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



For

WSP

August 2022



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:

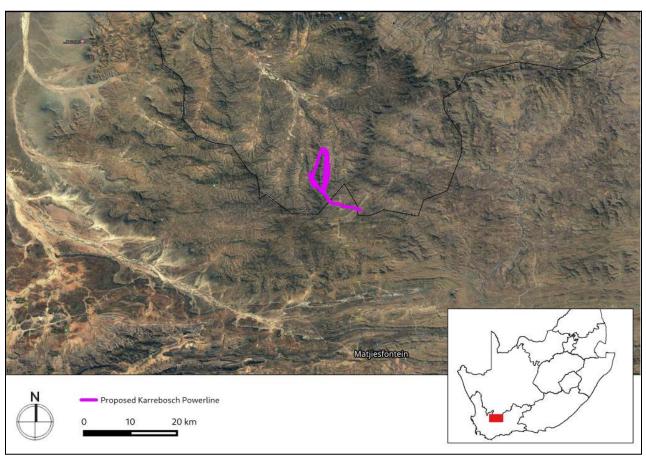


Figure A: Location of the proposed study area



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-ord	linates	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 gro	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

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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

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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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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.

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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

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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 Standyastigheid 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.



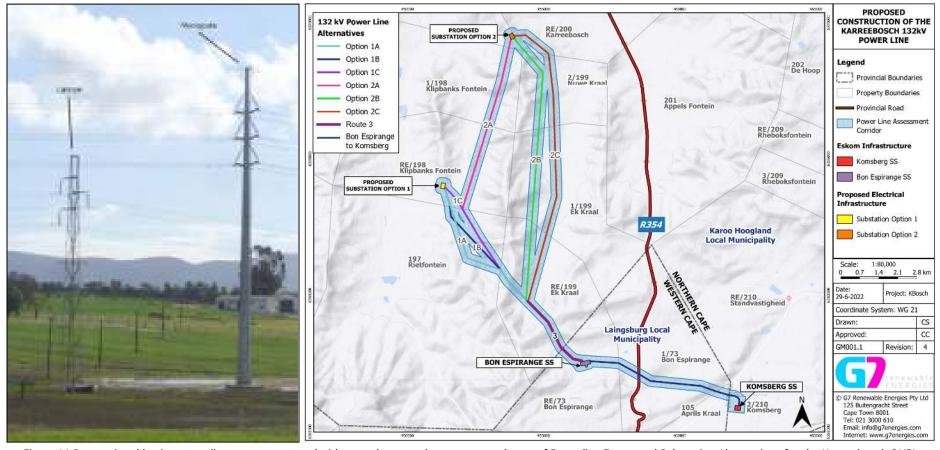


Figure 1.1 Conventional lattice powerline tower compared with a steel monopole structure and map of Powerline Route and Substation Alternatives for the Karreebosch OHPL



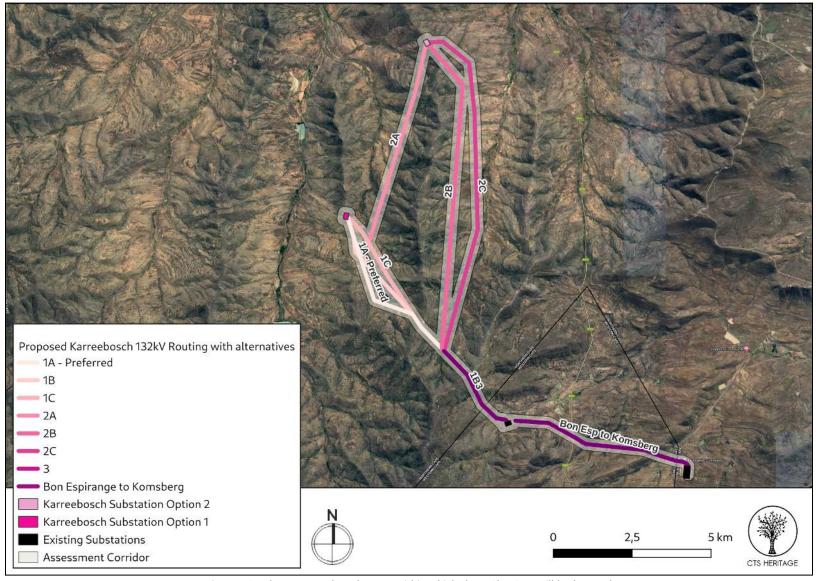


Figure 1.2: The proposed study area within which the 132kV OHL will be located

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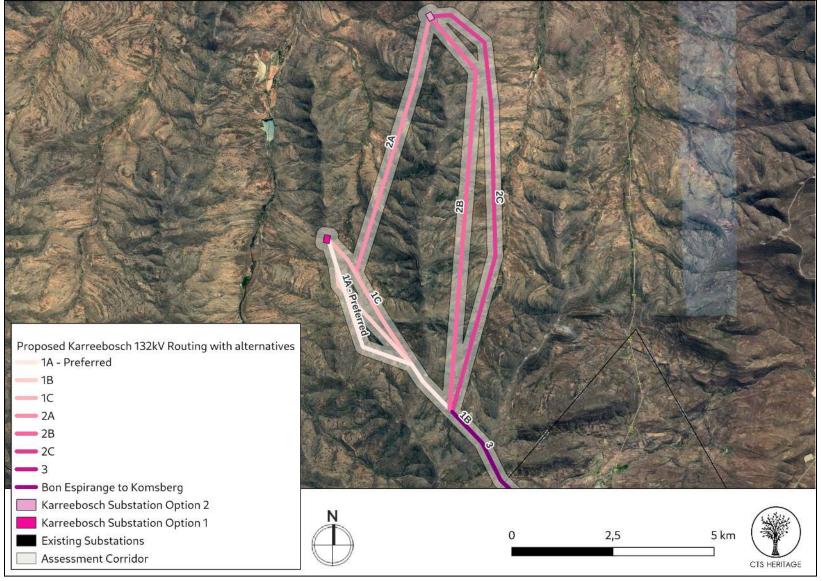


