HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROPOSED DEVELOPMENT OF THE TRANSMISSION CORRIDOR AND ASSOCIATED INFRASTRUCTURE LOCATED ON THE REMAINDER OF THE REMAINDER OF THE FARM ROODE KRAAL NO. 28, THE FARM RIET FOUNTAIN NO. 6, REMAINDER OF THE FARM HARTEBEEST HOEK NO. 31 AND THE REMAINDER OF THE FARM WAGT EN BIETTJE NO. 5, FOR THE PROPOSED JUPITER SOLAR PV1 DEVELOPMENT NEAR DE AAR, EMTHANJENI LOCAL MUNICIPALITY, PIXLEY KA SEME DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE.

(Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of a Basic Assessment)

Prepared for

Sharples Environmental Services cc

On behalf of

Jupiter Solar PV1 (Pty) Ltd

Draft: 28 September 2024

Revised draft: 27 November 2024

Prepared by

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EXECUTIVE SUMMARY

Project Name

Jupiter Solar PV1 Transmission Corridor and Associated Infrastructure

Location

The approximate centrepoint of the project area is: 30.717956°S / 24.122498°E.

Locality Plan

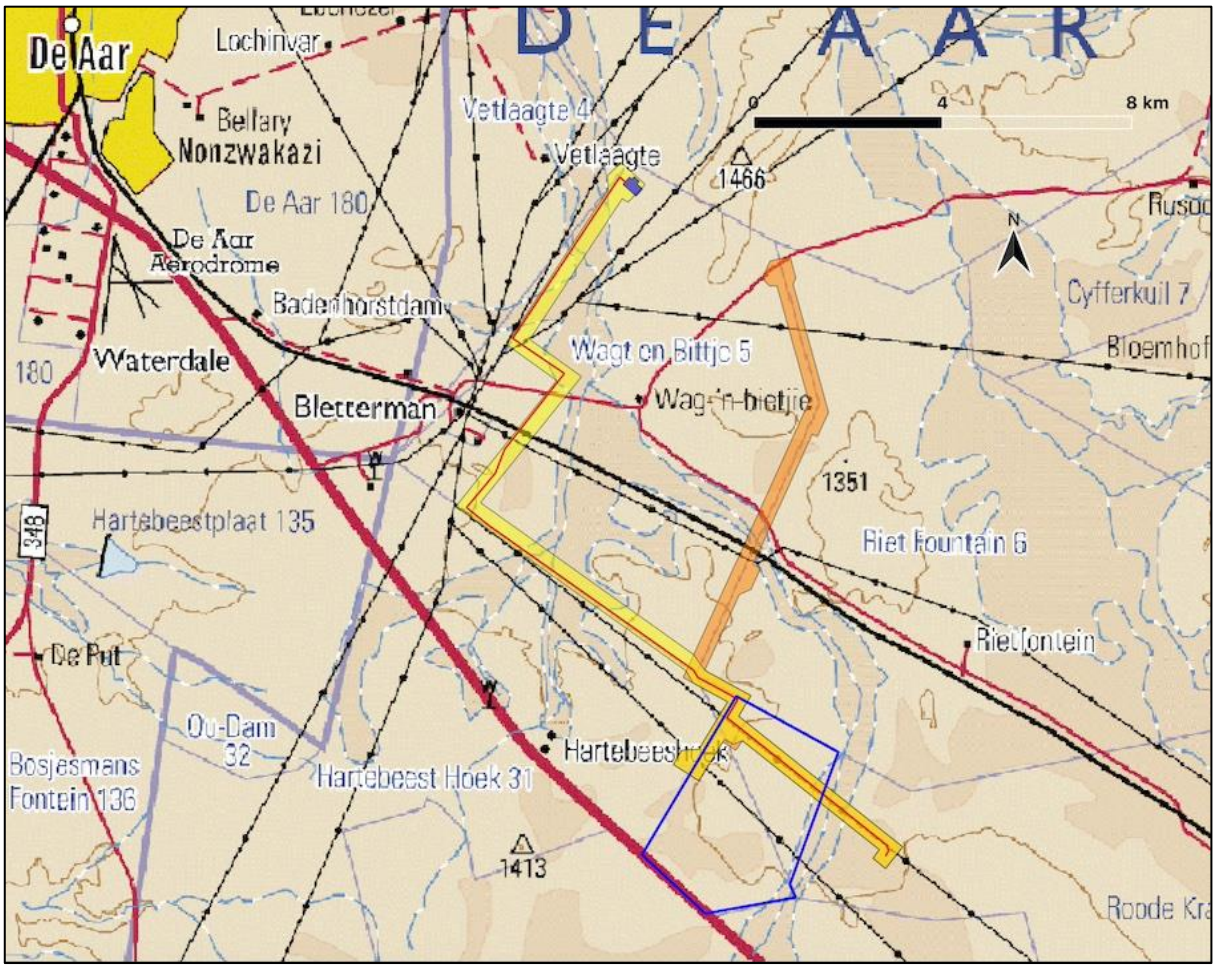

Figure 1: Extract from 1:250 000 topographical map sheet showing the location and extent of the proposed preferred transmission line and corridor (red line within shaded yellow polygon), alternative transmission line corridor (orange shaded polygon) and the location of the Kestrel MTS (shaded blue polygon) for the Jupiter Solar PV1 facility (dark blue polygon) outside De Aar (Source: 1:250 000 chart 3024, National Geo-spatial Information, http://www.ngi.gov.za).

Description of Proposed Development

TerraMare Archaeology (Pty) Ltd has been appointed by Sharples Environmental Services cc, on behalf of Jupiter Solar PV1 (Pty) Ltd conduct a heritage impact assessment for the proposed development of the transmission corridor and associated infrastructure for the proposed Jupiter Solar PV1 development, to be located on the Remainder of the Farm Roode

Kraal No. 28, the Remainder of the Farm Riet Fountain No. 6, the Remainder of the Farm Hartebeest Hoek No. 31, and the Remainder of the Farm Wagt en Biettje No. 5, near De Aar, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province.

The project triggers a Basic Assessment in terms of the National Environmental Management Act.

The proposed project will comprise a switching station, a 132 kV overhead power line from the switching station along the preferred transmission line alignment to the Kestrel Main Transmission Station, and a 132 kV feeder bay and 400/132 kV transformer and bay at the Main Transmission Station. An alternative transmission corridor is proposed to the Eskom Switching at the approved Wagt Solar PV1.

Heritage Impact Assessment

This heritage impact assessment is based on two archaeological survey visits and impact assessment conducted by TerraMare Archaeology, a palaeontological site visit and impact assessment conducted by Dr Gideon Groenewald. The assessment also draws on data from previous projects in the immediate vicinity of this project.

Findings

The palaeontological assessment indicates that both the preferred and alternative transmission corridors and associated infrastructure area for the Jupiter Solar PV1 project are underlain by rocks of the Adelaide Subgroup of the Beaufort Group, and by dolerite of the Karoo Supergroup. The former comprise sets of highly significant geological units which vary in age from Permian to Quaternary and which contain evidence of very early life. The Jurassic aged dolerites do not contain fossils.

Field observations and personal experience in the De Aar region by Dr Groenewald indicates that the geology of the sequence underlying the transmission corridor options and associated infrastructure area falls in the upper part of the Adelaide Subgroup, which places the region at De Aar in the important *Daptocephalus* Assemblage Zone.

The archaeological surveys found a range of archaeological sites and material in the two transmission corridors and associated infrastructure area, principally scatters of LSA hornfels lithics. Most of the lithics on these sites were “fresh” and unpatinated, although in some instances some carried a light grey patination. Most also contained a formal tool element. One of the scatters of tools appears to be a Smithfield assemblage

Some ephemeral scatters of heavily patinated MSA hornfels lithics were also recorded, particularly in the low-lying areas where water movement and wind erosion have deflated this material down into a gravel lag deposit. This type of archaeological material is very common and occurs widely across much of the Karoo and much of it is in secondary context. It is generally regarded as background scatter and is of very low cultural significance.

No ESA material was noted during the site visits.

The other features recorded in and near the transmission corridors were packed stone structures – both kraals and small hut circles. Two of these hut structures are constructed within what appear to be earlier, Khoekhoen kraals just outside the preferred transmission corridor, near the Hydra substation. Also just outside of the preferred transmission corridor

and east of the MTS, four hut structures seem to be associated with a large roughly square kraal situated nearby, between two small koppies.

No extant historical built structures are located within the Jupiter Solar PV1 transmission corridors or within the footprint of the Main Transmission Station. The surrounding historical farm complexes are at Rietfontein, Hartebeesthoek, Vetlaagte and Carolus Poort, and none are less than 1.3 km from either the transmission corridor or the proposed Main Transmission Station.

No identifiable graves were recorded during the survey of the transmission corridors and associated infrastructure area, but three small mounds of dolerite cobbles, recorded at the base of a koppie within the preferred transmission corridor and within 200 m of several nearby stone structures, could conceivably be graves. The form and size of the mounds and the underlying rockiness of the areas suggests, however, that this is unlikely.

In respect of the cultural landscape, the pre-colonial and historical use of the landscape within and around the Jupiter Solar PV1 transmission corridor options and associated infrastructure area has not significantly altered its overall natural character and until relatively recently it could best be described as a lightly used, organically evolved, largely relict landscape.

However, pre-colonial and historical landscape character has been recently altered by the proliferation of electrical infrastructure associated with the numerous renewable energy projects around De Aar and with the nearby Eskom Hydra substation. The proximity of the project area to Hydra means that a large number of overhead transmission lines converge in the area, some of them directly adjacent to the preferred Jupiter Solar PV1 transmission corridor and associated infrastructure area.

Although the construction of the transmission corridor and associated infrastructure will substantially alter the current landscape character of the project site, and will contrast markedly with the pre-colonial and historical elements that are present in the landscape, this development will take place in a cultural landscape which can now best defined as a continuing landscape, within which the evolutionary process towards an increasingly industrial cultural landscape around De Aar is well underway.

Recommendations

Palaeontology - The geology of the Jupiter Solar PV1 transmission corridors and associated infrastructure area includes some areas underlain by fossiliferous Adelaide Subgroup bedrock well-known for containing significant fossils from the *Daptocephalus* AZ. In other areas, Quaternary sands may contain sporadic fossil material. The areas underlain by dolerite will have a very low to insignificant sensitivity for palaeontological heritage

The PIA therefore makes the following recommendations:

- The EAP and developer must be informed that significant areas are underlain by rocks with a very high sensitivity for palaeontological heritage.
- All excavations that will expose sedimentary strata may impact significant fossils. The appointment of a palaeontologist to conduct a comprehensive Phase 2 PIA assessment (fossil collection during construction) will be the minimum requirement for monitoring of excavations into the Adelaide Subgroup strata.
- The project will require a formal “Chance Find Protocol” that will have to be upgraded

during the construction phase of the project.

- Recommendations for palaeontological monitoring and mitigation must be included in the EMPr which must be submitted to SAHRA for comment.

Archaeology - The two archaeological field surveys and desktop assessment conduced for this project identified a range of archaeological sites and material within the area that will be affected by the Jupiter Solar PV1 transmission corridors and associated infrastructure. No archaeological material was identified within the footprint of the proposed Main Transmission Station. Experience indicates that there may also be archaeological material buried within the surficial sediments within the development area, particularly pre-colonial archaeology potentially ranging from the ESA to the LSA. Earthworks and excavations for the project may, thus, encounter and disturb such buried archaeological material, if present.

JupiterThe following mitigation is recommended in respect of archaeological sites and material located within the preferred transmission corridor and associated infrastructure area:

- The likely hut structure at J058 must be subject to a buffer of 20 m. If this is not possible, the structure must be measured, photographed and accurately recorded by an archaeologist, before it is impacted.
- The ephemeral stone circle and associated artefacts at J059 must be subject to a buffer of 20 m. If this is not possible, the structure must be measured, photographed and accurately recorded by an archaeologist, before it is impacted.
- If any archaeological material is uncovered during development, work in the immediate area must be halted and the find reported to the heritage authorities. The find may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Close to, but outside of the preferred transmission corridor it is recommended that:

- The cluster of structures and sites at JG078-JG090 and the possible kraal at J054 must be avoided, and each cluster must be subject to a buffer of 40 m.
- The cluster of huts at J045-J048 must be subject to a buffer of 40 m.
- The kraal at G003 must be subject to a buffer of 40 m around its outer edge.

With regard to graves and burials, the following is recommended:

- The three stone mounds J054 - J056 must be excluded from the development footprint by means of a buffer of 20 m around each. If avoidance is not possible, then these stone mounds will need to be investigated by an archaeologist and if they are graves, will need to be exhumed prior to the commencement of construction work. This will require a permit from SAHRA under Section 36 of the NHRA.
- Should previously unknown human remains be encountered during construction, work in the vicinity of the find must cease, the remains must be left *in situ* but made secure, and SAHRA must be notified immediately so that mitigatory action can be determined and be implemented.

Cultural Landscape - No specific measures to mitigate impacts to the cultural landscape are recommended, but the implementation of any recommendations in the visual impact assessment designed to reduce visual impacts would assist in reducing the impact to the cultural landscape.

All of the recommendations above must be incorporated into the Environmental Management Programme (EMPr) and EA for the Jupiter Solar PV1 transmission corridor and associated infrastructure.

Conclusions

This assessment has found that the preferred and alternative Jupiter Solar PV1 transmission corridors and the site of the proposed Kestrel Main Transmission Station is a heritage environment of variable sensitivity but that significant impacts on palaeontological, archaeological and other heritage resources arising from the project are unlikely.

Impacts to the cultural landscape are expected, but the transmission line and Main Transmission Station will be constructed in an environment that is already significantly altered by existing electrical infrastructure. Impacts may be reduced through the implementation of any recommendations in the visual impact assessment designed to reduce the visual impacts of the project.

If the project is not implemented, the site will stay as it currently is with a neutral impact significance.

It is our reasoned opinion, therefore, that from a heritage perspective the construction of the Jupiter Solar PV1 transmission line within the preferred corridor, and associated infrastructure may be authorised, but subject to the recommendations contained within this report.

Author/s and Date

Heritage Impact Assessment: John Gribble and Gail Euston-Brown, TerraMare Archaeology (Pty) Ltd, 2024.

Archaeological Impact Assessment: John Gribble and Gail Euston-Brown, TerraMare Archaeology (Pty) Ltd, incorporated in the HIA, 2024.

Palaeontological Impact Assessment: Gideon Groenewald, 2024.

CONTENTS OF THE SPECIALIST REPORT – CHECKLIST

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	Preface pages and Appendix B
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix A
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 3
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Sections 5
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
(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;	Sections 6 & 7
(g) an identification of any areas to be avoided, including buffers;	Section 8 & 12
(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;	Figure 4 and Figure 5
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5.6
(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;	Sections 6 - 8
(k) any mitigation measures for inclusion in the EMPr;	Section 13
(l) any conditions for inclusion in the environmental authorisation;	Section 13
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof	Section 14

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 or Environmental Authorization, and where applicable, the closure plan;	
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	To be included in Section 5.7
(p) any other information requested by the competent authority	N/A
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

THE AUTHOR

John Gribble has an MA (UCT, 1989), in archaeology and has been working in cultural resource management since the early 1990s. He has worked in both the regulatory and commercial heritage management fields: the former during 13 years at the National Monuments Council / South African Heritage Resources Agency (SAHRA), and the latter as both a terrestrial and maritime archaeological consultant in South Africa and the UK.

He holds archaeological accreditation with the Association of Southern African Professional Archaeologists CRM section (Member #43) as follows:

- Principal Investigator: Maritime Archaeology and Colonial Archaeology; and
- Field Director: Stone Age Archaeology.

A signed and certified specialist statement of independence is attached to this report as Appendix A and the author's CV is attached as Appendix B.

GLOSSARY

Archaeology: Remains resulting from human activity which is in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

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

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.

Later Stone Age: The archaeology of the last 20 000 years associated with fully modern people.

Middle Stone Age: The archaeology of the Stone Age between approximately 200,000 and 20,000 years ago, associated with early modern humans.

Palaeontology: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Quaternary: The geologic time period that encompasses the most recent 2.6 million years. It comprises the Pleistocene (2.6 Ma – 10,000 years ago) and the Holocene (10,000 years ago to the present) and is characterised by a series of global glacial cycles.

SAHRA: South African Heritage Resources Agency – the compliance authority which protects national heritage.

Structure (historic): Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.

Trekboer: A farmer who moves stock from locality to locality on a seasonal cycle.

