertaining to the heritage of the site

Application and associated documentation to be emailed to ceoheritage@westerncape.gov.za

A. APPLICABILITY OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA)

Department of Environmental Affairs Development Planning (Western Cape); Department of Mineral Resources (National); Department of Environmental Affairs (National); Reference Number (if applicable): **N/A**	
Please tick the applicable section:	
☒	This application is made in terms of Section 38(8) of the NHRA and an application under NEMA has been made to the following authority: National Department of Forestry, Fisheries and Environment (DFFE)
☐	This development will not require a NEMA application.

B. BASIC DETAILS

PROPERTY DETAILS:

Name of property: Karreebosch Overhead Powerline and Substation	
Street address or location (eg: off R44): 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces.	
Erf or farm number/s: Portion 2 (Nuwe Kraal) of Farm Ek Kraal No. 199 Remainder of Farm Wilgebosch Rivier No. 188 Remainder of farm Klipbanks Fontein No. 198 Portion 1 of Farm Klipbanks Fontein No. 198 Remainder of Farm Karreebosch No. 200 Portion 1 of Farm Ek Kraal No. 199 Remainder of Farm Ek Kraal No.199 Remainder of Farm Bon Espirange No. 73 Farm Rietfontein No. 197 Portion 1 of Farm Bon Espirange No. 73 Farm Aprils Kraal No. 105 Portion 2 of Farm Standvastigheid No. 210 RE/210 Standvastheid See attached Project Description	Coordinates: 32°53'48.07"S 20°30'44.56"E (A logical centre point. Format based on WGS84.)
Town or District: Laingsburg	Municipality: extends over Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province
Extent of property: Between 14km - 20km (longest connection alternative 20.5km in full extent)	Current use: Renewable Energy, some sections are used for agricultural grazing (private landowners)
Predominant land use/s of surrounding properties: Some sections are used for agricultural grazing (private landowners) and renewable energy	

REGISTERED OWNER OF PROPERTY:

Name and Surname: *See attached list*
Address:

Telephone:	Cell:	E-mail:

APPLICANT/ AUTHORISED AGENT:

Name and Surname: Kilian Hagemann of Karreebosch Wind Farm RF (Pty) Ltd		
Address: 125 Buitengracht Street, 5th floor Cape Town 8001, South Africa		
Telephone +27 21 300 0610	Cell	E-mail karreebosch@g7energies.com

By the submission of this form and all material submitted in support of this notification (ie: 'the material'), all applicant parties acknowledge that they are aware that the material and/or parts thereof will be put to the following uses and consent to such use being made: filing as a public record; presentations to committees, etc; inclusion in databases; inclusion on and downloading from websites; distribution to committee members and other stakeholders and any other use required in terms of powers, functions, duties and responsibilities allocated to Heritage Western Cape under the terms of the National Heritage Resources Act. Should restrictions on such use apply or if it is not possible to copy or lift information from any part of the digital version of the material, the material will be returned unprocessed. All sections of the form have been completed.

Signature of Owner: Date:

_____

Should the owner not be able to sign, the applicants/ agents must attach a copy of power of attorney to this form.

Signature of Applicant/ Authorised Agent: Date:

_____

Applicants/ agents must attach a copy of power of attorney to this form.

C. DEVELOPMENT DETAILS:

Please indicate below which of the following Sections of the National Heritage Resources Act, or other legislation has triggered the need for notification of intent to develop.

☒	S38(1)(a) Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.	S38(1)(c) Any development or activity that will change the character of a site -	
☐	S38(1)(b) Construction of a bridge or similar structure exceeding 50m in length.	☐	(i) exceeding 5 000m^2 in extent;
☐	S38(1)(d) Rezoning of a site exceeding 10 000m^2 in extent.	☐	(ii) involving three or more existing erven or subdivisions thereof;

☒	Other triggers, eg: in terms of other legislation, (ie: National Environment Management Act, etc.) Please set out details: NEMA	☐	(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years. If you have checked any of the three boxes above, describe how the proposed development will change the character of the site:

If an impact assessment process has also been / will be initiated in terms of other legislation please provide the following information:

Authority / government department (ie: consenting authority) to which information has been /will be submitted for final decision: National DFFE

Present phase at which the process with that authority stands:

Provide a full description of the nature and extent of the proposed development or activity including its potential impacts:

The proposed 132kV Karreebosch Overhead Powerline (OHPL), 33/132kV Substation and associated infrastructure is located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The proposed Karreebosch OHPL will evacuate power from the authorised Karreebosch Wind Energy Facility (WEF) (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), located in the Northern Cape Province, and will connect to the existing Komsberg substation.

The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures. Figure 6 below provides an example of a conventional lattice tower compared with a monopole structure. Pole positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). However, a 400m wide assessment corridor is being considered (200m wide on either side of the centre line) and has been walked down by the specialists for approval to allow for micro siting of tower positions once the detailed design has been completed. It is anticipated that towers will be located on average 200m to 250m apart; however, longer spans may be needed due to terrain and watercourse crossings.

The registered servitude will fall within this 400m wide assessment corridor and will be 31m wide (15.5 m on either side of the centre line). The Right of Way servitude (servitude road) will be up to 14m wide (7m on either side of centre line), resulting in a total servitude width of 45m in total. The length of the longest powerline route alternative is 20.52 km, which will result in a servitude area of up to 92.3 ha.

The servitude is required to ensure safe construction, maintenance and operation of the powerline. Registration of the servitude grants the operator the right to erect, operate and maintain the powerline and to access the land to carry out such activities, but it does not constitute full ownership of the land. It should be noted that the OHPL will be ceded to Eskom post-construction.

Construction and operation activities and access to the powerline will be carried out with due respect to the affected landowners. The servitude required for the Project will be registered at the Deeds Office and will form part of the title deed of the relevant properties once the environmental authorisation has been obtained.

The Karreebosch OHPL will be routed from the proposed onsite Karreebosch 33/132kV substation (associated with the approved Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3 which is currently undergoing a Part 2 EA amendment,

final layout and EMPr approval process) to the existing Bon Espirange substation, after which it will connect to the existing 400kV Komsberg substation. Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site have been assessed as part of as part of the Basic Assessment Process, each with a 200m x 150m (3 ha) footprint. A 200m assessment area surrounding the proposed substation alternatives have been included as part of this assessment for micro siting, with a slight funnel leading into the existing Bon Espirange and Komsberg substations to allow for greater flexibility for micro siting for incoming proposed line connections. The proposed Karreebosch OHPL may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed as part of this BAR.

Estimated value cost of the project in South African Rands: R___Unknown at this stage_____

D. ANTICIPATED IMPACTS ON HERITAGE RESOURCES

Section 3 of the National Heritage Resources Act sets out the following categories of heritage resource as forming part of the national estate. Please indicate the known presence of any of these by checking the box alongside and then providing a description of each occurrence, including nature, location, size, type

Failure to provide sufficient detail or to anticipate the likely presence of heritage resources on the site may lead to a request for more detailed specialist information.

Provide a short history of the site and its environs (Include sources where available):

See attached desktop heritage screening assessment

Please indicate which heritage resources exist on the site and in its environs, describe them and indicate the nature of any impact upon them:	
☐	**Places, buildings, structures and equipment of cultural significance** Description of resource: Description of impact on heritage resource:
☐	**Places to which oral traditions are attached or which are associated with living heritage** Description of resource: Description of impact on heritage resource:
☐	**Historical settlements and townscapes** Description of resource: Description of impact on heritage resource:

☐	**Landscapes and natural features of cultural significance** Description of resource: Description of impact on heritage resource:
☐	**Geological resources of scientific or cultural importance** Description of resource: Description of impact on heritage resource:
☒	**Archaeological resources** (Including archaeological sites and material, rock art, battlefields & wrecks)**:** Description of resource: Potential impact to archaeological heritage Description of impact on heritage resource: Destruction through placement of pylon footings
☐	**Palaeontological resources** (i.e: fossils)**:** Description of resource: Description of impact on heritage resource:
☐	**Graves and burial grounds** (eg: ancestral graves, graves of victims of conflict, historical graves & cemeteries)**:** Description of Resource: Description of Impact on Heritage Resource:
☐	**Other human remains:** Description of resource: Description of impact on heritage resource:
☐	**Sites of significance relating to the history of slavery in South Africa:** Description of resource: Description of impact on heritage resource:
☐	**Other heritage resources:** Description of resource: Description of impact on heritage resource:

Describe elements in the environs of the site that could be deemed to be heritage resources:

This application is for a proposed powerline associated with the approved Karreebosch Wind Energy Facility (WEF) located in both the Western and Northern Cape Provinces (14/12/16/3/3/2/807/AM3). The Karreebosch WEF was previously referred to as Phase 2 of the Roggeveld WEF. SAHRA has made numerous comments on both the Roggeveld WEF and the Karreebosch WEF from 2013 with the last comment issued on 26 September 2018 (Case 7379 on SAHRIS). EA was granted for the Karreebosch WEF on 29 January 2016. In the EA, various requirements were stipulated in terms of impacts to Historical, Cultural and Palaeontological sites. Much of the area proposed for the development of the powerline was assessed as part of the HIA completed for the Karreebosch WEF (Figure 2a and 2b of the Screening Assessment) drafted by the ACO (Kendrick, 2015, SAHRIS Ref 183350). The remaining sections of the proposed powerline were assessed in the Heritage Assessments completed for the Roggeveld WEF (Hart and Webley, 2013, SAHRIS Ref 152531). The heritage information identified in these reports has been extracted and are mapped in Figures 3, 3a and 3b of the Screening Assessment. These reports are also referred to below in order to provide a contextual analysis of the heritage sensitivity of the area proposed for development.

The area proposed for development has been previously assessed, more than once. In addition, the proposed powerline routes lie immediately adjacent to existing grid infrastructure. The original fieldwork conducted for the Roggeveld WEF HIA (Hart and Webley, 2013) which covered the area proposed for development was comprehensive and remains relevant, similarly the fieldwork conducted for the Karreebosch WEF (2015). The Karreebosch HIA (2015) "*revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area. There are a number of existing farm houses that contain 19th century fabric, however very few of these have anything more than moderate heritage significance. Parts of the study area enjoy very high aesthetic qualities with the area known by locals as "Gods Window" having grade II aesthetic qualities, hence the significance of the study area lies mainly with its undeveloped wilderness qualities. Interestingly, pre-colonial or stone age heritage and archaeology is extremely scarce in the areas that were searched. Very few archaeological sites of these kinds were recorded despite the fact that overall 9 experienced archaeologists were involved in scouring the landscape.*" The HIA for the Karreebosch WEF notes that "*The most important colonial archaeological sites in the study area are associated with Ekkraal Valley, the Rietfontein-Wilgebosch River valley and the Krans Kraal-Karrekraal valley. The valley bottoms are archaeologically sensitive...*". As the proposed powerline alternatives traverse the valley areas which have been determined to be archaeologically sensitive, it is likely that significant archaeological heritage resources may be impacted by the proposed development. Further specialist archaeological assessment is therefore recommended.