Figure 1.3: Study Area in the Northern Cape

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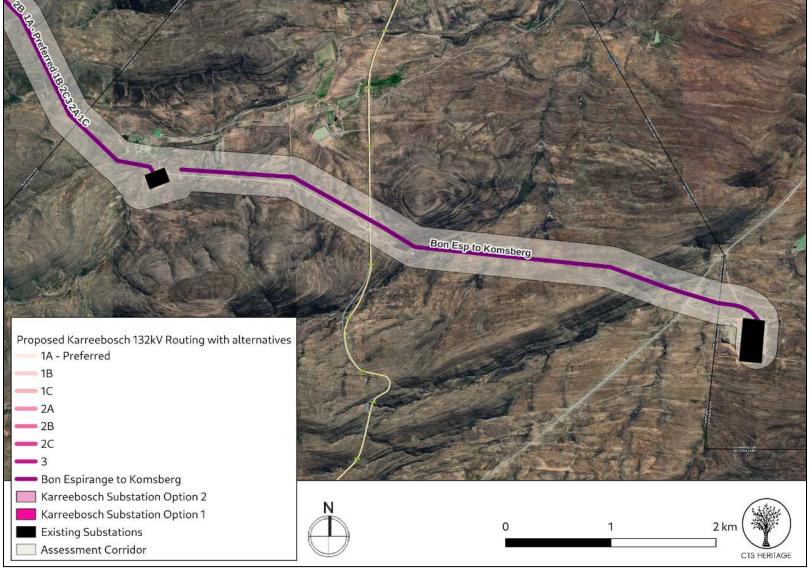


Figure 1.4: Study Area in the Western Cape (although the shapefile provided indicates that the line does not connect to the substation, this is incorrect and the line does in fact connect)

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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 <u>not</u> 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 direct¹, indirect², secondary³ 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



					1	
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 (+)			

Avoid or prevent

Refers to considering options in project location, nature, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services, and people. Where environmental and social factors give rise to unacceptable negative impacts the projects should not take place, as such impacts are rarely offsetable. Although this is the best option, it will not always be feasible, and then the next steps become critical.

Minimise

Refers to considering alternatives in the project location, scale, layout, technology and phasing that would **minimise impacts** on biodiversity and ecosystem services. Every effort should be made to minimise impacts where there are environmental and social constraints.

Rehabilitate Restore

Refers to the **restoration or rehabilitation** of areas where impacts were unavoidable and measures are taken to return impacted areas to an agreed land use after the project. Restoration, or even rehabilitation, might not be achievable, or the risk of achieving it might be very high, and it might fall short of replicating the diversity and complexity of the natural system, and residual negative impacts on biodiversity and ecosystem services will invariably still need to be offset.

Offset

Refers to measures over and above restoration to remedy the residual (remaining and unavoidable) negative impacts on biodiversity and ecosystem services. When every effort has been made to avoid or prevent impacts, minimise and then rehabilitate remaining impacts to a degree of no net loss of biodiversity against biodiversity targets, **biodiversity offsets** can – in cases where residual impacts would not cause irreplaceable loss - provide a mechanism to remedy significant residual negative impacts on biodiversity.

No

Refers to 'fatal flaw' in the proposed project, or specifically a proposed project in an area that cannot be offset, because the development will impact on strategically important Ecosystem Services, or jeopardise the ability to meet biodiversity targets. This is a fatal flaw and should result in the project being rejected.

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.



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

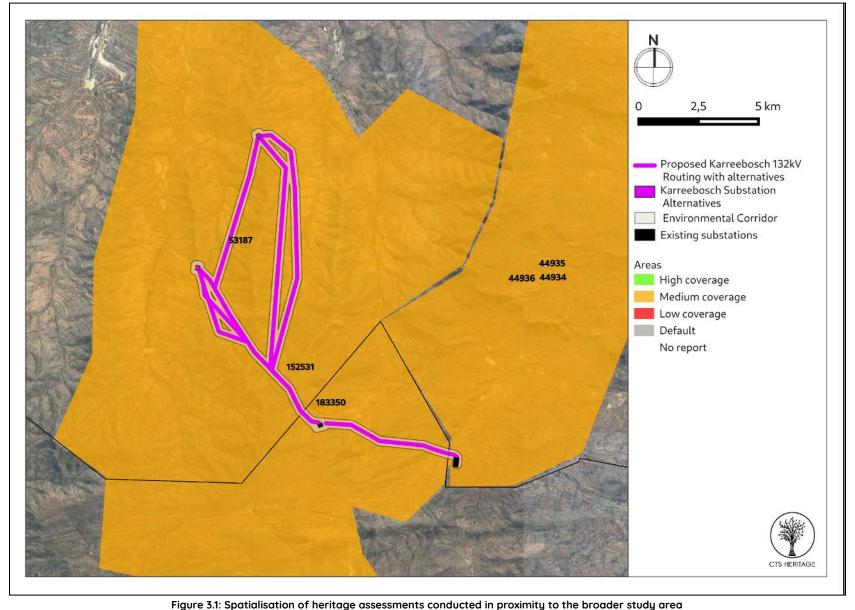


SAHRIS ID	Site No.	Site Name	Site Type	Grading
35202	ROG028	Roggeveld 028	Artefacts	Grade IIIc
35204	ROG029	Roggeveld 029	Cultural Landscape	Grade IIIc
35208	ROG030	Roggeveld 030	Stone walling	Grade IIIc
35215	ROG033	Roggeveld 033	Cultural Landscape	Grade IIIc
35137	ROG007	Roggeveld 007	Burial Grounds & 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	





