

APPENDIX E5: Phase 1 Cultural Heritage Impact Assessment

MOOIVLEI SOLAR 2 (PTY) LTD

**PROPOSED 240MW MOOIVLEI SOLAR 2 PHOTOVOLTAIC PROJECT WEST OF KROONSTAD, FREE
STATE PROVINCE**

HERITAGE IMPACT ASSESMENT

31 MAY 2023

Submitted to : Nema Consulting

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The heritage impact assessment report has been compiled considering the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

Requirements of Appendix 6 – GN R326 EIAs Regulations (2014, amended 2017)	Relevant section in report
1.(1) (a) (i) Details of the specialist who prepared the report	Section 1.1.3 of Report
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.1.3 and of Report and Appendix 2
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page iii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
(cA) An indication of the quality and age of base data used for the specialist report	N/A
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 6
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 7
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5.2 and 5.4, Section 6
(g) An identification of any areas to be avoided, including buffers	Section 6, Section 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;	Appendix 1
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3
(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	Sections 6, 8
(k) Any mitigation measures for inclusion in the EMPr	Sections 11, 12
(l) Any conditions for inclusion in the environmental authorisation	N/A
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 12
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 11, 12
(o) A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process will be handled as part of the EIAs and EMPr process.

Requirements of Appendix 6 – GN R326 EIAs Regulations (2014, amended 2017)	Relevant section in report
(p) A summary and copies if any comments that were received during any consultation process	Not applicable. To date no comments have been raised regarding heritage resources that require input from a specialist.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 38(3) of the NHRA

Declaration of Independence

The report has been compiled by Nitai Consulting (Pty) Ltd, an appointed Heritage Specialist for Nema Consulting for the Proposed 240MW Mooivlei Solar 2 Photovoltaic Project West of Kroonstad, Free State Province. The views contained in this report are purely objective and no other interests are displayed during the Heritage Impact Assessment Process.

I, Jennifer Kitto, declare that –

General declaration:

- I act as the independent heritage specialist*
- I will perform the work in an objective manner, even if this results in views and findings that are not favourable to the project;*
- I declare that there are no circumstances that may compromise my objectivity in performing such work;*
- I have expertise in conducting heritage impact assessments, including knowledge of the National Heritage Resources Act, No 25 of 1999 (NHRA), associated Regulations and any guidelines that have relevance to the proposed activity;*
- I will comply with the NHRA, associated Regulations and all other applicable legislation, specifically the National Environmental Management Act, No 107 of 1998 (NEMA);*
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA;*
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;*
- I undertake to disclose to the project proponent and the competent authority all material information in my possession that reasonably has or may have the potential of influencing -any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;*
- I will ensure that information containing all relevant facts in respect of the project is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;*
- I will provide the competent authority with access to all information at my disposal regarding the project, whether such information is favourable to the project or not*
- All the particulars furnished by me in this form are true and correct;*
- I will perform all other obligations as expected of a heritage specialist in terms of the NHRA and NEMA, associated Regulations, the constitutions of my affiliated professional bodies; and*
- I realise that a false declaration is an offence in terms of regulation 71 of the NEMA Regulations and is punishable in terms of section 24F of the NEMA.*

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the NEMA Regulations;

HERITAGE CONSULTANT - Nitai Consulting (Pty) Ltd

PRINCIPAL HERITAGE PRACTITIONER – Jennifer Kitto

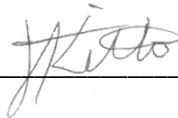
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Executive Summary

Mooivlei Solar 2 (Pty) Ltd (the “Applicant”) has proposed the development of the 240 MW Mooivlei Solar 2 Photovoltaic (PV) Project near Kroonstad, in the Free State Province (the “Project”). The electricity generated by the Project will be injected into the Eskom National Grid system via the proposed Eskom substation/switching station (which is being assessed in a separate EIA). The Applicant intends to bid for the current and future Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bid windows and/or other renewable energy markets within SA.

Nemai Consulting has been appointed as the independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Authorisation (EA) process for Proposed Solar PV Project. Nitai Consulting has been appointed by Nemai Consulting to conduct the specialist studies, one of which is the Heritage Impact Assessment (HIA).

This HIA report deals with the Mooivlei Solar 2, located on the Farm Mooivlei No.284 and Farm Naseby Thorns No. 288 (Alternative 1), an access road crossing Portion 1 of Farm No. 1475 and the Farm Leidzaamheid No. 213. An alternative layout is located the Farm Mooivlei 284 (Alternative 2), and an access road crossing Portion 1 of Farm No. 1475 and the Farm Leidzaamheid No. 213. The proposed Mooivlei Solar 2 PV project site footprint is situated approximately 10 km west of Kroonstad, will cover approximately 312 ha and is intended to generate up to 240MW.

Methodology/ Significance Assessment

The general overview from the historical desktop study has shown that various archaeological and historical resources can be expected to occur in the project area. Furthermore, the examination of the earliest edition (1960) of the 1:50 000 topographical maps produced by overlying the maps with satellite Imagery (Google Earth) has shown that no specific heritage features are depicted within the project footprint for Alternative 1 or Alternative 2. One heritage feature (homestead cluster) is depicted as located outside but relatively close to the north-east boundary of the project footprint (Alternative 1).

The Site Survey fieldwork provided confirmation of the existence of heritage resources occurring within and close to project area footprint. The inspection identified two heritage resources occurring within and close to the project area footprint: one probable homestead (Mooi 002) and one remains of probable recent/modern kraal site (Mooi 003).

Identification of Activities, Aspect and Impacts

The project area that will be impacted by the proposed Mooivlei Solar 2 PV project contains some areas that are currently disturbed by grazing activities.

The impact significance of the project on graves and cemeteries is low as no graves were identified. However, due to the dense grass in some areas there is a possibility of unidentified informal graves being uncovered.

The impact significance of the proposed project on protected historical structures is low as only two sites were identified (one homestead remains area, Mooi 002 and one kraal remains area, Mooi 003). Since the homestead is depicted on the 1954 topographical map the site is protected by section 34 of the NHRA and possibly section 36 as infant graves could be present. However, the Alternative 2 layout (which is the preferred alternative) avoids both of these sites.

Mitigation Measures

The proposed Mooivlei Solar 2 PV project could impact on two heritage resources identified within or adjacent to the project footprint for Alternative 1 and Alternative 2 (Mooi 002 – homestead remains and Mooi 003 – kraal remains). The recommendations below are provided to mitigate the potential impact of the proposed PV project on the identified heritage resources:

For the Alternative 1 layout, the homestead remains identified at Mooi 002 must be avoided and protected with at least a 30m buffer; and social consultation may be necessary to confirm the possible presence of infant graves. No mitigation is required for sites Mooi 003 and Mooi 001.

For the Alternative 2 layout (preferred layout) no mitigation is required as all three heritage resources are avoided by this layout.

No further mitigation for heritage resources is required except for the General Management Guidelines set out in Section 11, above.

Both the DFFE Screening tool and SAHRIS Palaeontological Map indicated that the project area falls into an area of both High and Very High fossil sensitivity, therefore a separate palaeontological study is being undertaken by a professional palaeontologist. The recommendations and mitigation measures provided by the palaeontological assessment must be implemented where necessary.

Conclusion

No fatal flaws were identified during this study, therefore, it is the considered opinion of the heritage specialist that the construction of the proposed Mooivlei Solar 2 PV project can proceed. There are no objections from a heritage perspective provided that the recommendations and mitigation measures contained in this report and in are implemented. Both the Alternative 1 and Alternative 2 layouts have a low heritage sensitivity, however, Alternative 2 is designed to specifically avoid the identified heritage resources, and therefore is preferred from a heritage perspective.

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List of Abbreviations

APHP	Association of Professional Heritage Practitioners
ASAPA	Association of Southern African Professional Archaeologists
BGG	Burial Grounds and Graves
CRM	Cultural Resources Management
DALRRD	Department of Agriculture, Land Reform & Rural Development
DFFE	Department of Fisheries, Forestry and Environment
EAP	Environmental Assessment Practitioner
EIA	Early Iron Age
EMPr	Environmental Management Programme
ESA	Early Stone Age
ESIA	Environmental and Social Impact Assessment
FS PHRA	Free State Provincial Heritage Resources Authority
GIS	Geographic Information System
ha	Hectare
HIA	Heritage Impact Assessment
IAIASa	International Association for Impact Assessment South Africa
km	Kilometre (1 000m)
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NAMA	Nationally Appropriate Mitigation Actions
NEMA	National Environmental Management Act (No. 107 of 1998)
NHA	National Health Act, (No. 61 of 2003)
NHRA	National Heritage Resources Act (No 25 of 1999)
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

1 INTRODUCTION

Mooivlei Solar 2 (Pty) Ltd (the “Applicant”) has proposed the development of the 240MW Mooivlei 2 Solar Photovoltaic (PV) Project near Kroonstad, in the Free State Province (the “Project”). The electricity generated by the Project will be injected into the Eskom National Grid system via the proposed Eskom substation/switching station (which is being assessed in a separate EIA)s. The Applicant intends to bid for the current and future Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bid windows and/or other renewable energy markets within SA.

Nemai Consulting has been appointed as the independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Authorisation (EA) process for Proposed Solar PV Project. Nitai Consulting has been appointed by Nemai Consulting to conduct the specialist studies, one of which is the Heritage Impact Assessment (HIA).

This HIA report deals with the Mooivlei Solar 2 project, located on the Farm Mooivlei No. 284 and the Farm Naseby Thorns No. 288 (Alternative 1 layout), an access road crossing Portion 1 of Farm No. 1475 and the Farm Leidzaamheid No. 213. An alternative layout (Alternative 2), is located on the Farm Mooivlei No. 284 and the Farm Naseby Thorns No. 288 with the same access road as Alternative 1. The proposed Mooivlei Solar 2 PV project is situated approximately 10 km west of Kroonstad, will cover approximately 312 ha and is intended to generate up to 240MW.

1.1 Scope & Terms of Reference for the HIA report

1.1.1 Summary of Key Issues & Triggers Identified During Scoping

In terms of the NHRA, the following proposed activities trigger the need for a Heritage Impact Assessment (HIA):

- Potential occurrence of heritage resources, graves and structures older than 60 years within the Project’s footprint.
- Proposed development that is more than 5000m²
- Proposed linear development that is longer than 300m
- Proposed development where an impact assessment is triggered in terms of NEMA.

1.1.2 Approach

- Undertake a Heritage Impact Assessment in accordance with the NHRA.
- Identify and map all heritage resources in the area affected, as defined in Section 2 of the NHRA, including archaeological sites on or near (within 100m of) the proposed developments.
- Assess the significance of such resources in terms of the heritage assessment criteria as set out in the regulations.
- Assess the impacts of the Project on such heritage resources.

- Prepare a heritage sensitivity map (GIS-based), based on the findings of the study.
- Identify heritage resources to be monitored.
- Comply with specific requirements and guidelines of FSHRA and SAHRA.

1.1.3 Nominated Specialist Details

Organisation:	Nitai Consulting
Name:	Jennifer Kitto
Qualifications:	BA Archaeology and Social Anthropology; BA (Hons) Social Anthropology
No. of years' experience:	24
Affiliation (if applicable):	Association of Southern African Professional Archaeologists (ASAPA) - Technical member No.444 International Association of Impact Assessors South Africa (IAIAsa) Member No. 7151

1.2 Project Description

The Applicant has proposed the development of the 240MW Mooivlei Solar 2 PV Project west of Kroonstad, in the Free State Province. The electricity generated by the Project will be injected into the Eskom National Grid via the proposed Eskom substation/switching station (which is being assessed in a separate EIA).

The proposed Mooivlei solar 2 project is located on the Farm Mooivlei No. 284 and the Farm Naseby Thorns No. 288 (Alternative 1 layout), an access road crossing Portion 1 of Farm No. 1475 and the Farm Leidzaamheid No. 213. An alternative layout (Alternative 2) is located on the Farm Mooivlei No. 284, and the Farm Naseby Thorns No. 288 with the same access road as Alternative 1. The project footprint is located approximately 10 km west of Kroonstad. The proposed PV project will cover approximately 312 ha and is intended to generate up to 240MW.

2 LEGISLATION

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by various pieces of legislation, including the National Heritage Resources Act, 25 of 1999 (NHRA) and associated Regulations, National Environmental Management Act, Act 107 of 1998 (NEMA) and associated Regulations and, as well as the National Health Act, Act No. 61 of 2003 (NHA), specific Regulations governing human remains.

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

The NHRA is the defines cultural heritage resources (section 3), provides protection to specific types of heritage resources (sections 34, 35, 36) and also requires an impact assessment of such resources for specific development activities (section 38(1)). Section 38(8) further allows for cooperation and integration of the management of such impact assessment between the national or provincial heritage authority (SAHRA or a PHRA) and the national environmental authority (DFFE).

In terms of section 38(1)(a) of the NHRA, the specific types of development activity that may require a Heritage Impact Assessment (HIA) include: the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length. As the proposed Solar PV project is larger than 5000m², this study falls under s38(8) and requires comment from the relevant heritage resources authority. (South African Heritage Resources Authority-SAHRA and/or the Free State Provincial Heritage Authority).

Sections 34-36 of the NHRA further stipulate the protections afforded to specific types of heritage resources, *i.e.*, structures older than 60 years (s34); archaeological, palaeontological, meteorites (s35); graves and burial grounds (s36), as well as the mitigation process to be followed if these resources need to be disturbed. The construction of the solar PV project and powerline may result in impacts to any of these types of heritage resources.

2.2 National Environmental Management Act, Act 107 of 1998 (NEMA)

NEMA states that an integrated Environment Management Plan (EMP) should, (23 -2 (b)) "...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage". In addition, the NEMA and associated Regulations GNR 982 (Government Gazette 38282, 14 December 2014, amended 2017) state that, "the objective of an environmental impact assessment process is to, ... identify the location of the development footprint within the preferred site ... focussing on the geographical, physical, biological, social, economic, *cultural and heritage aspects* of the environment" (GNR 982, Appendix 3(2)(c), emphasis added).

The EIA Regulations, 2014 (as amended), published in GNR 982 of 2014 (Government Gazette 38282) promulgated under the (NEMA) contain specific requirements to be addressed in the different types or impact assessment reports (Regulations 19, 21 and 23) as well as requirements for Specialist Reports (Appendix 6).

2.3 The National Health Act, No. 61 of 2003 (NHA), Regulations 2013

In the case of graves and/or burial grounds that could be impacted by a proposed development, and which are identified through an impact assessment, specific Regulations relating to the Management of Human Remains (GNR 363 of 2013 in Government Gazette 36473) address the exhumation and reburial of human remains: Regulations 26, 27 and 28.

3 ASSUMPTIONS AND CONSTRAINTS

This assessment assumes that all the information provided by the Environmental Assessment Practitioner (EAP) regarding the project footprint (Including the powerline) is correct and current.