According to the SAHRIS Palaeosensitivity Map (Figure 4 of the Screening Assessment), the area proposed for the powerline development is underlain by sediments of very high palaeontological sensitivity belonging to the Abrahamskraal Formation of the Beaufort Group. A Palaeontological Assessment was conducted by Almond (2015) for the Karreebosch WEF which covers a larger portion of the area proposed for the powerline development, and covered the proposed powerline alternatives specifically (Figure 2b above, Appendix to the ACO Report 2015, SAHRIS Ref 183350). According to Almond (2015), "*The fluvial Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) that underlies almost the entire wind farm study area is known for its diverse fauna of Permian fossil vertebrates - notably various small- to large-bodied therapsids and reptiles - as well as fossil plants of the Glossopteris Flora and low diversity trace fossil assemblages. However, desktop analysis of known fossil distribution within the Main Karoo Basin shows a marked paucity of fossil localities in the study region between Matjiesfontein and Sutherland where sediments belonging only to the lower part of the thick Abrahamskraal Formation succession are represented. Bedrock exposure levels in the Karreebosch Wind Farm study area are generally very poor due to the pervasive cover by superficial sediments (colluvium, alluvium, soils, calcrete) and vegetation. Nevertheless, a sufficiently large outcrop area of Abrahamskraal Formation sediments, exposed in stream and riverbanks, borrow pits, erosion gullies as well as road cuttings along the R354, has been examined during the present fieldwork to infer that macroscopic fossil remains of any sort are very rare indeed here. Exceptions include common trace fossil assemblages (invertebrate burrows) and occasional fragmentary plant remains (horsetail ferns). Levels of tectonic deformation of the bedrocks are generally low and baking by dolerite intrusions (Early Jurassic Karoo Dolerite Suite) is very minor. It is concluded that the Lower Beaufort Group bedrocks in the study area are generally of low palaeontological sensitivity and this also applies to the overlying Late Caenozoic superficial sediments (colluvium, alluvium, calcrete, soils etc).*"

Dr Almond goes on to note that "*No areas or sites of exceptional fossil heritage sensitivity or significance have been identified within the Karreebosch Wind Farm study area. The majority of fossil sites recorded in the study region lie*

outside the anticipated development footprint. The common trace fossil assemblages identified in this study are of widespread occurrence within the Abrahamskraal Formation (i.e. not unique to the study area). Construction of the Karreebosch Wind Farm and associated infrastructure is therefore unlikely to entail significant impacts on local fossil heritage resources; i.e. the impact significance of the wind farm project is assessed as MINOR. The impact significance of both transmission line route options to Komsberg Substation (Figure 2b) is likewise assessed as MINOR and there is no marked preference for either route option on palaeontological grounds. Irreplaceable loss of fossil heritage is not anticipated, although it should be highlighted that any new vertebrate fossil finds made during construction (e.g. exposed in new bedrock excavations) would be of considerable scientific interest, given their rarity." According to the HIA for the Karrebosch WEF (ACO, 2015), "*While the geology of the study area is potentially palaeontologically sensitive, very few fossils were found by either Dr Duncan Miller or Dr John Almond in the study area. No further work in this respect is recommended, other than reporting of any finds during construction to the heritage authorities.*" Due to the overlap in assessment areas (Figure 2b of the Screening Assessment), these findings can be extrapolated to the current proposed powerline development. As such, it is recommended that little new information is likely to be gained by further palaeontological fieldwork. Potential impacts to palaeontological heritage can be mitigated through the inspection of final pylon footings by a palaeontologist prior to construction.

According to various ACO reports (2011, 2013 and 2015), parts of the study area enjoy very high aesthetic qualities hence the significance of the study area lies mainly with its undeveloped wilderness qualities which may be negatively impacted by the development of the proposed powerline. However, it must be noted that the proposed powerline is located within a Renewable Energy Development Zone which has been identified for this kind of development. In REDZ areas, there is a reasonable expectation that the cultural landscape of an area will be changed to be dominated, or at least heavily altered, by renewable energy development and its associated infrastructure. In fact, this is the intention of the REDZ areas. Furthermore, the proposed powerline is located within a suite of authorised renewable energy facilities (Figure 5 of the Screening Assessment) and as such, the impact of this proposed powerline on the cultural landscape is likely to be negligible. No further specialist cultural landscape assessment is therefore recommended.

Description of impacts on heritage resources in the environs of the site:

Based on the information available, it is likely that the proposed grid connection corridor will impact on significant archaeological heritage and as such, it is recommended that a Heritage Impact Assessment is conducted that complies with section 38(3) of the NHRA for the proposed development with special focus on impacts to significant archaeological heritage.

Summary of anticipated impacts on heritage resources:

Based on the information available, it is likely that the proposed grid connection corridor will impact on significant archaeological heritage and as such, it is recommended that a Heritage Impact Assessment is conducted that complies with section 38(3) of the NHRA for the proposed development with special focus on impacts to significant archaeological heritage.

E. ILLUSTRATIVE MATERIAL:

Attach to this form a minimum A4 sized locality plan showing the boundaries of the area affected by the proposed development, its environs, property boundaries and a scale. The plan must be of a scale and size that is appropriate to creating a clear understanding of the development.

Attach also other relevant graphic material such as maps, site plans, satellite photographs and photographs of the site and the heritage resources on it and in its environs. These are essential to the processing of this notification.

Please provide all graphic material on paper of appropriate size and on CD/ USB in JPEG format. It is essential that graphic material be annotated via titles on the photographs, map names and numbers, names of files and/or provision of a numbered list describing what is visible in each image.

F. RECOMMENDATION

In your opinion do you believe that a heritage impact assessment is required? ☒ Yes ☐ No

Recommendation made by:

Name: Jenna Lavin

Capacity: Heritage Assessment Practitioner

PLEASE NOTE: No Heritage Impact Assessment should be submitted with this form or conducted until Heritage Western Cape has expressed its opinion on the need for such and the nature thereof.

G. INFORMATION TO BE PROVIDED AND STUDIES TO BE CONDUCTED AS PART OF THE HERITAGE IMPACT ASSESSMENT (HIA)

If it is recommended that an HIA is required, please complete this section of the form.

DETAILS OF STUDIES TO BE CONDUCTED IN THE INTENDED HIA

In addition to the requirements set out in Section 38(3) of the NHRA, indicate envisaged studies:	
☒	Heritage resource-related guidelines and policies.
☐	Local authority planning and other laws and policies.
☐	Details of parties, communities, etc. to be consulted.
☒	Specialist studies, eg: archaeology, palaeontology, architecture, townscape, visual impact, etc. Provide details: Archaeology (CTS Heritage), Palaeontology (Natura Viva)
☐	Other. Provide details:

PLEASE NOTE: Any further studies which Heritage Western Cape requires should be submitted must be in the form of a single, consolidated report with a single set of recommendations. Specialist studies must be incorporated in full, either as chapters of the report, or as annexures thereto.
Please refer to the *Guidelines for Heritage Impact Assessments required in terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999)*

Surname	Name	Farm Name	Farm Number	Portion	Tel	Cell
Paulse	Nellie	Wilgebosch Rivier	188	RE	023-572-1036	
Breedt	Johannes	Wilgebosch Rivier	188	RE	012-346-3634	082-825-6577
Breedt	Riana	Wilgebosch Rivier	188	RE		082-399-2795
le Roes	Johanna	Klipbanks Fontein	198	1	023-551-1094 023-551-1362	
le Roux	Esti	Klipbanks Fontein	198	RE	023-004-0138	083-234-5313
Conradie	Ockert	Kareebosch	200	RE	023 5511 821 087 806 3257	082 2924 545 073 357 1176-Dotjie
Steenkamp	Helene	Ek Kraal (Nuwekraal)	199	2	021 903 8203/4069	082-891-0468
Calldo	Douglas and Esme	Ek Kraal	199	1	023-551-1812	078-081-2462
Conradie	Marina	Ek Kraal	199	RE	023-551-1711	079-711-4212
Conradie	Marina	Bon Espirange	73	RE	023-551-1711	079-711-4212
Calldo	Douglas and Esme	Aprils Kraal	105	0	023-5511-812	078-081-2462
Motsisi	Lungile	Standvastigheid	210	2	011-800-8111	
Le Roux	Kobus	Rietfontein	197	0	023-0040-230	078 358 4330 (Kobus) 084 512 7372 (wife)

CTS HERITAGE

HERITAGE SCREENER

CTS Reference Number:	**CTS21_108**
HWC Ref No.	
SAHRIS Case No.	**17397**
Client:	**WSP**
Date:	**July 2022**
Title:	**Proposed establishment of 132kV powerline to evacuate power from the Karreebosch WEF to the National Grid in the Western and Northern Cape**

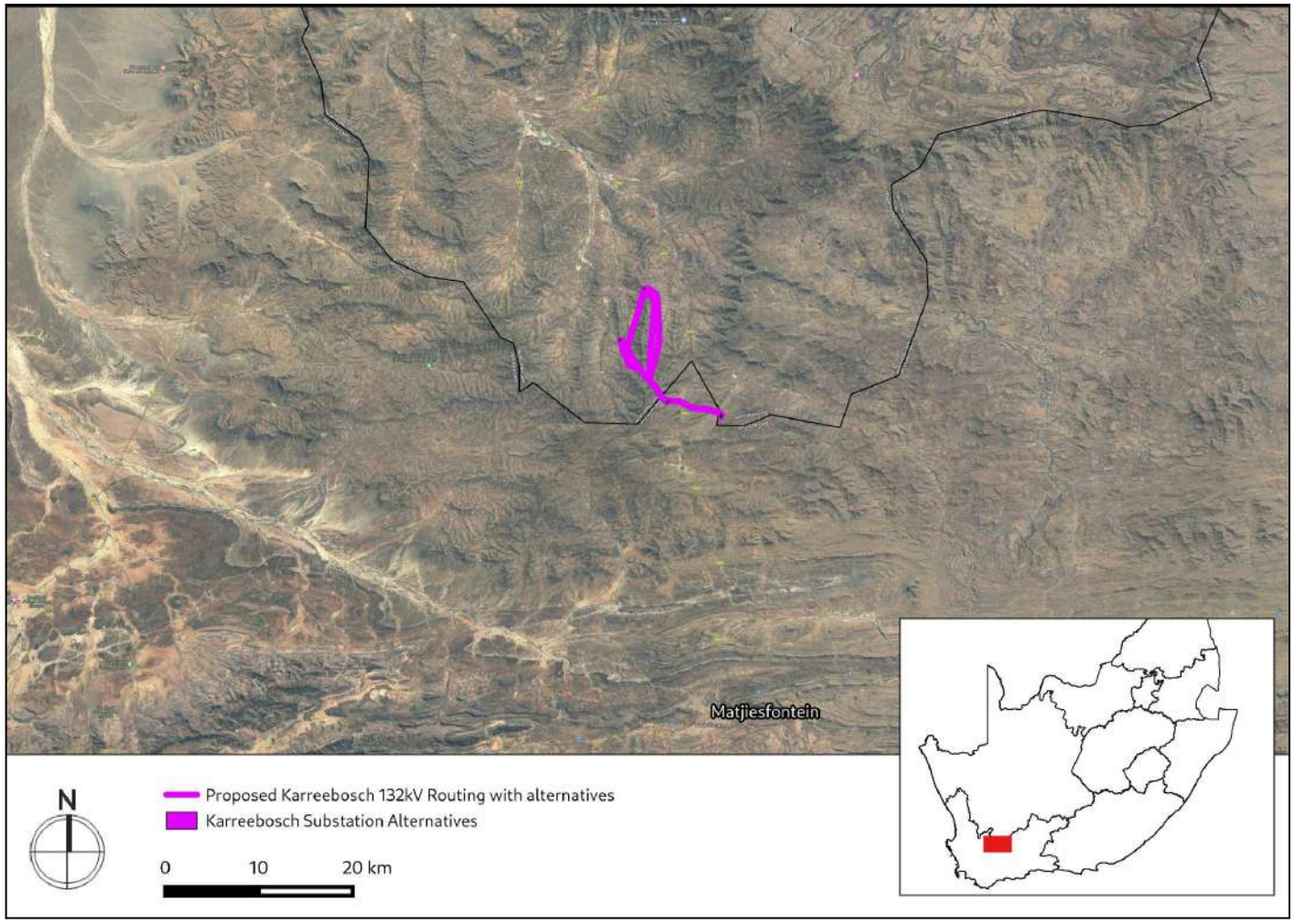


Figure 1a. Satellite map indicating the location of the proposed development in the Western and Northern Cape

CTS Heritage Recommendation	**RECOMMENDATION** **Based on the information available, it is likely that the proposed grid connection corridor will impact on significant archaeological heritage and as such, it is recommended that a Heritage Impact Assessment is conducted that complies with section 38(3) of the NHRA for the proposed development with special focus on impacts to significant archaeological heritage.**

CTS Heritage
238 Queens Road, Simons Town
Email: info@ctsheritage.com **Web:** www.ctsheritage.com

CTS HERITAGE

1. Proposed Development Summary

The proposed 132kV Karreebosch Overhead Powerline (OHPL), 33/132kV Substation and associated infrastructure is located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The proposed Karreebosch OHPL will evacuate power from the authorised Karreebosch Wind Energy Facility (WEF) (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), located in the Northern Cape Province, and will connect to the existing Komsberg substation.

The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures. Figure 6 below provides an example of a conventional lattice tower compared with a monopole structure. Pole positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). However, a 400m wide assessment corridor is being considered (200m wide on either side of the centre line) and has been walked down by the specialists for approval to allow for micro siting of tower positions once the detailed design has been completed. It is anticipated that towers will be located on average 200m to 250m apart; however, longer spans may be needed due to terrain and watercourse crossings.

The registered servitude will fall within this 400m wide assessment corridor and will be 31m wide (15.5 m on either side of the centre line). The Right of Way servitude (servitude road) will be up to 14m wide (7m on either side of centre line), resulting in a total servitude width of 45m in total. The length of the longest powerline route alternative is 20.52 km, which will result in a servitude area of up to 92.3 ha.

The servitude is required to ensure safe construction, maintenance and operation of the powerline. Registration of the servitude grants the operator the right to erect, operate and maintain the powerline and to access the land to carry out such activities, but it does not constitute full ownership of the land. It should be noted that the OHPL will be ceded to Eskom post-construction.