ACRONYMS

AZ	Assemblage Zone
BA	Basic Assessment
BESS	Battery Energy Storage System
BP	Before Present
DFFE	Department of Fisheries, Forestry and the Environment
EA	Environmental Authorization
EMPr	Environmental Management Programme
ESA	Early Stone Age
GPS	Global Positioning System
ha	Hectare
HIA	Heritage Impact Assessment
HV	High Voltage
IPP	Independent Power Producer
LSA	Late Stone Age
MSA	Middle Stone Age
MTS	Main Transmission Station
MV	Medium Voltage
MW	Megawatt
mya	Million years ago
NCW	Not Conservation Worthy
NEMA	National Environmental Management Act (No. 107 of 1998)
NHRA	National Heritage Resources Act (No. 25 of 1999)
O&M	Operational and Maintenance
PHRA	Provincial Heritage Resources Authority
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SEF	Solar Energy Facility
SS	Switching Station
ZVAP	Zeekoe Valley Archaeological Project

Table of Contents

1 INTRODUCTION

TerraMare Archaeology (Pty) Ltd has been appointed by Sharples Environmental Services cc, on behalf of Jupiter Solar PV1 (Pty) Ltd conduct a heritage impact assessment for the proposed development of the transmission corridor and associated infrastructure for the proposed Jupiter Solar PV1 development, to be located on the Remainder of the Farm Roode Kraal No. 28, the Remainder of the Farm Riet Fountain No. 6, the Remainder of the Farm Hartebeest Hoek No. 31, and the Remainder of the Farm Wagt en Bietjje No. 5, near De Aar, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province (Figure 1 and Figure 2).

The proposed project triggers a Basic Assessment (BA) in terms of the National Environmental Management Act, 1998 (NEMA).

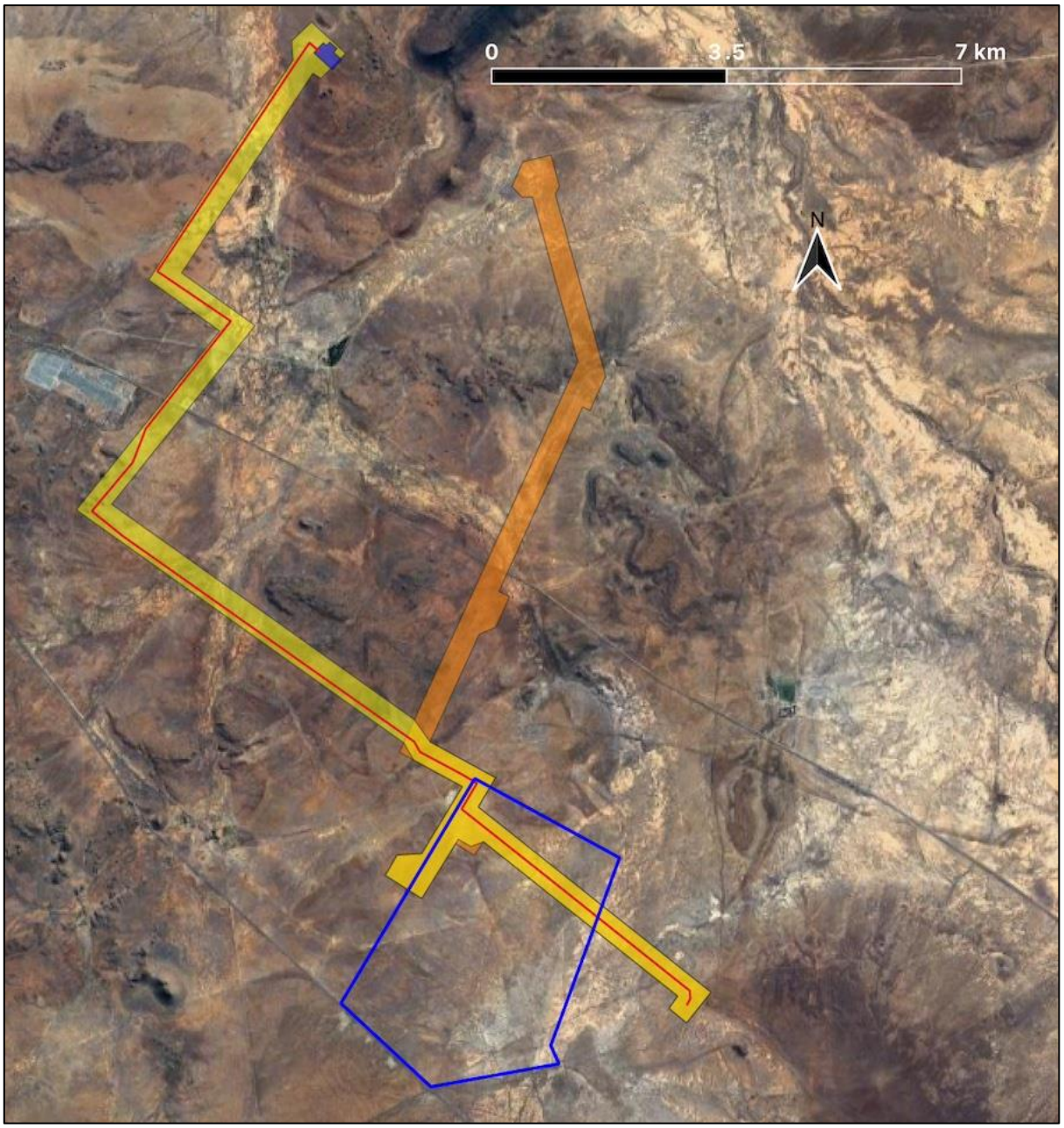

Figure 2: The location and extent of the proposed preferred transmission line and corridor (red line within shaded yellow polygon), alternative transmission line corridor (orange shaded polygon) and the location of the Kestrel

MTS (shaded blue polygon) for the Jupiter Solar PV1 facility (dark blue polygon) outside De Aar (Source: Google Earth).

2 PROJECT DESCRIPTION

The proposed preferred transmission corridor and associated infrastructure for the Jupiter Solar PV1 facility will be located on the Remainder of the Farm Roode Kraal No. 28, the Remainder of the Farm Riet Fountain No. 6, the Remainder of the Farm Hartebeest Hoek No. 31, and the Remainder of the Farm Wagt en Bietjje No. 5.

An alternative transmission line corridor terminating at the Eskom Switching at the approved Wagt Solar PV1 is also proposed (Figure 2),

The preferred transmission line will be approximately 13.8 km long and the alternative approximately 9.5 km.

The affected properties are currently zoned Agriculture.

The proposed transmission infrastructure will comprise the following:

- An Eskom switching station (SS) adjacent to the proposed Independent Power Producer (IPP) substation.
- A 132 kV overhead power line from the switching station to the future Kestral Main Transmission Station (MTS) (previously referred to as the Wag ‘n Bietjie MTS approved through DFFE Ref: 14/12/16/3/3/1/2577/4).
- A 132 kV feeder bay will be constructed at the MTS and the 400 kV Busbar at the MTS will be extended.
- The installation of a new 400/132 kV transformer and bay at the MTS.

3 TERMS OF REFERENCE

TerraMare Archaeology was commissioned to produce this HIA as part of a BA process for the construction of the proposed transmission corridor and associated infrastructure for the Jupiter Solar PV1 facility, as required by the National Environmental Management Act (No. 107 of 1998), as amended.

This HIA aims to identify heritage resources which may be impacted during the construction, operation and decommissioning phases of the Jupiter Solar PV1 transmission corridor and associated infrastructure, assess their significance and make recommendations for mitigation, if required.

This document therefore includes the following:

- A desk-top heritage literature review to assess the potential for archaeological, cultural and historic sites in the proposed development area.
- The results of two archaeological site surveys undertaken by TerraMare Archaeology, and an archaeological impact assessment which drew on data from previous projects in the immediate vicinity of this project.
- The results of a site visit and desktop palaeontological impact assessment (PIA) undertaken by Dr Gideon Groenewald of the project area, to assess whether palaeontological features will be affected by the proposed transmission corridor and associated infrastructure.

- An assessment of potential impacts from the project on the cultural landscape is also included.

The results of these assessments are integrated in this HIA report, along with an assessment of the sensitivity and significance of any heritage resources, an evaluation of the potential impacts on them of the construction, operation and decommissioning of the project, and recommendations for measures to mitigate any negative impacts of the project on them.

The HIA must be submitted for comment to the South African Heritage Resources Agency (SAHRA) and the Northern Cape Provincial Heritage Resources Authority (Ngwao-Boswa Jwa Kapa Bokone), as the relevant statutory commenting bodies under the National Environmental Management Act (NEMA), as amended.

4 RELEVANT LEGISLATION

4.1 National Heritage Resources Act (No 25 of 1999)

The National Heritage Resources Act (NHRA) came into force in 2000 with the establishment of the South African Heritage Resources Agency (SAHRA), replacing the National Monuments Act (No. 28 of 1969 as amended) and the National Monuments Council as the national agency responsible for the management of South Africa's cultural heritage resources.

The NHRA reflects the tripartite (national/provincial/local) nature of public administration under the South African Constitution and makes provision for the devolution of cultural heritage management to the appropriate, competent level of government. In the Northern Cape this is Ngwao-Boswa Jwa Kapa Bokone, although SAHRA currently manages archaeology and palaeontology on an agency basis for the PHRA.

The NHRA gives legal definition to the range and extent of what are considered to be South Africa's heritage resources. According to Section 2(xvi) of the Act a heritage resource is "any place or object of cultural significance". This means that the object or place has aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

In terms of the definitions provided in Section 2 of the NHRA, heritage resources potentially relevant to this assessment are:

- Material remains of human activity which are in a state of disuse and are in or on land [which includes land under water] and which are older than 100 years, including artefacts, human and hominid remains and artificial features.
- Rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency, and which is older than 100 years.
- Any fossilised remains or fossil trace of animals or plants which lived in the geological past [other than fossil fuels or fossiliferous rock intended for industrial use] and any site which contains such fossilised remains or trace.
- Any building, works, device or other facility made by people, and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith, older than 60 years of age.
- Any movable property of cultural significance which may be protected in terms of any provisions of the NHRA, including any archaeological artefact or palaeontological

specimen.
- Intangible heritage such as traditional activities, oral histories and places where significant events happened.

As per the definitions provided above, these cultural heritage resources are protected by the NHRA and a permit from SAHRA (archaeology and palaeontology) or the Ngwao-Boswa Jwa Kapa Bokone (historical built environment) is required to destroy, damage, excavate, alter, deface or otherwise disturb any such site, material or structure.

It is also important to be aware that in terms of Section 35(2) of the NHRA, all archaeological objects and palaeontological material is the property of the State and must, where recovered from a site, be lodged with an appropriate museum or other public institution.

Section 38 of the NHRA requires a HIA for certain kinds of development. In relation to this project, the relevant activities are:

- A development which will change the character of a site exceeding 5000 m^2 in extent (Section 38(1)(c)(i)), and
- The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300 m in length (Section 38(1)(a)).

4.1.1 Grading of Heritage Resources

The South African heritage resources management system is based on grading, in terms of which the appropriate level of management responsibility to a heritage resource is assigned.

Grading, according to Winter & Oberholzer (2013) is “generally based on the intactness, rarity and representivity of the resource, as well as its role in the larger landscape or cultural context”.

The grading of heritage resources is conducted in terms of Section 3 of the NHRA which suggests the following criteria for assigning heritage significance:

- Importance in the community or pattern in South Africa’s history,
- Possession of uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage,
- Potential to yield information that will contribute to an understanding of South Africa’s natural or cultural heritage,
- Importance in demonstrating the principal characteristics of a particular class of South Africa’s natural or cultural places or objects,
- Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group,
- Importance in demonstrating a high degree of creative or technical achievement during a particular period,
- Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons,
- Strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa, and
- Significance in relating to the history of slavery in South Africa.

The generally accepted heritage resource grades are shown in Table 1 below.

Table 1: Grading of heritage resources (Source: Baumann & Winter 2005: Box 5).

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources.

4.1.2 Minimum Standards for Heritage Specialist Studies in terms of Section 38 of the National Heritage Resources Act (No. 25 of 1999)

SAHRA has published minimum standards for heritage studies which have been applied to this HIA (see SAHRA, no date). The minimum standards indicate which specialist studies should form part of a HIA, discusses impact assessment methodologies, sets out the requirements for heritage-related consultation as part of heritage assessments, and provides generic report templates for the various reports required by SAHRA in terms of Section 38 of the NHRA.

This HIA complies with SAHRA's minimum standards and is based on the report template for Section 38 (1 and 8) HIAs set out in Section 9.2. of that document.

4.1.3 Protocols Applicable to the Study

At the time of writing there are no published Environmental Theme Protocols applicable to cultural heritage resources in the *Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes* published by the Minister of Environment, Forestry and Fisheries on 20 March 2020.

According to these procedures, where a specialist assessment is required and no specific environmental theme protocol has been prescribed, 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.

This HIA has considered the findings of a Screening Tool Report for the Jupiter Solar PV1 transmission corridors and associated infrastructure, generated on 27 November 2024, which indicates a low archaeological and cultural heritage sensitivity and very high overall palaeontological sensitivity for the area assessed.

4.2 National Environmental Management Act (Act No 107 of 1998)

The National Environmental Management Act (NEMA), as amended, provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals that are likely to have a negative effect on the environment.

Regulations governing the environmental authorisation process have been promulgated in

terms of NEMA and include the EIA Regulations, 2014 as amended (GNR R326/2017) and Listing Notices 1 – 3 (GNR 324, 325 and 327/2017). These regulations were amended in April 2017 by Government Notices 324, 325, 326 and 327.

The development proposed for this project triggers a number of activities in the Listing Notices and, in terms of GNR 325 therefore, the project will be subject to a BA process and the developer will be required to obtain a positive Environmental Authorisation from the Department of Fisheries, Forestry and the Environment (DFFE) prior to commencement of the proposed activities.

5 METHODOLOGY

This HIA aims to provide a general description of the known and potential heritage sensitivities of the project site and wider area, to assess the impacts of the proposed Jupiter Solar PV1 transmission corridor and associated infrastructure on heritage resources and to make recommendations to mitigate any such impacts. The following sections provide an outline of the approach and methodology used in the study.

In terms of the definitions provided in Section 2 of the NHRA, heritage resources potentially present on the Jupiter Solar PV1 transmission corridor and associated infrastructure area, include:

- Palaeontological resources;
- Pre-colonial archaeological sites and materials;
- Colonial era archaeological sites and materials;
- Rock paintings and / or rock engravings;
- Historical built structures; and
- Graves and burials.

5.1 Study Area

The study area for this heritage assessment of the comprises the extents of the preferred and alternative transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility which crosses the Remainder of the Farm Roode Kraal No. 28, the Remainder of the Farm Riet Fountain No. 6, the Remainder of the Farm Hartebeest Hoek No. 31, and the Remainder of the Farm Wagt en Biettje No. 5.

The total heritage study area for the Jupiter Solar PV1 transmission corridors and associated infrastructure area is approximately 1,110 ha.

5.2 Sources of Information

A survey of available and relevant heritage literature was carried out to assess the general heritage context within which the transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility are set.

This included a review of published material and available unpublished reports, including those generated for previous archaeological assessments and heritage studies that have been conducted in the vicinity of the project site, available on the SAHRIS online platform (https://sahris.sahra.org.za/), in TerraMare Archaeology's project archive or from other heritage consultants.

The sources of information used are shown in Table 2 below and include published archaeological papers and reports for the general project area and unpublished archaeological and heritage impact assessments that have been undertaken in the vicinity of the project site.

Table 2: Information sources used in this assessment

Data/Information	Source	Date	Type	Description
Maps	Chief Directorate: National Geo-SpatialInformation	Various	Spatial	Historical and current 1:50 000 topographic maps of the study area and immediate surrounds
Geological chart	Council for Geoscience	Various	Spatial	Current 1:250 000 geological survey chart for the area
Aerial photographs	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical aerial photographyof the study area and immediate surrounds
Aerial photographs	Google Earth	Various	Spatial	Recent and historical aerial photography of the study area and immediate surrounds
Cadastral data	Northern Cape Farm Portions	Current	Spatial	Cadastral boundaries, extentsand aerial photography
Cadastral data	Chief Directorate: National Geo-Spatial Information	Various	Survey diagrams	Historical and current survey diagrams, property survey and registration dates
Background data	South African Heritage Resources Information System (SAHRIS)	Various	Reports	Previous impact assessments for any developments in the vicinity of the study area
Palaeontological sensitivity	South African Heritage Resources Information System (SAHRIS)	Current	Spatial	Map showing palaeontological sensitivity and required actions based on the sensitivity.
Background data	Books, journals, websites	Various	Books, journals, websites	Historical and current literature describing the study area and any relevant aspects of cultural heritage.

Important, detailed information about the archaeology of this part of the Karoo was provided by publications generated by the Zeekoei Valley Archaeological Project (ZVAP), whose study area lies south-east of the transmission corridors and associated infrastructure area for the Jupiter Solar PV1 project.