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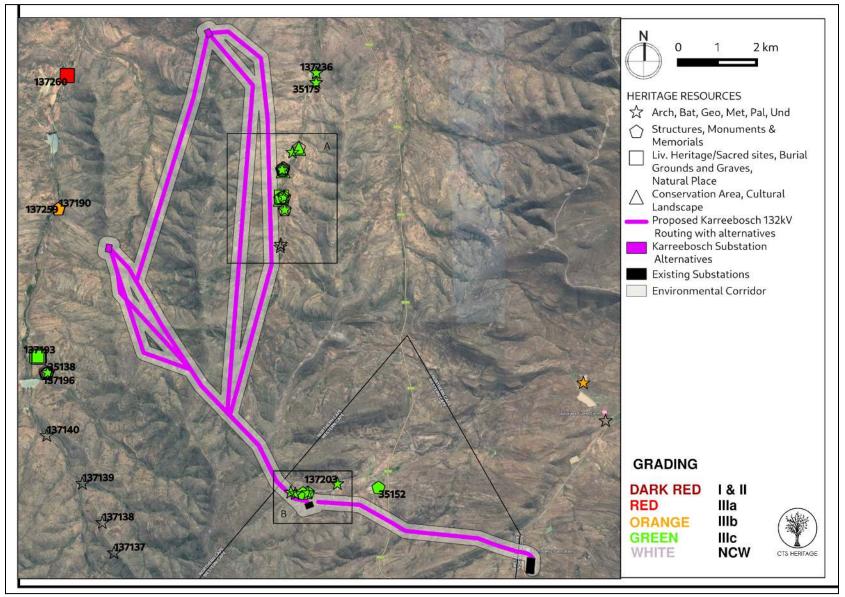


Figure 3.2: Spatialisation of heritage resources known in proximity to the broader study area

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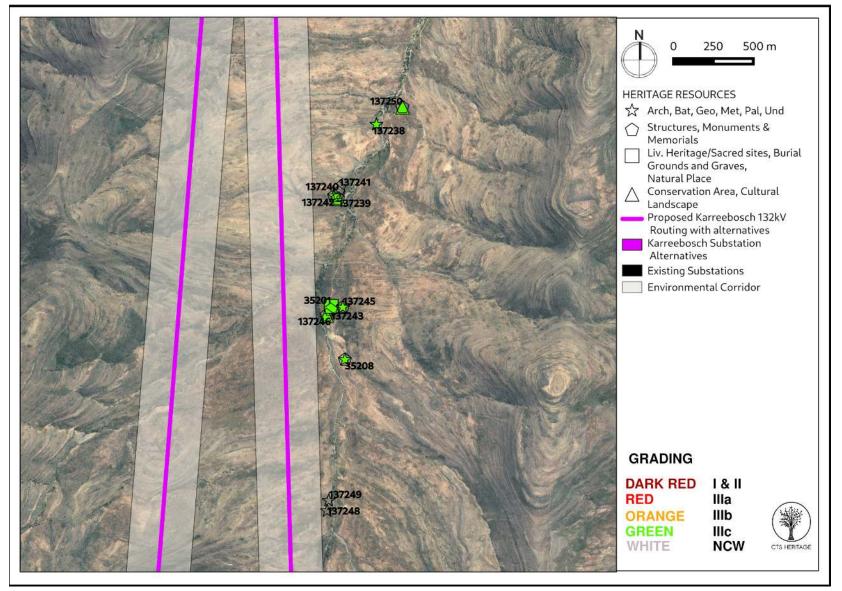


Figure 3.3: Spatialisation of heritage resources known in proximity to the broader study area - inset A

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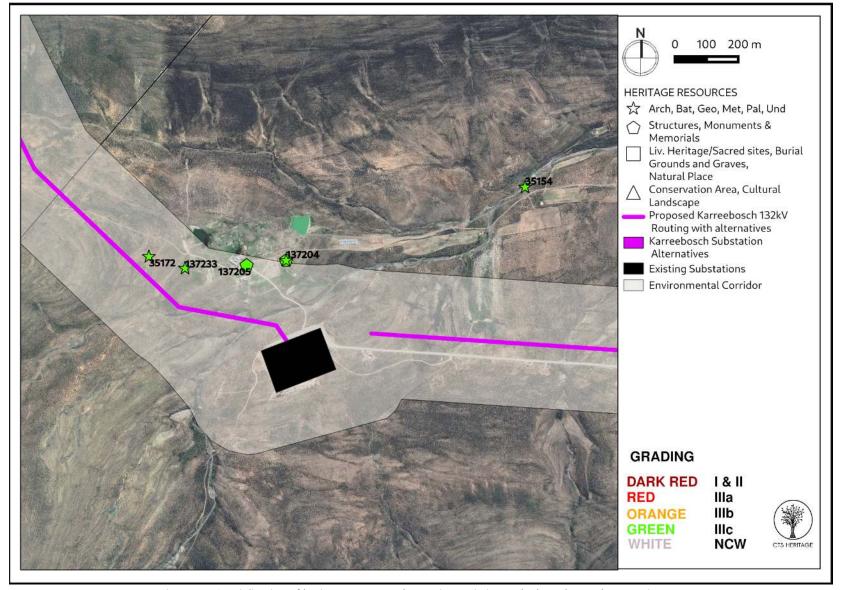