Construction and operation activities and access to the powerline will be carried out with due respect to the affected landowners. The servitude required for the Project will be registered at the Deeds Office and will form part of the title deed of the relevant properties once the environmental authorisation has been obtained.

The Karreebosch OHPL will be routed from the proposed onsite Karreebosch 33/132kV substation (associated with the approved Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3 which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process) to the existing Bon Espirange substation, after which it will connect to the existing 400kV Komsberg substation. Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site have been assessed as part of as part of the Basic Assessment Process, each with a 200m x 150m (3 ha) footprint. A 200m assessment area surrounding the proposed substation alternatives have been included as part of this assessment for micro siting, with a slight funnel leading into the existing Bon Espirange and Komsberg substations to allow for greater flexibility for micro siting for incoming proposed line connections. The proposed Karreebosch OHPL may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed as part of this BAR.

CTS HERITAGE

2. Application References

Name of relevant heritage authority(s)	SAHRA and HWC
Name of decision making authority(s)	DFFE

3. Property Information

Latitude / Longitude	32°53'48.07"S 20°30'44.56"E
Erf number / Farm number	Portion 2 (Nuwe Kraal) of Farm Ek Kraal No. 199 Remainder of Farm Wilgebosch Rivier No. 188 Remainder of farm Klipbanks Fontein No. 198 Portion 1 of Farm Klipbanks Fontein No. 198 Remainder of Farm Karreebosch No. 200 Portion 1 of Farm Ek Kraal No. 199 Remainder of Farm Ek Kraal No.199 Remainder of Farm Bon Espirange No. 73 Farm Rietfontein No. 197 Portion 1 of Farm Bon Espirange No. 73 Farm Aprils Kraal No. 105 Portion 2 of Farm Standvastigheid No. 210 RE/210 Standvastheid
Local Municipality	Laingsburg and Karoo Hoogland
District Municipality	Central Karoo and Namakwa District
Province	Western Cape and Northern Cape
Current Zoning	Agriculture

CTS HERITAGE

4. Nature of the Proposed Development

Total Area	Between 14km and 20km in length
Depth of excavation (m)	Powerline pole structures - excavations are typically 2 - 3 m in depth - often drilled not dug (depending on terrain)
Height of development (m)	Max 45m in height

5. Category of Development

x	**Triggers: Section 38(8) of the National Heritage Resources Act**
	Triggers: Section 38(1) of the National Heritage Resources Act
x	1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.
	2. Construction of a bridge or similar structure exceeding 50m in length.
	3. Any development or activity that will change the character of a site-
	a) exceeding 5 000m^2 in extent
	b) involving three or more existing erven or subdivisions thereof
	c) involving three or more erven or divisions thereof which have been consolidated within the past five years
	4. Rezoning of a site exceeding 10 000m^2
	5. Other (state):

6. Additional Infrastructure Required for this Development

Substation - assume 3ha (that should include construction space. Concrete slab, transformers , buss bars etc.. Similar height to towers.

7. Mapping (please see Appendix 3 and 4 for a full description of our methodology and map legends)

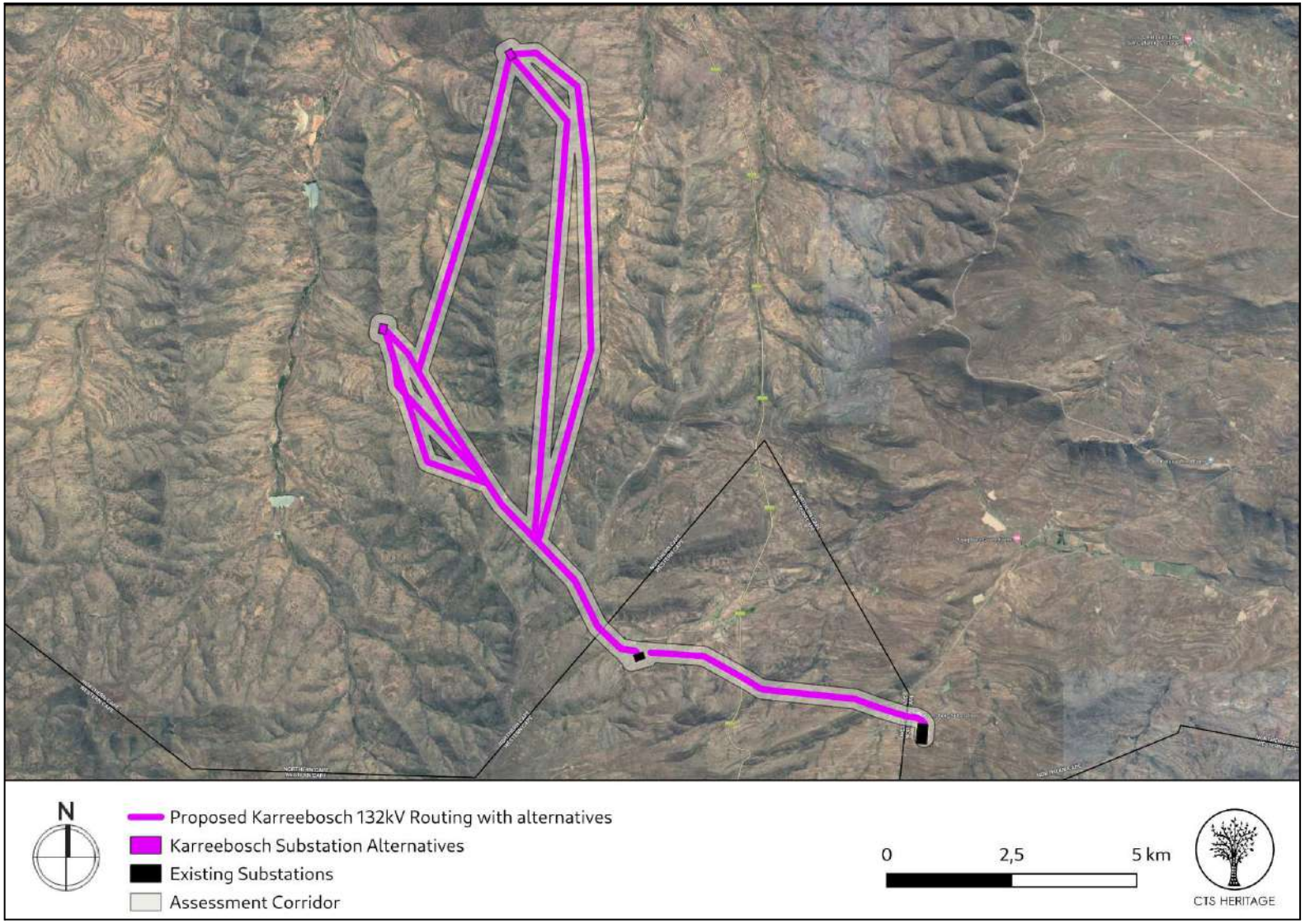


Figure 1b. Overview Map. Satellite image (2022) indicating the proposed development area

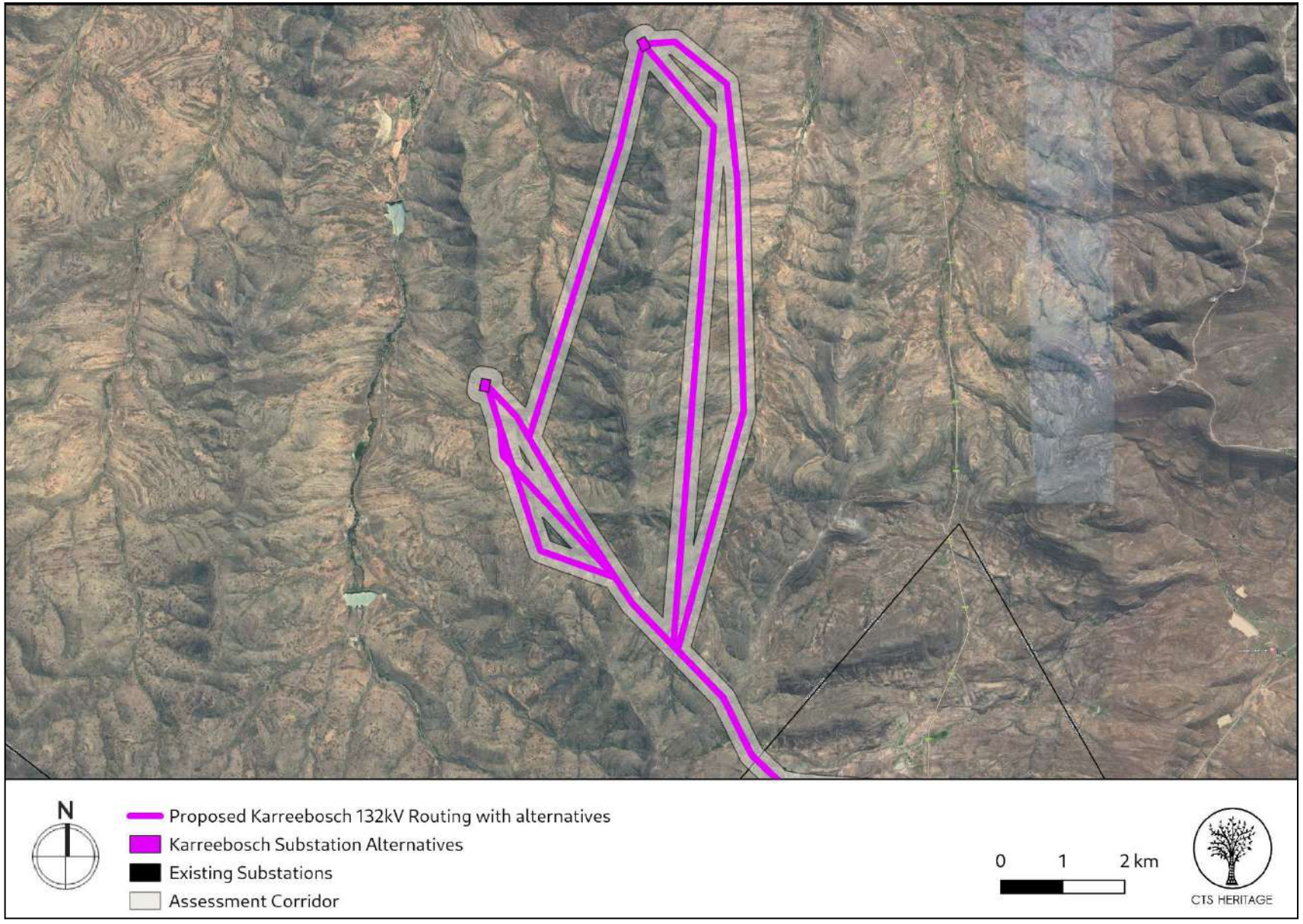


Figure 1c. Overview Map. Satellite image (2020) indicating the proposed development area in the Northern Cape