The project area traverses various properties separated by fences, and access was sometimes restricted by locked gates. Some sections also contained long dense grassland vegetation which hindered visibility.

The large area of the project footprint meant that it was not feasible to undertake a pedestrian survey of the whole area and the fieldwork therefore comprised a combination of vehicle and pedestrian investigation. The extremely dense and long vegetation in a few areas meant that archaeological and heritage visibility was low in those areas. Therefore, there is a possibility that some heritage resources were not identified, specifically, informal graves or burial sites, as well as archaeological material which is usually situated sub-surface.

4 PROJECT DESCRIPTION

4.1 Location

The Mooivlei Solar 2 PV -project is located on the Farm Mooivlei No. 284 and the Farm Naseby Thorns No. 288 (Alternative 1 layout), an access road crossing Portion 1 of Farm No. 1475 and the Farm Leidzaamheid No. 213. An alternative layout (Alternative 2), is located on the Farm Mooivlei 284 and the Farm Naseby Thorns No. 288 with the same access road as Alternative 1. The project is situated approximately 10 km west of Kroonstad and falls within Ward 7 of the Moqhaka Local Municipality, within the Fezile Dabi District Municipality in the Free State Province. The proposed Solar PV project will cover approximately 312 ha and is intended to generate up to 240MW.

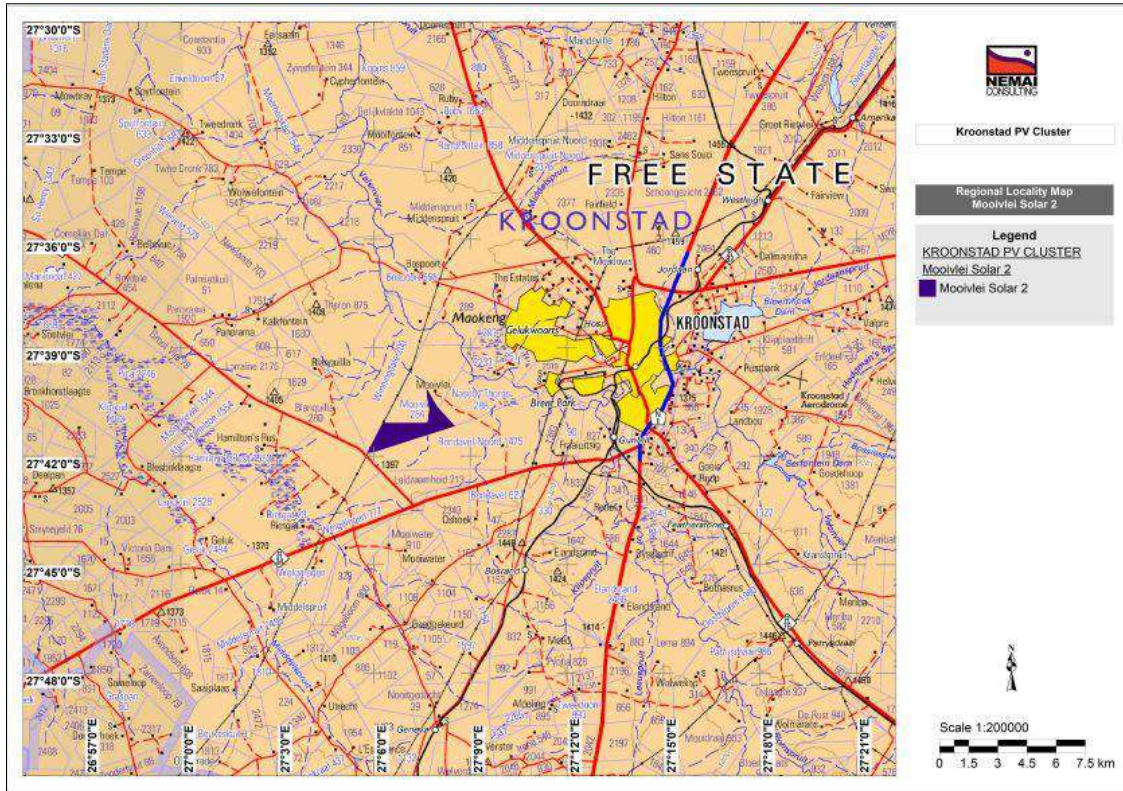


Figure 1: Project Locality west of Kroonstad (purple polygon)

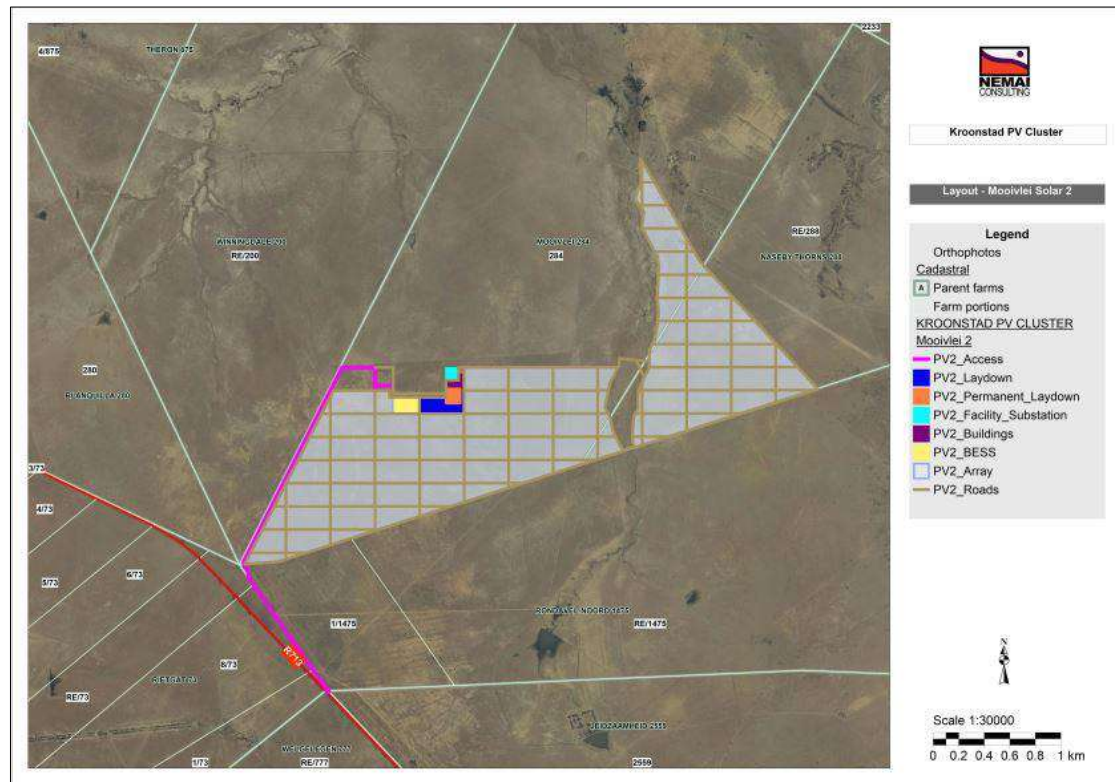


Figure 2: Mooivlei Solar 2 Layout (Alternative 1 layout)



Figure 3: Mooivlei Solar 2 Layout (Alternative 2 layout)

4.2 Project Technical Details

4.2.1 Solar Technology

Solar energy facilities operate by converting solar energy into a useful form (i.e., electricity). The use of solar energy for electricity generation is a non-consumptive use of a natural resource and consumes no fuel for continuing operation. Solar power produces an insignificant quantity of greenhouse gases over its lifecycle as compared to conventional coal-fired power stations. The operational phase of a solar facility does not produce carbon dioxide, sulphur dioxide, mercury, particulates, or any other type of air pollution, as fossil fuel power generation technologies do.

4.2.2 PV Technology Overview

PV technology produces direct current (DC) which is then converted to alternating current (AC) via power electronic inverters. The main technology categories are crystalline modules (mono or poly), thin film, and concentrated photovoltaics (CPV). **Figure 4** below provides an overview of a typical Solar PV Power Plant.

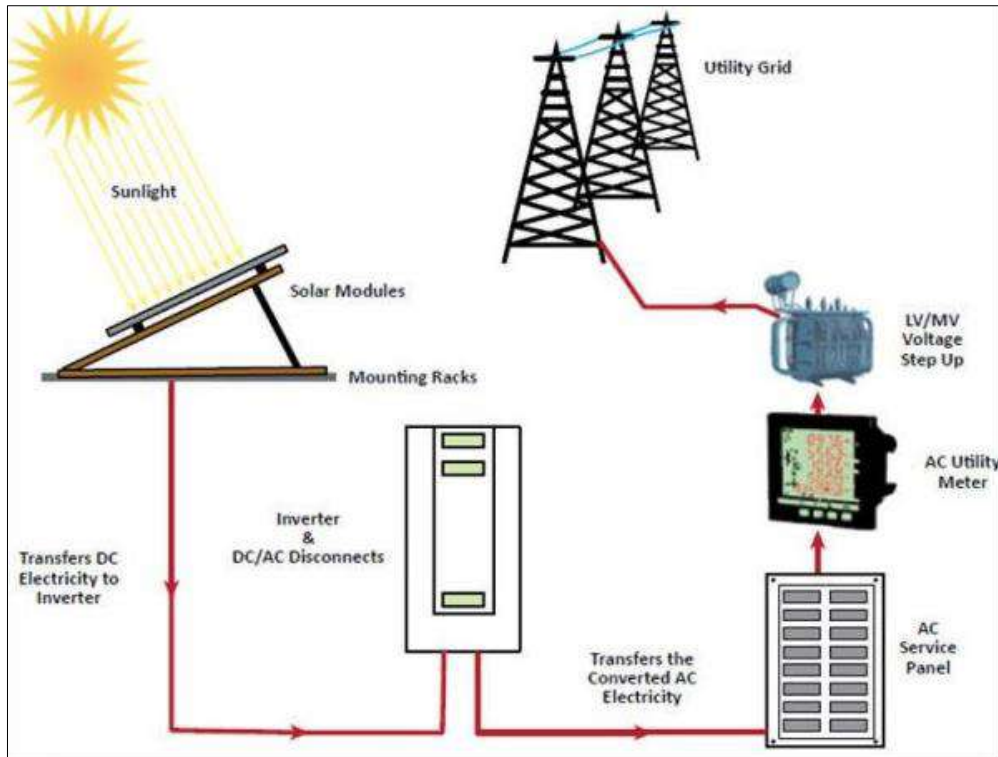


Figure 4: Overview of Solar PV Power Plant (International Finance Corporation, 2015. Utility-Scale Solar Photovoltaic Power Plan.)

4.2.3 Overview of Technical Details:

The technical details of the proposed Mooivlei Solar 2 PV Plant are captured in Table 1 below.

Table 1: Technical details of the proposed PV Plant

No.	Component	Alternative 1 - Description / Dimensions	Alternative 2 - Description / Dimensions
1.	Height of PV panels	Up to 5.5m	Up to 5.5 m
2.	Area of PV Array	Up to approximately 312ha	Monofacial or Bifacial PV panels, mounted on either fixed-tilt, single-axis tracking, and/or double-axis tracking systems. Area: Up to 300 ha
3.	Area occupied by inverter / transformer stations / substations	Up to 1ha	It is estimated that the maximum size of the facility substation will not exceed 1 ha. Each facility will require inverter-stations, transformers, switchgear and internal electrical reticulation (underground cabling).

No.	Component	Alternative 1 - Description / Dimensions	Alternative 2 - Description / Dimensions
4.	Capacity of on-site substation	Medium voltage (up to 33 kV) to high voltage (132 kV)	The facility substation will collect the power from the facility and transform it from medium voltage (up to 33 kV) to high voltage (132 kV).
5.	BESS	Area up to ± 5ha	Area: up to ± 5 ha
6.	Area occupied by both permanent and construction laydown areas	Temporary: Up to 5ha Permanent: Up to 1 ha (located within the area demarcated for temporary construction laydown)	Temporary construction laydown area up to 5 ha. Permanent laydown area up to 1 ha (to be located within the area demarcated for the temporary construction laydown).
7.	Area occupied by buildings	Up to 1.5ha	Up to 1.5 ha
8.	Length of internal roads	Up to 30km	Up to 30 km
9.	Width of internal roads	The internal roads will be up to 6 m wide. The access roads will be up to 8 m wide.	The internal roads will be up to 6 m wide. The access roads will be up to 8 m wide.
10.	Proximity to grid connection	Project site directly adjacent to 275kV overhead lines	Project site directly adjacent to 275kV overhead lines
11.	Height of fencing	Up to 3.5m	Up to 3.5m
12.	Type of fencing	Type will vary around the site, welded mesh, palisade and electric fencing	Type will vary around the site, welded mesh, palisade and electric fencing

4.2.4 Project Layout

The layout of the Mooivlei Solar 2 PV Plant is shown in Error! Reference source not found. and **Figure 3** above. The desirability of the earmarked site for the development of the proposed Solar PV Plant is due to the following key characteristics:

- Solar Irradiation: The feasibility of a solar facility is dependent on the direct solar irradiation levels. The Project Area is considered to have favourable solar irradiation levels, which makes it ideal for the production of solar power via PV Panels.
- Topography: The suitability of the surface area is an important characteristic for the construction and operation of solar facilities. Most of the site has a low gradient slope and is suitable for this development.
- Grid connection: The electricity generated by the Solar PV Plant will be injected into the existing Eskom National Grid via the proposed Eskom substation/switching station (which is being assessed in a separate EIA).
- Extent of site: The overall extent of the site is sufficient for the installation of the PV facility. θ Site access: The site can be accessed via the R713, which is located to the south of the site.

4.2.5 Components of the Proposed Solar PV Plant

The proposed Solar PV Project includes the following infrastructure:

- PV panel arrays, which are the subsystems which convert incoming sunlight into electrical energy;
- PV modules and mounting structures which will consist of either Monofacial or Bifacial PV panels, mounted on either fixed-tilt, single-axis tracking, and/or double-axis tracking systems.
- Inverters and transformers.
- Battery Energy Storage System (BESS) area up to 5ha.
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses and workshops for storage and maintenance.
- Grid connection infrastructure. It is estimated that the maximum size of the facility substation will not exceed 1 ha. The facility substation will collect the power from the facility and transform it from medium voltage (up to 33 kV) to high voltage (132 kV). Additional 33 kV or 132 kV cabling or powerlines will connect the facility substation to the proposed Eskom substation / switching station.
- Temporary construction laydown area up to 5 ha.
- Permanent laydown area up to 1 ha (to be located within the area demarcated for the temporary construction laydown).
- Internal roads will be up to 6 m wide, to allow access to the Solar PV modules for operations and maintenance activities.
- Main Access Road is up to 8 m wide. The site is accessible via the R713, R34 and gravel farm roads.