Figure 3.4: Spatialisation of heritage resources known in proximity to the broader study area - inset B

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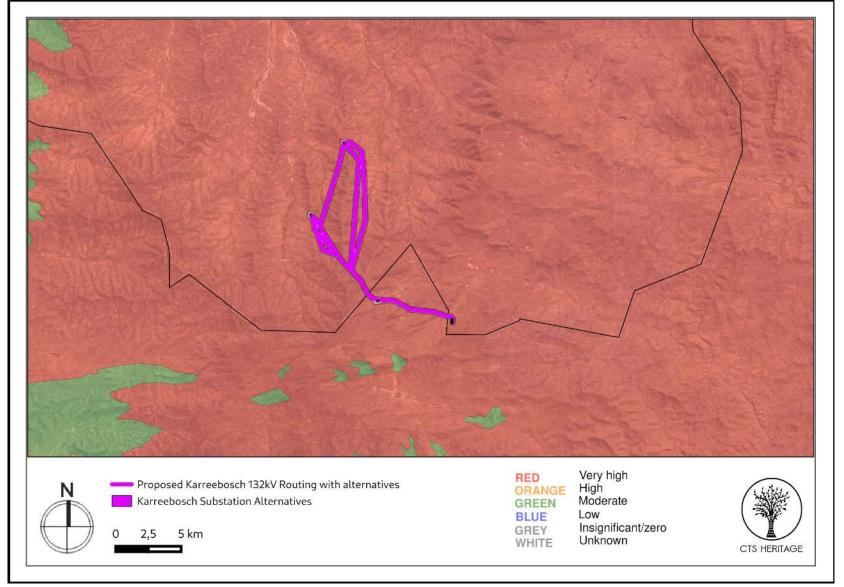


Figure 4: Palaeontological sensitivity of the area surrounding the broader study area

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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)."



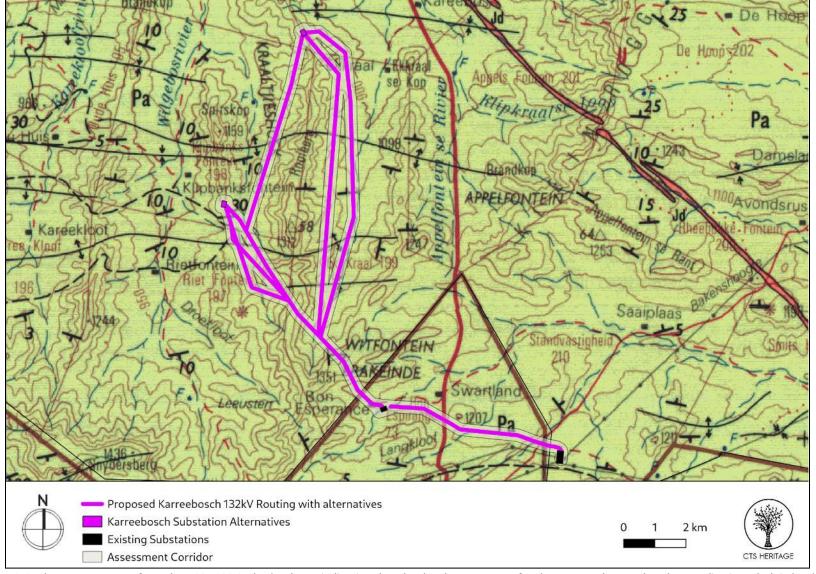


Figure 4.2 Geology Map. Extract from the CGS 3220 Sutherland Map indicating that the development area for the proposed Karreebosch Powerline is underlain by the Pa:

Abrahamskraal Formation of the Beaufort Group



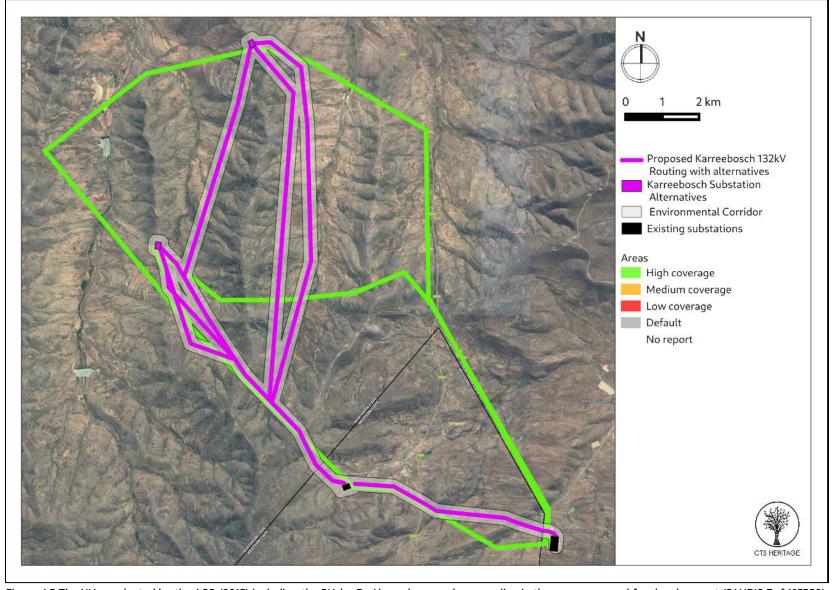


Figure 4.3 The HIA conducted by the ACO (2015) including the PIA by Dr Almond covered a powerline in the area proposed for development (SAHRIS Ref 183350).