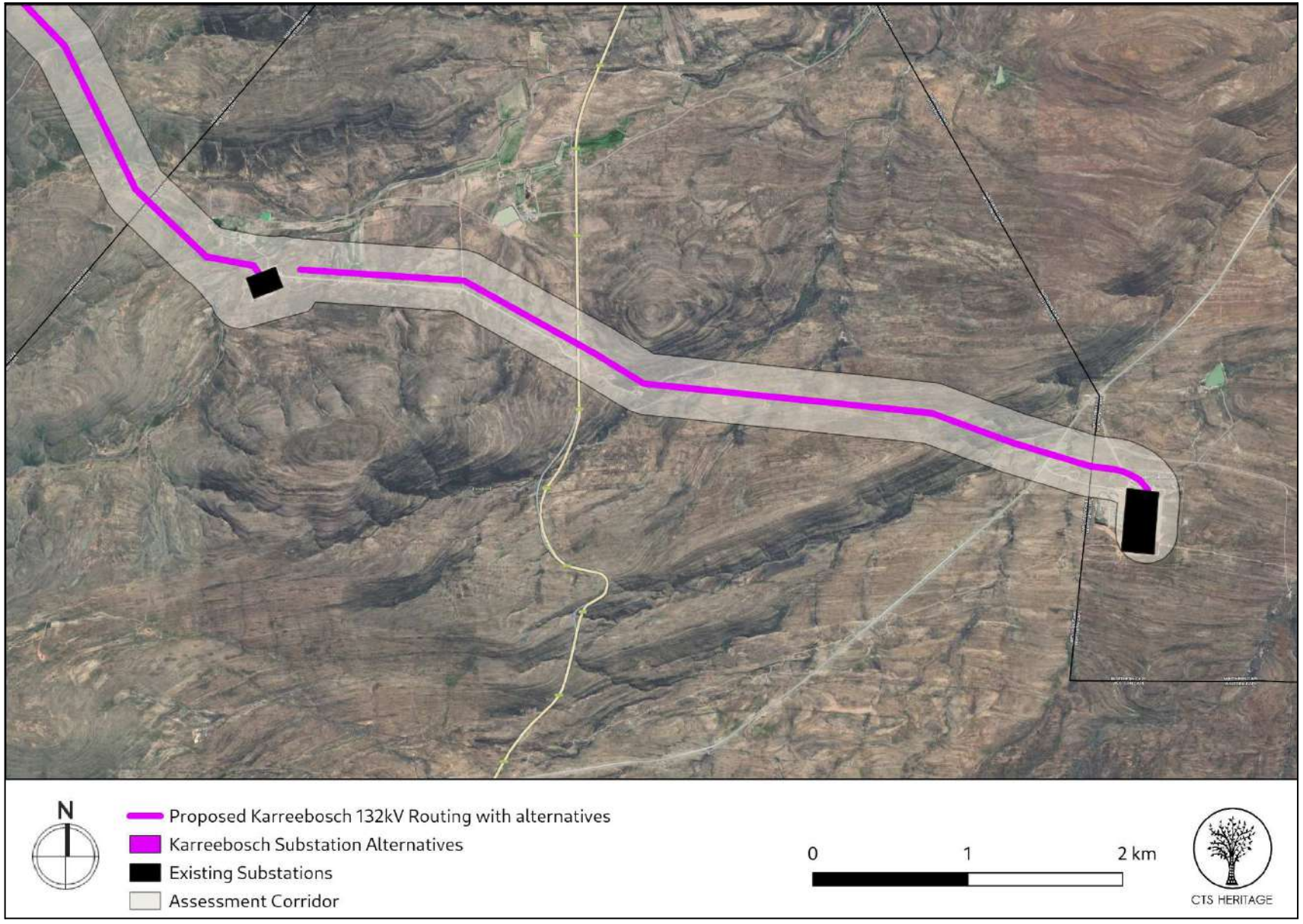


Figure 1d. Overview Map. Satellite image (2020) indicating the proposed development area in the Western and Northern Cape

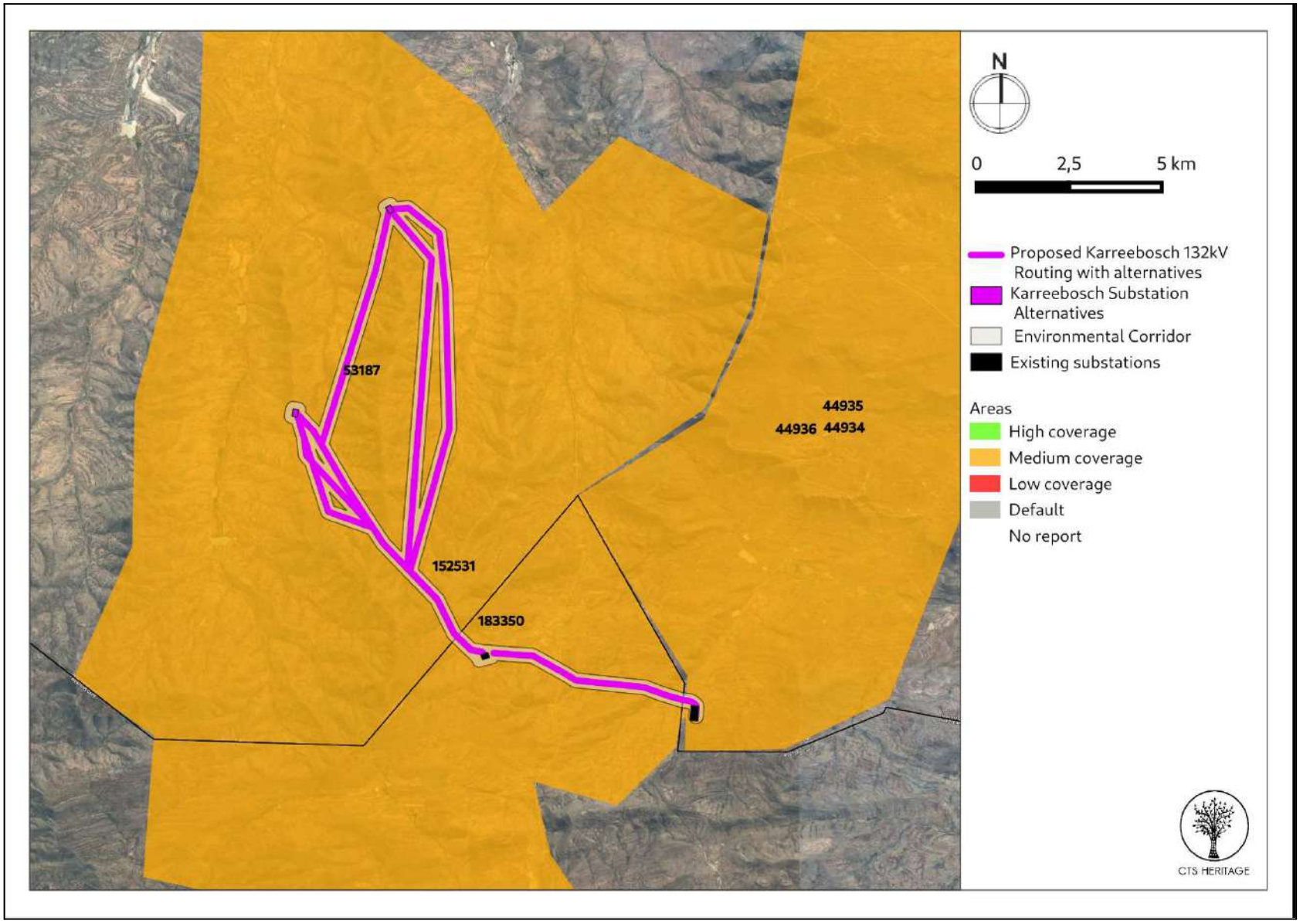


Figure 2a. Previous HIAs Map. Previous Heritage Impact Assessments covering the proposed development area with SAHRIS NIDS indicated. Please see Appendix 2 for a full reference list.

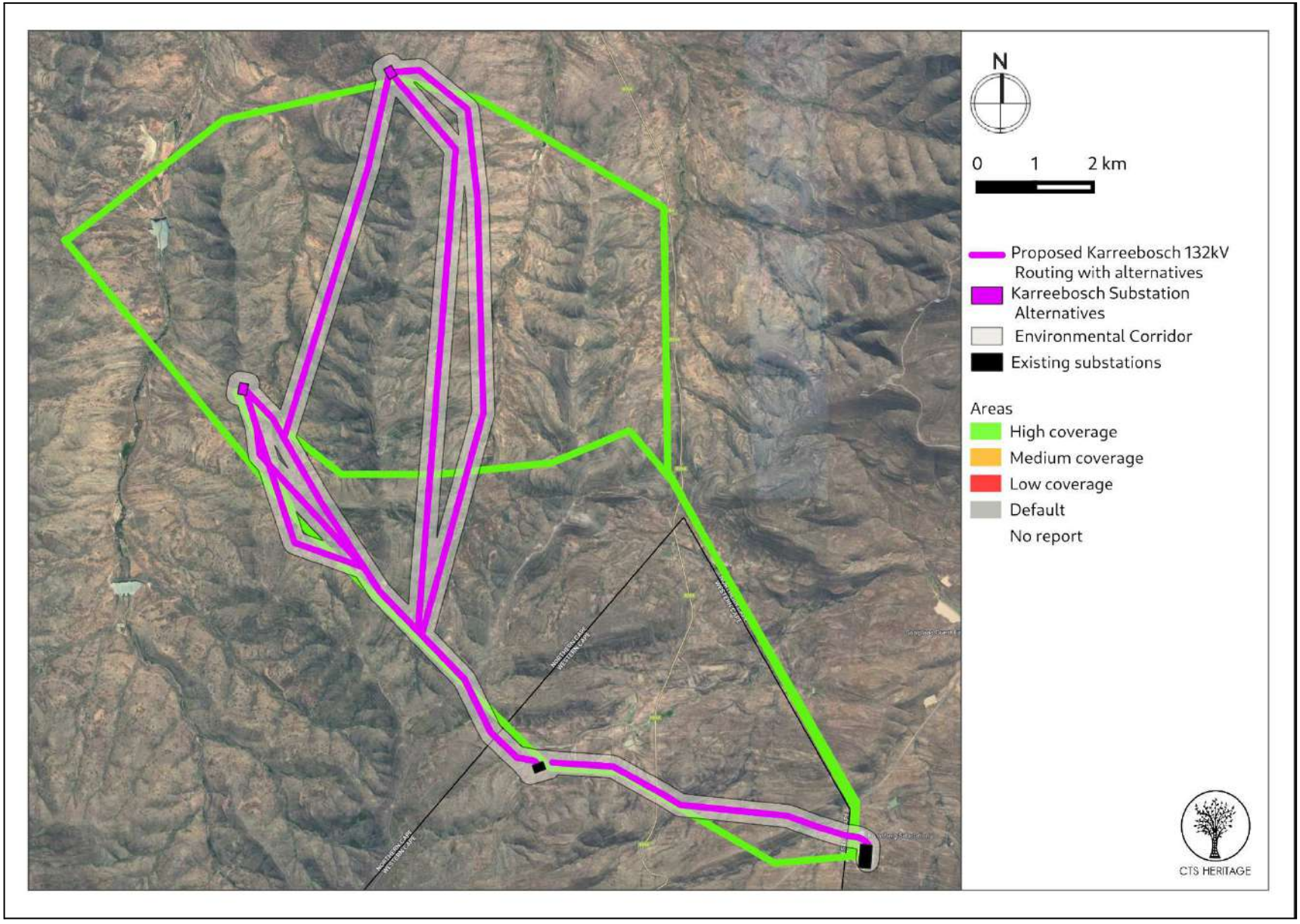


Figure 2b. Previous HIAs Map. HIA conducted by ACO including PIA by Dr Almond (2015) covered a powerline in the area proposed for development (SAHRIS Ref 183350).

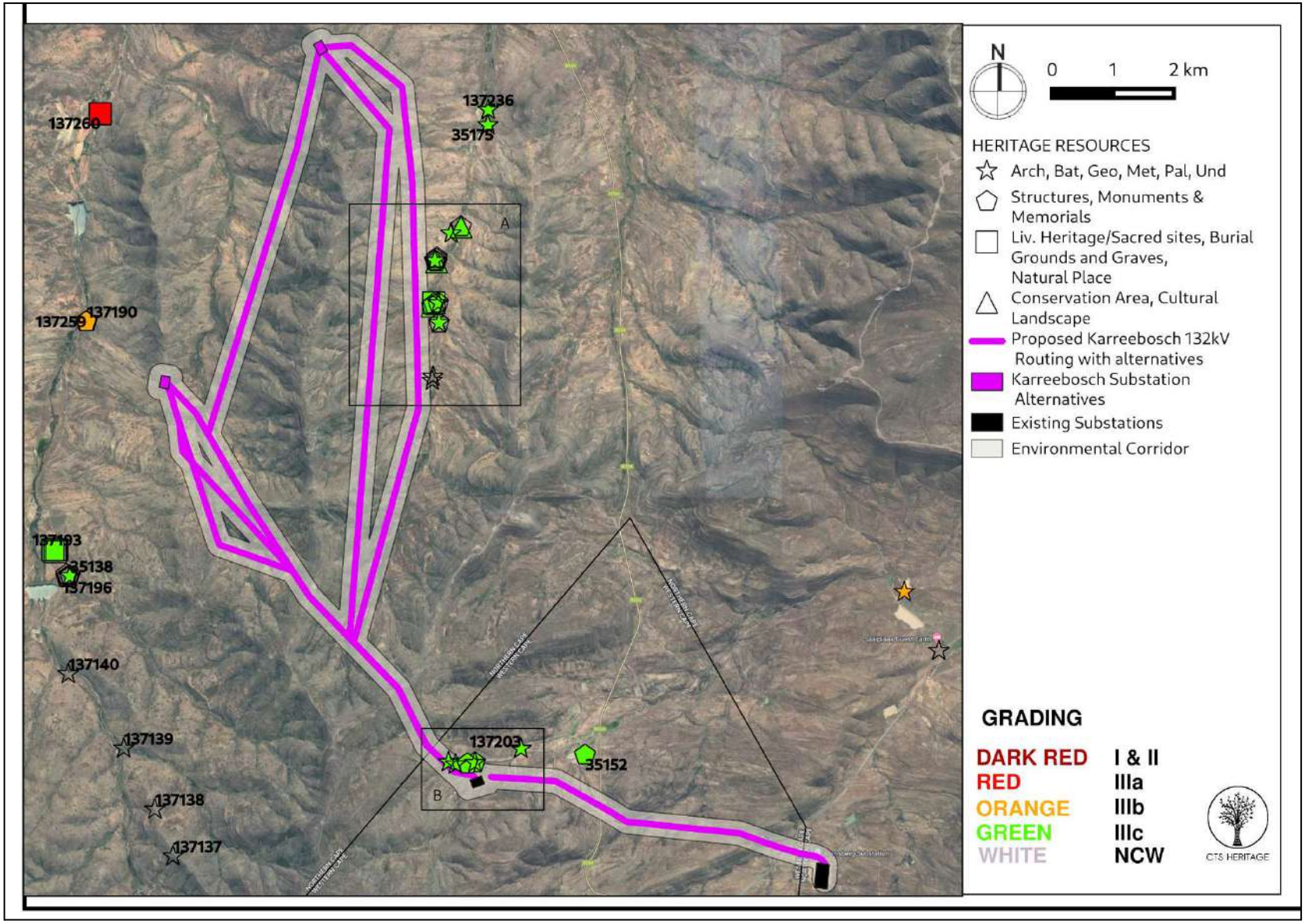


Figure 3. Heritage Resources Map. Heritage Resources previously identified within the study area, with SAHRIS Site IDs indicated in the insets below. Please See Appendix 4 for a full description of heritage resource types.