The proposed Solar PV Projects have a design life of a minimum of 25 years. The extension of the life of the plant will be considered when assessing the plant's economic viability to remain operational after its end of life.

5 STATUS QUO ANALYSIS

5.1 General Existing Condition of Receiving Environment

The Mooivlei Solar 2 PV -project is located on the Farm Mooivlei No. 284 and the Farm Naseby Thorns No. 288 (Alternative 1 layout), an access road crossing Portion 1 of Farm No. 1475 and the Farm Leidzaamheid No. 213 with grid connection infrastructure on the Remaining Extent of the Farm Winningdale No. 200. An alternative layout (Alternative 2), is located on the Farm Mooivlei 284 and the Farm Naseby Thorns No. 288 with the same access road as Alternative 1 and grid connection infrastructure on the Remaining Extent of Farm Winningdale No. 200

The general area is covered with grassland which varies from shorter to long and dense. A few patches of dense acacia shrub thicket occur. Several farm dams occur and there are outcrops of sandstone. In some sections locked gates limited access to certain sections of the project area. The project area is fairly flat and

used currently mainly for cattle and game farming. A stream runs from north to south and separates the east and west sections of the project footprint (Alternative 1 layout).



Figure 5: View of the northern section of the PV project footprint, showing the long dense grass cover (Alternative 1)



Figure 6: View looking south-west showing dense grassland with a few scattered stands of trees or bushes along the stream (Alternative 1)



Figure 7: Another view over the grasslands covering most of the project footprint (Alternative 2)



Figure 8: View of the southern section of the project footprint, looking south (Alternative 1)



Figure 9: View of powerline running adjacent to the western boundary of the project footprint (Alternative 2)



Figure 10: View of the grassland with a small area of acacia shrub (Alternative 2)

5.2 Cultural-Heritage Receiving Environment

5.2.1 DFFE Screening Tool

The DFFE Environmental Screening Tool was accessed for information on the cultural-heritage sensitivity of the general region. This tool indicated that the Archaeological and Cultural Heritage Sensitivity of the general region is Low for both Alternative 1 and Alternative 2 (Figure 11 and Figure 12). However, the Palaeontological Sensitivity of the region and project footprint is indicated as being of both High and Very High sensitivity for both Alternative 1 and Alternative 2 (Figure 13 and Figure 14).

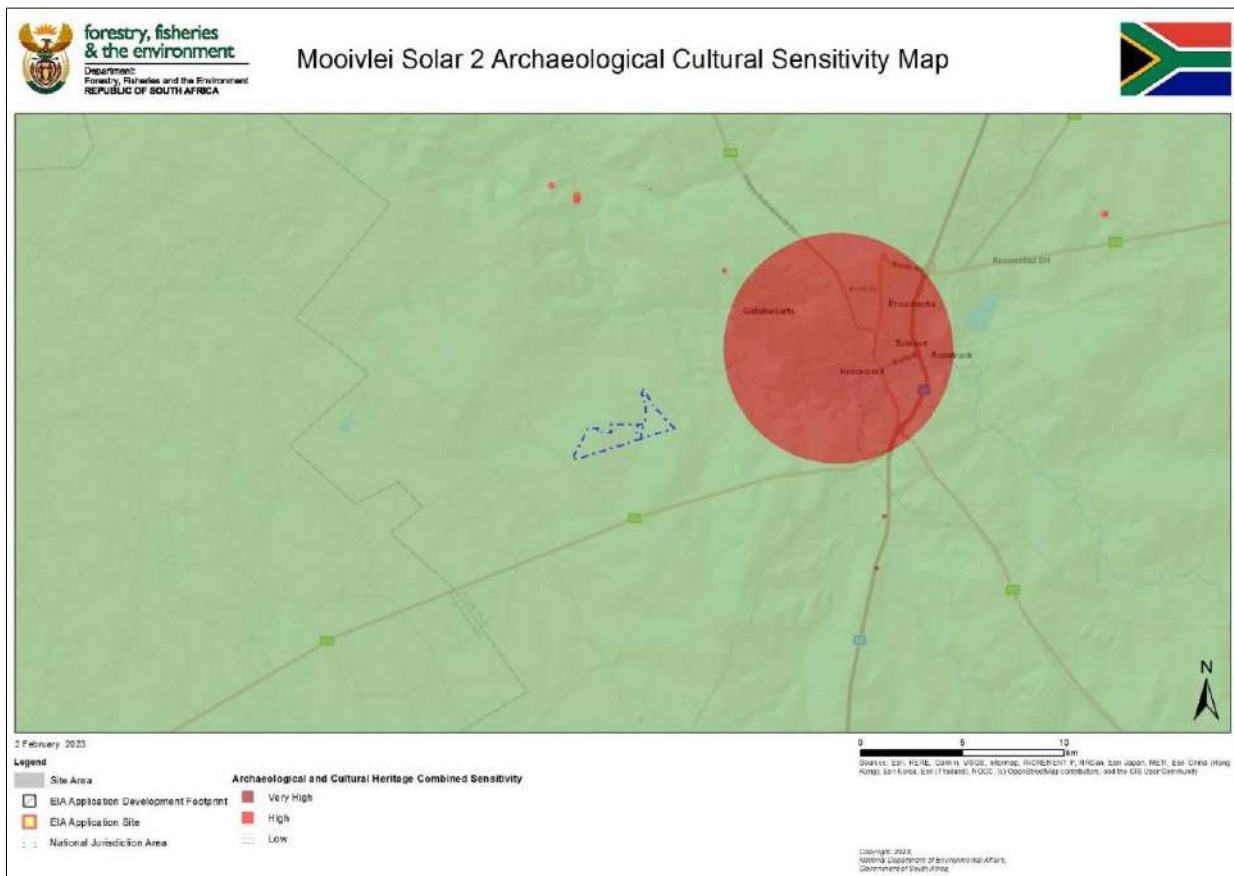


Figure 11: Archaeological and Cultural heritage sensitivity map indicating that the project footprint _Alternative 1 (blue polygon) is located within a region of low sensitivity.

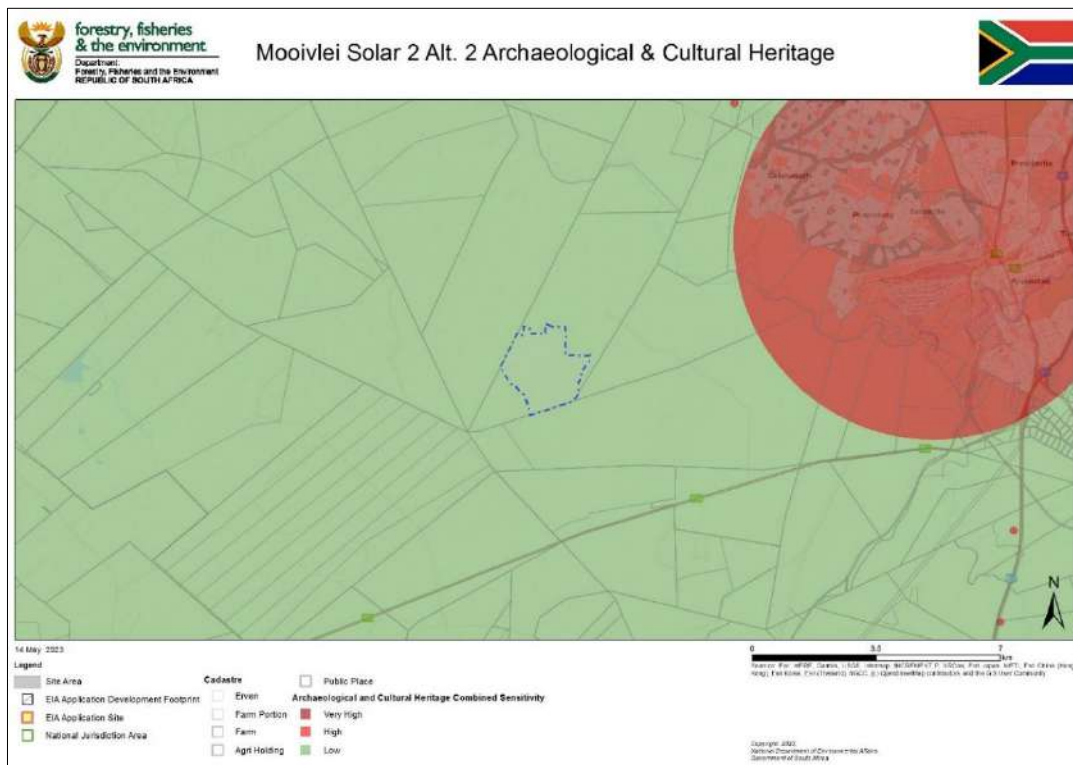


Figure 12: Archaeological and Cultural heritage sensitivity map indicating that the project footprint Alternative 2 (blue polygon) is located within a region of low sensitivity.

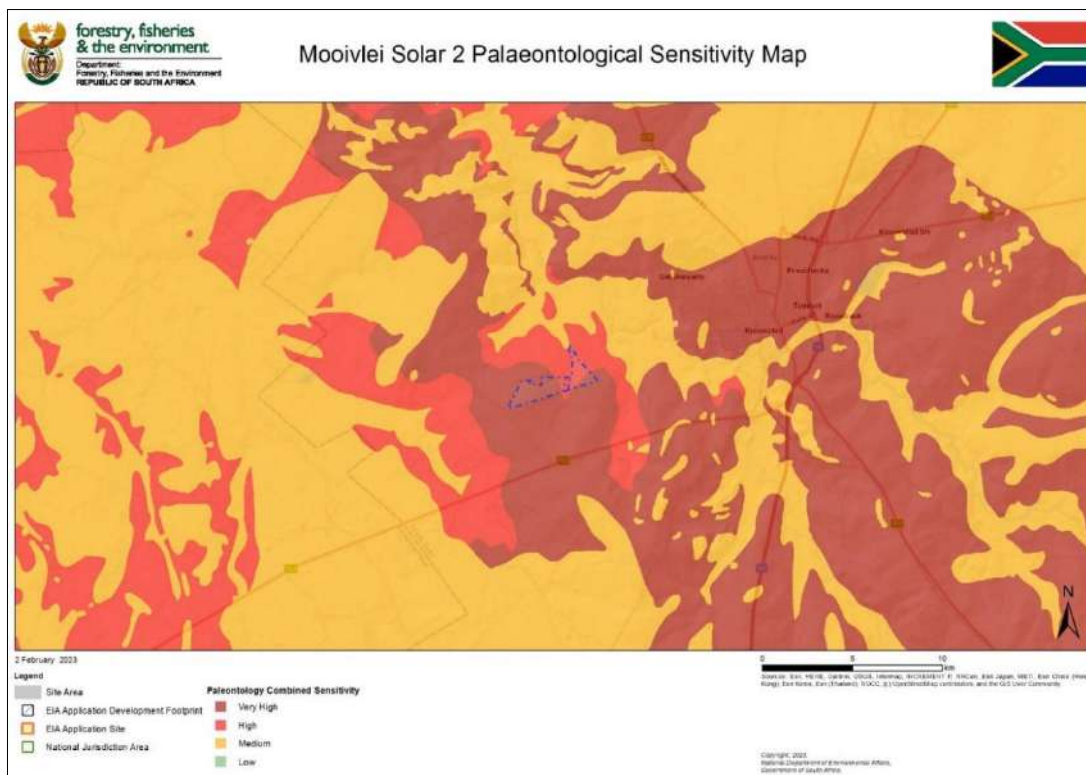


Figure 13: Palaeontological Sensitivity Map indicating that the project footprint Alternative 1 (blue polygon) is located within a region of both High and Very High palaeontological heritage sensitivity

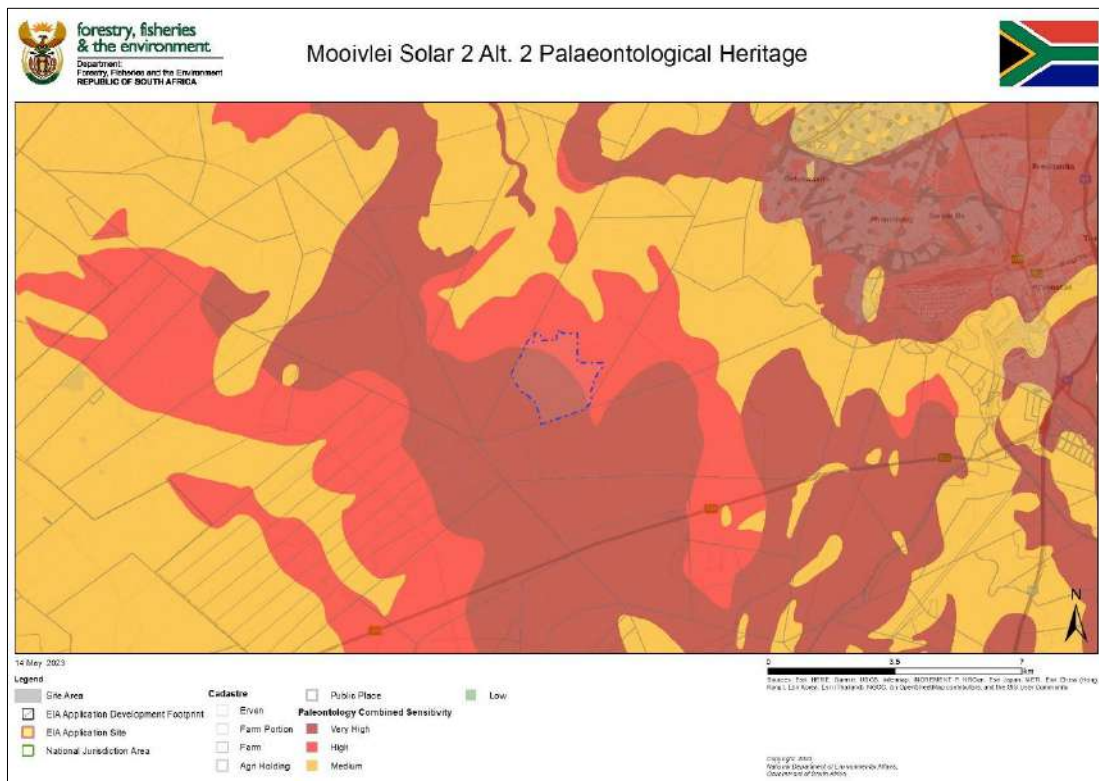


Figure 14: Palaeontological Sensitivity Map indicating that the project footprint Alternative 1 (blue polygon) is located within a region of both High and Very High palaeontological heritage sensitivity

5.2.2 Historical Background of Surrounding Region (archaeological and historical literature survey)

The Free State is rich in archaeological and historical resources and includes significant aspects such as Later Stone Age rock art, Battlefields and Iron Age stonewalled enclosures. The general region of the project area was a frontier region where San hunter-gatherers, Nguni and Sotho-Tswana agro-pastoralists, Dutch Voortrekkers and British Colonists all interacted.