The ZVAP surveyed almost 5 000 square kilometres of the catchment of the Zeekoei River (from the Sneeuberg Mountains to the Gariep River Valley) (Figure 3) and recorded some 14 000 archaeological sites representing a history of human occupation covering at least 250 000 years (Sampson, 1985).

This assessment was also informed by the extensive professional experience of both the project archaeologists and the palaeontologist, arising out of numerous previous field surveys and impact assessments they have conducted in the Karoo in general, and the De Aar region in particular.

Figure 3: Extent of the Zeekoei Valley Archaeological Project (ZVAP) study area (orange polygon) in relation to the Jupiter Solar PV1 transmission corridors and associated infrastructure area shown at top left (Google Earth).

5.3 Palaeontological Assessment

The assessment of the palaeontology of the transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility was carried out by Dr Gideon Groenewald (Groenewald, 2024). Dr Groenewald is a palaeontologist based in Middelburg in the Cape,

and so has good local knowledge and extensive experience of the palaeontology of the Karoo. His findings, which have been integrated in part into this report, are based on a desktop study, which included consulting geological maps, literature and palaeontological databases, and published and unpublished records to determine the likelihood of fossils occurring in the area affected by the transmission corridor and associated infrastructure, and on a field survey of the development footprint undertaken on 14 and 15 September 2024.

The palaeontological field assessment recorded detailed observations within and around the area to be occupied by the transmission corridors and associated infrastructure (Figure 4). A photographic record of geological information and the fossils occurring in the outcrops are presented in Appendix C below.

The site visit to the project site was limited to accessible roads but included some hiking into area of specific interest in terms of a very high likelihood of finding significant fossils. Due to time constraints, it was not possible to visit all the potential outcrops. The survey did confirm the high likelihood of finding significant fossils wherever excavation of bedrock of the Adelaide Subgroup occurs.

The PIA is attached to this report as Appendix D.

5.4 Archaeological Field Assessment

Two physical heritage surveys of the areas to be affected by the transmission corridors and associated infrastructure for the Jupiter Solar PV1 facility were undertaken by John Gribble and Gail Euston-Brown of TerraMare Archaeology between 21 - 24 September 2022, and 7 - 10 September 2024.

Each member of the field team carried a hand-held GPS receiver, set to the WGS84 datum and loaded with the outlines of the transmission corridors and area proposed for the associated infrastructure, local roads and farm tracks captured from Google Earth and any points of potential heritage interest identified from Google Earth or other mapping sources. The latter included data collected during a survey by the same team, conducted in 2020 for another transmission line where this overlapped with the preferred Jupiter Solar PV1 transmission corridor (Gribble & Euston-Brown, 2021).

The travelled tracks of the field team were logged by the GPS units and waypoints were entered on the units at the location of any identified heritage resources (Figure 5). Also indicated on Figure 5 are the sites recorded in for the other transmission line project referred to in the previous paragraph.

Appendix E contains the detail of the observations made in the field within the project area.

Photographs were taken of most sites and heritage resources located, of examples of artefacts seen and of the landscape setting, to provide context.

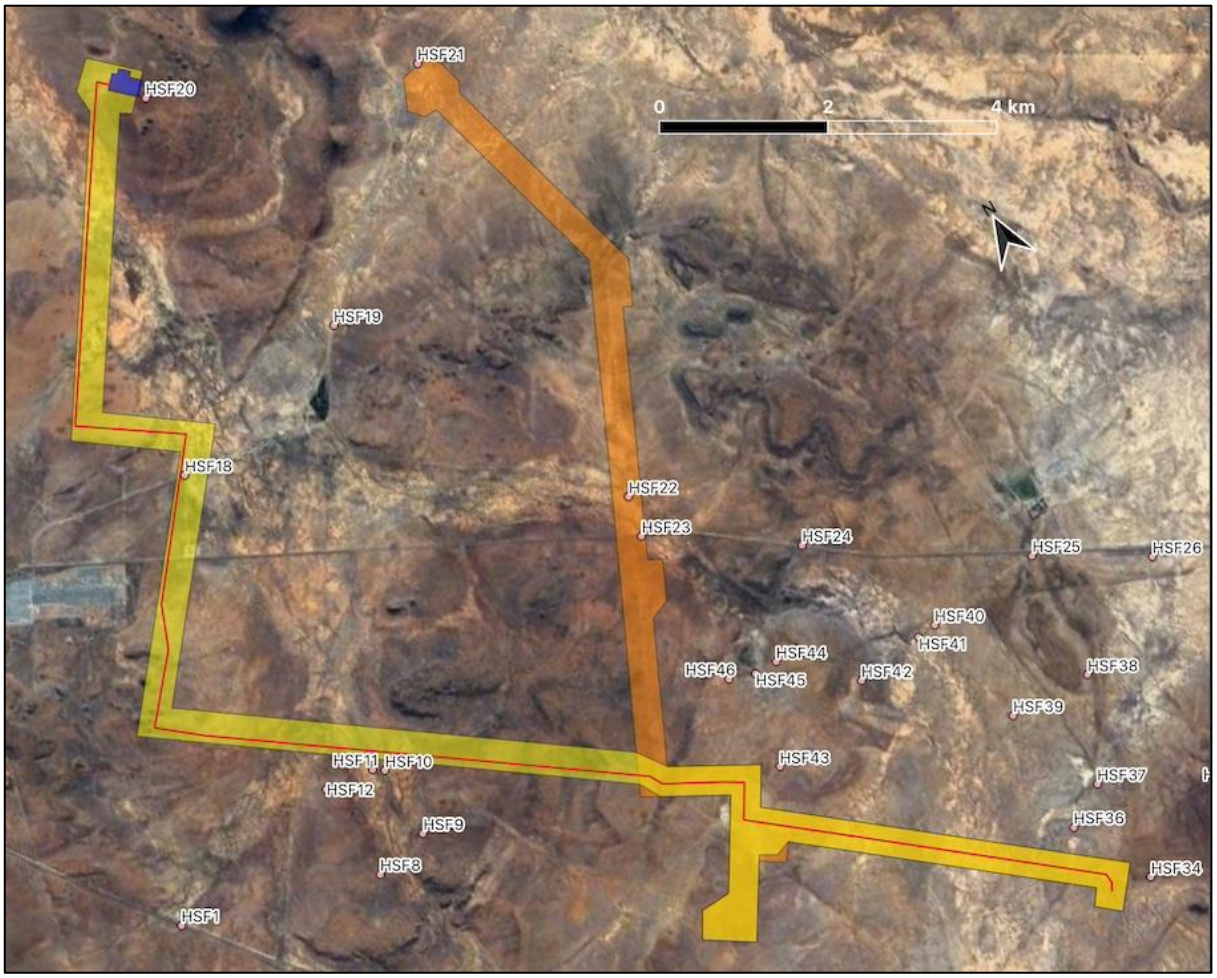

Figure 4: Specific points visited, and observations made during the palaeontological field assessment of the Jupiter Solar PV1 transmission corridors and associated infrastructure area (Groenewald, 2024).

The analysis of heritage resources, which were a mix of pre-colonial and colonial era archaeological material, is based on the experience of the team members who are familiar with the standard classification systems for this artefactual material and can roughly date and characterise an archaeological site based on its visible content and artefacts.

No archaeological material was removed from the project site, and all observations were based on visible surface material.

Both surveys took place in spring. Much of the study area was covered in typical Karoo scrub and grasses, but ground visibility was sufficient for survey purposes and did not negatively affect the outcome of the survey.

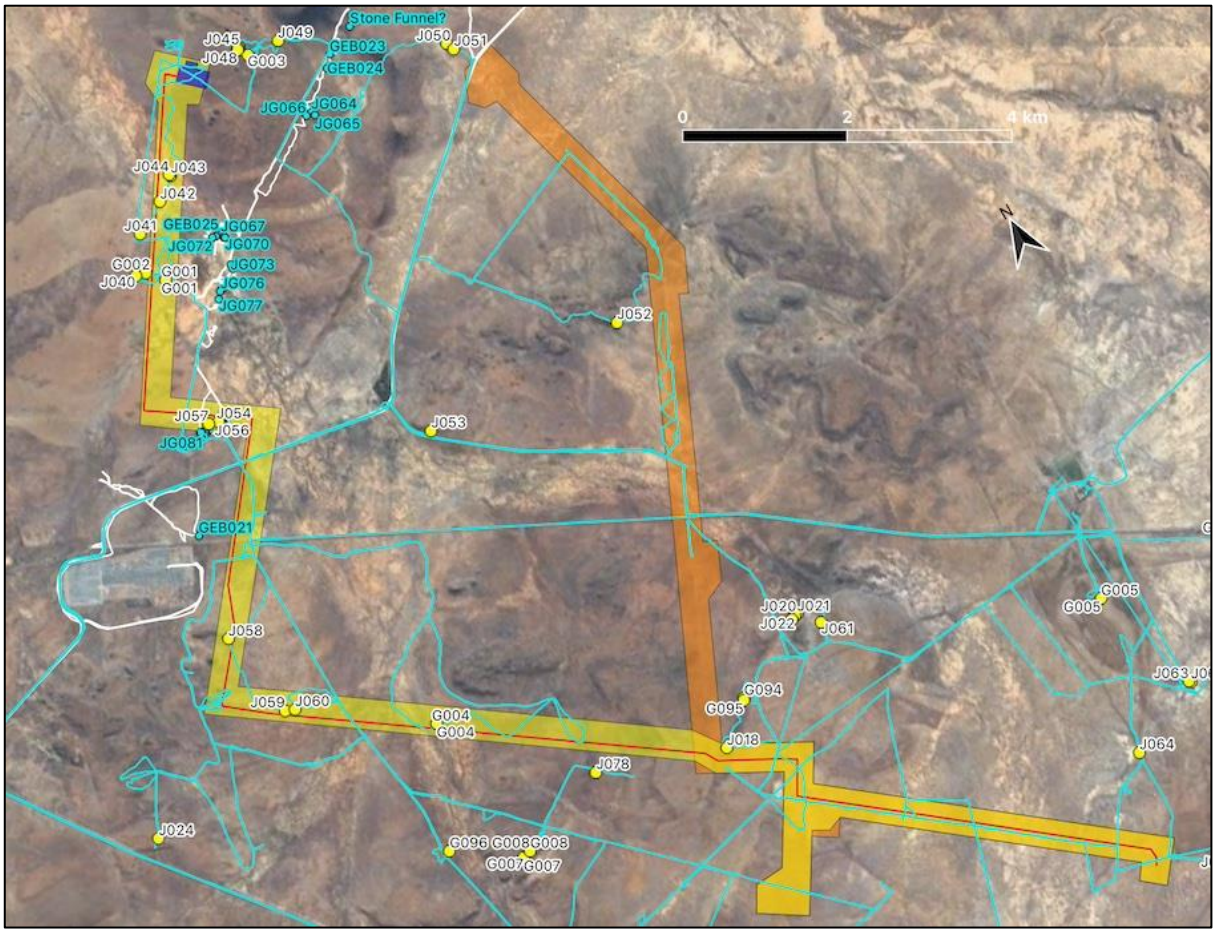

Figure 5: 2022 (pale blue) and 2024 (dark blue) TerraMare Archaeology survey tracks and sites located (white numbered points) within the proposed Jupiter Solar PV1 transmission corridors and associated infrastructure area (blue shaded polygon). The 2020 ACO survey tracks for an adjacent transmission line project are indicated by the white lines and blue coloured numbered points (Google Earth).

5.5 Grading and Site Sensitivity

The survey protocol required the grading in the field of any finds of heritage resources, using the table in Baumann and Winter (2005) referred to above.

Sites of local heritage significance form the Grade 3 tier of the system, with those of high local significance designated as Grade 3A. Those of medium or low local significance are designated Grades 3B and 3C respectively. It is generally assumed that Grade 3A heritage resources should be preserved in their entirety, while Grade 3B and 3C sites can be mitigated or part preserved, as appropriate.

Resources which do not meet the Grade 3 criteria are referred to as Not Conservation-Worthy, although these authors prefer the term “Ungradable” and this is used in this report. Generally, ungradable resources require no further action or mitigation in respect of development proposed on a site.

5.6 Limitations and Assumptions

5.6.1 Palaeontology

A key assumption with respect to the palaeontological assessment is that the existing

geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing.

There is also an inadequate database of fossil heritage for much of South Africa, and most development study areas have never been surveyed by a palaeontologist.

These factors may give rise to either an underestimation or overestimation of the palaeontological significance of a given study area.

5.6.2 Archaeology

The archaeological field surveys were carried out at the surface only and any completely buried archaeological sites or material will not have been recorded.

Survey coverage was good and although some portions of the transmission corridor could not be accessed, the survey team's specialist knowledge and experience in this area of the Karoo with respect to the spatial distribution of heritage resources, means that we are confident that a sound baseline has been created against which to assess the development proposal.

As indicated above, the project site was generally well vegetated. However, based on the archaeological material that was recorded during the survey, and the survey team's experience in this geographical area, it is unlikely that significant archaeological occurrences were not recorded. Landscape features such as rocky hills and outcrops, which are known to be the focus of heritage resources in this area, could be easily identified and visited.

Although we believe that most of the relevant archaeological assessments and HIAs from the area have been located and reviewed, it is acknowledged that some reports may not have been identified for review.

5.7 Public Participation

As required by the NEMA, a public participation exercise will be undertaken as part of the BA process for the Jupiter Solar PV1 transmission corridor and associated infrastructure.

As part of that process, this HIA will be submitted both SAHRA and Ngwao-Boswa Jwa Kapa Bokone for comment, as the relevant statutory commenting bodies under the NEMA. The HIA will also be submitted to the relevant local and regional municipalities, and any other stakeholders or interested and affected parties with an interest in heritage resource es in the area.

Heritage-related comments received during the public participation exercise will be addressed in the revised, final version of this HIA that will form part of the final BA report.

6 RECEIVING ENVIRONMENT

6.1 Physical Characteristics

The Jupiter Solar PV1 transmission corridors and associated infrastructure area are situated in an area whose topography is characterized by wide, undulating plains and valley floors broken by dolerite dykes and sills, swarms of low dolerite hills and ridges, and occasional larger, flat-topped mountains. There are occasional outcrops of Beaufort Group shales, but most of proposed development site is dominated by the red alluvial sands typical of this part

of the Northern Cape.

The properties on which the transmission corridors and associated infrastructure are being proposed are rural farmland and are zoned agricultural. Historically the land has been and continues to be used for stock and game farming.

The vegetation is the grassy, dwarf shrubland typical of the Nama-Karoo biome (Plate 1 - Plate 5). The only trees in the landscape are those planted in historical times around concrete dams constructed to water livestock.

Plate 1: View north-west along the alternative transmission corridor towards the Burgersdorp road which runs left to right across the image below the hills in the distance (Photo: J Gribble)

Plate 2: View south-east along the alternative transmission corridor towards the proposed Jupiter Solar PV1 facility which is beyond the hills in the distance (Photo: J Gribble).

Plate 3:View south along the preferred transmission corridor. The Kestrel MTS will be located on the flat area in the centre of the image, The Hydra substation is visible on the horizon and the proposed Jupiter Solar PV1 facility is off the picture on the left (Photo: J Gribble).

Plate 4: View north along the preferred transmission corridor from near the Hydra substation towards the proposed Kestrel MTS which will be located at the point marked by the arrow. (Photo: J Gribble).

Plate 5: View south-east from the Burgersdorp road along the alternative transmission corridor. The line will cross the hills in the distance to the left of the line of larger koppies on the right of the image (Photo: J Gribble).

6.2 Regional Context

6.2.1 Palaeontology

The flat plains of the modern Karoo are a vast palaeontological landscape underlain by multiple layers of shale and mudstone strata which represent some 120 million years (300 – 183 Ma) of depositional history and which that contain an array of fossils, ranging from fish, early vertebrates, plant remains to trace fossils. It is one of the most complete fossil repositories on the planet (Visser et al, 1977).

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. They are bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks.

During the Carboniferous Period South Africa was part of the huge continental landmass known as Gondwanaland and it was positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa (Visser, 1986, 1989; Isbell et al., 2012). Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed fine-grained sediments in the large inland sea. These are the oldest rocks in the system and are exposed around the outer part of the ancient Karoo Basin and are known as the Dwyka Group (Johnson et al., 2006).

Overlying the Dwyka Group sediments are rocks of the Ecca Group that are Early Permian in age and all of which have varying proportions of sandstones, mudstones, shales and siltstones. These sediments represent shallow to deep water settings, deltas, rivers, streams and overbank depositional environments (Bamford, 2023).