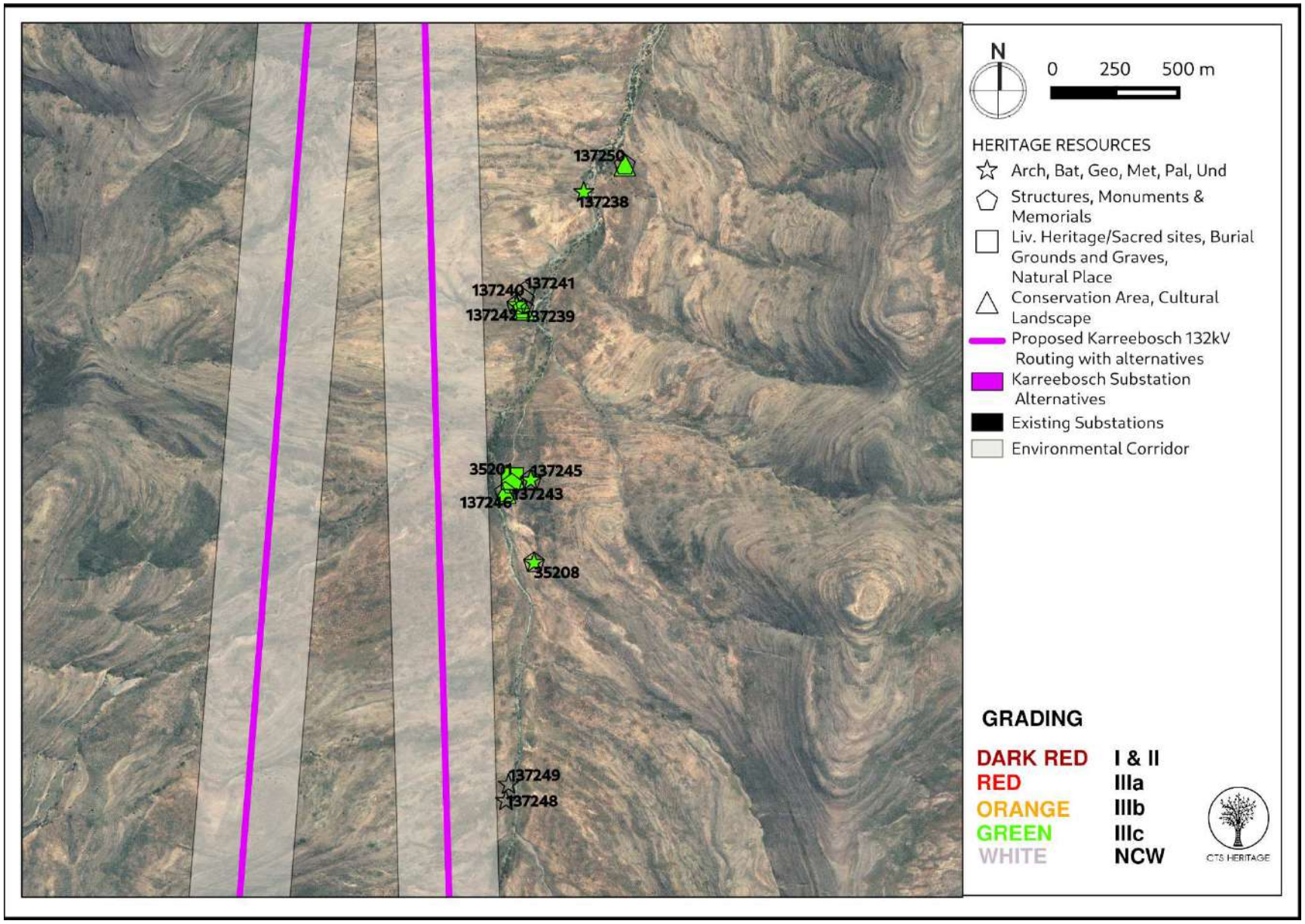


Figure 3a. Heritage Resources Map Inset A

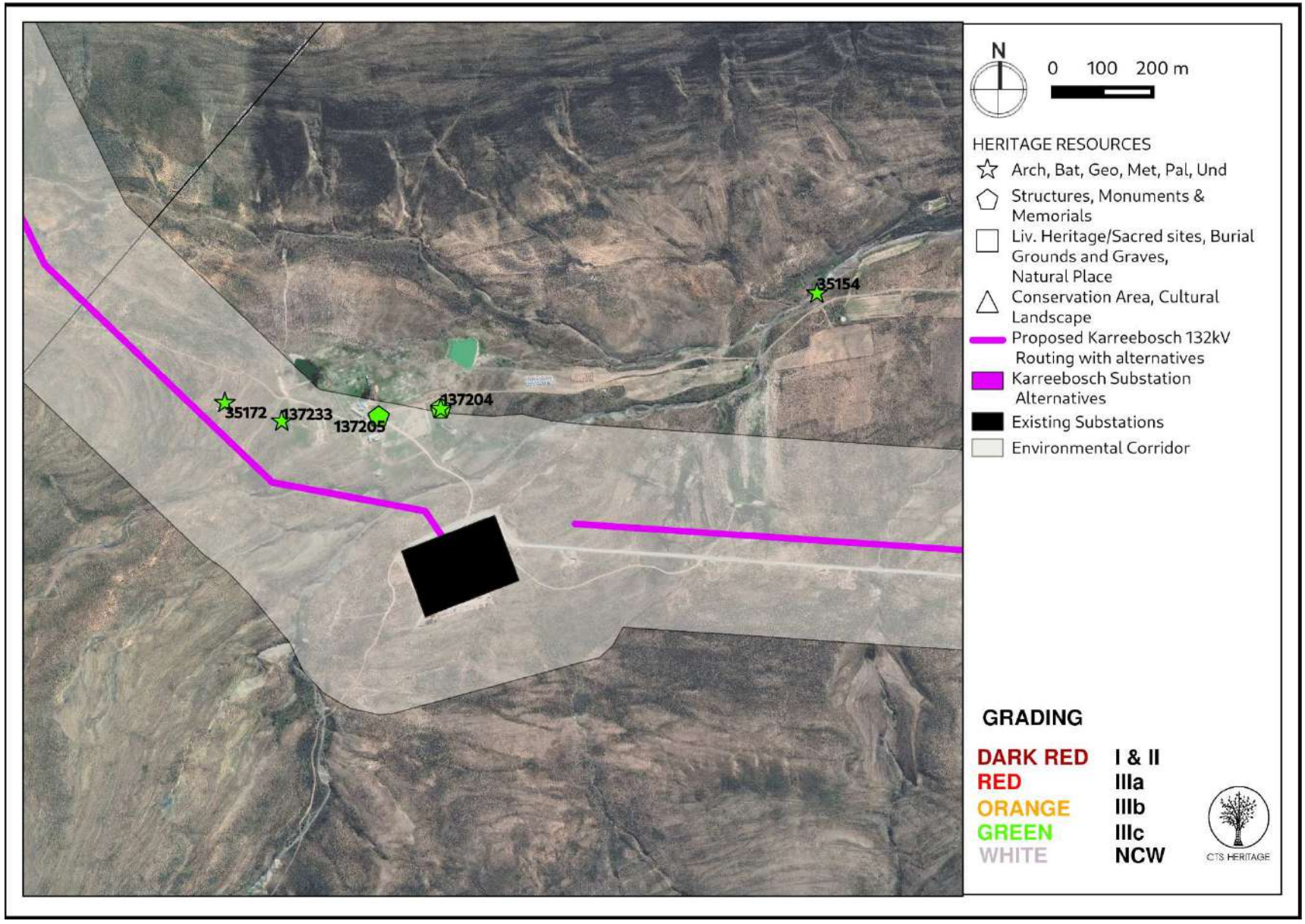


Figure 3b. Heritage Resources Map Inset B

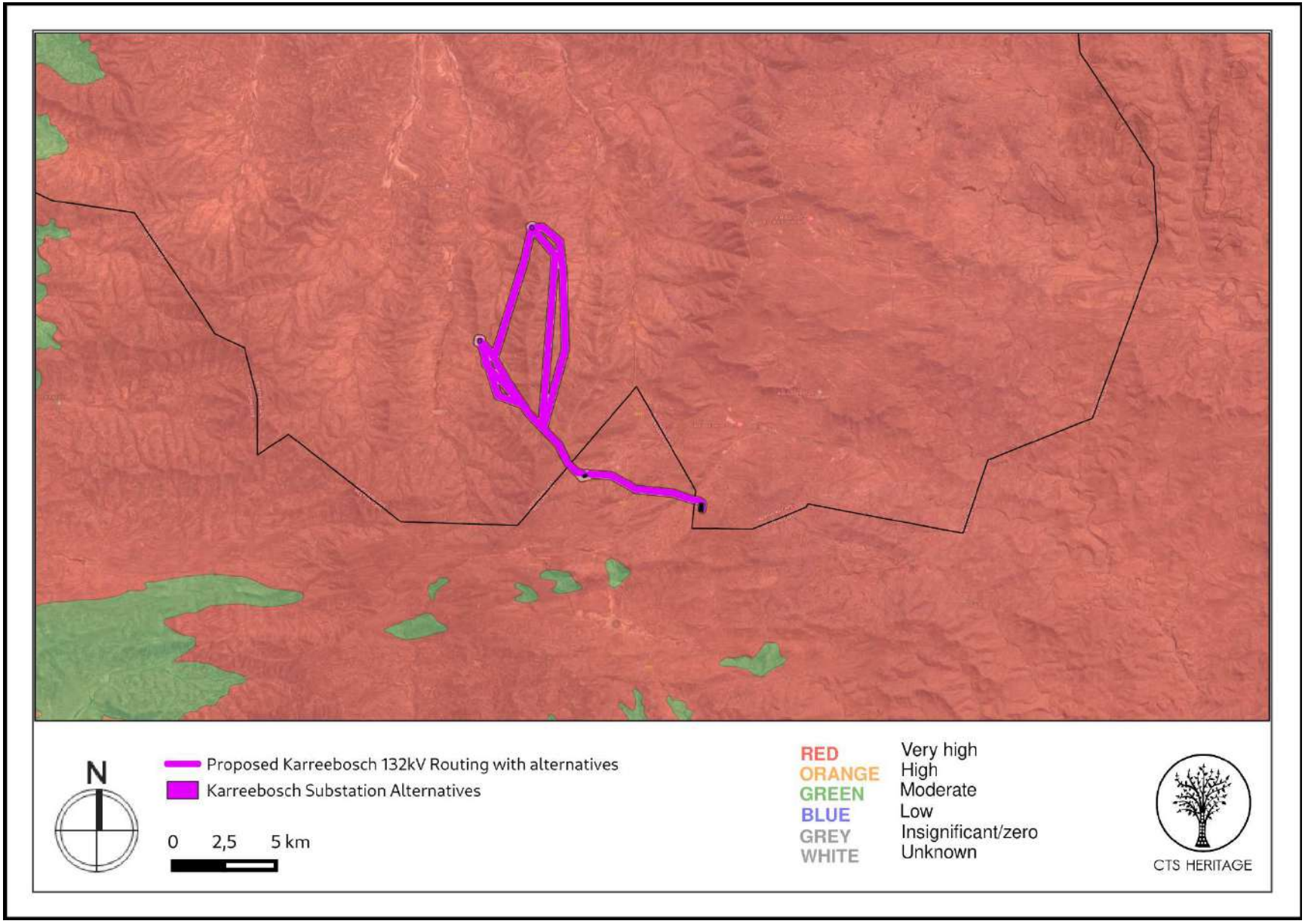


Figure 4a. Palaeosensitivity Map. Indicating fossil sensitivity underlying the study area. Please See Appendix 3 for a full guide to the legend.