The archaeological history of the area can broadly be divided into a Stone Age, Iron Age and Historic or Colonial Period. An overview of the general region is presented below.

The Stone Age

The Earlier Stone Age (ESA) is the first and oldest phase identified in South Africa’s archaeological history and the material culture of the earliest people comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian which is comprised of more refined stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates to approximately 1.5 million years ago. No ESA sites are known from the study area and surrounding region (Fourie 2021; Angel and Kitto 2018).

The Middle Stone Age (MSA) material culture is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and

complex cognition (Wadley, 2013). Not many sites are known in the immediate area of the project footprint, however, research fieldwork by the National Museum in Bloemfontein, recorded ten sites where MSA and/or Later Stone Age lithics were identified in association with mammal fossil remains from erosion channels along the Sand, Vet and Doring Rivers (De Ruiter et. al. 2011; Fourie 2021; Angel and Kitto 2018).

The Later Stone Age (LSA) is the third archaeological phase and is characterised by very small stone tools known as microliths. This period is associated with hunter-gatherers (San) as well as early pastoralists (Khoekhoe) and lasted until the arrival of Iron Age and European communities (and in some areas, for a considerable period). Apart from the occurrence of LSA stone tools along the Sand, Vet and Doring Rivers (see above), no other LSA sites are known from the surroundings of the study area.

The Later Stone Age is also associated with the production of rock engravings and rock paintings. Rock engravings are known from the wider vicinity of the study area (Bergh, 1999). The closest rock art site in the general area is Spitskop. Spitskop is located 12 km west of Verkeerdevlei on the link road to the N1 in the Brandfort District. The Spitskop site consists of three San or 'Bushman', as well as Khoe or 'Khoi' rock-engraving sites located on adjacent farms which are all relatively close to a sandstone mountain known as Spitskop. There are images of eland, geometric forms, human figures, and ostrich (Ouzman, S. 2001); <http://www.nasmus.co.za/departments/rock-art/public-rock-art-sites>).

The Iron Age

The Iron Age in South Africa (c.AD 1600 – c.AD 1840) is associated with pre-colonial farming communities and includes both agricultural and pastoralist farming activities, metal working and stone-walled settlements known as the 'Central Cattle Pattern' (Huffman, 2007), as well as cultural customs such as lobola. According to the distribution map for Iron Age settlements on the Southern Highveld as published in Maggs (1976:38-39), the project area is located within the western boundary of the known distribution of such Late Iron Age sites. The distribution maps as published by Huffman (2007) also indicate that the project area is located very close to the periphery of two Iron Age ceramic typological sub-groups known as facies. These two Iron Age facies are known as Thabeng and Makgwareng.

The Thabeng facies of the Moloko Branch of the Urewe Tradition is one of the facies identified within the study area. The decoration on the ceramics associated with this facies is characterised by incised triangles, coloured chevrons and arcades. The Tlhaping at Dithakong, Rolong at Platberg and the Kubung from the Free State form a Southwestern Sotho-Tswana cluster that is associated with this Thabeng facies pottery and so-called 'Type Z' settlement layouts (Huffman, 2007). The Type Z settlements are one of the Late Iron Age stonewalled settlement types identified initially by Tim Maggs during his extensive archaeological research project on the Iron Age of the southern Highveld (Maggs, 1976), which includes the present project area. These Type Z sites are characterised by large primary enclosures surrounded by characteristic dwellings, the layout of which comprises two sections or lobes, one being larger than the other. Each of these 'bilobial' dwellings comprises a hut at its front with a semi-circular courtyard at the back. While a number of Type Z sites are located within the general region of the project area, one of the more well-known ones is OXF1, situated a short distance north-west of the town of Ventersburg. Ventersburg is

located approx. 45km south of Kroonstad. This site was excavated by Tim Maggs during the 1970s as part of his overall research project (Maggs, 1976).

The next known Iron Age period within the surroundings of the study area is represented by the Makgwareng facies of the Blackburn Branch of the Urewe Ceramic Tradition (Huffman 2007). The decoration on the ceramics from this sub-group is characterised by finely stamped triangles, rim notching and appliqué (Huffman, 2007). This sub-group developed from Ntsuanatsatsi south of the Vaal River and can be associated with the so-called 'Type V' stone walling settlement type (Huffman, 2007). Dreyer (1990) also conducted excavations on Type V Late Iron Age stonewalled settlements located a short distance south-west of Winburg, which is approx. 100km south of Kroonstad. The Type V settlements comprise a core of cattle enclosures surrounded by beehive huts. Corbelled stone huts are associated with this walling type. They are low stone huts located at the edge of the cattle enclosures (Huffman 2007).

The best known site of this type found within the surroundings of the study area, is a site known as "Early Sotho Settlement, Waterval, Sandrivierhoogte" that was originally declared a National Monument and which is now registered as a Provincial Heritage Site in terms of the National Heritage Resources Act (No 25 of 1999). The site is located roughly 42km south-east of the present study area. The original declaration as a national monument was on 17 December 1982. In the declaration, the site is described as a "Leghoya Village" comprising corbelled huts and stonewalls (Govt. Gazette No. 8481, 1982).

Historical/Colonial Period

From roughly the 1820s, there was a period characterised by conflict across the Southern Highveld. This resulted from the migration of three Nguni groups from the current Kwazulu-Natal province into the present-day Free State province which was a result of the expansion of the Zulu kingdom under King Shaka. The three Nguni groups were the Hlubi of Mpangazitha, the Ngwane of Matiwane and the Khumalo Ndebele (Matabele) of Mzilikazi. The migrations of all three groups would have had a definite impact on the northern Free State (Fourie 2021).

During the early Colonial Period (early 1800s) the study area and surroundings became known as Transorangia. The people called the Griqua had moved into the area in the years prior to 1804. Then a few white Trekboers started moving across the Orange River from the Cape Colony in search of better grazing for their livestock during times of drought. At first the farmers requested permission from the Cape authorities before crossing the river. However, later groups moved into the Transorangia region without permission (Fourie 2021, citing Schoeman, 1980). During the 1830s, this occasional movement developed into a mass migration of Afrikaner families from the Cape Colony to the interior. This mass migration became known as the 'Great Trek' and the families were known as Voortrekkers (Fourie 2021, citing Visagie, 2011). The first Voortrekker party of some 70 wagons crossed over the Orange River during early 1836. More groups followed and established themselves along the Vet River (Fourie 2018, citing Schoeman, 1980).

In 1841 the town of Winburg was established on the banks of the Vet River. It was laid out on the farm Waaifontein in 1841 and became a municipality in 1872. Raper (2014) notes that the name, originally spelt Wenburg, which means 'town of winning'. He considered that this original spelling may refer to a military victory over the Matabele at Mosega on 17 January 1837, or to the triumph of those residents of the town

who were in favour of Waaifontein as the site of the town (Raper 2014). After the annexation of Natal by the British in 1843 and the subsequent dissolution of the Voortrekker Republic of Natalia, Winburg became the capital of the Voortrekkers in what is today known as the Free State (Erasmus, 2014). Winburg is located nearly 83km south-west of the project area.

In 1846, Major H.D. Warden was appointed British Resident of the area between the Orange and the Vaal rivers, to maintain peace between the various population groups. In 1848, General Harry Smith annexed the area between the Orange and Vaal rivers as British territory and named it the Orange River Sovereignty. However, due to ongoing conflict between the Boers, the Griqua people and the Basotho people, the British government subsequently withdrew from the Orange River Sovereignty in 1854 and the area became an Afrikaner republic, the Orange Free State, with JP Hoffman as first Afrikaner State President and Bloemfontein as the state capital (Afrikaans community 1820-1899 | South African History Online (sahistory.org.za)).

On 16 January 1852, the Sand River Convention was signed between the British Government and the Transvaal Boers. This convention formally recognised the existence and independence of a Boer Republic north of the Vaal River by the British Government, namely the Zuid-Afrikaansche Republiek (South African Republic). The site where the signing of the convention took place, was declared a monument and for many years was marked by a stone cairn and plaque (Fourie 2021, citing Oberholster, 1972). The site is located near the bridge where the N1 highway passes over the Sand River and is located approximately 53.36 km south- west of the present project area.

The Town of Kroonstad was laid out on the farm Klipplaatsdrift in 1855. It is generally accepted to have been named after Kroondrift, a ford on the Vals/Valsch River, so called because a horse named Kroon broke its leg there (Raper 2014).

After the end of the Anglo-Transvaal War (also referred to the First South African War) which ended the two-year British annexation of the Zuid-Afrikaansche Republiek (ZAR), the Pretoria Convention of 1881 redefined the western boundary of the ZAR which was moved from the Makwassie Spruit to roughly the Harts River. In 1884, the western boundary of the Z.A.R. was again moved further west following the recommendations of the London Convention (Bergh, 1999).

The railway line between Bloemfontein and Johannesburg was built during the early 1890s, and eventually reached Johannesburg during September 1891 and Pretoria in January 1892 (Fourie 2021, citing Schoeman, 1980).

The Second South African War (1899 – 1902) was fought between the Boer Republics of the Transvaal and Free State against Great Britain but the victims and participants of the war were not excluded to British or Boer citizens alone. During this war, a concentration camp was located at Kroonstad, somewhere in the vicinity of the Valsch Rivier. This was at first divided into two sections, with people from the Lindley district on the south side of the river and those from other districts on the north side. However, flooding of the river cut off the Lindley people completely and made it impossible to provide them with rations, so the Lindley people were transferred to the main section south of the river. The camp at Kroonstad seems to have been formed between September and November 1900. Quite a few farms had been burnt by 1900,

resulting in a substantial influx of homeless families into the town. A camp for black people was also established but information on the location and other details is lacking (British Concentration Camps of the South African War 1900-1902 (uct.ac.za)).

At the beginning of the First World War (1914-1918) when the South African Government of General Louis Botha notified Great Britain of their willingness to support that country against Germany several former Boer Generals, such as Christiaan de Wet, JCG Kemp and General Christiaan Frederik Beyers led an armed rebellion. An incident which occurred close to Kroonstad was an attempt by De Wet with about 1500 or more men to capture the railway station at Virginia, roughly 55km southwest of Kroonstad, which was held by about 250 government troops. The troops held off the rebels until government reinforcements and a train arrived (The-Boer-Rebellion-in-South-Africa-pdf.pdf (moltenofamily.net)). Several casualties of the Rebellion are buried in the old Kroonstad Cemetery (SJ de Klerk 2021, Battlefields Route – Koppies to Kroonstad | The Heritage Portal).

In 1975, Winnie Mandela was incarcerated at the Kroonstad Prison. In February 1975, our founding President, the late Nelson Mandela, wrote her a letter where he was encouraging her not to let Prison break her down (www.sahistoryonline).

In 2014 the Kroonstad Correctional Centre was officially renamed to the 'Bizzah Makhate Correctional Centre". This name pays tribute to the late Comrade; Wilfred Sefularo 'Bizzah' Makhate who was incarcerated at this facility in the eighties (<https://www.gov.za/kroonstad-correctional-centre-officially-renamed-bizzah-makhate-correctional-centre>).

Reverend Zaccheus Richard "ZR" Mahabane, lived and worked in Kroonstad for most of his long career, and is buried in Seeisoville Cemetery in Maokeng, although he was born in Thaba Nchu. Rev. Mahabane was one of the Founding Fathers of the ANC, and was elected ANC President in 1924. He constantly strove for black unity and together with Mr A Abdurahman established the non-European Unity Movement (NEUM) between 1927 and 1934. In 1935 he served as an executive committee member of the All Africa Convention (AAC), a federal body that gave expression to the aspirations of black people and fought against the Native trust and Land Act promulgated in 1936. He was elected as ANC President for the second time from 1936 – 1940. He also played a prominent role in the development of the Methodist Church in South Africa and helped draft the church's constitution and define the equal status of all in the church (Verwey 1995, SA History Online). His grave in Seeisoville Cemetery was recently declared as a National Heritage Site (Govt Gazette Notice No.380 2019).

5.2.3 Cartographic findings

An assessment of available historical topographical maps was undertaken to establish a historic layering for the study area. Overlays of the maps were made on Google Earth. These historic maps are valuable resources in identifying possible heritage sites and features located within the study area. It should be noted that the earliest edition of the map sheets for this area dates to the 1950s. As the first edition of this sheet dates to 1954, it was not considered necessary to examine the later edition map sheets. Any heritage resources that are 60 years or older would be depicted on the 1954 edition sheet.

The topographical maps were obtained from the Department of Agriculture, Land Reform and Rural Development (DALRRD) in Cape Town

The following 1:50 000 map sheet was assessed for the Mooivlei Solar 2 footprint: 2727CA Kroonstad Edition 1 1954. The map was surveyed in 1954 and drawn in 1957 by the Trigonometrical Survey Office of the Republic of South Africa from aerial photographs taken in 1951.

As can be seen in **Figure 15** and **Figure 16** the 1954s edition map depicts no heritage features within the Mooivlei Solar 2 footprint. However, one heritage feature is depicted a short distance outside the project footprint. This is a cluster of homesteads, located to the northeast of the eastern boundary of the project footprint. (Alternative 1).