The Ecca Group is overlain by the rocks of the Beaufort Group that has been divided into the lower Adelaide Subgroup for the Upper Permian strata, and the Tarkastad Subgroup for the Early to Middle Triassic strata.

The laying down of the Beaufort shales about 230 million years ago is the best-known depositional event of the Karoo sequence. These shales are a rich, stratified sequence of fish, reptilian and amphibian remains that are fossilized in Permian and Triassic period swamp deposits (Truswell, 1977; Visser et al., 1977; Oelofsen and Loock, 1987).

At the end of the Triassic period and start of the Jurassic, a series of geological upheavals driven by volcanic activity took place, beginning at 187 million years ago with the fragmentation of the Gondwanaland continent. This volcanic activity was largely responsible for giving the Karoo its characteristic landscape (Truswell, 1977). During this time the horizontal volcanics of the Drakensberg were laid down and the shales of the Karoo were penetrated by dolerite intrusions and extrusions in the form of vertical dykes and horizontal sills following the bedding planes of the shales. These geological structures give rise to a very characteristic topography typically found in the project area with general occurrences of mesas, hillocks and sharp ridges.

The part of the basin in which the Jupiter Solar PV1 transmission corridors and associated infrastructure area are located is underlain by rocks of the Adelaide Subgroup of the Beaufort Group.

Three formations are recognised in the Adelaide Subgroup: the basal Koonap Formation, the Middleton Formation and the thick Balfour Formation (Smith et al., 2020). From the recent

map provided in Smith et al. (2020), the consensus is that the dominant lithological unit underlying the transmission corridors and associated infrastructure area is the Balfour Formation.

The depositional environment of the Adelaide Subgroup is interpreted as a high sinuosity meandering river environment controlled by the northward warping of the foreland Karoo Basin (Figure 6).

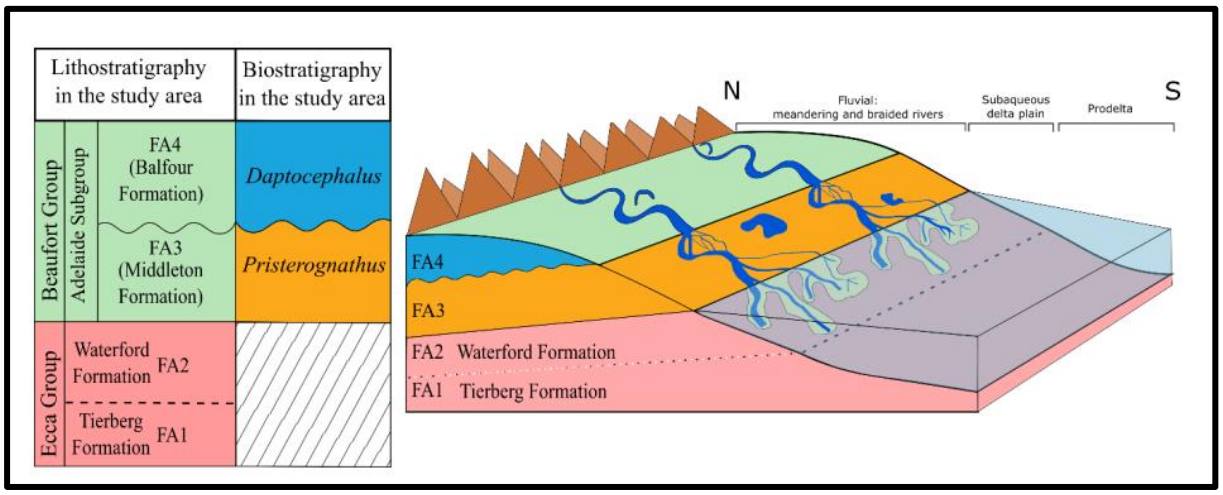

Figure 6: Depositional environments related to the Ecca and Beaufort Groups in the Study area (David Groenewald, pers comm, 2021).

Large exposures of Jurassic dolerite occur throughout the area. This igneous rock intruded through the Karoo sediments around 183 million years ago, at about the same time as the Drakensberg basaltic eruption and formed vertical dykes and horizontal sills following the bedding planes of the shales. These geological structures give rise to a very characteristic topography of the Karoo with its mesas, hillocks and sharp ridges (Visser, 1986; Bamford, 2023).

In the water courses of the area much younger sands and alluvium of the Quaternary Kalahari Sands have been deposited. These sediments were transported from farther north in the past when there was likely much more rainfall in the system, and more recently with flash flooding. Their composition and origin can be very mixed, and they may contain transported fossils that originated in the source area of the sediments or have been trapped in palaeo-channels along the modern river valleys. This fossil material will be fragmentary and out of its original context, but may, nevertheless, preserve important palaeontological information (Bamford, 2020).

6.2.2 Prehistory and History of the Study Area

The Karoo has been occupied by people for hundreds of thousands of years as testified by the vast “litter” of stone artefacts that blanket the land, and which range from heavily weathered Early (ESA) and Middle Stone Age (MSA) lithics dating back to as much as 1 mya to the more recent Later Stone Age (LSA) artefacts deposited within the last 30 000 years.

Our understanding of the pre-colonial archaeology of the Upper Karoo is founded on the early work by two of the pioneers of South African archaeology, John Goodwin and Clarence van Riet Lowe (Goodwin and Van Riet Lowe, 1929). This was substantially enhanced in large part by an exhaustive archaeological survey of a portion of the Zeekoe River Valley, south of De Aar, by Prof Garth Sampson (1985, 1992; Sampson et al, 2015) and described earlier in this

report and shown in **Error! Reference source not found.** above.

The ZVAP recorded a long sequence of archaeological material in the Upper Karoo indicating the occupation of the region by our forebears since the ESA Acheulian, through multiple MSA phases, four LSA phases to herder sites, many with low stone-walled kraals and Khoekhoe-like, thin-walled ceramics, dating to within the last 2,000 years (Sampson 1985, Sampson et al, 2015:3).

Since the completion of the ZVAP, a substantial number of archaeological impact assessments have been conducted in the this part of the Karoo in recent years to support wind and solar energy projects and other developments around De Aar to the north and west of Jupiter Solar PV1 transmission corridors and associated infrastructure area (see Figure 7 below) (see, for example, Bekker, 2012a, 2012b; Fourie, 2012, 2014; Gribble, 2024a, 2024b; Gribble and Euston-Brown, 2020, 2021; Huffman, 2013; Kaplan, 2010a, 2010b; Kruger, 2012; Lavin, 2022a, 2022b; Orton & Webley, 2013a, 2013b; Webley and Orton, 2011).

The ZVAP results and those from the recent impact assessment surveys referred to above have allowed the development of a good understanding of the pre-colonial, Stone Age archaeology of this area of the Karoo and of the likely locations and distribution of sites of different periods within the landscape.

Due to the geology of the Karoo, caves and rock shelters are very rare. This means that most pre-colonial archaeology is found on open sites and comprises principally stone artefacts. Ostrich eggshell is sometimes preserved, and occasionally pottery on sites that are less than 2,000 years old, but bone and other organic material is rarely preserved on Karoo sites, except in rare, stratified contexts.

The rarity of organic archaeological material in this area means that dating of sites and material can be difficult, but the ZVAP noted an important correlation between stone tool age and the patina on the hornfels, the fine-grained metamorphic rock (also called lydianite and indurated shale) which is the dominant Stone Age raw material used in the Karoo. The ZVAP found that lithics patinated dark brown to yellow = ESA; red = MSA; grey to grey-brown = LSA (Lockshoek); light brown/tan = LSA (Interior Wilton); and black = LSA (Smithfield). This culture-history sequence forms a basis for identifying stone tool industries and historic occupations over the entire region (Huffman, 2013).

Dolerite, in the form of dykes and sills, plays a significant role in the archaeology of the Karoo. Not only is it the source of hornfels, which occurs in the contact zone between intrusive magma and shale beds, but these dolerite intrusions also served as foci for pre-colonial campsites and provided the palettes for the rock engravings that largely replace painted rock art in this cave- and rock shelter-poor environment (Huffman, 2013; Palaeo Field Services, 2014).

With respect to the archaeological sequence of the Upper Karoo as we understand it from the results of the ZVAP and other studies, Sampson (1985) reported that ESA Acheulian sites tend to cluster close to sources of tool-making stone raw material, rather than close to sources of water and are generally to be found on the flats rather than on ridges and hills. This means that these sites and artefacts are often buried under the more recent sediments and, as a result, ESA lithics and sites have seldom been reported by the various surveys undertaken in the region.

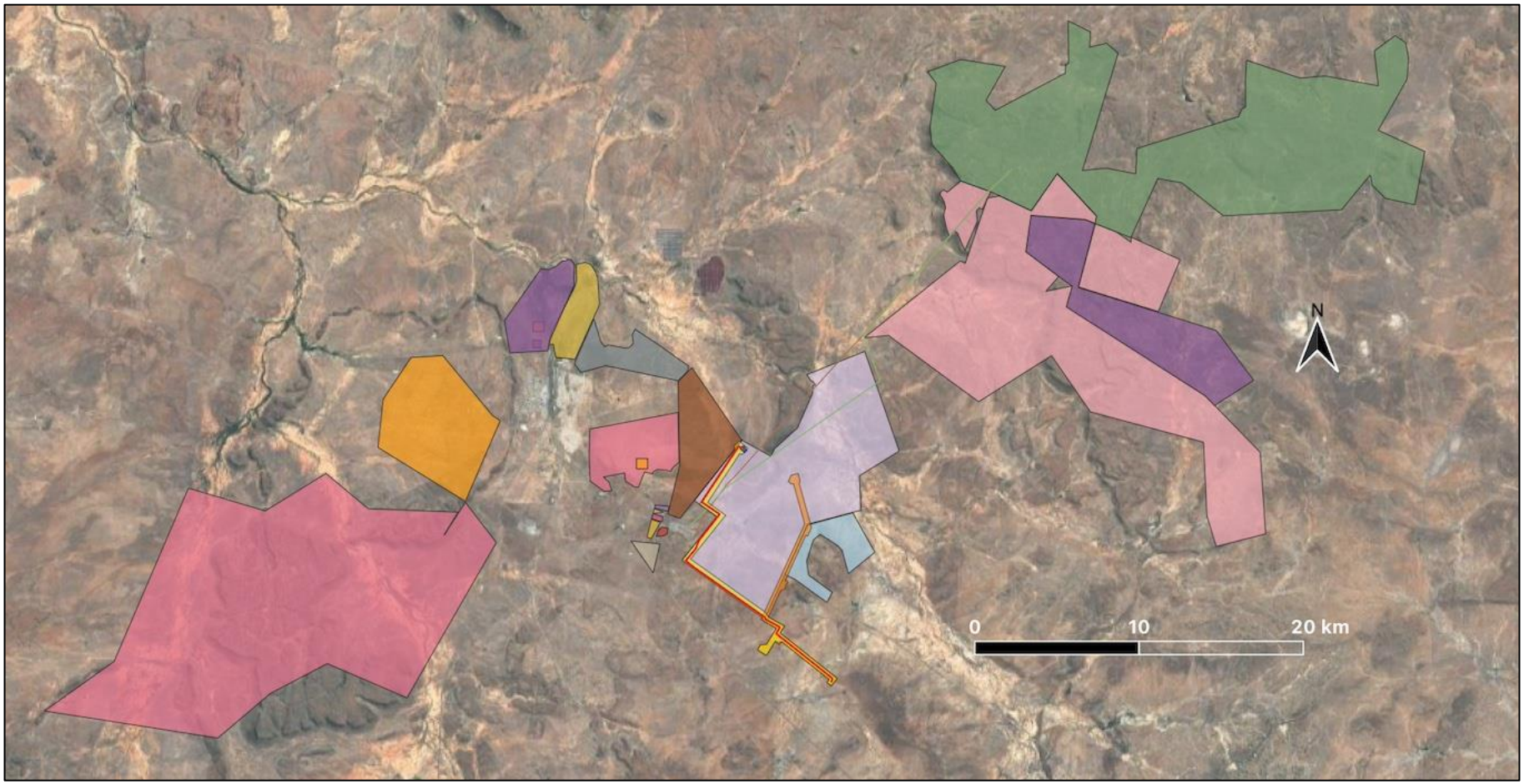

Figure 7: Some of the areas covered by previous heritage assessments in the vicinity of the Jupiter Solar PV1 transmission corridors and associated infrastructure area (Source: Google Earth).

The many MSA artefact occurrences in the region are almost exclusively open sites, and tend to be visible as dense clusters of lithics in erosion features along stream banks, as scatters of tools on the edges of pans and at the base of small hills or koppies, or as a wide and persistent scatter or “litter” of lithics across the landscape, which are particularly visible on gravel lag surfaces where the overlying coversands have been removed by erosion (Sampson, 1985).

Where definable scatters of Early and Middle Stone Age material occur, they are considered to be significant heritage sites.

Thousands of LSA sites have been recorded in the region and these are attributed to the ancestors of the San peoples and, after c.1,000 years ago, to Khoekhoen pastoralists (Sampson, 1985; Webley and Orton, 2011). As with the MSA sites, the LSA material is generally found in the open due to the scarcity of rock shelters and often comprise large scatters of stone tools.

Sampson has observed that almost all LSA sites are situated at the bottom of the breaks of dolerite dykes, in sheltered areas on the crests of dolerite dykes, as well as in dolerite mazes and outcrops. So too, are the stone circles and circle complexes built by Khoekhoen groups after 1000 AD which are almost always built on the edges of low ridges and dykes. The higher ridges provided a view, some security, loose stones with which to build kraals and screens and allowed people to be elevated above the frost levels in winter.

Definable sites of the LSA are sparse on the flat plains as these areas offered little protection from the wind and collect frost in winter. Hence, natural features such as rock outcrops and dolerite dykes played a significant role for LSA people.

Although there are several temporal subdivisions of the LSA which are described below, the San in general were nomadic hunter-gatherers who moved between temporary campsites, re-occupying some places from time to time. As a result, LSA sites in this region, often contain more than one industry (Sampson, 1972, 1974).

The earliest phase of the LSA dates to around 10,000 years ago and is described by Sampson (1985) as the Lockshoek. In broad terms, the Lockshoek is one of the terminal Pleistocene / early Holocene, non-microlithic industries that belong to the Oakhurst complex, and it is the oldest archaeological unit (about 12,000 to 8,000 years ago) that can be confidently associated with the San (i.e. Bushmen).

The entire Later Stone Age sequence afterwards is commonly credited to ancestral San (Deacon, 1984; Huffman, 2013). The Lockshoek is characterised by large sidescrapers, frontal scrapers, endscrapers, thick backed adzes and a wide variety of ground stone implements, and sites are overwhelmingly found near water points (Webley and Orton, 2011).

The Lockshoek is followed by the Interior Wilton which Sampson (1985) describes as including small convex scrapers, adzes, drills, reamers, as well as ceramics in its final phase. Unlike the Lockshoek, Interior Wilton sites are found on hills and ridges with commanding views of rivers and valleys (Webley and Orton, 2011).

The Interior Wilton is succeeded by the Smithfield which is characterised by abundant endscrapers made on elongated flakes, often with extensive trimming down the margins. Sampson’s Smithfield is generally associated with ceramics (Webley and Orton, 2011). In a typical Karoo setting, Smithfield surface sites are concentrated on low dolerite hills and ridges, but not in the mountains or out on the flats. They occur in dense clusters each composed of several sites no more than a few hundred metres apart. Most clusters are found near

waterholes on adjacent hills or ridges and clusters near both water and hornfels quarries tend to contain more sites. Clusters form around hornfels quarries only rarely. Sites with ceramics cluster tightly on the landscape, mainly near waterholes, and are assumed to be the residues of camps (Sampson, 1974).

After c.1,000 years before present (BP) people who were herding sheep/goats and possibly cattle, made an incursion into the interior and established a new economic order based on transhumant pastoralism (Hart 1989, Sampson, Hart, Wallsmith and Blagg 1989, Sampson 2010). The presence of these herding people, the Khoekhoen, who are likely to have utilized the grazing opportunities of the Karoo on a seasonal basis, is represented by stone walled structures that occur throughout the region.

By the early 18th century, the San appear to have retreated to the Great Karoo ahead of the expansion north and east from the Dutch settlement around the Cape of mobile colonial stock farmers or trekboers. Here they managed to eke out an existence which includes hunting, gathering, and raiding the livestock of the trekboers, resulting in the "Bushman War". Eventually kommandos dispatched from regional centres such as Graaff Reinet prevailed and the "wild bushman" of the Karoo was rendered extinct by the early 19th century (Webley and Orton, 2011:14).