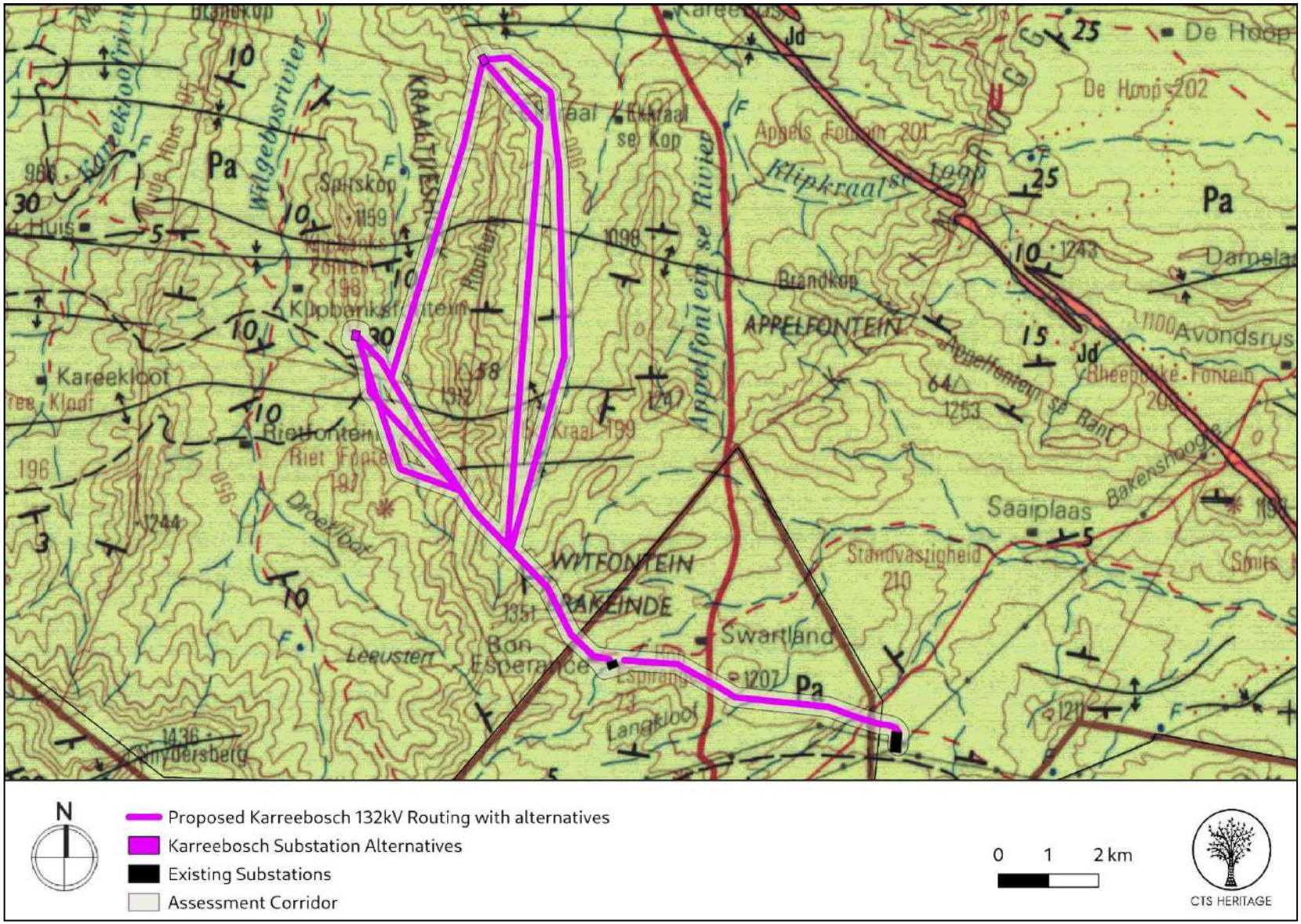


Figure 4b. Geology Map. Extract from the CGS 3220 Sutherland Map indicating that the development area for the proposed Karrebosch Powerline is underlain by the Pa: Abrahamskraal Formation of the Beaufort Group

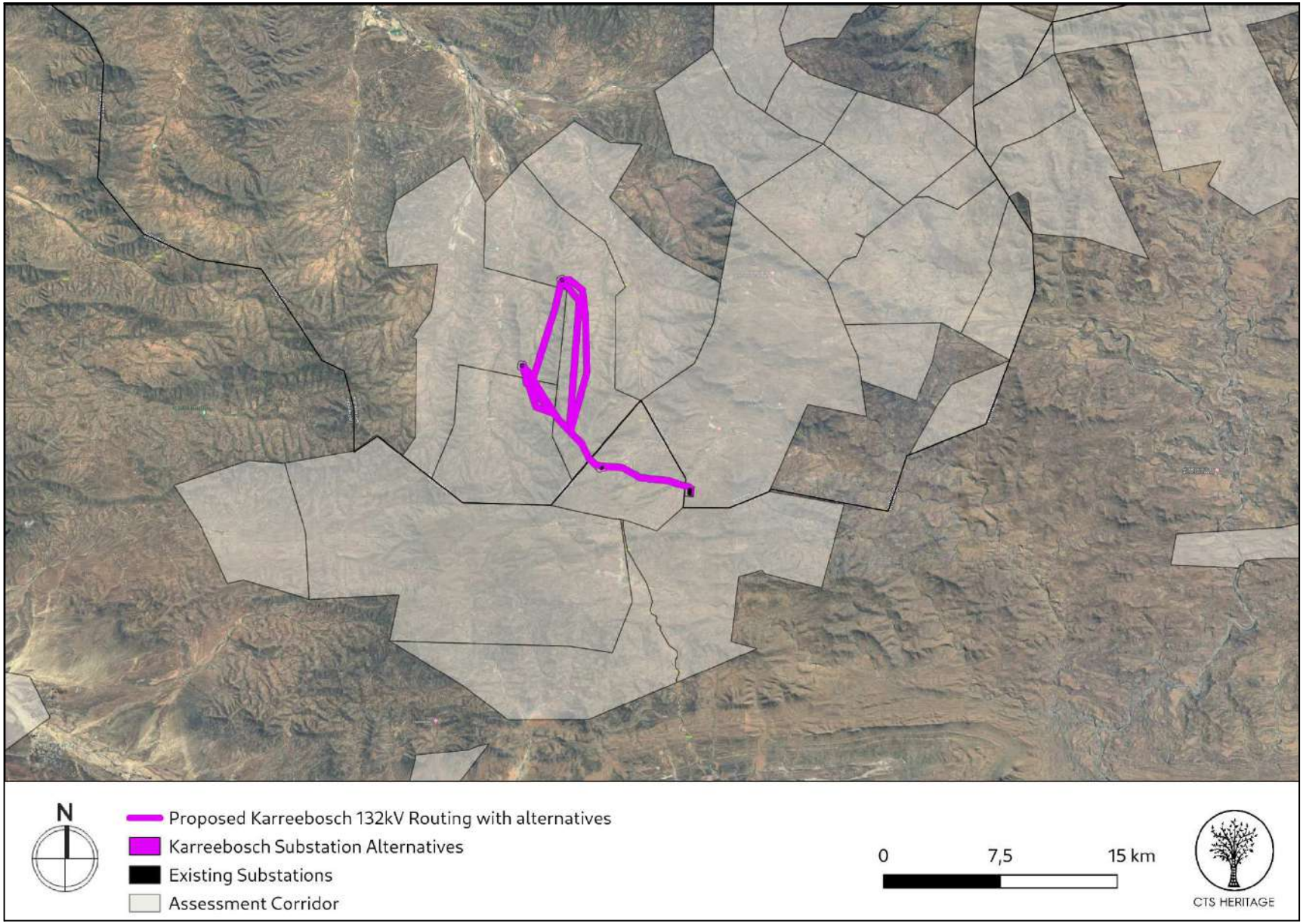
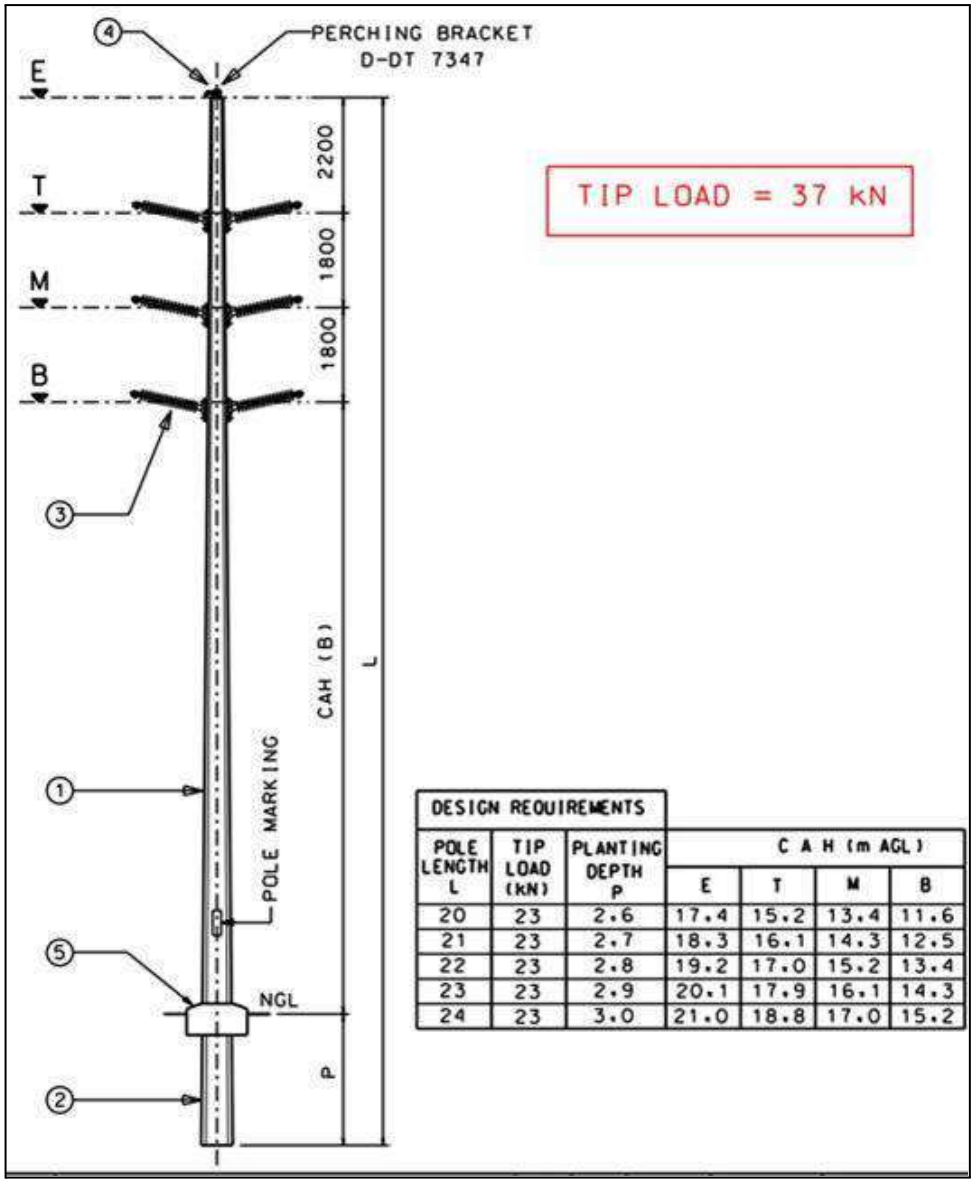
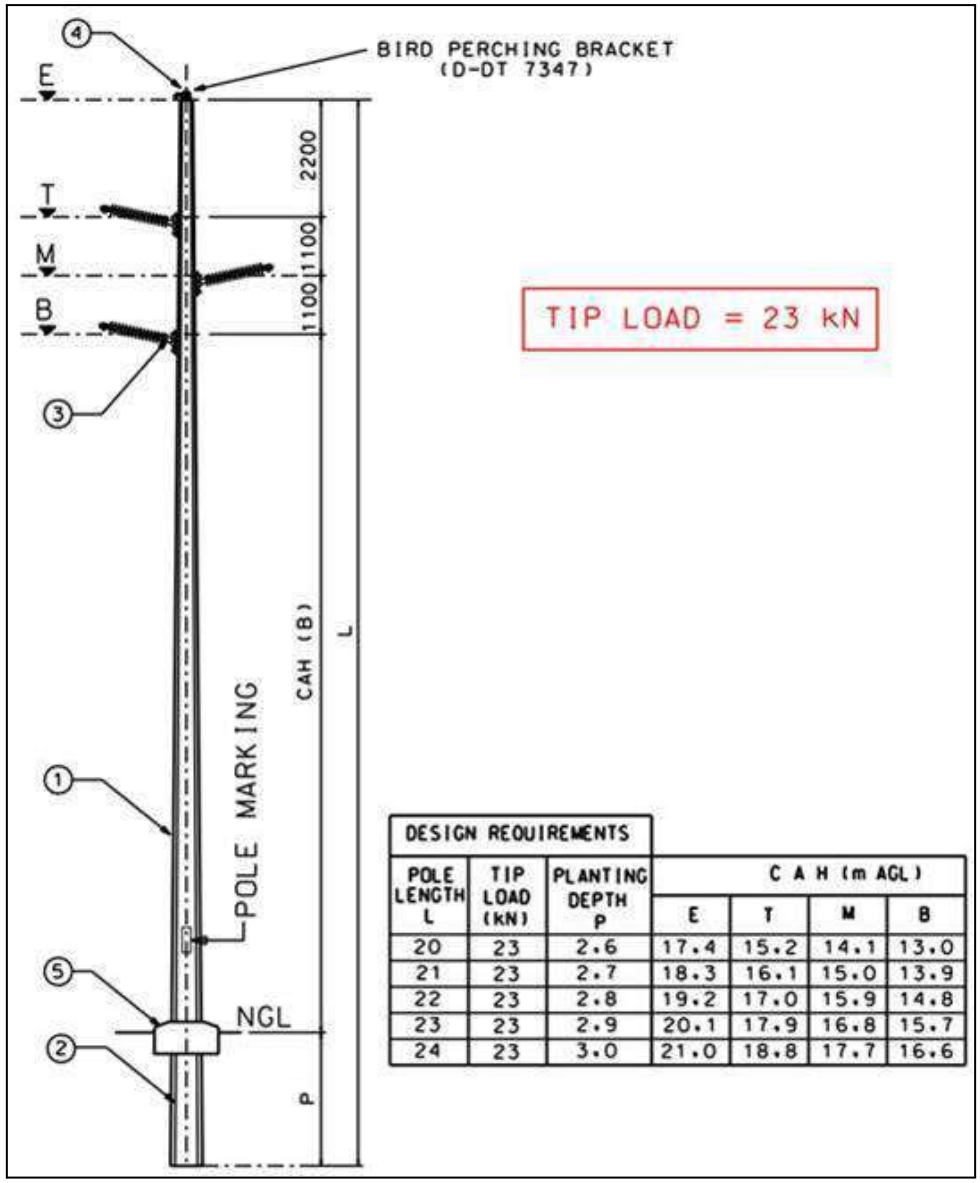