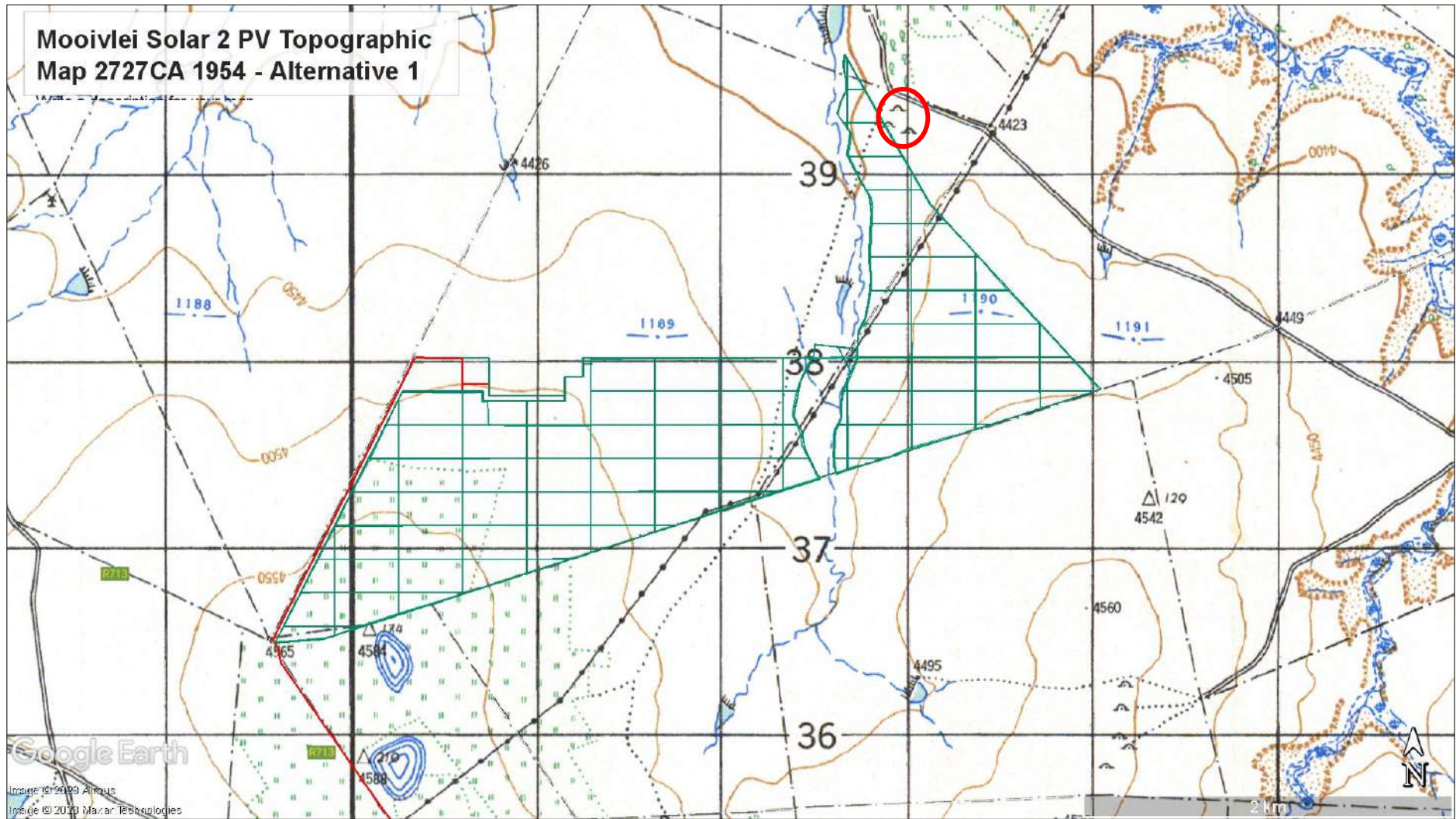


Figure 15: Enlarged view of topographic map 2727CA Ed 1 1954, depicting no heritage features within the Mooivlei Solar 2 footprint Alternative 1. A cluster of homesteads (Hut symbol) is depicted just outside the north-eastern boundary of the footprint (red polygon).

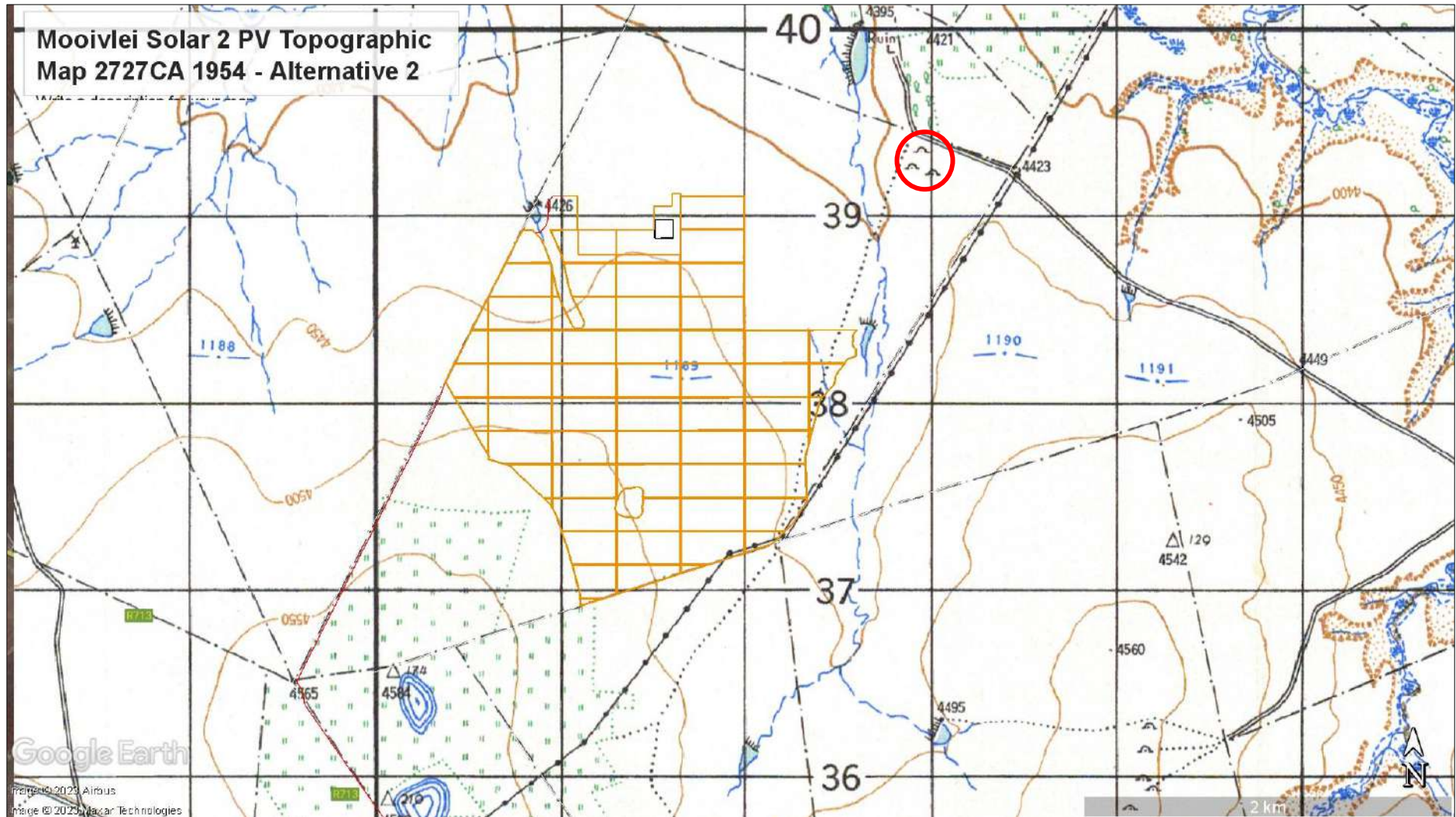


Figure 16: Enlarged view of topographic map 2727CA Ed 1 1954, depicting no heritage features within the Mooivlei Solar 2 footprint Alternative 2. A cluster of homesteads (Hut symbol) is depicted a short distance outside the north-eastern boundary of the footprint (red polygon).

5.3 Previous HIA reports in the area

A search on the South African Heritage Resources Information System (SAHRIS) has identified several Heritage Impact Assessments conducted in and around the study area.

Dreyer, C. 2006. *Archaeological And Historical Investigation Of The Proposed Township Developments At Maokeng, Kroonstad, Free State*. The site for the proposed township developments is located on municipal land, known as Maokeng to the north west of Kroonstad. No remains of any archaeological or historical significance were found.

Fourie, W. 2021. HIA for *The Proposed Harmony Fss6 Reclamation Pipeline, Welkom, Free State Province*. During the survey, no heritage sites were identified. This includes historical structures and burial ground and graves.

Lavin, J. 2020. *Archaeological Specialist Study In terms of Section 38(8) of the NHRA for a Proposed development of the Vrede and Rondavel Solar Energy Facilities near Kroonstad, Free State Province*. Two Later Stone Age scatters and one isolated flake (RDW003) were identified within the area proposed for the Rondavel SEF. A series of four stone piles were also identified.

Matenga, E. 2019. *Phase I Heritage Impact Assessment (Including Palaeontological Desktop Assessment) In Terms Of Section 38 Of The National Heritage Resources Act No 25/1999 For The Proposed Phase Ii Maokeng Housing Development (5390 Erven Moakeng) (Kroonstad), Free State Province*. Several recent/modern buildings were identified in this project area.

Van der Walt, J. 2019. *Heritage Desktop Report Lengana Health Sa Prospecting Application, Koppies, Free State Province*. The proposed prospecting activities were located on Felix 318, Goedgunst 315, Kronenbloem 51, Ventersbloem 163, Oceaen 64, Oceaen 99, Broodkop 304, Enkelsbosch 31, Hooge Bult 542, Geluk 237, Verdeel 278, Goudlaagte 238, Ongegund 507. The desktop study noted that structures of unknown age occur within the prospecting right area, no stone walled settlements were visible on aerial images consulted and no known graves occur in the study area, although informal graves could be expected in the study area.

Angel, J and J Kitto. 2018. *Kophia Diamonds (Pty) Ltd Catherine's Fancy 831, which forms part of the Blaauwbosch Mine, Boshof District, Free State Province Heritage Impact Assessment*. The HIA was necessitated by the discovery of skeletal material during the course of mining activities on the farm Catherine's Fancy. Seven heritage resources were located, not including the accidentally discovered burial ground. These included three Middle Stone Age sites and four historical structures.

5.4 Palaeontological sensitivity

Note that this section was compiled by the author and not by a palaeontological specialist. A basic palaeontological sensitivity was determined using the SAHRIS South African Palaeontological Sensitivity Map (<http://www.sahra.org.za/sahris/map/palaeo>). This map correlates with the DFFE map and indicates that the project footprint (both Alternative 1 and Alternative 2) falls within an area of mostly High (orange)

and Very High (red) fossil sensitivity (see **Figure 17** and **Figure 18** below). The different palaeontological sensitivities that are defined on the SAHRIS Palaeontological Sensitivity Map are outlined in the table below. Due to the underlying geology being of both High (orange) and Very High (red) sensitivity for fossils, a separate palaeontological assessment is being undertaken. The recommendations and mitigation measures provided by this assessment must be implemented where necessary.

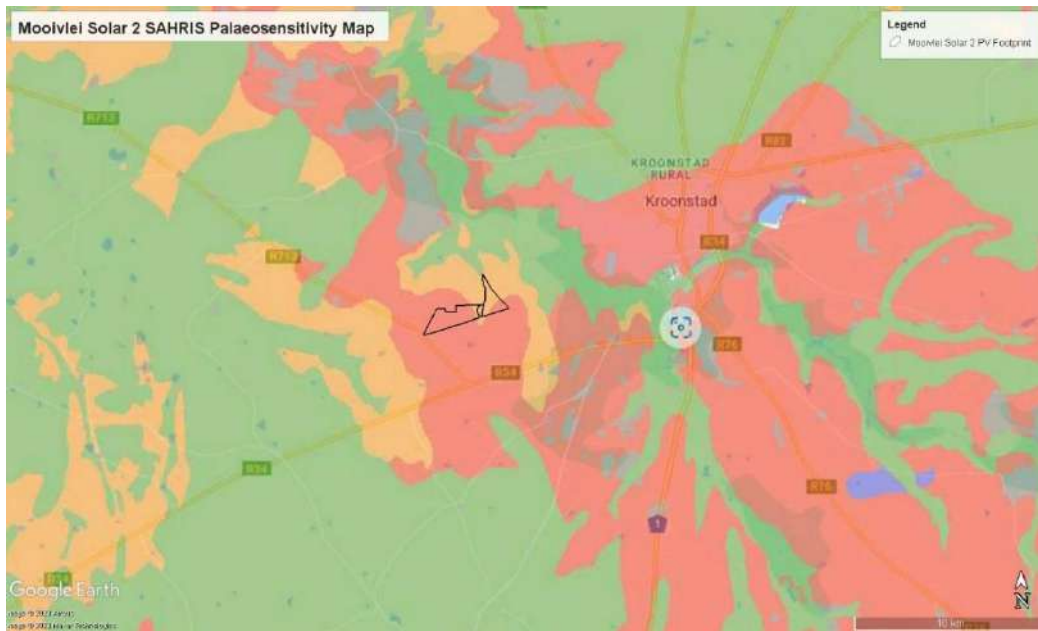


Figure 17: SAHRIS Palaeo sensitivity map overlain on the Mooivlei Solar 2 project footprint (black polygon). The underlying geology is shown as having both High (orange) and Very High (red) fossil sensitivity

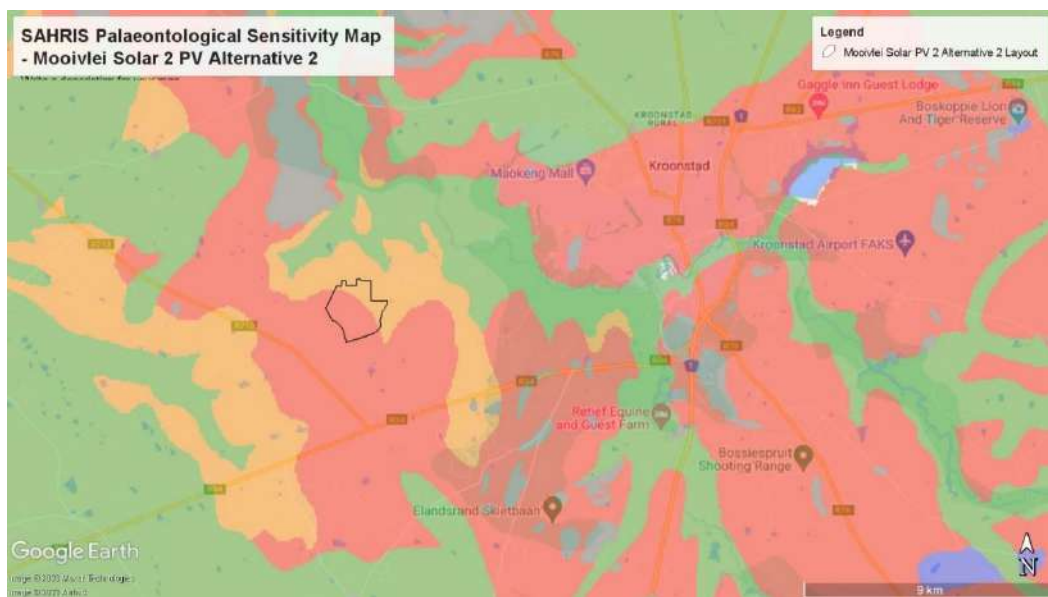


Figure 18: SAHRIS Palaeo sensitivity map overlain on the Mooivlei Solar 2 project footprint Alternative 2 (black polygon). The underlying geology is shown as having both High (orange) and Very High (red) fossil sensitivity

Table 2: SAHRIS Fossil Map Palaeontological Sensitivity Ratings and Required Actions

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required.
ORANGE/ YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely to be requested.
GREEN	MODERATE	Desktop study is required.
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required.
GREY	INSIGNIFICANT /ZERO	No palaeontological studies are required.
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information becomes known, SAHRA will continue to populate the map.