The formal granting of farms to the trekboers saw the vast landscapes of the Karoo partitioned in 5,000 morgen allocations (Sampson et al, 1994). Farms tended to be situated close to water sources such as natural springs and in the best grazing land. Indigenous people were increasingly marginalised onto the few remaining patches of as yet unclaimed land. Deprived of the ability to hunt (by the early 1800's the game herds had been shot out) and with traditional social structures disrupted they had little choice but to seek work on farms or settle at mission stations established for their emancipation (Sampson et al, 1994). A life-style thousands of years old ended, however the archaeological heritage that has survived is prolific and is manifested in the form of thousands of archaeological sites.

6.2.3 Historical Period

The most recent archaeological layer in the Karoo landscape relates to the historical occupation of the area by stock farmers of European descent from the late 18th century but is a layer which is not well-documented. These European pastoralists were highly mobile – hence the name trekboers – moving between winter and summer grazing on and off the Great Escarpment.

Land ownership was informal and only became regulated after the implementation of the quitrent system of the early 19th century used by the Government to control the lives and activities of the farmers.

However, judging by the kinds of artefacts and structures found on the landscape, many of the farms in the Upper Karoo are likely to have been used well before land was formally granted or loaned in the early 19th century (Sampson et al, 1994).

The nearest town to the Jupiter Solar PV1 transmission corridors and associated infrastructure area is De Aar which was originally established as a railway junction and continues to serve this function today. The farm De Aar was on railway line between Cape Town and Kimberley and was chosen in 1881 by the Cape Government Railways as the site of the junction of the western, central and eastern railway systems which linked the interior of the country with the major seaports of the time (Cape Town, Port Elizabeth and Durban, respectively). In 1899 the

Friedlander brothers, who ran a trading store and hotel at the junction, purchased the farm and after the end of the South African War surveyed the land for the establishment of a town. The municipality was created a year later (https://en.wikipedia.org/wiki/De_Aar).

7 SITE SPECIFIC BASELINE

7.1 Palaeontology

The transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility are underlain by rocks of the Adelaide Subgroup of the Beaufort Group, and by dolerite of the Karoo Supergroup (Figure 8).

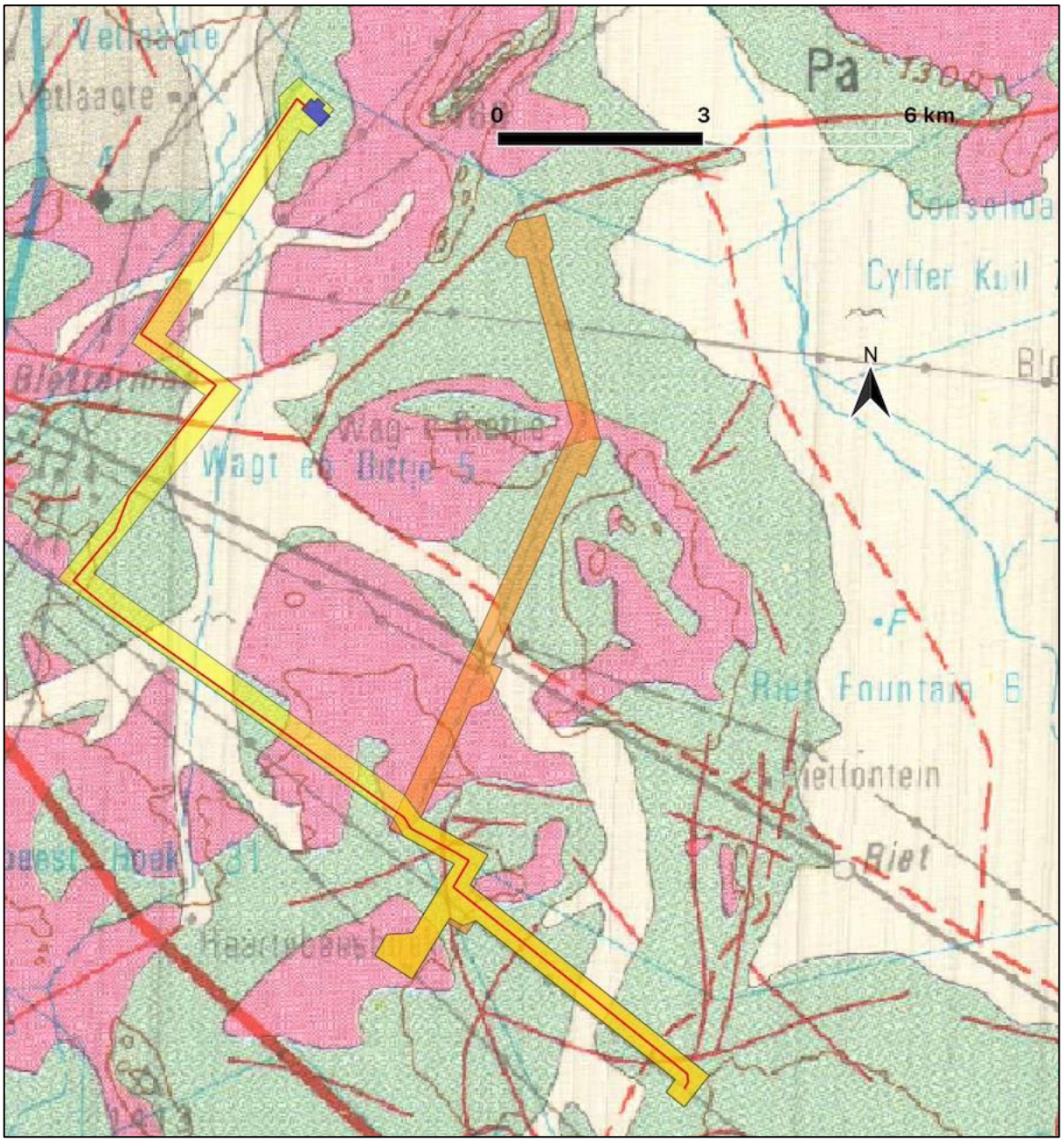

Figure 8: The transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility is underlain by sedimentary rocks of the Adelaide Subgroup (green shading), dolerite (red shading) and Quaternary alluvium (paler yellow shading) (Source: 1:250 000 scale geological map 3024 Colesberg (Council for

Geoscience)).

The former comprises of sets of highly significant geological units which vary in age from Permian to Quaternary aged sediments and which contain evidence of very early life. The Jurassic aged dolerites do not contain fossils.

Field observations and personal experience in the De Aar region by Dr Groenewald indicates that the geology of the sequence underlying the transmission corridors and associated infrastructure area falls in the upper part of the Adelaide Subgroup, Beaufort Group and correlates with the Balfour Formation present to the east of De Aar.

The Balfour Formation is characterised by greyish-blue to green-grey and red-coloured mudstone with thinly bedded yellow-brown sandstone. Well-defined outcrops are limited to quarries and several isolated erosion dongas on the steeper sides of the many hills associated with dolerite sill intrusions surrounding the proposed development area (Groenewald, 2024).

The sandstone bodies within the transmission corridors and associated infrastructure area are relatively thin (1,5m) lenticular units with well-defined sharp basal contacts with underlying mudstone. These contact zones are important palaeo-environmental indicators and invariably contain significant palaeontological heritage items, including vertebrate fossil bones (Plate 6).

Plate 6: Well-defined basal contacts of the sandstone with mudstone of the type found within the transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility. The transitional palaeo-environments are rich in vertebrate fossil remains like the example shown top right (Photos: G Groenewald).

This stratigraphic setting places the region at De Aar in the *Daptocephalus* Assemblage Zone (AZ) (Smith et al, 2020). Previously known as the *Dicynodon* AZ, the *Daptocephalus* AZ overlies the *Cistecephalus* AZ and is characterised by the co-occurrence of *Daptocephalus leoniseps* and *Theriognathus microps* (Rubidge (ed), 1995; Viglietti, 2016).

Although the upper boundary is not preserved in the study area, the lower boundary is defined by the first appearance datum of the above species. Other genera that are expected in the study area include *Aulacephalodon, Oudenodon, Dicynodon, Procynosuchus delaharpeae* and *Lystrosaurus maccaigi* (Rubidge (ed), 1995; MacRae, 1999; McCarthy and Rubidge, 2005; Viglietti, 2016).

The palaeontological heritage of the Adelaide Subgroup and specifically the Balfour Formation is part of the extremely highly rated treasures of the South African Karoo. Years of investigation have led to the consensus is that this lithological unit contains one of the most significant extinction events (Permian/Triassic extinction).

Groenewald's (2024) detailed desktop survey of existing data and field assessment indicate that large areas in the proposed transmission corridors and associated infrastructure area are underlain by very highly sensitive geological formations (Figure 9).

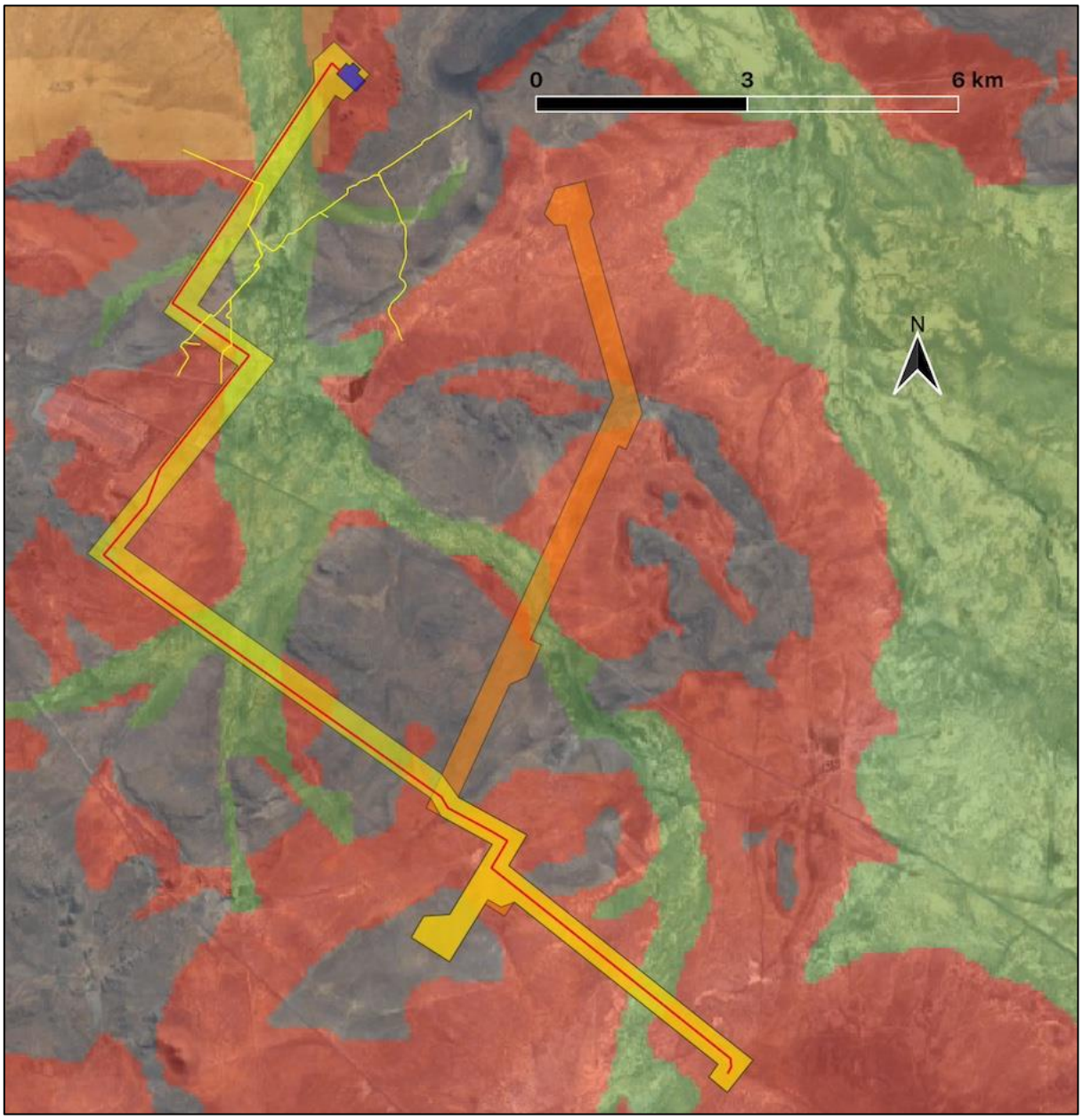

Figure 9: The palaeontological sensitivity of formations underlying the area proposed for the Jupiter Solar PV1 facility transmission corridors and associated infrastructure. Red = very high sensitivity, orange = high, green = moderate, grey = low (Source: SAHRIS palaeo-sensitivity map, https://sahris.org.za/map/palaeo).

Within the transmission corridors and associated infrastructure area, the rocks of the Adelaide Subgroup are covered by loamy sand which ranges between 1 and 2 m in thickness (Groenewald, 2024). These areas of deep soil cover (colluvial plains) are indicated as moderately sensitive (green) because only deep excavation (>1,5m) can potentially expose

significant fossils-bearing bedrock.

Areas of the project site underlain by dolerite (grey) will have a very low significance for palaeontology.

7.2 Archaeology

The archaeological surveys of the proposed Jupiter Solar PV1 facility transmission corridors and associated infrastructure area found a range of sites and material (Figure 5). The sites recorded are all listed in Appendix E, and some are described below.

A number of scatters of hornfels LSA lithics were recorded (for example, G002, J040, J042) (see Plate 7). Most of the lithics on these sites were “fresh” and unpatinated, although in some instances some carried a light grey patination. Most also contained a formal tool element, with J040 found to have multiple scrapers present. Occasional pieces of OES were recorded on some of these sites, but because they are surface sites, it is possible that the OES is not part of the archaeology and may have been naturally introduced later. One of the scatters of tools (J042) appears to be a Smithfield assemblage.

Plate 7: Site G002 (left) and a selection of the LSA hornfels lithics recorded on the site (top right). The image bottom right is of a small endscraper from the site (Photos: G Euston-Borwn).

Several ephemeral scatters of heavily patinated MSA hornfels lithics were also recorded, particularly in the low-lying areas where water movement and wind erosion have deflated this material down into a gravel lag deposit. This type of archaeological material is very common and occurs widely across much of the Karoo and much of it is in secondary context. It is generally regarded as background scatter and is of very low cultural significance.

No ESA material was noted during the site visits.

The other feature of the archaeological sites recorded in and near the transmission corridors was packed stone structures – both kraals and small hut circles. Some of these features are almost certainly from the colonial era and are probably shepherds’ huts (for example, JG083 and JG090, G094 and G095, and J045-J048). These structures generally between 1.5 and 1.8 m across internally with a narrow opening on one side – usually the east. Surviving walls are generally 50-60 cm high. Structure J046 is bi-lobial and comprises two rooms (see Plate 9 below). Although these structures appear to be colonial period, many are associated with

scatters of LSA lithics.

Two of these hut structures (JG083 and JG090) are constructed within what appear to be earlier, Khoekhoen kraals (JG082 and JG089) within the preferred transmission corridor (Figure 5). This complex is visible on Google Earth photography and may extend well beyond the three clear stone circles identified during the survey (J048, for example) (Figure 10).

Complexes of circular Khoekhoen kraals are a feature of the region and large numbers were recorded by Sampson in the Zeekoe Valley. These features tend to form clusters of circular or sub-circular packed stone walls and are often located in the lee of koppies or rocky outcrops.