Figure 5. Cumulative Impact Map. Indicating other Renewable Energy Facilities that have been granted Environmental Authorisation (EA).



DESIGN REQUIREMENTS						
POLE LENGTH L	TIP LOAD (kN)	PLANTING DEPTH P	C A H (m AGL)			
			E	T	M	B
20	23	2.6	17.4	15.2	13.4	11.6
21	23	2.7	18.3	16.1	14.3	12.5
22	23	2.8	19.2	17.0	15.2	13.4
23	23	2.9	20.1	17.9	16.1	14.3
24	23	3.0	21.0	18.8	17.0	15.2



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21	23	2.7	18.3	16.1	15.0	13.9
22	23	2.8	19.2	17.0	15.9	14.8
23	23	2.9	20.1	17.9	16.8	15.7
24	23	3.0	21.0	18.8	17.7	16.6

Figure 6. Typical Infrastructure. Eskom

8. Heritage Assessment

This application is for a proposed powerline associated with the approved Karreebosch Wind Energy Facility (WEF) located in both the Western and Northern Cape Provinces (14/12/16/3/3/2/807/AM3). The Karreebosch WEF was previously referred to as Phase 2 of the Roggeveld WEF. SAHRA has made numerous comments on both the Roggeveld WEF and the Karreebosch WEF from 2013 with the last comment issued on 26 September 2018 (Case 7379 on SAHRIS). EA was granted for the Karreebosch WEF on 29 January 2016. In the EA, various requirements were stipulated in terms of impacts to Historical, Cultural and Palaeontological sites. Much of the area proposed for the development of the powerline was assessed as part of the HIA completed for the Karreebosch WEF (Figure 2a and 2b above) drafted by the ACO (Kendrick, 2015, SAHRIS Ref 183350). The remaining sections of the proposed powerline were assessed in the Heritage Assessments completed for the Roggeveld WEF (Hart and Webley, 2013, SAHRIS Ref 152531). The heritage information identified in these reports has been extracted and are mapped in Figures 3, 3a and 3b above. These reports are also referred to below in order to provide a contextual analysis of the heritage sensitivity of the area proposed for development.

The area proposed for development has been previously assessed, more than once. In addition, the proposed powerline routes lie immediately adjacent to existing grid infrastructure. The original fieldwork conducted for the Roggeveld WEF HIA (Hart and Webley, 2013) which covered the area proposed for development was comprehensive and remains relevant, similarly the fieldwork conducted for the Karreebosch WEF (2015). The Karreebosch HIA (2015) "*revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area. There are a number of existing farm houses that contain 19th century fabric, however very few of these have anything more than moderate heritage significance. Parts of the study area enjoy very high aesthetic qualities with the area known by locals as "Gods Window" having grade II aesthetic qualities, hence the significance of the study area lies mainly with its undeveloped wilderness qualities. Interestingly, pre-colonial or stone age heritage and archaeology is extremely scarce in the areas that were searched. Very few archaeological sites of these kinds were recorded despite the fact that overall 9 experienced archaeologists were involved in scouring the landscape*." The HIA for the Karreebosch WEF notes that "*The most important colonial archaeological sites in the study area are associated with Ekkraal Valley, the Rietfontein-Wilgebosch River valley and the Krans Kraal-Karrekraal valley. The valley bottoms are archaeologically sensitive...*". As the proposed powerline alternatives traverse the valley areas which have been determined to be archaeologically sensitive, it is likely that significant archaeological heritage resources may be impacted by the proposed development. Further specialist archaeological assessment is therefore recommended.

According to the SAHRIS Palaeosensitivity Map (Figure 4 above), the area proposed for the powerline development is underlain by sediments of very high palaeontological sensitivity belonging to the Abrahamskraal Formation of the Beaufort Group. A Palaeontological Assessment was conducted by Almond (2015) for the Karreebosch WEF which covers a larger portion of the area proposed for the powerline development, and covered the proposed powerline alternatives specifically (Figure 2b above, Appendix to the ACO Report 2015, SAHRIS Ref 183350). According to Almond (2015), "*The fluvial Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) that underlies almost the entire wind farm study area is known for its diverse fauna of Permian fossil vertebrates - notably various small- to large-bodied therapsids and reptiles - as well as fossil plants of the Glossopteris Flora and low diversity trace fossil assemblages. However, desktop analysis of known fossil distribution within the Main Karoo Basin shows a marked paucity of fossil localities in the study region between Matjiesfontein and Sutherland where sediments belonging only to the lower part of the thick Abrahamskraal Formation succession are represented. Bedrock exposure levels in the Karreebosch Wind Farm study area are generally very poor due to the pervasive cover by superficial sediments (colluvium, alluvium, soils, calcrete) and vegetation. Nevertheless, a sufficiently large outcrop area of Abrahamskraal Formation sediments, exposed in stream and riverbanks, borrow pits, erosion gullies as well as road cuttings along the R354, has been examined during the present fieldwork to infer that macroscopic fossil remains of any sort are very rare indeed here. Exceptions include common trace fossil assemblages (invertebrate burrows) and occasional fragmentary plant remains (horsetail ferns). Levels of tectonic deformation of the bedrocks are generally low and baking by dolerite intrusions (Early Jurassic Karoo Dolerite Suite) is very minor. It is concluded that the Lower Beaufort Group bedrocks in the study area are generally of low palaeontological sensitivity and this also applies to the overlying Late Caenozoic superficial sediments (colluvium, alluvium, calcrete, soils etc).*"

Dr Almond goes on to note that "*No areas or sites of exceptional fossil heritage sensitivity or significance have been identified within the Karreebosch Wind Farm study area. The majority of fossil sites recorded in the study region lie outside the anticipated development footprint. The common trace fossil assemblages identified in this study are of widespread occurrence within the Abrahamskraal Formation (i.e. not unique to the study area). Construction of the Karreebosch Wind Farm and associated infrastructure is therefore unlikely to entail significant impacts on local fossil heritage resources; i.e. the impact significance of the wind farm project is assessed as MINOR. The impact significance of both transmission line route options to Komsberg Substation (Figure 2b) is likewise assessed as MINOR and there is no marked preference for either route option on palaeontological grounds. Irreplaceable loss of fossil heritage is not anticipated, although it should be highlighted that any new vertebrate fossil finds made during construction (e.g. exposed in new bedrock excavations) would be of considerable scientific interest, given their rarity*." According to the HIA for the Karrebosch WEF (ACO, 2015), "*While the geology of the study area is potentially palaeontologically sensitive, very few fossils were found by either Dr Duncan Miller or Dr John Almond in the study area. No further work in this respect is recommended, other than reporting of any finds during construction to the heritage authorities.*" Due to the overlap in assessment areas (Figure 2b above), these findings can be extrapolated to the current proposed powerline development. As such, it is recommended that little new information is likely to be gained by further palaeontological fieldwork. Potential impacts to palaeontological heritage can be mitigated through the inspection of final pylon footings by a palaeontologist prior to construction.

According to various ACO reports (2011, 2013 and 2015), parts of the study area enjoy very high aesthetic qualities hence the significance of the study area lies mainly with its undeveloped wilderness qualities which may be negatively impacted by the development of the proposed powerline. However, it must be noted that the proposed powerline is located within a Renewable Energy Development Zone which has been identified for this kind of development. In REDZ areas, there is a reasonable expectation that the cultural landscape of an area will be changed to be dominated, or at least heavily altered, by renewable energy development and its associated infrastructure. In fact, this is the intention of the REDZ areas. Furthermore, the proposed powerline is located within a suite of authorised renewable energy facilities (Figure 5 above) and as such, the impact of this proposed powerline on the cultural landscape is likely to be negligible. No further specialist cultural landscape assessment is therefore recommended.

RECOMMENDATION

Based on the information available, it is likely that the proposed grid connection corridor will impact on significant archaeological heritage and as such, it is recommended that a Heritage Impact Assessment is conducted that complies with section 38(3) of the NHRA for the proposed development with special focus on impacts to significant archaeological heritage.

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APPENDIX 1

List of heritage resources within the development area

Site ID	Site no	Full Site Name	Site Type	Grading
35222	ROG037	Roggeveld 037	Building	Grade IIIb
35135	ROG005	Roggeveld 005	Building	Grade IIIc
35138	ROG008	Roggeveld 008	Stone walling	Grade IIIc
35152	ROG012	Roggeveld 012	Building	Grade IIIc
35154	ROG013	Roggeveld 013	Stone walling	Grade IIIc
35157	ROG014	Roggeveld 014	Transport infrastructure	Grade IIIc
35159	ROG015	Roggeveld 015	Building	Grade IIIc
35171	ROG016	Roggeveld 016	Stone walling	Grade IIIc
35172	ROG017	Roggeveld 017	Stone walling	Grade IIIc
35174	ROG019	Roggeveld 019	Stone walling	Grade IIIc
35175	ROG020	Roggeveld 020	Stone walling	Grade IIIc
35177	ROG021	Roggeveld 021	Stone walling	Grade IIIc
35178	ROG022	Roggeveld 022	Conservation Area	Grade IIIc
35191	ROG025	Roggeveld 025	Ruin> 100 years, Artefacts	Grade IIIc
35202	ROG028	Roggeveld 028	Artefacts	Grade IIIc
35204	ROG029	Roggeveld 029	Cultural Landscape	Grade IIIc
35208	ROG030	Roggeveld 030	Stone walling	Grade IIIc