5.5 Findings of the Historical Desktop Study

The general overview from the historical desktop study has shown that various archaeological and historical resources can be expected to occur in the project area. Furthermore, the examination of the earliest edition (1960) of the 1:50 000 topographical maps produced by overlying the maps with satellite Imagery (Google Earth) has shown that no specific heritage features are depicted within the project footprint. One heritage feature (homestead cluster) is depicted as located outside but relatively close to the north-east boundary of the project footprint.

The Site Survey fieldwork identified two heritage resources occurring within and close to project area footprint (Alternative 1). One of these heritage resources is situated within the general Alternative 2 footprint but the specific layout avoids this area.

6 SITE SURVEY/FIELDWORK RESULTS

The survey of the Mooivlei Solar 2 project footprint took place over two days (16-17 January 2023) by the author (heritage specialist) as part of a specialist team. A vehicle was used to access the project footprint area and the survey was conducted by both vehicle and on foot (at selected areas). The survey covered as much of the project footprint area as was feasibly accessible, given that certain sections were not accessible due to locked gates.

The author used a Global Positioning System (GPS) application to navigate access roads in the study area and for recording the tracklog of the survey and waypoints of the identified heritage resources. A combination of Sony digital camera and Samsung mobile phone camera was used for photographic recording of identified heritage resources and general images of the project study area.

The survey aimed to find and identify archaeological and other heritage resources such as burial grounds and graves (BGG), archaeological material or sites, historic built environment and landscape features of cultural heritage significance. The inspection identified two heritage features within the project footprint: one is a probable homestead site (Mooi 002) and is situated in the location depicted on the 1954 topographic map as a homestead cluster and one is the remains of a probable kraal (Mooi 003). A third possible site, Mooi 001 is situated outside the boundary for Alternative 2 layout, however, this comprises building rubble from a possible demolished structure.

Identified Heritage Sites

Site Name	Mooi 002_Homestead Remains
GPS Coordinates	27°40'24.27"S, 27° 7'49.44"E (Mooi 002.1); 27°40'26.54"S, 27° 7'49.55"E (Mooi 002.2)
Site Description	This is the remains of a homestead. It comprises an open area with disturbed vegetation and several groups of stones, with some stones forming a line. The estimated extent is approx. 70mx20m
Approximate Age	More than 60 years old. The site is depicted on the 1954 topographic map.
NHRA, No. 25	Section 34 of the Act and possibly section 36
Field Grading and Ratings	
Site context and description	The site comprises a clear area with disturbed vegetation and several groups of stones, with some stones forming a line. Several pieces of glass were also found. The character of the soil seemed quite ashy. This is the remains of a homestead. It is situated in the north-east portion of the eastern section of the project footprint (Alternative 1), and this location is shown on the 1954 topographic map as a cluster of homesteads.
Site Density	Unknown
Uniqueness	Low
Heritage Significance	Low (homestead remains); High (potential infant burials)
Mitigation	The site is situated partially outside and partially inside the north-eastern section of the PV array area of the project footprint.(Alternative 1). It is avoided completely by the Alternative 2 layout. For the preferred Alternative 2 layout no mitigation is required. For the Alternative 1 layout it should be demarcated with at least a 30m buffer to prevent possible impacts and social consultation could be required to confirm the presence of potential infant graves.



Figure 19: View of the site Mooi 002 showing the open area with much shorter grass and disturbance vegetation



Figure 20: View of a cluster of stones forming the remains of a structure



Figure 21: View of a line of stones forming the foundation wall of a structure



Figure 22: View of a piece of glass found at site Mooi 002

Site Name	Mooi 003_Structure Remains
GPS Coordinates	27°41'23.38"S, 27° 6'54.64"E
Site Description	The site comprises an open area with disturbance vegetation and some scattered sandstone rocks, but no clear foundation walls. The estimated extent is approx. 117m x 85m (from satellite imagery).
Approximate Age	Unknown. Nothing is depicted here on the 1954 topographic map, but a kraal is depicted here on the 2 nd edition 1975 topographic map. The structure remains could be between 48-58 years old.
NHRA, No. 25	Possibly Section 34 of the Act
Field Grading and Ratings	
Site context and description	The site comprises an open area with disturbed vegetation and several scattered sandstone rocks. No material culture was noted. This is depicted on the 1975 map as a kraal. It is located within the general footprint of Alternative 1 and Alternative 2. But the specific design of Alternative 2 avoids this area.
Site Density	N/A
Uniqueness	Low
Heritage Significance	Low/NCW
Mitigation	No mitigation is required.



Figure 23: view of the open area showing disturbed plants and animal burrows, Mooi 003

Site Name	Mooi 001 _Demolished Structure remains
GPS Coordinates	-27°40'30.93"S, 27° 6'34.85"E
Site Description	The site consists of a pile of building rubble which was visible on the ground. As the material was situated outside the project area footprint (Alternative 2) it was not possible to get closer to the site for verification purposes.
Approximate Age	It is not clear if a structure is depicted in this location on the 1954 topographic map.
NHRA, No. 25	N/A
Field Grading and Ratings	
Site context and description	Probable remains of a demolished structure. A pile of building rubble was visible on the ground and a possible foundation was visible from satellite imagery investigated prior to the site survey. However, the remains were too far to take a clear photograph. The material was situated outside the project area footprint (Alternative 2) and it was not possible to get closer to the site for verification purposes.
Site Density	N/A
Uniqueness	Low
Heritage Significance	Low/ NCW
Mitigation	N/A



Figure 24: View of the site Mooi 001, showing the pile of probable building rubble (arrow)

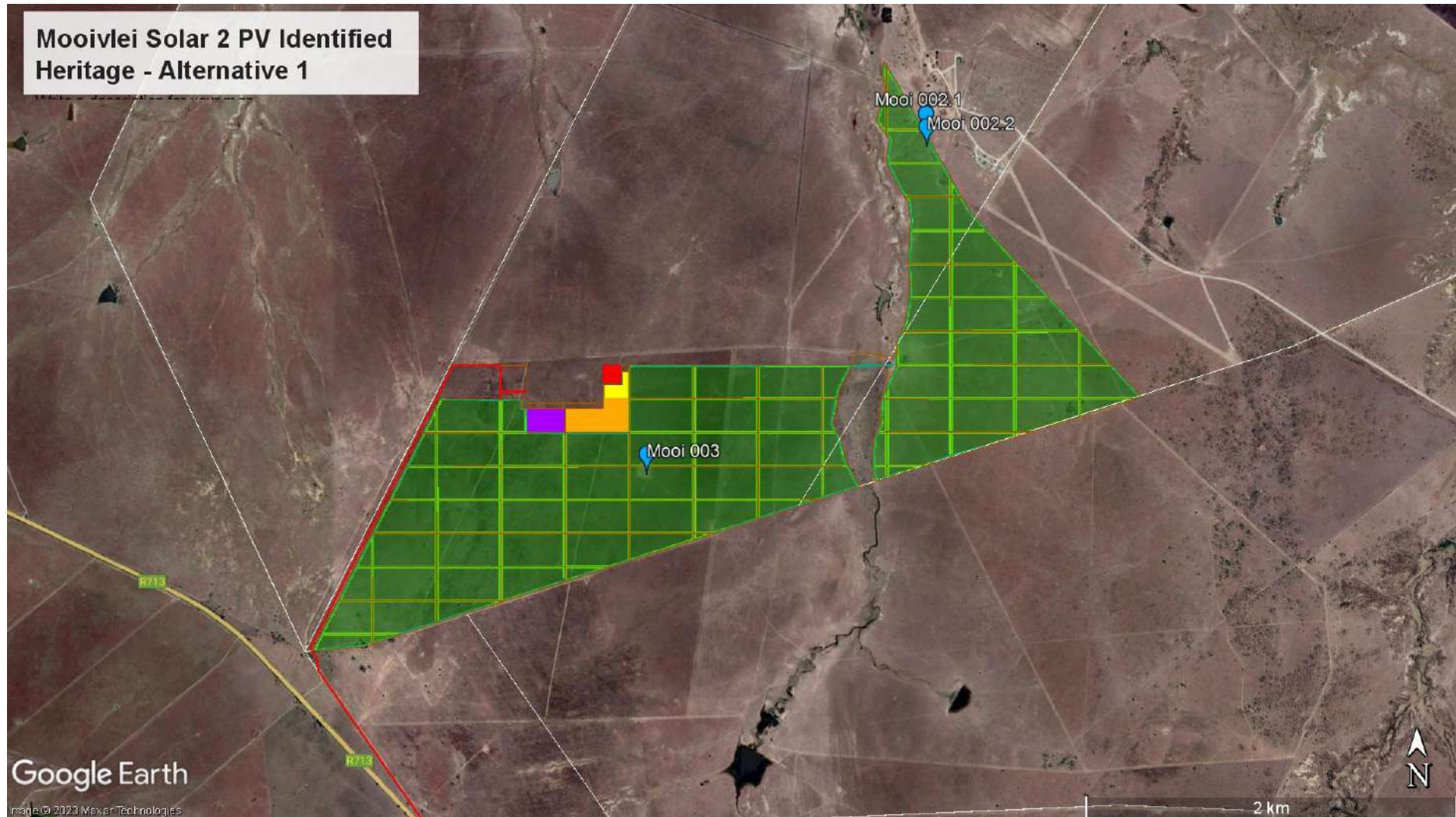


Figure 25: Heritage resources (blue icons) identified during the site survey and overlaid on the project layout Alternative 1 (green polygon)

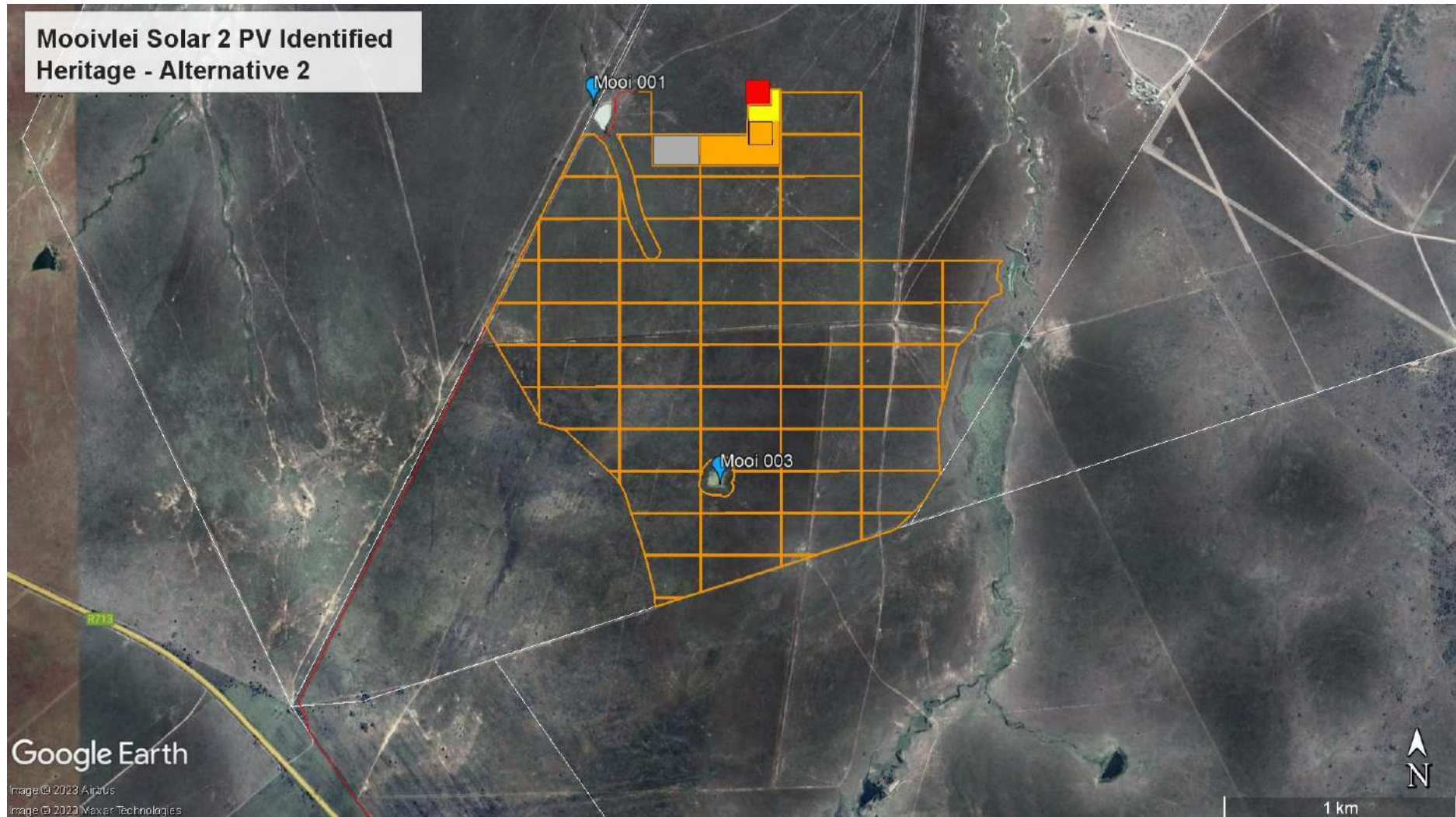


Figure 26: Heritage resources (blue icons) identified during the site survey and overlaid on the project layout Alternative 2 (orange polygon)