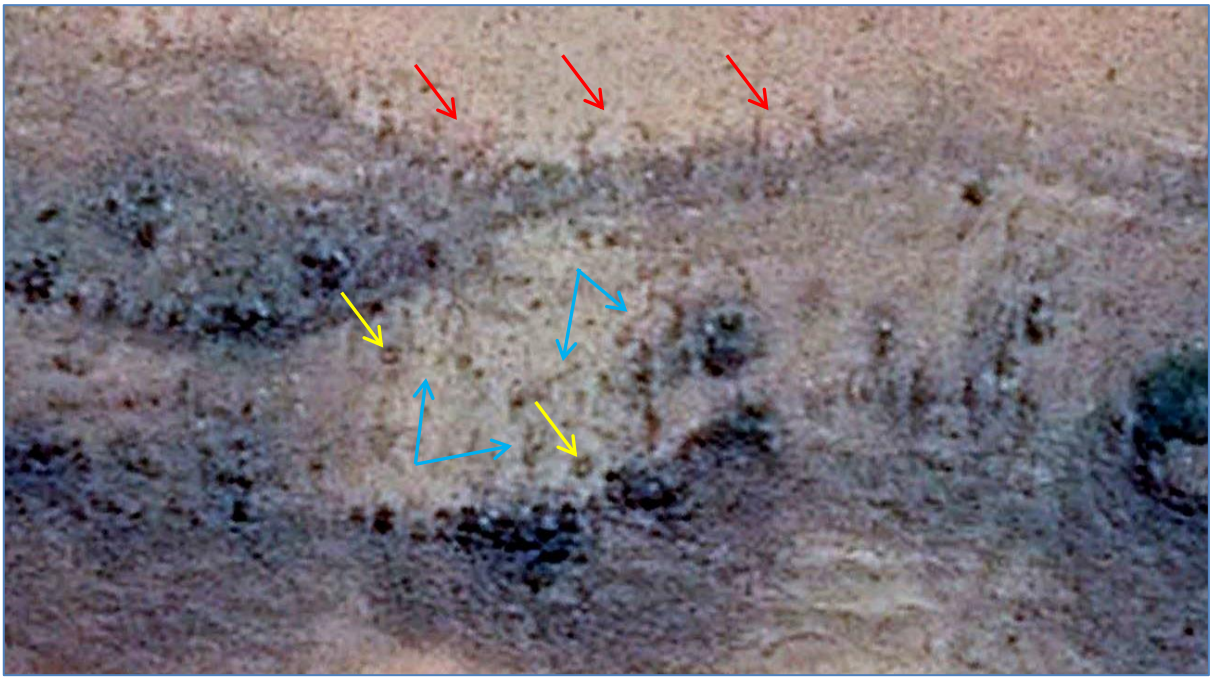

Figure 10: Google Earth image of possible Khoi kraal complex. Shepherds' huts JG083 and JG090 are marked by the yellow arrows. Both are located within wider Khoi stone kraal circles (blue arrows), with other conjoining walls visible in the hollow between the surrounding koppies and possibly against the northern (top of image) slope of the hill (red arrows). (Source: Google Earth).

Another possible, although very ephemeral example of a Khoekhoen kraal was recorded near the transmission corridor at J078 (Figure 5 and **Error! Reference source not found.**).

Elsewhere (J045-J048) the four hut structures seem to be associated with a large roughly square kraal situated nearby between two small koppies (Figure 11 and Plate 9).

7.3 Historical Built Environment

Both the archaeological surveys and a comparison of the 1:50,000 topographic map sheets for the area with modern satellite imagery in a GIS indicate that there are no extant historical built structures within the transmission corridors and the associated infrastructure area for the Jupiter Solar PV1 facility. The surrounding historical farm complexes are Rietfontein, Hartebeesthoek, Vetlaagte and Carolus Poort, none of which are less than 1.3 km from the transmission corridor.

Plate 8: The ephemeral possible Khoekhoen kraal (J078) (left) and the rubbed rock included in the wall (right) (Photos: J Gribble).

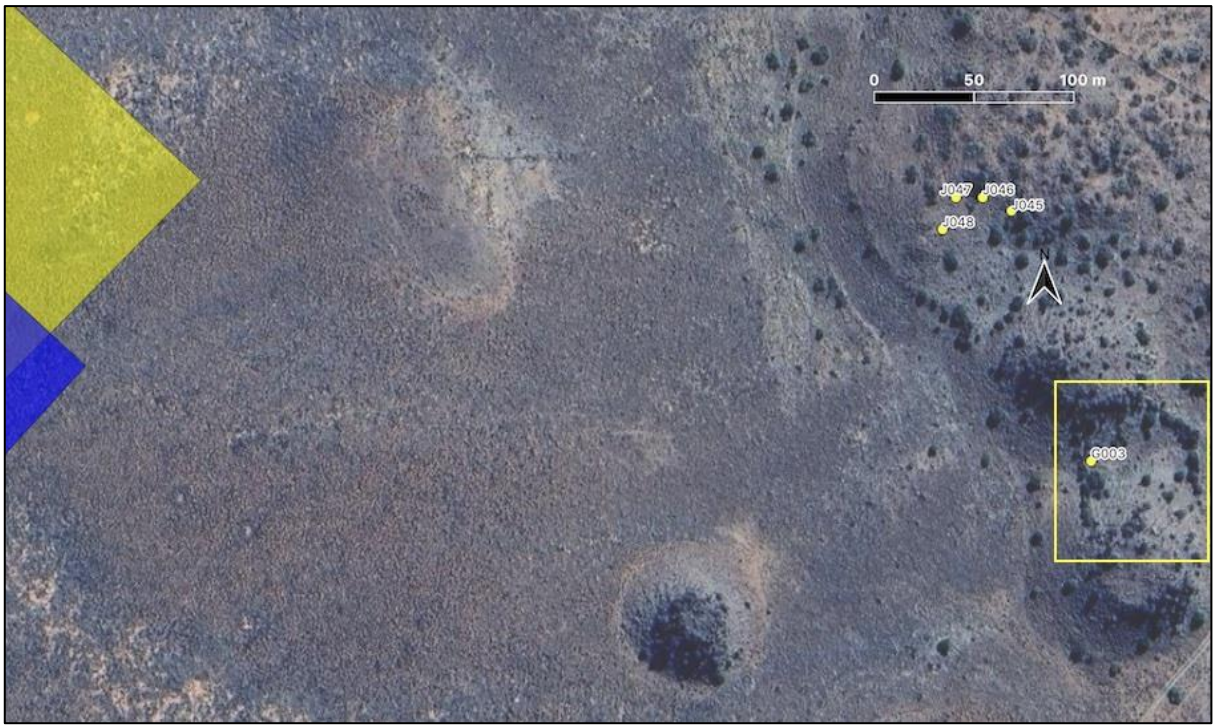

Figure 11: Kraal G003 (circled) and the nearby cluster of packed stone huts (J045-J048) located east of the Kestrel MTS and outside of the preferred transmission corridor (Source: Google Earth).

Plate 9: Examples of the packed stone huts in the cluster of structures at J045-J048 (Photos: J Gribble).

7.4 Graves and Burials

No graves were recorded during the survey of the transmission corridors and associated infrastructure area. Historical burials tend to occur at or near farm complexes, of which there are none within the transmission corridors, and at other activity nodes like stock posts. It is, therefore, possible that there may be graves associated with the clusters of packed stone huts and kraals described above, but none were noted at these sites during the archaeological surveys.

Three small mounds of dolerite cobbles were recorded as J054, J055 and J056. Located at the base of a koppie within the preferred transmission corridor and within 200 m of the shepherds' hut / Khoekhoen kraals described above (JG083, JG090, JG082, JG089). Although these mounds could conceivably be graves, their form and size and the underlying rockiness of the areas suggests that it is unlikely. These three mounds have, nevertheless been buffered in the archaeological mitigation measures set out below (Plate 10).

Pre-colonial burials often occur in areas of soft sand along river courses and are unlikely to be marked, except possibly by cairns of stone. Such burials will thus only become evident if disturbed during construction.

7.5 Cultural Landscape

The concept of "cultural landscapes" finds expression in Article 1 of the World Heritage Convention 1972 where it is defined as a category of cultural heritage site which is representative of the "combined works of nature and of man".

Although not referenced in the NHRA, a consideration of any proposed development within the context of the cultural landscape within which it is proposed has become a standard requirement of HIA's in South Africa.

Plate 10: Stone mounds J015 and J016 (Photos: J Gribble)

The term "cultural landscape" as embraces a diversity of manifestations of the interaction between humankind and its natural environment. Cultural landscapes are thus 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 (https://whc.unesco.org/en/culturallandscape/#1).

The Operational Guidelines (2008) of the World Heritage Convention define three main categories of cultural landscape, namely:

- **Clearly defined landscapes designed and created intentionally by people**. This embraces garden and parkland landscapes constructed for aesthetic reasons which are often (but not always) associated with religious or other monumental buildings and ensembles.
- **Organically evolved landscapes**. These result from an initial social, economic, administrative, and/or religious imperative and have developed their present form by association with and in response to their natural environment. Such landscapes reflect that process of evolution in their form and component features and fall into two sub-categories:
  - **a relict (or fossil) landscape** in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are, however, still visible in material form.
  - **a continuing landscape**, which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time, it exhibits significant material evidence of its evolution over time.
- **Associative cultural landscapes**. The inclusion of such landscapes on the World Heritage List is justifiable by virtue of the powerful religious, artistic, or cultural

associations of the natural element rather than material cultural evidence, which may be insignificant or even absent.

Sauer's (1925) definition of the cultural landscape is also useful: "The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result". The natural landscape acted on by human agents comprises components such as rocks, soils, mountains, plains, tall and short vegetation, rivers, springs and pans. Each of these features will have influenced how people interacted with the landscape.

In respect of the landscape within which the transmission corridors and the associated infrastructure area for the Jupiter Solar PV1 facility are located, the climate of the area and its geology has resulted in rugged landforms with low-growing, Karoo shrub and grasses extending over an expansive, undulating landscape broken by rocky intrusions.

The paucity of natural landscape features that could have served as foci for pre-colonial human activities and the relatively small number of archaeological sites recorded on the project site suggest that the landscape of the Jupiter Solar PV1 transmission corridors and associated infrastructure area was lightly used and occupied by pre-colonial people.

Similarly, with the exception of the small number of kraals and associated remains of small dwellings, the cultural landscape which reflects the recent historical use of the land for stock farming, is not well developed. Its main features are fences, water troughs and wind pumps.

The pre-colonial and historical use of landscape of the Jupiter Solar PV1 transmission corridors and associated infrastructure area did not significantly altered its overall natural character and until relatively recently, the landscape could best be described as a lightly used, organically evolved, largely relict landscape.

However, pre-colonial and historical landscape character has been altered by the proliferation of electrical infrastructure associated with the numerous renewable energy projects around De Aar and with the nearby Eskom Hydra substation. The proximity of the project area to Hydra means that a large number of overhead transmission lines converge in the area, some of them directly adjacent to the preferred Jupiter Solar PV1 transmission corridor and associated infrastructure area.

Although the construction of the transmission corridors and associated infrastructure will alter the current landscape character of the project site, and will contrast with the pre-colonial and historical elements that are present in the landscape, this development will take place in a cultural landscape which can now best defined as a continuing landscape, within which the evolutionary process towards an increasingly industrial cultural landscape around De Aar is well underway.

8 IMPACT ASSESSMENT

Heritage resources are highly context sensitive, and the main cause of impacts is the physical disturbance of the material itself and its context.

The best method for managing impacts to heritage resources is avoidance or the exclusion of the resource from project activities that may cause impacts. If this is not possible, then some form of mitigation is required to manage the impacts. This is generally considered a second-best approach, and *in situ* preservation, wherever possible, is always the preferred option.

The construction, operation and decommissioning of the Jupiter Solar PV1 transmission corridor and associated infrastructure has the potential to have direct impacts to the following heritage receptors:

- Palaeontology
- Archaeology
- Graves and burials
- Cultural landscape

Because there are no historical built complexes that will be directly affected by the transmission corridor and associated infrastructure, the historical built environment has been scoped out of this assessment.

This impact assessment makes use of a methodology attached as Appendix F below.

8.1 Assessment of Impacts to Palaeontology

Palaeontology is susceptible to physical impacts that destroy fossils. The destruction of fossil material that may be caused by development activities which disturb the soil and bedrock, such as excavations for foundations, earthworks for site levelling and the construction of roads, all of which may encounter fossiliferous bedrock.

Negative impacts on local fossil heritage are mainly anticipated during the construction phase within the preferred transmission corridor and associated infrastructure area for the Jupiter Solar PV1 facility, which will involve physical disturbance that could destroy fossils contained in the soil and bedrock.

The operational phase of the the transmission line and associated infrastructure is unlikely to involve further adverse impacts on palaeontological heritage.

There are positive impacts which can result from handling palaeontology correctly within the context of the proposed development. The amount of palaeontological knowledge that has accumulated as a result of the numerous impact assessments throughout the country is beginning to make a mark on science and education. It is possible that important scientific benefit can be derived from material rescued as part of a development-led mitigation program, however a fossil that is destroyed without allowing it to yield knowledge is information lost forever.

The construction of the transmission corridor and associated infrastructure for the Jupiter Solar PV1 facility will entail the creation of access roads, the excavation of foundations for the pylons and the stringing of the cables.

The PIA indicates that earthworks and excavations more than 1.5 m deep are likely to encounter the fossil-bearing shales and siltstones of the Adelaide Subgroup which underlie the Quaternary sands across much of the area covered by the transmission corridor and associated infrastructure area.

The extent of any impacts to the Adelaide Subgroup sediments will be **localised** and limited to the footprints of the activities which disturb them. The non-renewable nature of such resources, however, means that where impacts do occur, their intensity will be **high**, the effects will be **permanent** and the consequence rating is thus **high**.

The presence of these fossil-bearing sediments across much of the development area suggests it is **probable** that construction activities will intersect and impact this resource.

The impact rating for palaeontological resources in the development area is thus assessed to be **high** and the status of the impact will be **negative**.

The level of confidence in this assessment of impacts is **high**.

The implementation of mitigation measures (collection and recording of significant fossils and palaeontological data) will contribute significantly towards our understanding of the Permian/Triassic extinction event and would result in a **positive** impact of **low** significance.

Table 3: Significance of loss of or damage to palaeontological resources

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Permanent 3	**High** **7**	Probable	**HIGH**	– ve	High
Essential mitigation measures: • A Chance Finds Protocol must be implemented during the construction phase of the project. • A suitably qualified and experienced palaeontologist must be appointed to monitor any excavations into the Adelaide Subgroup strata and recover any significant fossils encountered. • The palaeontologist must train the ECO and dedicated members of the technical team of the contractor, to recognise "significant" fossils. • Fossils recorded during construction must be curated and moved to the institute indicated by SAHRA. • The EMPr must be submitted to SAHRA for comment.								
With mitigation	Local 1	Low 1	Permanent 3	**Low** **5**	Probable	**LOW**	+ ve	High

8.2 Assessment of Impacts to Archaeology

Archaeological sites and/or materials may be affected during activities associated with the construction and decommissioning of the transmission line and associated infrastructure for the Jupiter Solar PV1 facility.

Impacts arising from the operation of the transmission line and associated infrastructure are unlikely.

Impacts to archaeological sites and materials will be limited to those sites and material within the project footprint.

Of the archaeological sites recorded within the transmission corridors and associated infrastructure area, those considered to be ungradable do not require preservation or mitigation should they be affected by construction activities.

The sites Graded 3C in Appendix E below should be avoided, through the implementation of buffers, but where this is not possible can be mitigated or part preserved, as appropriate.

The extent of any impacts to archaeological sites and material will be **localised** and limited to the footprints of the activities which disturb them. The non-renewable nature of such resources, however, means that where impacts do occur, their intensity will be **high**, the effects will be **permanent** and the consequence rating is thus **high**.

It is **probable** that construction activities will intersect and impact this resource. The impact rating for archaeological resources in the development envelope is thus assessed to be **high** and the status of the impact will be **negative**.

The level of confidence in this assessment of impacts is **high**.

Archaeological best practice aims for the in situ preservation of significant heritage resources as the first option. Recommended mitigation thus always strives to ensure that significant sites or materials are avoided, and thus preserved, as part of the development process.

Where avoidance is not possible, the recording, collection, and/or excavation of sites or material ensures that although the site may be damaged or destroyed by the development, the information it contains is saved and safely curated and can contribute to the body of archaeological knowledge.

The implementation of measures which will mitigate impacts to significant archaeological sites and material would thus result in a reduction in the impact significance to **low**.

Potential impacts on archaeological resources arising from the construction of the Jupiter Solar PV1 transmission line and associated infrastructure are assessed in Table 4 as follows:

Table 4: Significance of loss of or damage to archaeological resources

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Permanent 3	**High** **7**	Probable	**HIGH**	– ve	High

Essential mitigation measures:
• The following mitigation is recommended in respect of archaeological sites and material located within the preferred transmission corridor and associated infrastructure area:
  • The likely hut structure at J058 must be subject to a buffer of 20 m. If this is not possible, the structure must be measured, photographed and accurately recorded by an archaeologist, before it is impacted.
  • The ephemeral stone circle and associated artefacts at J059 must be subject to a buffer of 20 m. If this is not possible, the structure must be measured, photographed and accurately recorded by an archaeologist, before it is impacted.
• If any archaeological material is uncovered during development, work in the immediate area must be halted and the find reported to the heritage authorities. The find may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
• Close to, but outside of the preferred transmission corridor it is recommended that:
  • The cluster of structures and sites at JG078-JG090 and the possible kraal at J054 must be avoided, and each cluster must be subject to a buffer of 40 m.
  • The cluster of huts at J045-J048 must be subject to a buffer of 40 m. If this is not possible, these stone structures must be measured, photographed and accurately recorded by an archaeologist, before they impacted.
  • The kraal at G003 must be subject to a buffer of 40 m around its out edge. If this is not possible, the kraal must be measured, photographed and accurately recorded by an archaeologist, before they impacted.							