CIS HERITAGE

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.

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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."

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4.2 Heritage Resources identified

Table 3: Heritage resources identified in the broader study area

POINT ID	Site Name	Description	Co-ord	linates	Grading	Mitigation
	•	Archaeology				
		Quartzite flakes, thinly struck, prep. Platforms, MSA.				
KRB017	Karrebosch 017	Near valley floor; cores and flakes, knapping and			NCW	NA
		production site	-32.85936	20.47184		
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			NCW	NA
		pump, LSA	-32.90585	20.44082		
KRB022	Karrebosch 022	Chert flake, LSA	-32.88297	20.517862	NCW	NA
		Palaeontology				
		Extensive exposure of SSE-dipping sandstone bed				
		top with sets of small-scale wave ripples and				
		meandering epichnial invertebrate burrows that				
	Palaeo	were probably generated on the margins of a				
PAL KRB	Karreebosch	shallow floodplain pond or playa lake. Sharply				
001	001	overlying grey-green mudrocks show numerous	32°52′37.22″S	20°29′19.68″E	IIIC	None
001	001	ball-and-pillow load structures	32 32 37.22 3	20 29 19.00 L	IIIC	None
		Small (c. 6 cm wide), angular block of pale grey				
		phosphatic concretion containing comminuted				C - 11 41
		vertebrate bone and perhaps bony spines or				Collection
		teeth (pearly grey to black). Possibly of bony fish				under
		or – more likely - amphibian (i.e. temnospondyl)				workplan
	Palaeo	affinity. Block in surface float along shallow				application
PAL_KRB	Karreebosch	drainage line running along top of well-exposed				of Option 1E
002	002	grey-green mudrock package.	32°52′37.45″S	20°29′22.32″E	IIIB	is developed
						Collection
						under
						workplan
	Palaeo					application
PAL_KRB	Karreebosch					of Option 1E
003	003	Probably part of the same fossiliferous concretion	32°52′37.61″S	20°29′21.97″E	IIIB	is developed
						Collection
						under
						workplan
	Palaeo					application
PAL_KRB	Karreebosch	As above (2 blocks). Probably part of the same				of Option 1E
004	004	fossiliferous concretion.	32°52′36.97″S	20°29′23.42″E	IIIB	is developed
		Hillslope exposure of steeply dipping, SE-facing				
		current-rippled bed top with sparse epichnial				
	Palaeo	invertebrate burrows up to c. 2 cm wide,				
PAL_KRB	Karreebosch	subhorizontal with central convex core (possibly				
005	005	segmented) and shallow marginal grooves	32°52′39.07″S	20°29′29.12″E	IIIC	None
	Palaeo	Dense mat of reworked reedy sphenophyte stems				
	I 12 1 1		1	I	1	
PAL_KRB	Karreebosch	(horsetail ferns) preserved as compressions within				



POINT ID	Site Name	Description	Co-ord	linates	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

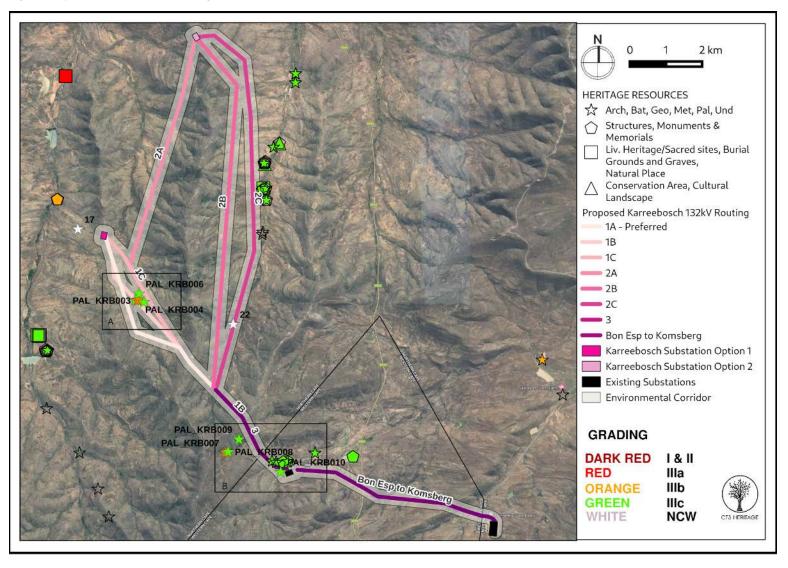


Figure 5.1: Map of heritage resources identified during the field assessment, relative to the broader study area