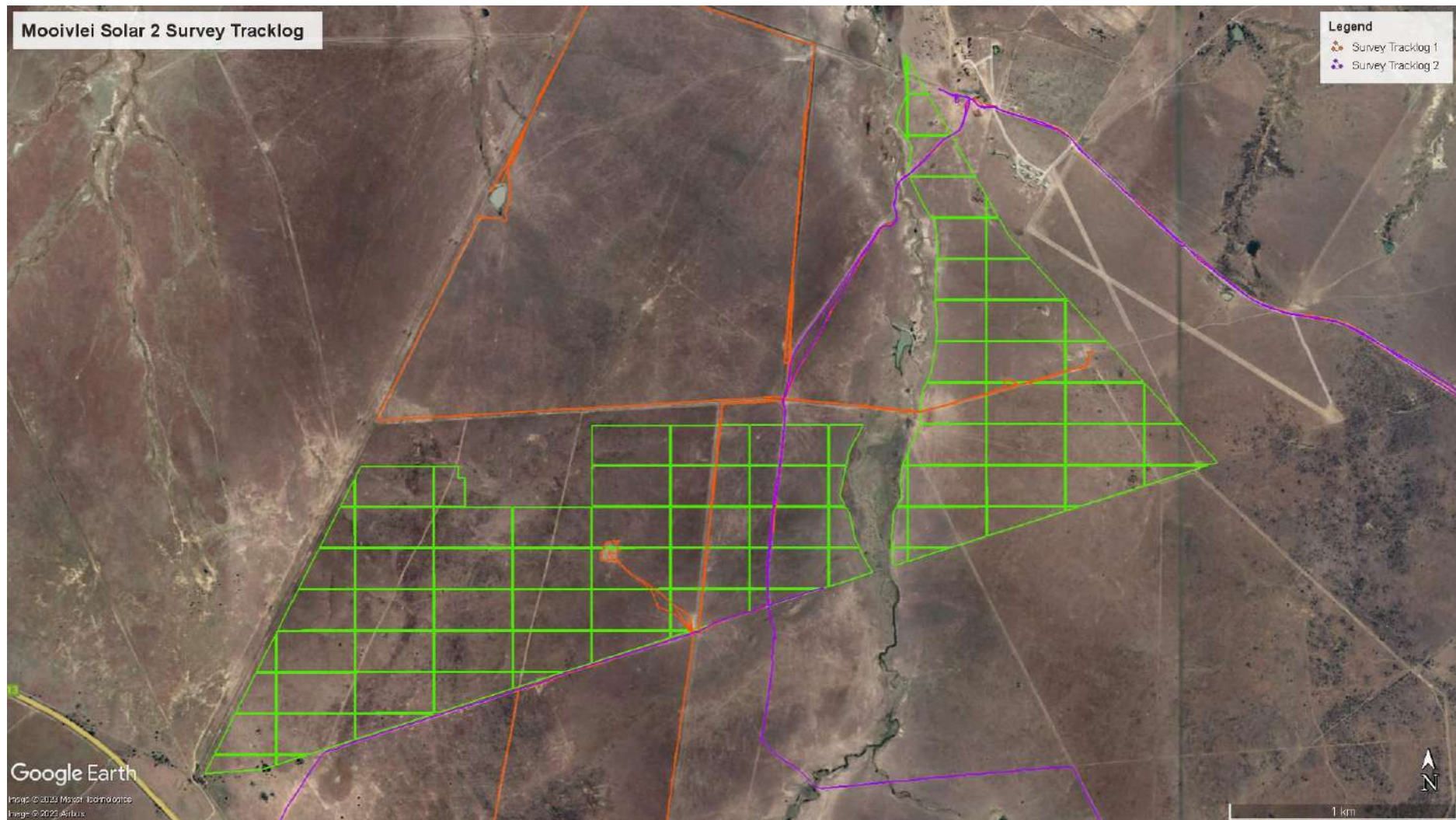


Figure 27: Site Survey Tracklog (orange) overlaid on the Mooivlei Solar 2 PV project footprint Alternative 1 (green)

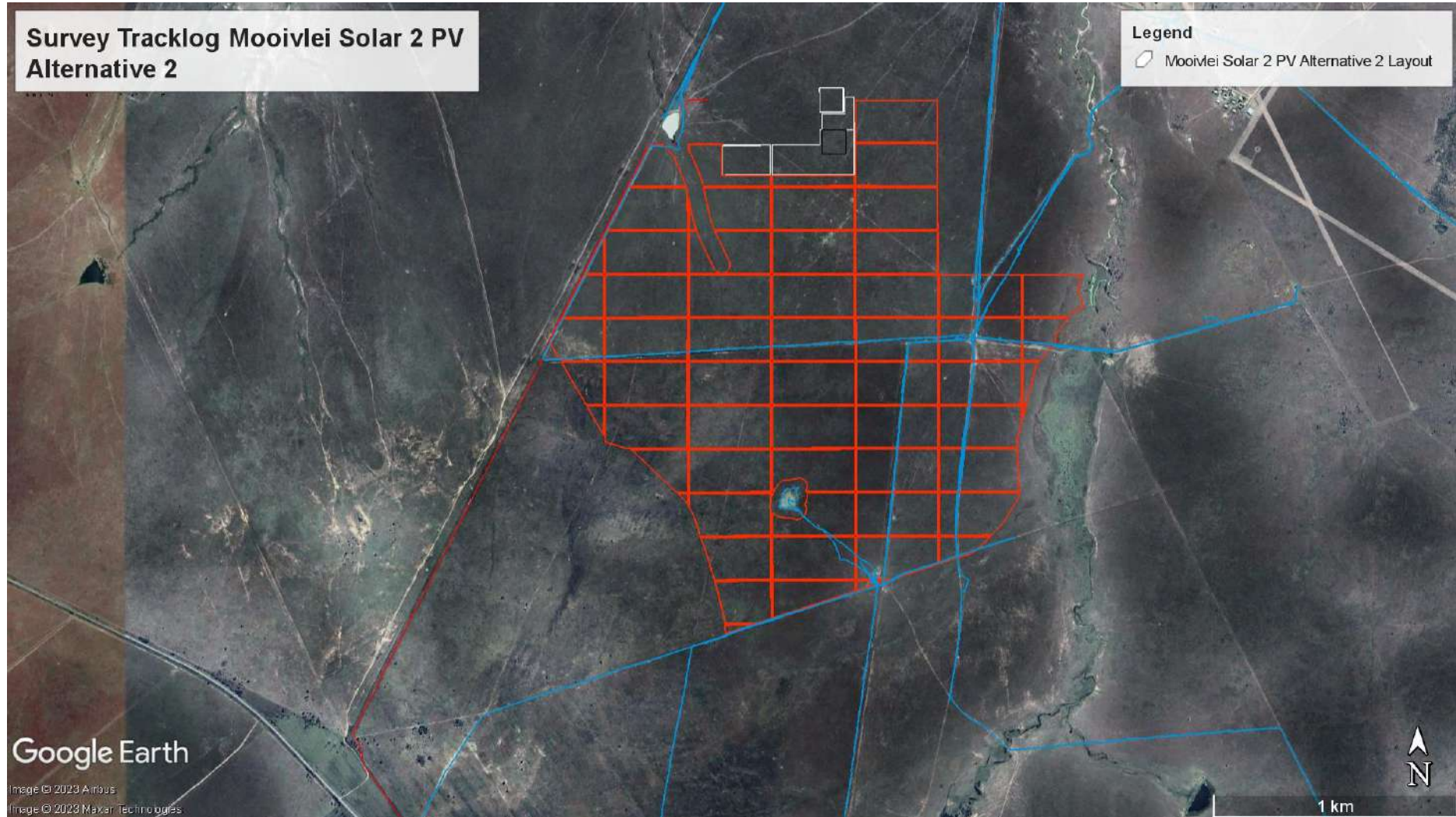


Figure 28: Site Survey Tracklog (blue) overlaid on the project footprint Alternative 2 (orange)

7 SITE SENSITIVITY VERIFICATION

The Historical Desktop study showed that that no specific heritage features were depicted on the historical topographic maps within the project footprint (for either Alternative 1 or Alternative 2). One heritage feature is depicted a short distance outside the project footprint. This is a cluster of homesteads, located to the northeast of the eastern boundary of the project footprint (Alternative 1).

The Site Survey fieldwork provided confirmation of the presence of one heritage resource (homestead) occurring on the boundary of the Alternative 1 layout, with the possible demolished remains of a structure situated outside the Alternative 2 layout. This confirmed the sensitivity from the initial PV Site screening results that the Archaeological Cultural Heritage sensitivity is low.

The palaeontological sensitivity verification will be discussed in the separate palaeontological report.

8 SIGNIFICANCE ASSESSMENT

Methodology for Assessing Heritage Site Significance

The applicable maps, tables and figures are included, as stipulated in NHRA and NEMA. The HIA process consists of three steps:

Literature Review

The desktop literature review provided information on the Heritage Background of the general region and project area. This included investigating published and unpublished sources as well as past HIA studies conducted for the project area and surrounding region. An examination of historical 1:50 000 topographical maps and/or archival maps (if available) was also undertaken. The relevant early editions of the 2727CA Kroonstad topographical map sheets were obtained from the Department of Rural Development & Land Reform, Cape Town. A number of internet sites were also accessed for information. A number of internet sites were also accessed for information including ,amongst others, the website of SA History Online (<https://www.sahistory.org.za>), and the concentration camp database website of the University of Cape Town ([British Concentration Camps of the South African War 1900-1902 \(uct.ac.za\)](https://www.uct.ac.za/heritage/british-concentration-camps-of-the-south-african-war-1900-1902)).

Literature resources accessed are listed in Table 3.

Table 3: Literature sources accessed

Source	Information
Background Information Document - Nema	Project location and description details

Published and unpublished sources and Past HIAs	Historical and archaeological background on Kroonstad and surrounding region
Directorate: National Geo-spatial Information of the Department of Agriculture, Land Reform and Rural Development, Cape Town	Historical topographic maps, 1:50 000 2727CA Kroonstad, Edition 1 1954.

Physical Survey

A physical Site Inspection or Field Survey was then conducted predominantly by vehicle and on foot through the project area by an experienced heritage specialist as part of a specialist team. This focussed on identifying and documenting heritage resources situated within and immediately adjacent to the proposed project area footprint.

Compiling HIA Report

The final step involved the recording and documentation of the identified heritage resources, the assessment of such resources in terms of heritage significance and impact assessment criteria, producing a heritage sensitivity map and compiling the heritage impact assessment report with constructive recommendations for mitigation, if required.

Impacts on these sites by the development will be evaluated as follows:

Site Significance

Site significance classification standards use is based on the heritage classification of s3 in the NHRA and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments. The update classification and rating system as developed by Heritage Western Cape (2021) is implemented in this report.

Site significance classification standards prescribed by the Heritage Western Cape Guideline (2016), were used for the purpose of this report (as set out in **Table 4** and **Table 5**).

Table 4: Rating system for archaeological resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Langebaanweg (West Coast Fossil Park), Cradle of Humankind	May be declared as a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Exceptionally High Significance
III	Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	Resource must be retained. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree.	Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	Resource must be satisfactorily studied before impact. If the recording already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant or the consultant and approved by the authority.	No research potential or other cultural significance

Table 5: Rating system for built environment resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: St George's Cathedral, Community House	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority.	Exceptionally High Significance
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape,	Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at local level.	Medium Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
	neighbourhood, settlement or community.		
IIC	Such a resource is of contributing significance to the environs These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	This grading is applied to buildings and/or sites whose significance is contextual, i.e., in large part due to its contribution to the character or significance of the environs. These buildings and sites should, as a consequence, only be regulated if the significance of the environs is sufficient to warrant protective measures, regardless of whether the site falls within a Conservation or Heritage Area. Internal alterations should not necessarily be regulated.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant and approved by the authority. Section 34 can even be lifted by the PHRA for structures in this category if they are older than 60 years.	Not Conservation worthy – no research potential or other cultural significance

Table 6: Site significance classification standards as prescribed by SAHRA.

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	Very High - of National Significance	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	Very High – of Provincial Significance	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
Generally Protected A (GP.A)		High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)		Medium Significance	Recording before destruction
Generally Protected C (GP.A)		Low Significance	Destruction

9 IDENTIFICATION OF IMPACTS

9.1 Impacts and Mitigation Framework

All impacts are analysed in the section to follow with regard to their nature, extent, magnitude, duration, probability and significance.

ISO 14001-2004 defines impacts as “any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s environmental aspects”.

When considering an assessment of the impacts and their mitigation, the following definitions as per Table 7 apply.

Table 7: Impact and Mitigation Quantification Framework

Nature	The project could have a positive, negative or neutral impact on the environment.
Extent	<p>Local – extend to the site and its immediate surroundings.</p> <p>Regional – impact on the region but within the province.</p> <p>National – impact on an interprovincial scale.</p> <p>International – impact outside of South Africa.</p>
Magnitude	<p>Degree to which impact may cause irreplaceable loss of resources:</p> <p>Low – natural and socio-economic functions and processes are not affected or minimally affected.</p> <p>Medium – affected environment is notably altered; natural and socio-economic functions and processes continue albeit in a modified way.</p> <p>High – natural or socio-economic functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.</p>
Duration	<p>Short term – 0-5 years.</p> <p>Medium term – 5-11 years.</p> <p>Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.</p>

	Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability	<p>Almost certain – the event is expected to occur in most circumstances.</p> <p>Likely – the event will probably occur in most circumstances.</p> <p>Moderate – the event should occur at some time.</p> <p>Unlikely – the event could occur at some time.</p> <p>Rare/Remote – the event may occur only in exceptional circumstances.</p>
Significance	<p>Provides an overall impression of an impact’s importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-</p> <p>0 – Impact will not affect the environment. No mitigation necessary.</p> <p>1 – No impact after mitigation.</p> <p>2 – Residual impact after mitigation.</p> <p>3 – Impact cannot be mitigated.</p>
Mitigation	Information on the impacts together with literature from socio-economic science journals, case studies and field work will be used to provide mitigation recommendations to ensure that any negative impacts are decreased and positive benefits are enhanced.
Monitoring	Monitoring usually involves developing and implementing a monitoring programme to identify deviations from the proposed action and to manage any negative impacts. The recommended mitigation measures will also include monitoring measures.

Table 8: Impact Methodology Table

Nature				
Negative		Neutral		Positive
-1		0		+1
Extent				
Local	Regional		National	International
1	2		3	4
Magnitude				
Low		Medium		High
1		2		3
Duration				
Short Term (0-5yrs)	Medium Term (5-11yrs)		Long Term	Permanent
1	2		3	4
Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5
Significance				
No Impact/None	No Impact After Mitigation/Low	Residual Impact After Mitigation/Medium	Impact Cannot be Mitigated/High	be
0	1	2	3	

9.2 Identification of Activities and Aspects

An “Activity” is defined as a distinct process or risks undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation (International Organization for Standardization, 2011).

An aspect is defined as elements of an organisation’s activities or products or services that can interact with the environment.

In order to capture the impacts associated with the proposed infrastructure, an activity – aspect – impact table was created refer to 9 below.

Table 9: Activity, Aspects and Impacts of the Project

Activity	Aspect	Potential Impact – Positive	Potential Impact – Negative
Site clearance/ construction camp	Heritage		Damage to existing historical structures or unidentified graves
Construction	Heritage	Positive - if historical structures are reused	Damage to existing historical structures
Operation	Heritage	Positive – if historical structures are reused	Damage to existing historical structures

9.3 Impact and Mitigation Assessment

The project area that will be impacted by the proposed Mooivlei Solar 2 PV project contains some areas that are currently disturbed by grazing activities and other animal activity.

The impact significance of the project on graves and cemeteries is low as no graves were identified.

The impact significance of the proposed project on protected historical structures is low as only one probable homestead (Mooi 002) and one historical structure remains site (Mooi 003) were identified. The homestead site is located just outside the north-east portion of the eastern section of the project footprint (Alternative 1). The probable kraal site is located within the general PV array area on the western section of the project footprint (Alternative 2).but is avoided by the specific layout.