35215	ROG033	Roggeveld 033	Cultural Landscape	Grade IIIc
35137	ROG007	Roggeveld 007	Burial Grounds & Graves	Grade IIIc
35201	ROG027	Roggeveld 027	Burial Grounds & Graves	Grade IIIc
35226	ROG038	Roggeveld 038	Burial Grounds & Graves	Grade IIIa
137190	KWF-005	KAREEBOSCH WIND FARM	Building	
137192	KWF-007	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137193	KWF-008	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137194	KWF-009	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137195	KWF-010	KAREEBOSCH WIND FARM	Structures	
137196	KWF-011	KAREEBOSCH WIND FARM	Structures	
137197	KWF-012	KAREEBOSCH WIND FARM	Structures	
137198	KWF-013	KAREEBOSCH WIND FARM	Structures	
137202	KWF-017	KAREEBOSCH WIND FARM	Building	
137203	KWF-018	KAREEBOSCH WIND FARM	Stone walling	
137204	KWF-019	KAREEBOSCH WIND FARM	Archaeological	
137205	KWF-020	KAREEBOSCH WIND FARM	Building	
137233	KWF-021	KAREEBOSCH WIND FARM	Stone walling	
137234	KWF-022	KAREEBOSCH WIND FARM	Stone walling	
137236	KWF-024	KAREEBOSCH WIND FARM	Stone walling	
137237	KWF-025	KAREEBOSCH WIND FARM	Stone walling	

137238	KWF-026	KAREEBOSCH WIND FARM	Stone walling	
137239	KWF-027	KAREEBOSCH WIND FARM	Structures	
137240	KWF-028	KAREEBOSCH WIND FARM	Structures	
137241	KWF-029	KAREEBOSCH WIND FARM	Structures	
137242	KWF-030	KAREEBOSCH WIND FARM	Structures	
137243	KWF-031	KAREEBOSCH WIND FARM	Structures	
137244	KWF-032	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137245	KWF-033	KAREEBOSCH WIND FARM	Structures, Artefacts	
137246	KWF-034	KAREEBOSCH WIND FARM	Structures	
137247	KWF-035	KAREEBOSCH WIND FARM	Structures	
137248	KWF-036	KAREEBOSCH WIND FARM	Stone walling	
137249	KWF-037	KAREEBOSCH WIND FARM	Stone walling	
137250	KWF-038	KAREEBOSCH WIND FARM	Structures	
137259	KWF-046	KAREEBOSCH WIND FARM	Structures	Ungraded
137260	KWF-047	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137137	BWE-048	Brandvalley Wind Energy	Deposit	
137138	BWE-049	Brandvalley Wind Energy	Deposit	
137139	BWE-050	Brandvalley Wind Energy	Deposit	
137140	BWE-051	Brandvalley Wind Energy	Deposit	

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APPENDIX 2

Reference List with relevant AIAs and PIAs

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
44934	AIA Desktop	Celeste Booth	01/08/2011	An archaeological desktop study for the proposed establishment of the Hidden Valley wind energy facility and associated infrastructure on a a site south of Sutherland, Northern Cape Province
44935	AIA Phase 1	Celeste Booth	01/02/2012	A Phase 1 AIA for the proposed HIdden Valley Wind Energy Facility, near Sutherland, Northern cape Province
44936	PIA Desktop	Lloyd Rossouw	01/03/2012	Palaeontological desktop assessment of the proposed Hidden Valley Wind Energy Facility near Sutherland, Northern Cape Province
53187	HIA Phase 1	Timothy Hart, Lita Webley	01/03/2011	HERITAGE IMPACT ASSESSMENT PROPOSED WIND ENERGY FACILITY
152531	HIA Phase 1	Timothy Hart, Lita Webley	20/12/2013	Heritage Impact Assessment Report for the Phase 1 Roggeveld Wind Farm
183350	HIA Phase 1	Natalie Kendrick	27/10/2014	Heritage Impact Assessment for the Karreebosch Wind Farm (Phase 2 Roggevelt Wind Farm)
353483	AIA Phase 1	Jonathan Kaplan	1/12/2015	ARCHAEOLOGICAL IMPACT ASSESSMENT Proposed borrow pit (Karusa R354) on the Farm Karreebosch 200/1 near Sutherland, Northern Cape Assessment conducted under Section 38 (3) of the National Heritage Resource Act (No. 25 of 1999)

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APPENDIX 3 - Keys/Guides

Key/Guide to Acronyms

AIA	Archaeological Impact Assessment
DARD	Department of Agriculture and Rural Development (KwaZulu-Natal)
DEFF	Department of Environmental, Forestry and Fisheries (National)
DEADP	Department of Environmental Affairs and Development Planning (Western Cape)
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism (Eastern Cape)
DEDECT	Department of Economic Development, Environment, Conservation and Tourism (North West)
DEDT	Department of Economic Development and Tourism (Mpumalanga)
DEDTEA	Department of economic Development, Tourism and Environmental Affairs (Free State)
DENC	Department of Environment and Nature Conservation (Northern Cape)
DMR	Department of Mineral Resources (National)
GDARD	Gauteng Department of Agriculture and Rural Development (Gauteng)
HIA	Heritage Impact Assessment
LEDET	Department of Economic Development, Environment and Tourism (Limpopo)
MPRDA	Mineral and Petroleum Resources Development Act, no 28 of 2002
NEMA	National Environmental Management Act, no 107 of 1998
NHRA	National Heritage Resources Act, no 25 of 1999
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
VIA	Visual Impact Assessment

Full guide to Palaeosensitivity Map legend

	RED:	VERY HIGH - field assessment and protocol for finds is required
	ORANGE/YELLOW:	HIGH - desktop study is required and based on the outcome of the desktop study, a field assessment is likely
	GREEN:	MODERATE - desktop study is required
	BLUE/PURPLE:	LOW - no palaeontological studies are required however a protocol for chance finds is required
	GREY:	INSIGNIFICANT/ZERO - no palaeontological studies are required
	WHITE/CLEAR:	UNKNOWN - these areas will require a minimum of a desktop study.

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APPENDIX 4 - Methodology

The Heritage Screener summarises the heritage impact assessments and studies previously undertaken within the area of the proposed development and its surroundings. Heritage resources identified in these reports are assessed by our team during the screening process.

The heritage resources will be described both in terms of **type**:

- Group 1: Archaeological, Underwater, Palaeontological and Geological sites, Meteorites, and Battlefields
- Group 2: Structures, Monuments and Memorials
- Group 3: Burial Grounds and Graves, Living Heritage, Sacred and Natural sites
- Group 4: Cultural Landscapes, Conservation Areas and Scenic routes

and **significance** (Grade I, II, IIIa, b or c, ungraded), as determined by the author of the original heritage impact assessment report or by formal grading and/or protection by the heritage authorities.

Sites identified and mapped during research projects will also be considered.

DETERMINATION OF THE EXTENT OF THE INCLUSION ZONE TO BE TAKEN INTO CONSIDERATION

The extent of the inclusion zone to be considered for the Heritage Screener will be determined by CTS based on:

- the size of the development,
- the number and outcome of previous surveys existing in the area
- the potential cumulative impact of the application.

The inclusion zone will be considered as the region within a maximum distance of 50 km from the boundary of the proposed development.

DETERMINATION OF THE PALAEONTOLOGICAL SENSITIVITY

The possible impact of the proposed development on palaeontological resources is gauged by:

- reviewing the fossil sensitivity maps available on the South African Heritage Resources Information System (SAHRIS)
- considering the nature of the proposed development
- when available, taking information provided by the applicant related to the geological background of the area into account

DETERMINATION OF THE COVERAGE RATING ASCRIBED TO A REPORT POLYGON

Each report assessed for the compilation of the Heritage Screener is colour-coded according to the level of coverage accomplished. The extent of the surveyed coverage is labeled in three categories, namely low, medium and high. In most instances the extent of the map corresponds to the extent of the development for which the specific report was undertaken.

Low coverage will be used for:

- desktop studies where no field assessment of the area was undertaken;
- reports where the sites are listed and described but no GPS coordinates were provided.
- older reports with GPS coordinates with low accuracy ratings;
- reports where the entire property was mapped, but only a small/limited area was surveyed.
- uploads on the National Inventory which are not properly mapped.

Medium coverage will be used for

- reports for which a field survey was undertaken but the area was not extensively covered. This may apply to instances where some impediments did not allow for full coverage such as thick vegetation, etc.
- reports for which the entire property was mapped, but only a specific area was surveyed thoroughly. This is differentiated from low ratings listed above when these surveys cover up to around 50% of the property.

High coverage will be used for

- reports where the area highlighted in the map was extensively surveyed as shown by the GPS track coordinates. This category will also apply to permit reports.

RECOMMENDATION GUIDE

The Heritage Screener includes a set of recommendations to the applicant based on whether an impact on heritage resources is anticipated. One of three possible recommendations is formulated:

(1) The heritage resources in the area proposed for development are sufficiently recorded - The surveys undertaken in the area adequately captured the heritage resources. There are no known sites which require mitigation or management plans. No further heritage work is recommended for the proposed development.

This recommendation is made when:

- enough work has been undertaken in the area
- it is the professional opinion of CTS that the area has already been assessed adequately from a heritage perspective for the type of development proposed

(2) The heritage resources and the area proposed for development are only partially recorded - The surveys undertaken in the area have not adequately captured the heritage resources and/or there are sites which require mitigation or management plans. Further specific heritage work is recommended for the proposed development.

This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

- improvement on some components of the heritage assessments already undertaken, for instance with a renewed field survey and/or with a specific specialist for the type of heritage resources expected in the area
- compilation of a report for a component of a heritage impact assessment not already undertaken in the area

- undertaking mitigation measures requested in previous assessments/records of decision.

(3) The heritage resources within the area proposed for the development have not been adequately surveyed yet - Few or no surveys have been undertaken in the area proposed for development. A full Heritage Impact Assessment with a detailed field component is recommended for the proposed development.

Note:
The responsibility for generating a response detailing the requirements for the development lies with the heritage authority. However, since the methodology utilised for the compilation of the Heritage Screeners is thorough and consistent, contradictory outcomes to the recommendations made by CTS should rarely occur. Should a discrepancy arise, CTS will immediately take up the matter with the heritage authority to clarify the dispute.

APPENDIX 5 -Summary of Specialist Expertise

Jenna Lavin, an archaeologist with an MSc in Archaeology and Palaeoenvironments, and currently completing an MPhil in Conservation Management , heads up the heritage division of the organisation, and has a wealth of experience in the heritage management sector. Jenna's previous position as the Assistant Director for Policy, Research and Planning at Heritage Western Cape has provided her with an in-depth understanding of national and international heritage legislation. Her 8 years of experience at various heritage authorities in South Africa means that she has dealt extensively with permitting, policy formulation, compliance and heritage management at national and provincial level and has also been heavily involved in rolling out training on SAHRIS to the Provincial Heritage Resources Authorities and local authorities.

Jenna is a member of the Association of Professional Heritage Practitioners (APHP), and is also an active member of the International Committee on Monuments and Sites (ICOMOS) as well as the International Committee on Archaeological Heritage Management (ICAHM). In addition, Jenna has been a member of the Association of Southern African Professional Archaeologists (ASAPA) since 2009. Recently, Jenna has been responsible for conducting training in how to write Wikipedia articles for the Africa Centre's WikiAfrica project.

Since 2016, Jenna has drafted over 100 Heritage Impact Assessments throughout South Africa.

Our Ref: HM/ CENTRAL KAROO/ LAINGSBURG/ KARREEBOSCH/ MULTIPLE FARMS
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Erfenis Wes-Kaap
Heritage Western Cape

Jenna Lavin
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RESPONSE TO NOTIFICATION OF INTENT TO DEVELOP: HIA REQUIRED
In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999) and the Western Cape Provincial Gazette 6061, Notice 298 of 2003

NOTIFICATION OF INTENT TO DEVELOP: PROPOSED KARREEBOSCH OVERHEAD POWERLINE AND SUBSTATION, MULTIPLE FARMS, LAINGSBURG AND KAROO HOOGLAND, SUBMITTED IN TERMS OF SECTION 38(1) OF THE NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

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 the 22 August 2022.

You are hereby notified that, since there is reason to believe that the proposed Karreebosch Overhead Powerline and Substation, Multiple Farms, Laingsburg and Karoo Hoogland 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:

- Archaeological Impact Assessment
- Visual Impact Assessment

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Our Ref: HM/ CENTRAL KAROO/ LAINGSBURG/ KARREEBOSCH/ MULTIPLE FARMS
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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.

Please note, should you require the HIA to be submitted as a Phased HIA, a written request must be submitted to HWC prior to submission. HWC reserves the right to determine whether a phased HIA is acceptable on a case-by-case basis.

If applicable, applicants are strongly advised to review and adhere to the time limits contained the Standard Operational Procedure (SOP) between DEADP and HWC. The SOP can be found using the following link http://www.hwc.org.za/node/293

Kindly take note of the HWC meeting dates and associated agenda closure date in order to ensure that comments are provided within as Reasonable time and that these times are factored into the project timeframes.

HWC reserves the right to request additional information as required.
Should you have any further queries, please contact the official above and quote the case number.

.....
Nuraan Vallie
Acting Deputy Director

Heritage Western Cape
Erfenis Wes-Kaap
ILifa leMveli leNtshona Koloni

30 August 2022