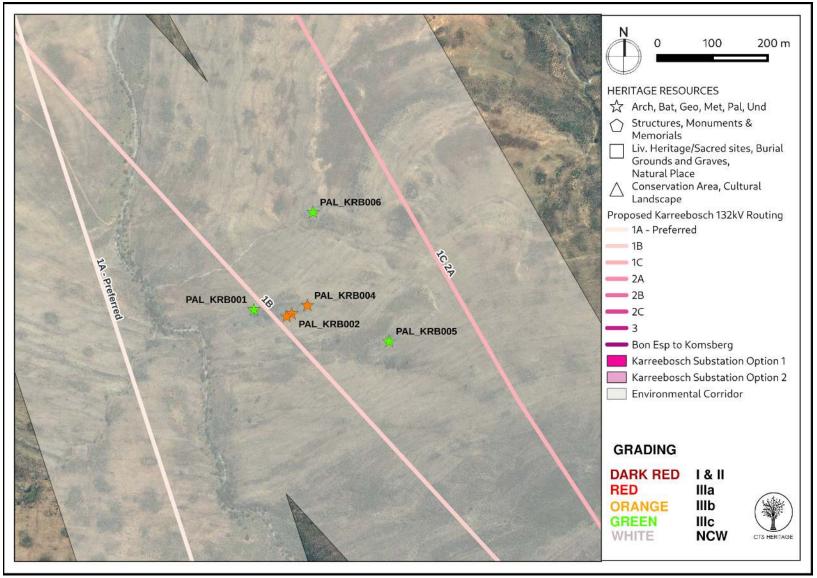


Figure 5.2: Inset A



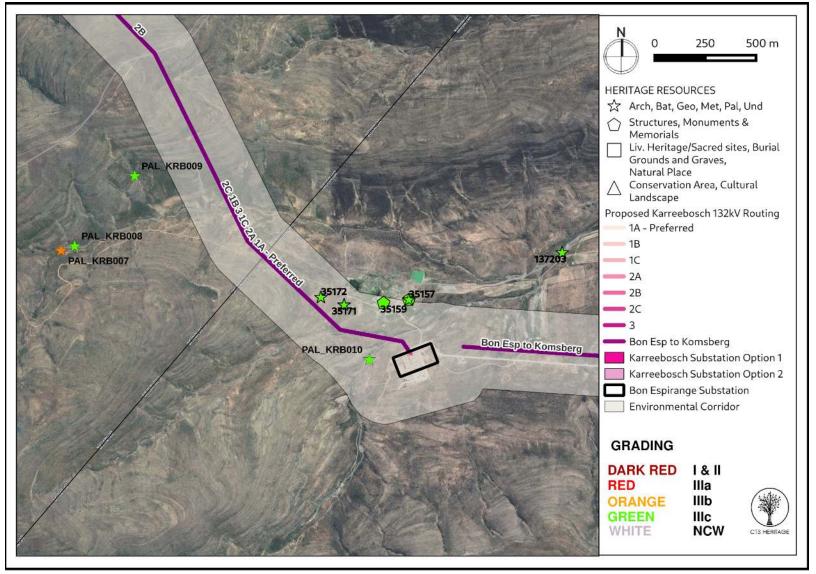


Figure 5.3: Inset B

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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	12	12	45	12
combining the above criteria: S=(E+D+R+M)xP	Very Low	Very Low	Moderate	Very Low
Mitigation Recommendations	None		that are at risk if Option 1 Chance Fossil Finds Proce	f sensitive fossil resources I B is developed



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.