With mitigation	Local 1	Low 1	Permanent 3	**Low** **5**	Probable	**LOW**	- ve	High

8.3 Assessment of Impacts to Graves and Burials

Although no identifiable graves were recorded within the transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility, the three stone mounds J054 – J056 within the preferred corridor could conceivably be graves and could be impacted by the construction of the transmission line.

The extent of any impacts to these three occurrences will be **localised** and limited to the footprint of the activities which disturb them, should they occur. The non-renewable and extremely sensitive nature of graves, however, means that any impact intensity will be **high**,

the effects will be **permanent,** and the consequence rating is thus **high**.

Provided J054 – J056 are avoided, it is **improbable** that the construction of the transmission line and associated infrastructure will intersect and impact graves and burials.

The impact rating for archaeological resources in the development envelope is thus assessed to be **medium** and the status of the impact will be **negative**.

The level of confidence in this assessment of impacts is **high**.

Archaeological best practice aims for the in situ preservation of significant heritage resources as the first option and this is particularly the case with graves. Recommended mitigation thus always strives to ensure that graves are avoided, and thus preserved, as part of the development process.

It is, therefore, recommended that the stone mounds J054 - J056 are excluded from the development footprint by means of a buffer of 20 m around each. If avoidance is not possible, then these stone mounds will need to be investigated by an archaeologist and if they are graves, will need to be exhumed prior to the commencement of construction work. This will require a permit from SAHRA under Section 36 of the NHRA.

Pre-colonial graves are unlikely to be marked, expect possibly by cairns of stone, and although they could be encountered within the development envelope, the absence of any evidence of their presence suggests it is unlikely that construction and/or decommissioning activities will intersect with this resource.

Measures to deal with chance finds of graves or human remains are set out Section 12 below.

The implementation of these mitigation measures would result in a reduction in the impact significance to **low**.

Potential impacts on graves and burials arising from the construction of the Hercules Solar PV1 transmission line and associated infrastructure are assessed in Table 5 as follows:

Table 5: Significance of loss of or damage to known graves and burials

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Long-term 3	**High** **7**	Improbable	**MEDIUM**	– ve	High
Essential mitigation measures: • Stone mounds J054 - J056 must be excluded from the development footprint by means of a buffer of 20 m around each. If avoidance is not possible, then these stone mounds will need to be investigated by an archaeologist and if they are graves, will need to be exhumed prior to the commencement of construction work. This will require a permit from SAHRA under Section 36 of the NHRA. • Should previously unknown human remains be encountered, work in the vicinity of the find must cease, the remains must be left *in situ* but made secure, and SAHRA must be notified immediately so that mitigatory action can be determined and be implemented.								
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Improbable	**LOW**	- ve	High

8.4 Assessment of Impacts to the Cultural Landscape

As indicated above, the proposed transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility are situated in a landscape which is overwhelmingly natural but one with a substantial and increasing industrial element present, arising particularly from the large number of renewable energy projects and associated electrical infrastructure in the

area, both built and planned.

The construction of the Jupiter Solar PV1 transmission line and associated infrastructure will continue this trend and will further alter the character or sense of place of the cultural landscape within which it will be constructed. It is likely, however, that the change in landscape character resulting from the project will be largely absorbed by the changes already occurring in the surrounding landscape.

Impacts to the cultural landscape which will flow from the construction and operation of the transmission line and associated infrastructure will be **localised** (i.e. limited to the development envelope and immediate surrounds).

Impact intensity is assessed to be **high**, and the effects will be **long-term**, although reversible should the transmission line and MTS be decommissioned and removed from the site in future.

The consequence rating is thus **medium**.

The construction of the transmission line and associated infrastructure will have **definite** impacts on the cultural landscape, and the impact rating is thus to be **medium negative**.

The level of confidence in this assessment of impacts is **high**.

The implementation of measures to mitigate the intrusion of the transmission line and associated infrastructure into the landscape could include the screening of the infrastructure area and keeping as much of the activity as possible out of the public view.

Potential impacts on the cultural landscape arising from the construction of the transmission line and associated infrastructure for the Jupiter Solar PV1 facility are assessed in Table 6 as follows:

Table 6: Significance of impact on the cultural landscape

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Permanent 3	**High** **7**	Definite	**HIGH**	– ve	High
Essential mitigation measures: • None								
With mitigation	Local 1	Medium 2	Permanent 3	**MEDIUM** **6**	Probable	**MEDIUM**	- ve	High

8.5 Cumulative Impacts

Cumulative impacts, or effects, can be described as “changes to the environment that are caused by an action in combination with other past, present and future human actions”. They are the result of multiple activities whose individual direct impacts may be relatively minor but which, in combination with others result are significant environmental effects (DEAT 2004:5).

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities.

The assessment of cumulative impacts for the transmission corridors and associated infrastructure for the Jupiter Solar PV1 facility is based on the list of approved Wind and Solar PV projects in the Renewable Energy EIA Application (REEA) Database 2024_Q2) located within 30 km of the project area and shown in Figure 12.

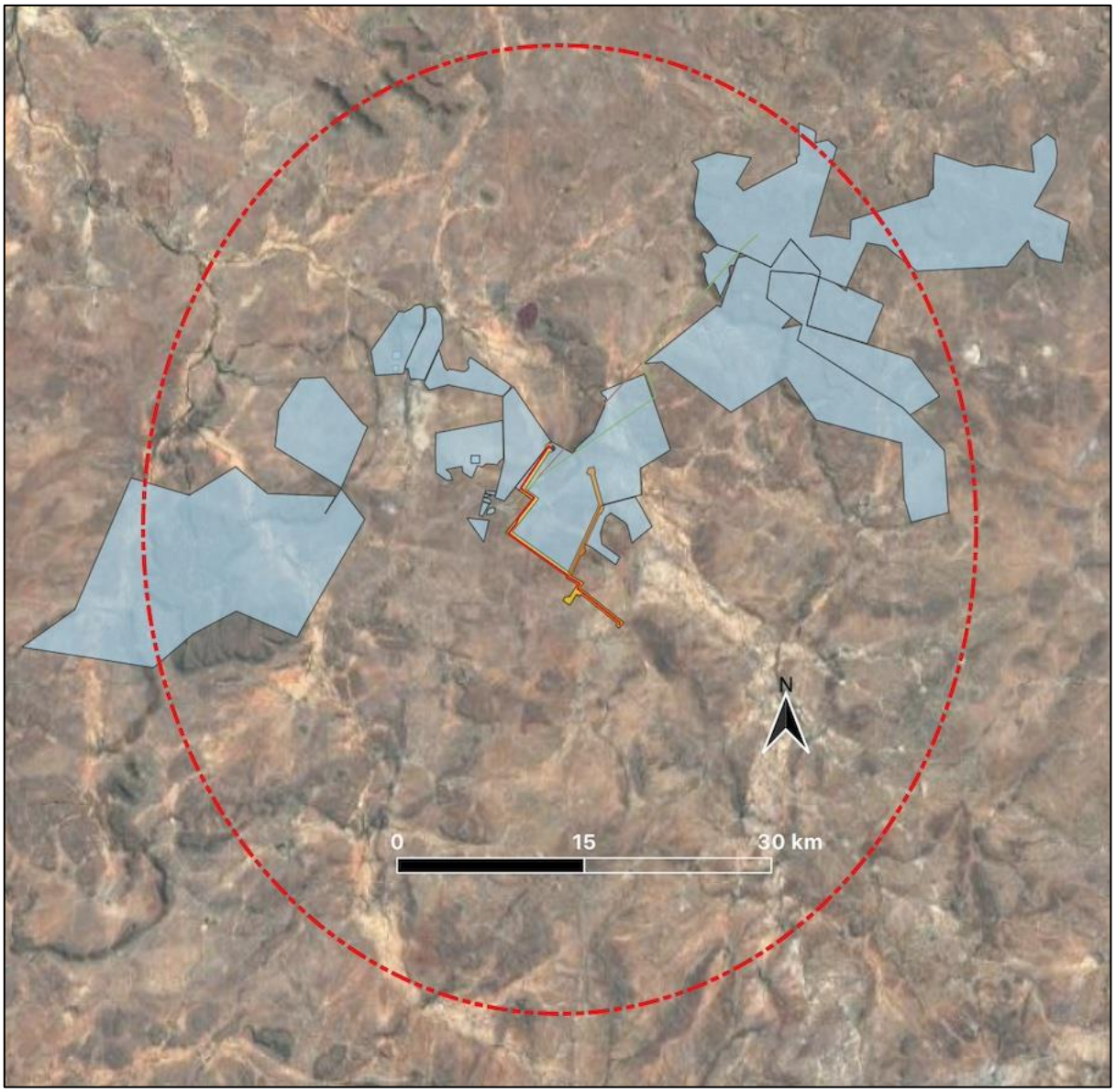

Figure 12: The location of other projects (blue polygons) within 30 km (dotted red circle) of the transmission corridors and associated infrastructure area for the Jupiter Solar PV1 facility considered in the assessment of cumulative impacts.

Cumulative impacts to palaeontological material are difficult to assess because of the very variable distribution of fossils within the underlying bedrock of the region but are expected to be of **low (negative)** significance before mitigation.

As with palaeontology, cumulative impacts to archaeological sites and/or materials are difficult to assess, again because of the variable distribution of sites and materials across the landscape and because of the differences in the quality of surveys and reporting on different projects. Field observations made in previous assessments in the vicinity of the Jupiter Solar PV1 transmission corridor and associated infrastructure indicate that significant archaeological sites and materials are not common in this area and that, provided appropriate

mitigation measures are implemented, impacts to the resource across the area are likely to be **low (negative)** and not cumulatively significant.

The cumulative impact on the cultural landscape of arising from the transmission line and associated infrastructure for the Jupiter Solar PV1 facility and the numerous other projects in the region is expected to be of **high** significance. There are few mitigation measures that can significantly reduce the cumulative visual impact of the introduction of multiple renewable energy projects and their associated infrastructure into a rural landscape, but the sympathetic design of projects can help to reduce visual impacts.

Generally, new and future development projects in the vicinity of the preferred Jupiter Solar PV1 transmission corridors and associated infrastructure area will follow a similar iterative impact assessment process and have, and will, be designed to reduce impacts to all heritage resources as far as practically possible.

Overall, the implementation of the mitigation measures recommended for individual projects will ensure that cumulative impacts to heritage resources in the area can be managed, mitigated and reduced as far as is practical.

9 SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) of the NHRA requires that a heritage impact assessment must "evaluate the impact of [a] development on heritage resources relative to the sustainable social and economic benefits to be derived from the development".

The proposed construction of the transmission line and associated infrastructure for the Jupiter Solar PV1 facility has the potential to impact heritage resources, but this can be mitigated through the implementation of the measures proposed below.

Thus, while there may be impacts on heritage resources arising from the construction of the transmission line and associated infrastructure, it is likely that these will be outweighed by the sustainable social and economic benefits accruing from the contribution this infrastructure will make to local and national energy security.

10 THE NO-GO ALTERNATIVE

If the transmission line and associated infrastructure for the Jupiter Solar PV1 facility is not constructed, the proposed project areas will stay as they currently are and there will continue to be the generally neutral impact on heritage resources that arises from the historical use of the land for farming.

Although the heritage impacts likely to arise from the project would be greater than the existing, negligible, agriculture-related impacts, the loss of socio-economic benefits is more significant and suggests that the no-go option is less desirable.

11 LEVELS OF ACCEPTABLE CHANGE

Any impact to heritage resources is deemed unacceptable until such time as the affected resource has been inspected by a suitable specialist, and mitigated or studied further, if necessary.

12 RECOMMENDED MITIGATION MEASURES FOR INCLUSION IN

12.1 Palaeontology

The Jupiter Solar PV1 transmission corridors and associated infrastructure area are underlain by fossiliferous Adelaide Subgroup bedrock, well-known for containing significant fossils from the *Daptocephalus* AZ. In other areas of the site Quaternary sands may also contain fossil material. The areas underlain by dolerite will have a very low to insignificant sensitivity for palaeontological heritage

The PIA therefore makes the following recommendations:

- The EAP and developer must be informed that significant areas are underlain by rocks with a very high sensitivity for palaeontological heritage.
- All excavations that will expose sedimentary strata may impact significant fossils. The appointment of a palaeontologist to conduct a comprehensive Phase 2 PIA assessment (fossil collection during construction) will be the minimum requirement for monitoring of excavations into the Adelaide Subgroup strata.
- The project will require a formal “Chance Find Protocol” that will have to be upgraded during the construction phase of the project.
- Recommendations for palaeontological monitoring and mitigation must be included in the EMPr which must be submitted to SAHRA for comment.

12.2 Archaeology

The two archaeological field surveys and desktop assessment conduced for this project identified a range of archaeological sites and material within the Jupiter Solar PV1 transmission corridors. No archaeological material was identified within the footprint of the proposed MTS.

Experience indicates that there may also be archaeological material buried within the surficial sediments within the development area, particularly pre-colonial archaeology potentially ranging from the ESA to the LSA. Earthworks and excavations for the project may, thus, encounter and disturb such buried archaeological material, if present.

The following mitigation is recommended in respect of archaeological sites and material located within and near the preferred transmission corridor:

- The likely hut structure at J058 must be subject to a buffer of 20 m. If this is not possible, the structure must be measured, photographed and accurately recorded by an archaeologist, before it is impacted.
- The ephemeral stone circle and associated artefacts at J059 must be subject to a buffer of 20 m. If this is not possible, the structure must be measured, photographed and accurately recorded by an archaeologist, before it is impacted.
- If any archaeological material is uncovered during development, work in the immediate area must be halted and the find reported to the heritage authorities. The find may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Outside of the preferred transmission corridor it is recommended that:

- The cluster of structures and sites at JG078-JG090 and the possible kraal at J054 must be avoided, and each cluster must be subject to a buffer of 40 m.
- The cluster of huts at J045-J048 must be subject to a buffer of 40 m. If this is not possible, these stone structures must be measured, photographed and accurately recorded by an archaeologist, before they impacted.
- The kraal at G003 must be subject to a buffer of 40 m around its out edge. If this is not possible, the kraal must be measured, photographed and accurately recorded by an archaeologist, before they impacted.

12.3 Graves and Burials

Three mounds of stone which could conceivably be graves were identified within the preferred Jupiter Solar PV1 transmission corridor. It is also possible that currently unrecorded human remains could be encountered within the transmission corridor and associated infrastructure area during construction work.

With regard to graves and burials, the following is recommended:

- The three stone mounds J054 - J056 must be excluded from the development footprint by means of a buffer of 20 m around each. If avoidance is not possible, then these stone mounds will need to be investigated by an archaeologist and if they are graves, will need to be exhumed prior to the commencement of construction work. This will require a permit from SAHRA under Section 36 of the NHRA.
- Should previously unknown human remains be encountered during construction, work in the vicinity of the find must cease, the remains must be left *in situ* but made secure, and SAHRA must be notified immediately so that mitigatory action can be determined and be implemented.

12.4 Cultural Landscape

No specific measures to mitigate impacts to the cultural landscape are recommended, but the implementation of any recommendations in the visual impact assessment designed to reduce visual impacts would assist in reducing the impact to the cultural landscape.

All of the recommendations above must be incorporated into the Environmental Management Programme (EMPr) and EA for the Jupiter Solar PV1 transmission corridor and associated infrastructure.

13 CONCLUSIONS

This assessment has found that the preferred and alternative Jupiter Solar PV1 transmission corridors and the site of the proposed Kestrel MTS is a heritage environment of variable sensitivity but that significant impacts on palaeontological, archaeological and other heritage resources arising from the project are unlikely.

Impacts to the cultural landscape are expected, but the transmission line and MTS will be constructed in an environment that is already significantly altered by existing electrical infrastructure.Impacts may be reduced through the implementation of any recommendations in the visual impact assessment designed to reduce the visual impacts of the project.

If the project is not implemented, the site will stay as it currently is with a neutral impact

significance.

It is our reasoned opinion, therefore, that from a heritage perspective the Jupiter Solar PV1 transmission line, within the preferred corridor, and associated infrastructure project may be authorised, but subject to the recommendations contained within this report.

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APPENDIX A: SPECIALIST DECLARATION

(See separate PDF file)

APPENDIX B: CURRICULUM VITAE – JOHN GRIBBLE

More than 30 years of practical professional archaeological and heritage resource management experience in both public sector compliance agency roles and private sector archaeological consulting. Wide range of archaeological, historical built environment and other heritage skills and knowledge. Hardworking and strive to produce quality deliverables.