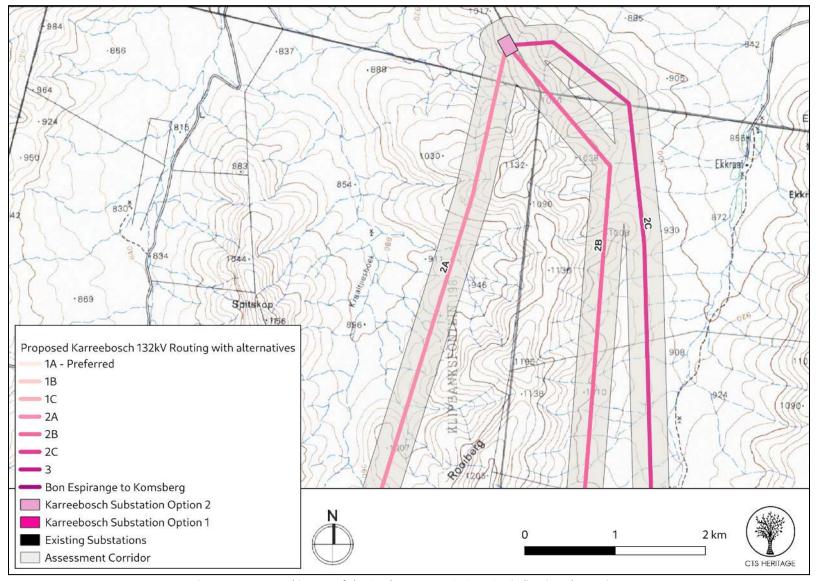


Figure 6.1 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives



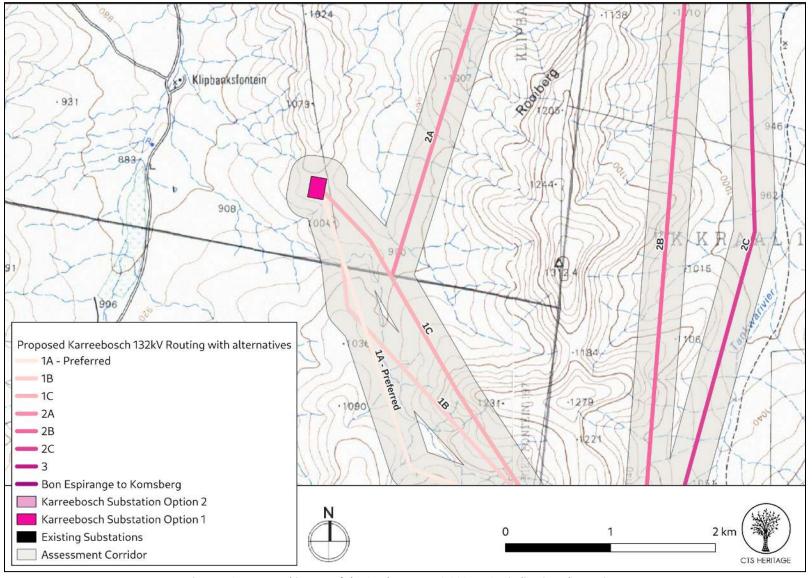


Figure 6.2 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives

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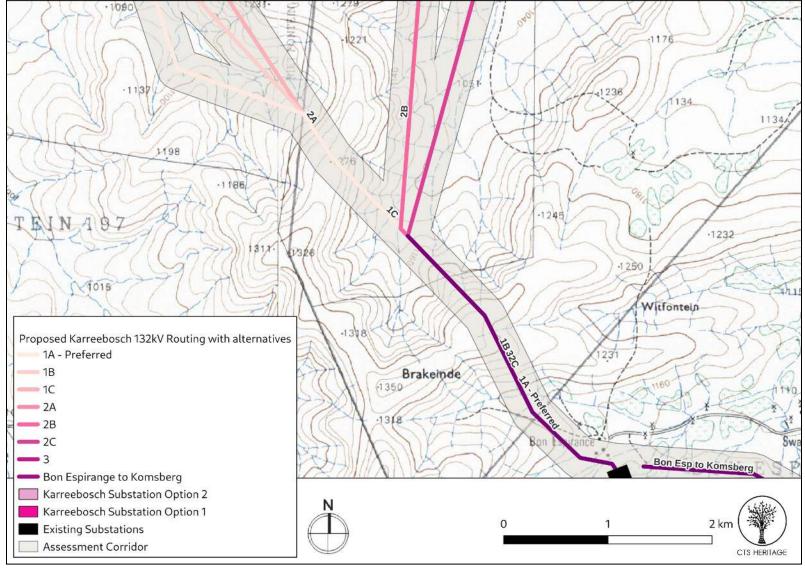


Figure 6.3 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives



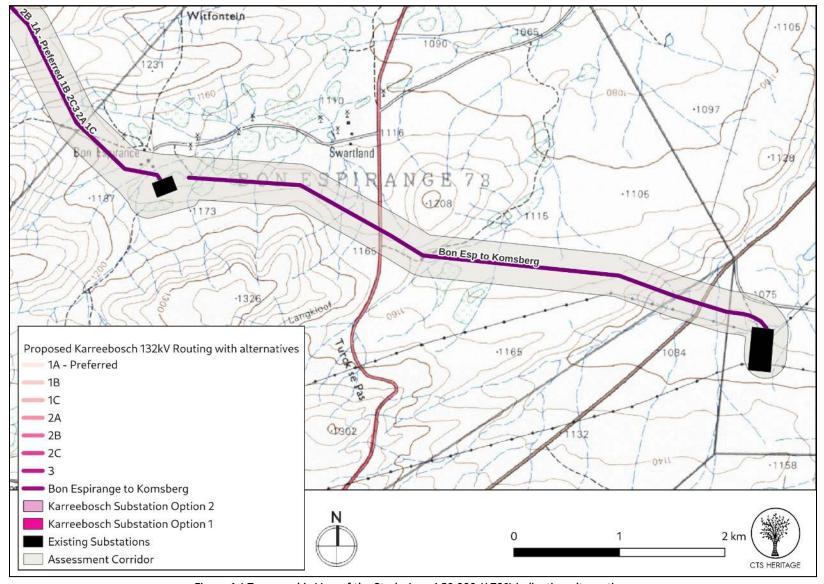


Figure 6.4 Topographic Map of the Study Area 1:50 000 (AZ08) indicating alternatives

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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.

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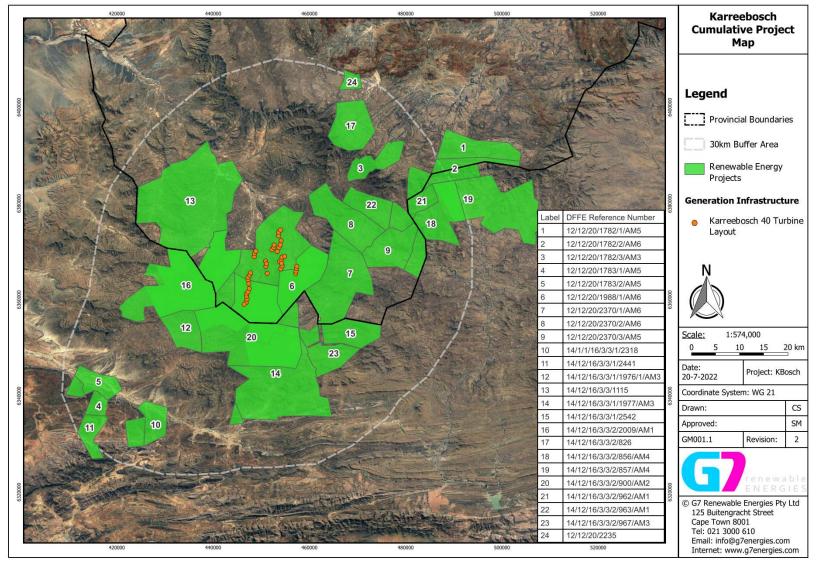


Figure 7: Map indicating renewable energy facilities that have existing environmental authorisation in proximity to the proposed development

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6. RESULTS OF PUBLIC CONSULTATION

There are no registered conservation bodies for this area according to the list on the HWC Website

(<u>www.hwc.org.za</u> 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

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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)	





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



APPENDIX 2: Palaeontology Heritage Report (2021)



APPENDIX 3: Visual Impact Assessment 2022



APPENDIX 4: Heritage Screening Assessment and NID Submission



APPENDIX 5: Outcome of Site Sensitivity Verification

Site Sensitivity Verification

Where a specialist assessment is required and no specific environmental theme protocol has been prescribed (as per Government Gazette 43110, 20 March 2020), the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.

Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration identified by the screening tool must be confirmed by undertaking a site sensitivity verification. The outcome of the site sensitivity verification must be recorded in the form of a report that:

- (a) confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
- (b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and
- (c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

Screening Tool Site Sensitivity

Archaeological and Cultural Heritage Theme

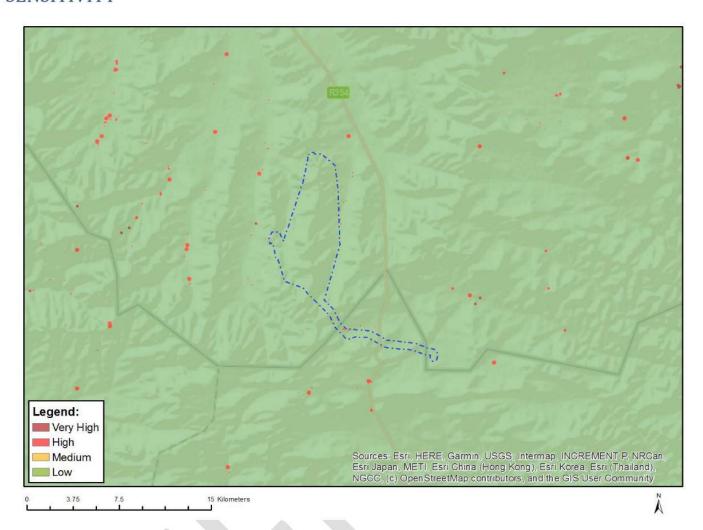
- The Screening Tool for the powerline rated the Archaeological and Cultural Heritage Theme as 'Low
 Sensitivity' with a few small areas of 'High Sensitivity' due to the presence of Grade IIIc heritage sites.
- The Screening Tool for the preferred substation rated the Archaeological and Cultural Heritage Theme as 'Low Sensitivity'.

Palaeontology Theme

- The Screening Tool for the powerline rated the Palaeontology Theme as 'Very High palaeontological sensitivity'.
- The Screening Tool for the preferred substation rated the Palaeontology Theme as 'Very High palaeontological sensitivity'.



MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Feature(s)	
High	Within 50m of a Grade IIIc Heritage site
Low	Low sensitivity



MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY

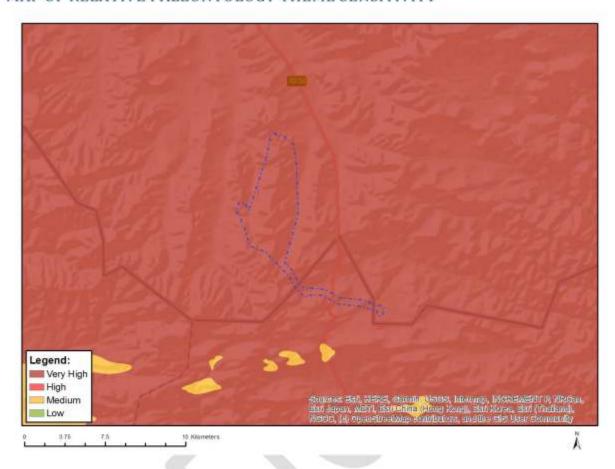


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity	Feature(s)
Low	Low sensitivity



MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

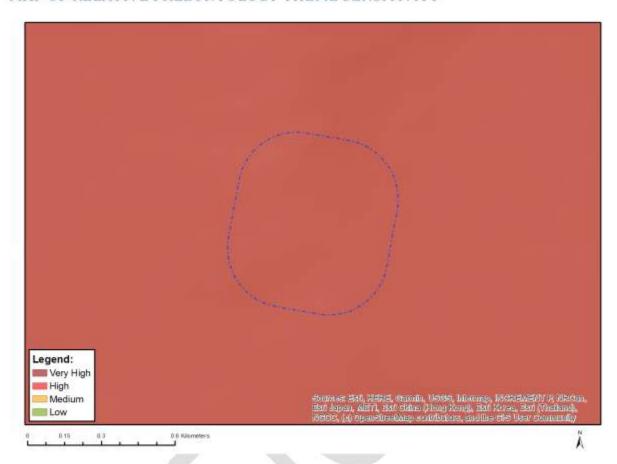


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X	A 1		

Sensitivity	Feature(s)
Very High	Features with a Very High paleontological sensitivity



MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			5000

Sensitivity	Feature(s)
Very High	Features with a Very High paleontological sensitivity



Confirmation of Site Sensitivity for both the powerline and substation

Archaeological and Cultural Heritage

A site verification visit on 13 August 2021 was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tools. Based on the site visit, the findings 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.

See Figures 3.2 - 3.4 and 5.1 - 5.3 of this report.

Palaeontological Heritage

A site verification visit on 23-24 and 29 September 2021 was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tools. Based on the site visit, 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.

See Figures 4 and 4.2 of this report