Education

Master of Arts: Archaeology, University of Cape Town *1990*

Bachelor of Arts (Honours): Archaeology, University of Cape Town *1987*

Bachelor of Arts: Archaeology, University of Cape Town *1986*

Work Experience

Director and Senior Archaeologist | TerraMare Archaeology (Pty) Ltd - Cape Town (*09/2023 – Current)*

Senior Archaeologist and Heritage Consultant | ACO Associates – Cape Town (*09/2017 - 08/2023)*

Maritime and Underwater Cultural Heritage Unit: Manager | South African Heritage Resources Agency – Cape Town (*2014 - 08/201)*

Director | Sea Change Heritage Consultants Limited – United Kingdom & Cape Town (*2012 – 2018)*

Principal Consultant: Maritime Archaeology | TUV SUD PMSS - Romsey, United Kingdom (*2011 – 2012)*

Principal Consultant: Maritime Archaeology | EMU Limited - Southampton, United Kingdom (*2009 – 2011)*

Project Manager: Coastal and Marine | Wessex Archaeology - Salisbury, United Kingdom (*2005– 2009)*

Maritime Archaeologist | National Monuments Council / South African Heritage Resources Agency – Cape Town (*1996 – 2005)*

Professional Officer: Boland and West Coast, Western Cape Office | National Monuments Council – Cape Town (*1994 – 1996)*

Professional Experience

- Archaeological experience includes:
  - Historical sites:
    - Survey and recording of traditional mudbrick vernacular houses at Verlorenvlei, West Coast for Honours and Masters dissertations
    - Cobern Street historical burial ground, Cape Town
    - Sayers Lane VOC burial ground, Simons Town
    - Sea Point Battery
    - 66 Wale Street, Cape Town

- YMCA Building, Queen Victoria Street
- Van Riebeeck's Fort, Grand Parade, Cape Town
- 90 Bree Street, Cape Town
- F Block, Castle of Good Hope, Cape Town
- Huntley Street town dump, Grahamstown (Makhanda)
- Piggots Park settler homestead, Eastern Cape
- Fort Double Drift, Fish River, Eastern Cape
- Morgenhof, Stellenbosch
- Paradise, Newlands Forest

- Pre-colonial sites:
  - De Aar 2 South Wind Energy Facility Transmission Line site mitigation
  - Elandsfontein Phosphate Mine site mitigation
  - Vredenburg Peninsula Archaeological Survey 1990-1991
  - Leentjiesklip, Langebaan
  - Doorspring, Lamberts Bay
  - Mauritz Bay, Vredenburg Peninsula
  - Spoeg River Cave, Namaqualand
  - Kasteelberg E Rock Shelter, Vredenburg Peninsula
  - Kasteelberg B, Vredenburg Peninsula
  - Witklip Shelter, Vredenburg;
  - Driebos Shelter, Tulbagh
  - Posberg Peninsula, Langebaan (6 sites)
  - Diepkloof Cave, Elands Bay
  - Hailstorm Midden, Elands Bay
  - Putslaagte Rock Shelters, Northern Cedarberg,Clanwilliam

- Middle East:
  - Chalcolithic (Gilat) and Roman / Byzantine (Bet Shean) excavations
- Maritime Surveys:
  - 1999 HMS *Pandora* field season, Great Barrier Reef, Queensland, Australia
  - *Santa Maria Madre de Deus* (Nahoon Wreck), East London
  - *Sao Goncalo*, Plettenberg Bay
  - *Colebrooke* (1778), Kogel Bay
  - *Brunswick* (1805), Simon's Bay
  - *Bato* (1805), Simon's Bay
  - *Britannia* (1826), Britannia Bay
  - *Philia* (1880), Mossel Bay
  - *Clan Stuart* (1914), Simons Bay
  - "Simon's Bay Rudder" site
  - "Cannon & Ballast Wreck" - Simon's Bay
  - "Swemgat" Wreck - Yzerfontein, West Coast
  - *Het Huis te Craaiesteyn* (1698), Oudekraal, Cape Town
  - "British Musket" wreck, "Sternpost" wreck, "Sunset Beach" wreck, "Milnerton Lighthouse" wreck, "Barrel" wreck, *Oosterland* (1697), *Hermes* (1901) and *Winton* (1934), Table Bay

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Professional Affiliations

- Association of Southern African Professional Archaeologists (Membership No. 043)

Certifications / Accreditations

- ASAPA Cultural Resources Management Section:
  - Principal Investigator: Maritime and Colonial Archaeology
  - Field Director: Stone Age Archaeology
- Class III Diver (Surface Supply), Department of Labour (South Africa) / UK (HSE III)

Memberships

- ICOMOS International Committee for Underwater Cultural Heritage *(2000 - present)*
- Joint Nautical Archaeology Policy Committee, United Kingdom (*2010 - present*)
- Advisory Board: Southern African Slave Wrecks Project

APPENDIX C: OBSERVATIONS DURING THE PALAEONTOLOGICAL FIELD ASSESSMENT

Photo	Coordinates	Comments	Photographic Record
HSF10	30.742990° S 24.107391° E	Deep sand, mostly Aeolian and colluvium covering vast plains in the study area. These sediments overly the very highly sensitive sandstone and mudstone of the Adelaide Subgroup and excavations will most probably not be deep enough to expose fossils.	
HSF11	30.742320° S 24.106313° E	Colluvium and sand covers the highly significant mudstone and sandstone of the Adelaide Subgroup. Excavation into the surface material to more than 1,5m will probably expose highly significant fossil remains.	
HSF12	30.741833° S 24.100960° E	Deep red coloured soils are most probably an indication of sub-outcrop of dolerite and no fossils are expected.	
HSF18	30.710361° S 24.104682° E	Part of the Grid Infrastructure is underlain by extensive calcrete deposits. No fossils were observed.	

HSF19	30.705294° S 24.126407° E	Artefacts of dolerite used for milling of food stuff. These rocks are indications that the areas were inhabited by humans for many years	
HSF20	30.678576° S 24.121175° E	Deep red coloured soils on highly weathered sub-outcrops of dolerite. No fossils observed	
HSF21	30.688297° S 24.148122° E	Excavations for road material. Exposure of mudstone and sandstone of the Adelaide Subgroup. Fossils observed include trace fossils as well as highly fractured vertebrate remains	
HSF21	30.688297° S 24.148122° E	Well-defined ripple-mark structures with trace fossils indicating shallow water conditions in an extensive floodplain environment.	
HSF21	30.688297° S 24.148122° E	Well-defined small-scale ripple marks indicating shallow water conditions and interference ripples caused by either wind action or two opposing water currents on the floodplains. Small scale trace fossils are associated with these ripple structures	

APPENDIX D: PALAEONTOLOGICAL IMPACT ASSESSMENT

(See separate PDF file)

APPENDIX E: LIST OF HERITAGE SITES RECORDED IN 2020, 2022 and 2024 ARCHAEOLOGICAL SURVEYS

NAME	YEAR	LATITUDE	LONGITUDE	SITE DESCRIPTION	GRADING
2020					
GEB021	2020	-30.714167	24.095526	A handful of worn hornfels MSA flakes, on open, flat area.	Ungradable
GEB023		-30.681224	24.134149	A general scatter of worn, patinated hornfels MSA flakes.	Ungradable
GEB024		-30.682218	24.133163	Mass of patinated hornfels, but no obvious flakes.	Ungradable
GEB026	2020	-30.705946	24.101517	Piece of grass-tempered pottery at site JG092.	3C
GEB027	2020	-30.706092	24.102212	Stone with striations found in shoulder between two koppies, before hill slopes down. Below sites JG082 - JG090.	Ungradable
JG078	2020	-30.705940	24.101496	Hornfels scatter in neck between koppies. Fresh. Associated with piece of grass-tempered pottery. Has views to north and south. Protected in hollow. Scatter covers large part of hollow.	3C
JG079	2020	-30.705935	24.101464		
JG080	2020	-30.706201	24.101419		
JG081	2020	-30.706136	24.101435	Modern stone circle (?) with glass and burned plastic. Old spade head with broad arrow. "R Steelface".	3C
JG082	2020	-30.706104	24.101675	Centre stone kraal - circular with JG083 (stone bothy) in kraal.	3C
JG083	2020	-30.706149	24.101740	Stone bothy in kraal. Approximately 1.5 x 1.5 cm. Entrance to East.	3C
JG084	2020	-30.706069	24.101819	Kraal 2?	3C
JG085	2020	-30.706136	24.101832	Line of kraal 2 wall. Not fully enclosed/circular	3C
JG086	2020	-30.706028	24.101865	Line of kraal 2 wall. Not fully enclosed/circular	3C
JG087	2020	-30.706021	24.101766	Line of kraal 2 wall. Not fully enclosed/circular	3C
JG088	2020	-30.705949	24.101484	Possible kraal 3 on far side of hollow. Walls not complete.	3C
JG089	2020	-30.705877	24.101336		
JG090	2020	-30.705959	24.101346	Bothy 2. Circular ± 1.8 x 1.8 m. Door to East.	3C
2022					

G094	2022	-30.75292	24.138228	Small stone structure below lip of dolerite dyke. ±3 x 2 m internally.	3C
G095	2022	-30.753068	24.138087	Circular stone structure. Shepherds' hut? Like G094 also built just below lip of dolerite dike using natural rock line as rear wall. ±1,5 m internally. Second similar structure ±1 m distant.	3C
2024					
G001	2024	-30.691841	24.106382	Below a hill of dolerite rocks are a handful of ceramics (stoneware and polychrome), and HF flakes, both fresh and lightly patinated). A few meters away is a tin lid with the embossed words '⋯Bensen 1883 Copenhagen'.	Ungradable
G002	2024	-30.690315	24.104845	On a raised clearing near some dolerite outcrops is a site of LSA lithics, which include cores, a slug, a teardrop shaped thumbnail scraper, flakes and some OES. Most of the hornfels lithics are fresh, but there are also some lightly patinated ones. There are ±4 -5 pieces per meter, over an area of about 20 m^2.	3C
G003	2024	-30.677406	24.126376	A bowl in the middle of two dolomite hills has been enclosed with stone boulder walls, which run between the two hills. These walls enclose the bowl to form a kraal, covering an area of about 20 m^2. The only artefact that was noted was a small piece of green glass, lying near one of the walls. The wall is made using the historical method of two layers of boulders, the centre of which is packed with smaller stones. Probably related to J006, J007, J008 and J009.	3C
G004	2024	-30.740583	24.107784	An open pan, with red sand, which has a handful of hornfels lithics - approximately one every 1-2 meters. The lithics are flakes, with no evidence of formal tools, and patination of the hornfels grades from light grey to red. The pan is about 12 m^2.	3C
J018	2022	-30.756165	24.133871	Thin scatter of LSA lithics on top of dolerite dyke. All hornfels except for a backed piece on a fine-grained white stone (CCS?). Occasional MSA lithics present.	Ungradable
J040	2024	-30.69009	24.103757	Scatter of LSA hornfels. On a slightly raised flat area among dolerite outcrops. Formal tool rich. Multiple scrapers found. The occasional MSA present. Covers an area of about 40 m^2. Small circle of dolerite cobbles - possible fire circle.	3C
J041	2024	-30.686928	24.106481	Ephemeral occurrence of LSA hornfels lithics on open plain. Mixture of fresh and lightly patinated pieces. Only 1-2 pieces / m^2 at maximum. Difficult to define edge but at least 50 m^2.	Ungradable

J042	2024	-30.685231	24.110083	Small scatter of LSA Smithfield hornfels lithics, in a pan which is behind a modern dam wall. Only about 8 artefacts - includes a typical end scraper. Covers an area of about 2 m^2.	3C
J043	2024	-30.683628	24.112511	Scatter of red patinated MSA hornfels lithics exposed in deflated red alluvium. Consists of flakes, blades, cores, along with chips etc. Up to 8 pieces / m. Extends between 004 and 005. Approximately 4 m wide.	3C
J044	2024	-30.683452	24.112436	As above.	3C
J045	2024	-30.676436	24.126018	Circular dolerite boulder/cobble stone structure. On south side of hill in a little valley. Very small - approximately 1.5 m internally. Piece of plain white earthenware noted nearby.	3C
J046	2024	-30.676384	24.125888	Bi-lobial circular hut structure. Each room approximately 1.8 x 1.5 m. Entrance at centre on east wall.	3C
J047	2024	-30.676384	24.125767	Circular stone structure about 4 m from J007. Approximately 1.5 m internally. Entrance on East.	3C
J048	2024	-30.676509	24.125706	Circular stone structure about 15 m from 007 and 008. Approximately 1.5 m internally. Bottle glass (dark green and light green wine bottle), tin, and transfer print earthenware noted around these structures.	3C
J049	2024	-30.677686	24.129998	Small (± 2 m^2) and ephemeral LSA hornfels scatter. Mostly fresh. Bladelet, and 1 quartz chip. 10-15 pieces in total noted.	Ungradable
J050	2024	-30.685847	24.145798	Hornfels scree exposure. Small red patinated hornfels. MSA lithics present. Also, LSA material. Quarry? At least 100 m^2. LSA is dense in places with multiple cores and chunks. Fairly fresh, mostly with light grey patinas. Avoid.	3C
J051	2024	-30.686612	24.1462	LSA hornfels quarry site. Dense occurrence of flaked stone over ± 10 m^2 on exposure of hornfels bedrock.	3C
J052	2024	-30.716471	24.146721	Ephemeral scatter of LSA hornfels. Fresh and small. ± 1 / m^2. Smallish area (± 6 m^2). Occasional patinated MSA.	3C
J053	2024	-30.716549	24.123245	Historical square stone kraal. Dolerite boulders on south-facing slope of hill. Natural outcrop used as rear wall, with gaps filled with loose rock. Front / lower wall missing. ± 15 m wide. Length unknown. Circular structure on eastern wall, on the outside. Occasional LSA lithics. Couple of dark green glass fragments.	3C

J054	2024	-30.705927	24.103861	Low stone mound / cairn ± 1.5 x 1 m, and 30 cm high. Use / origin unclear.	3C
J055	2024	-30.705899	24.103748	Ditto for J015	3C
J056	2024	-30.70587	24.103661	Ditto for J015 / J016.	3C
J057	2024	-30.705575	24.102563	Possible circular stone kraal. Ephemeral stone alignment remains.	3C
J058	2024	-30.723929	24.092704	Semi-circular stone structure on southern base of koppie. Dolerite cobbles and boulders. ± 1.5 m internally. Could be shepherd's hut or hunting skerm. Probably former, given orientation. No artefacts noted.	3C
J059	2024	-30.732406	24.094174	Circular stone structure. Shepherd's hut probably, although situation is odd. On open ground. Built around some outcropping dolerite boulders. 3/4's of circle is visible. ± 1.8 m internally. Clear bottle glass fragment in circle. Light green wine bottle glass base nearby. N & Co and numbers 4468 on base. Pieces of wire wrapped around nearby dolerite boulders. Number of fragments of white unmarked earthenware = plate. Number of fragments or red / pink transfer print - probably a teacup. One oval tin. All mostly in 'dump' area about 20 m from structure. 50 m buffer.	3C
J060	2024	-30.732766	24.095158	Stone circle. Widely spaced dolerite boulders, but a definite circle. Approximately 3 m across.	3C
J078	2024	-30.752002	24.120217	Possible circular stone kraal (Khoi). About 1/2 of the circle is clear. Rest is a bit ephemeral. Next to low dolerite outcrop. One flat / horizontal rock appears to have been rubbed.	3C

APPENDIX F: IMPACT ASSESSMENT METHODOLOGY

Impacts are rated according to the impact assessment methodology presented below.

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring, including possible irreversibility of impacts and/or loss of irreplaceable resources, and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in the table below.

Table 0-1: Criteria used to determine the consequence of the impact

Rating	Definition of Rating	Score
A. *Extent* *– the area (distance) over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g. the development envelope and immediate surrounds)	1
Regional	The region (e.g. Municipality or Quaternary catchment)	2
(Inter) national	Nationally or beyond	3
B. ***Intensity*** *– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered and/or irreplaceable resources[1] are lost	3
C. ***Duration*** *– the timeframe over which the impact will be reversed*		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years or irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Table 0-2: Method used to determine the consequence score

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence was derived, the probability of the impact occurring was considered, using the probability classifications presented in the table below.

Table 0-3: Probability classification

Probability *– the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring

[1] Defined as important cultural or biological resource which occur nowhere else, and for which there are no substitutes.

Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts was determined by considering consequence and probability using the rating system prescribed in the table below.

Table 0-4: Impact significance ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally, the impacts were also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below.

Table 0-5: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **INSIGNIFICANT**: the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.
- **VERY LOW**: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.
- **LOW**: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.
- **MEDIUM**: the potential impact **should** influence the decision regarding the proposed activity/development.
- **HIGH**: the potential impact **will** affect the decision regarding the proposed activity/development.
- **VERY HIGH**: The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended, and impacts are rated

in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential**: measures that must be implemented and are non-negotiable; and
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the applicant if not implemented.