9.4 Impacts During the Planning, Construction and Operation Phase

As a result of the analysis above,**Error! Reference source not found.** the following impact/mitigation table has been generated.

Table 10: Heritage Resources – Historical Structures remains Mitigation Table

Environmental Feature	Heritage resources – historical structure remains (Mooi 002)
Project life-cycle	Planning, Construction and Operation)

Potential Impact		Proposed Management Objectives / Mitigation Measures				
Possible damage to or destruction of historical homesteads remains		<ul style="list-style-type: none"> A buffer of at least 30m must be placed around the site to ensure that during construction, there is no indirect impact which could damage the remains The materials demarcating the 30 m buffer must be highly visible and must be made of durable material to ensure that they are still in place during the operation of the PV site so that maintenance crews are aware of the sites. 				
Possible damage to or destruction of unidentified historical structure remains		<ul style="list-style-type: none"> If any changes are made to the final design footprint prior to construction, monitoring of site clearance activities must be undertaken by a heritage specialist to identify any additional historical remains 				
Alternative 1	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Permanent	Moderate	2
After Mitigation	Positive	Local	Low	Long- term	Unlikely	1
Significance of Impact and Preferred Alternatives	The location of the site is just on the boundary of the PV array area of the project footprint (Alternate 1). Provided that the site is avoided and demarcated to prevent any impact then no further mitigation is required					
Alternative 2	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Neutral	Local	Low	Permanent	Remote	0
After Mitigation	Neutral	Local	Low	Long- term	Remote	0
Significance of Impact and Preferred Alternatives	The Alternative 2 layout avoids this site completely. No further mitigation is required					

9.5 Cumulative impacts

The project area and surrounding region has been affected by impacts of activities occurring in the past, current activities and proposed future developments. These will be discussed below.

Past impacts: The past HIA reports recovered from the SAHRIS database indicated that the Mooivlei Solar 2 PV project footprint and surrounding region has been affected by several development and other activities that would have disturbed the heritage resources which occur in the area. These include other solar PV projects, prospecting and mining projects, pipeline and housing developments, in addition to historical farming activities around Kroonstad and the development of Kroonstad town.

Current impacts: the immediate area of the Mooivlei Solar 2 PV footprint is affected mainly by farming activities (cattle and game).

The baseline impacts are considered to be Low for Heritage resources, and additional project impacts (if no mitigation measures are implemented) will increase the significance of the existing baseline impacts, where the cumulative unmitigated impact will probably be of a low to moderate significance. The impact is going to happen and will be long-term in nature, therefore the impact risk class will be Moderate. However, with the implementation of the recommended management and mitigation measures this risk class can be minimized to a Low rating.

10 ALTERNATIVES

10.1 Introduction

Alternatives are the different ways in which the Project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for a project.

10.2 Site Alternatives

No site alternatives are proposed for this Project. Favourable location factors for the PV Site include suitable solar irradiation levels, short distance to grid connection point, flat topography, suitable site access and availability of land.

10.3 Layout / Design Alternatives

It is anticipated that the space available at the PV Site will be adequate to position the facility and its associated infrastructure to avoid areas of sensitive environmental features, which will be determined in the EIA Phase through the specialist studies. The extent of the site allows for the identification of layout/design alternatives to manage impacts to environmental sensitivity.

There are two layout alternatives, Alternative 1 and Alternative 2. Alternative 2 has been designed specifically to avoid areas of environmental sensitivity.

10.4 No-Go Option

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the Project is included in the evaluation of the alternatives.

The no-go alternative can be regarded as the baseline scenario against which the impacts of the Project are evaluated. This implies that the current status and conditions associated with the proposed Project footprint will be used as the benchmark against which to assess the possible changes (impacts) associated with the Project.

In contrast, should the proposed Project not go ahead, any potentially significant environmental issues would be irrelevant, and the status quo of the local receiving environment would not be affected by the project-related activities. The objectives of the Project, including the benefits (such as the exploitation of SA's renewable energy resources, potential economic development and related job creation, and increased security of electricity supply), will not materialise.

11 STATEMENT OF IMPACT SIGNIFICANCE

The project area that will be impacted by the proposed Mooivlei Solar 2 PV project contains areas that are currently disturbed by farming (cattle and game) activities.

The impact significance of the project on graves is Low as none were identified within the footprint. However, due to the dense grass in some areas there is a possibility of unidentified informal graves being uncovered.

The impact significance of the proposed project on protected historical structures is low as only two sites were identified (one homestead remains area, Mooi 002 and one kraal remains area, Mooi 003). Since the homestead is depicted on the 1954 topographical map the site is protected by section 34 of the NHRA and possibly section 36 as infant graves could be present. However, the Alternative 2 layout (which is the preferred alternative) avoids both of these sites.

12 HERITAGE MANAGEMENT GUIDELINES

12.1 General Management Guidelines

The following general management guidelines should be followed:

1. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:
 - a. Heritage;
 - b. Graves;
 - c. Archaeological finds; and
 - d. Historical Structures.
2. This module must be tailor made to include all possible finds that could be expected in that area of construction. Possible finds include:
 - a. Unidentified graves or burials.

- b. Historical structure remains
 - c. Palaeontological deposits such as bones and teeth or plant fossils.
3. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
4. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
5. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
6. After mitigation, an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
7. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.
8. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
9. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

13 RECOMMENDATIONS AND CONCLUSION

The proposed Mooivlei Solar 2 PV project could impact on two heritage resource identified within or adjacent to the project footprint (Mooi 002 – homestead remains and Mooi 003 – kraal remains). A third possible site, Mooi 001 is situated outside the boundary for Alternative 2 layout, however, this comprises building rubble and does not require any mitigation. The recommendations below are provided to mitigate the potential impact of the proposed PV project on the identified heritage resources:

For the Alternative 1 layout, the homestead remains identified at Mooi 002 must be avoided and protected with at least a 30m buffer; and social consultation may be necessary to confirm the possible presence of infant graves. No mitigation is required for sites Mooi 003 and Mooi 001.

For the Alternative 2 layout (preferred layout) no mitigation is required as all three heritage resources are avoided by this layout.

No further mitigation for heritage resources is required except for the General Management Guidelines set out in Section 11, above.

Both the DFFE Screening tool and SAHRIS Palaeontological Map indicated that the project area falls into an area of both High and Very High fossil sensitivity, therefore a separate palaeontological study is being undertaken by a professional palaeontologist. The recommendations and mitigation measures provided by the palaeontological assessment must be implemented where necessary.

No fatal flaws were identified during this study, therefore, it is the considered opinion of the heritage specialist that the construction of the proposed Mooivlei Solar 2 PV project and associated powerline can proceed. There are no objections from a heritage perspective provided that the recommendations and mitigation measures contained in this report and in any palaeontological assessment are implemented where necessary. Both the Alternative 1 and Alternative 2 layouts have a low heritage sensitivity, however, Alternative 2 is designed to specifically avoid the identified heritage resources, and therefore is preferred from a heritage perspective.

14 REFERENCES

- Angel, J and J Kitto. 2018. *Kophia Diamonds (Pty) Ltd Catherine's Fancy 831, which forms part of the Blaauwbosch Mine, Boshof District, Free State Province Heritage Impact Assessment*.
- Bergh, J.S 1999. *Geskiedenisatlas van Suid-Afrika: die Vier Noordelike Provinsies*. Van Schaik, Pretoria.
- De Jong, RC. 2011. *Specialist Study: Heritage Impact Assessment for the Installation of the Sirius Fibre Optic Cable between Johannesburg and Yzerfontein, Gauteng, Free State, Eastern and Western Cape Provinces*
- De Ruiter, DJ., SE Churchill, JK Brophy and LR Berger. 2011. *Regional Survey of Middle Stone Age Fossil Vertebrate Deposits in the Virginia-Theunissen area of the Free State, South Africa* in Navorsing van die Nasionale Museum, vol. 27, part 1.
- Dreyer, C. 2006. *Archaeological And Historical Investigation of the Proposed Township Developments at Maokeng, Kroonstad, Free State*.
- Erasmus, B.P.J. 2014. *On Route in South Africa*. Third edition. Jonathan Ball Publishers: Johannesburg
- Fourie, W. 2021. HIA for *The Proposed Harmony Fss6 Reclamation Pipeline, Welkom, Free State Province*.
- Huffman, T.N. 2007. *Handbook to the Iron Age*. University of KwaZulu-Natal Press, Scottsville.
- Maggs, TMO'C. 1976. *Iron Age Communities of the Southern Highveld*. Natal Museum
- Lavin, J. 2020. *Archaeological Specialist Study In terms of Section 38(8) of the NHRA for a Proposed development of the Vrede and Rondavel Solar Energy Facilities near Kroonstad, Free State Province*

- Matenga, E. 2019. *Phase I Heritage Impact Assessment (Including Palaeontological Desktop Assessment) In Terms of Section 38 of the National Heritage Resources Act No 25/1999 for the Proposed Phase II Maokeng Housing Development (5390 Erven Moakeng) (Kroonstad), Free State Province*
- Notice No. 380. 2019. South African Heritage Resources Agency Declaration of the Grave of Reverend Zaccheus Richard Mahabane; Maokeng; Free State as a National Heritage Site in *Government Gazette Republic Of South Africa* Vol. 645 15 March 2019 No. 42304
- Oberholster, J.J. 1972. *The Historical Monuments of South Africa*. The Rembrandt van Rijn Foundation for Culture, Cape Town. Cited in Fourie 2021.
- Ouzman, S. 2001. *Spitskop rock-engraving site complex*. National Museum Rock Art Department internal publication.
- Raper, PE. 2014. *Dictionary of Southern African Place Names*. Jonathan Ball Publishers
- Schoeman, K. *Bloemfontein: die ontstaan van 'n stad 1846 – 1946*. Human & Rousseau, Cape Town. Cited in Fourie 2021.
- Van der Walt, J. 2019. *Heritage Desktop Report Lengana Health SA Prospecting Application, Koppies, Free State Province*.
- Wadley, L. 2013. *Recognizing complex cognition through innovative technology in Stone Age and Palaeolithic sites* in *Cambridge Archaeological Journal*, 23: 163-183. doi:10.1017/S0959774313000309
- Verwey EJ. (Ed). 1995. *New Dictionary Of South African Biography Volume 1*

[Afrikaans community 1820-1899 | South African History Online \(sahistory.org.za\)](https://www.sahistory.org.za/afrikaans-community-1820-1899)

[Battlefields Route – Koppies to Kroonstad | The Heritage Portal](https://www.heritageportal.co.za/battlefields-route-koppies-to-kroonstad)

[British Concentration Camps of the South African War 1900-1902 \(uct.ac.za\)](https://www.uct.ac.za/heritage/british-concentration-camps-of-the-south-african-war-1900-1902)

<https://www.gov.za/kroonstad-correctional-centre-officially-renamed-bizzah-makhate-correctional-centre>

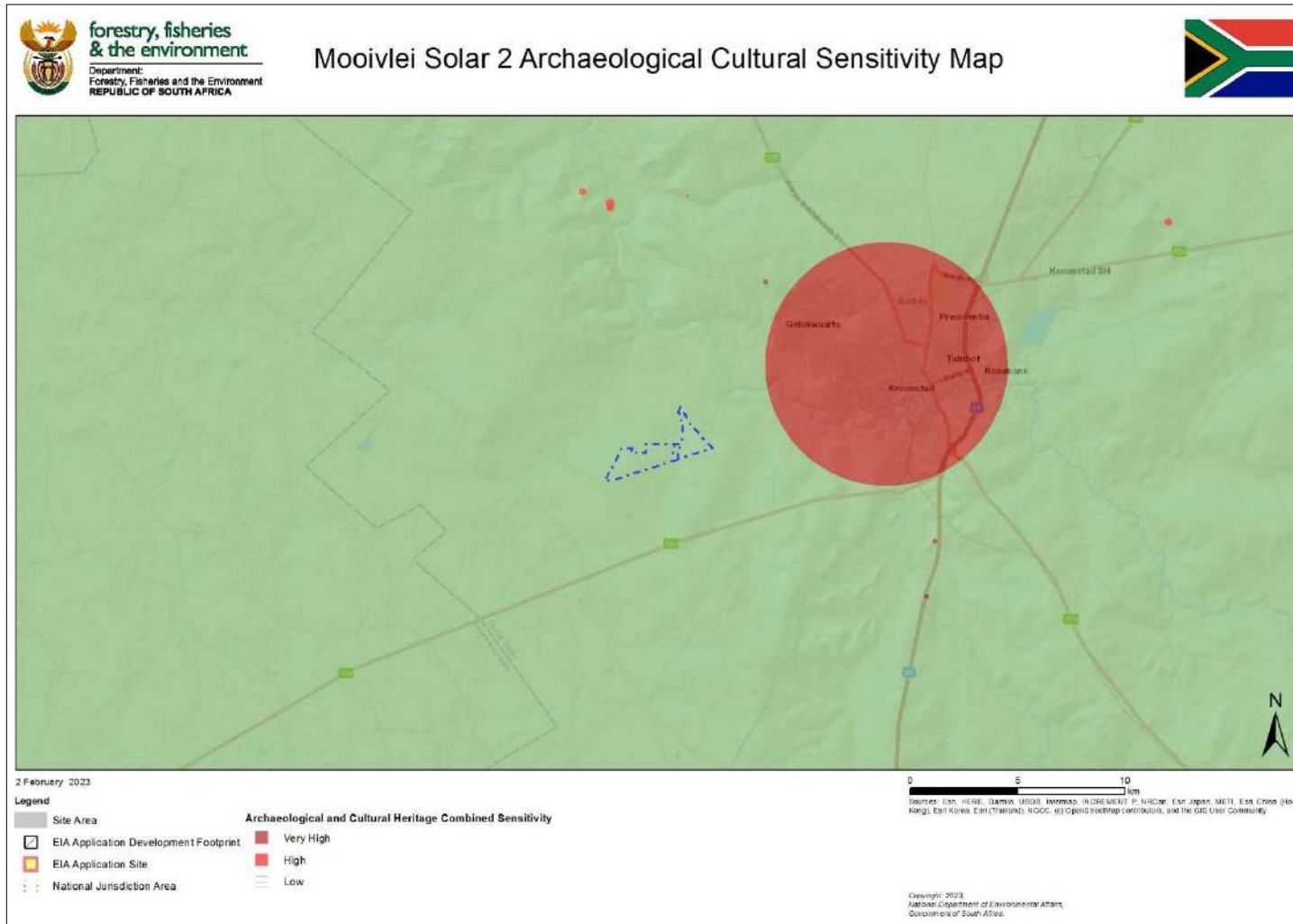
de Klerk SJ. 2021. [Battlefields Route – Koppies to Kroonstad | The Heritage Portal](https://www.heritageportal.co.za/battlefields-route-koppies-to-kroonstad)

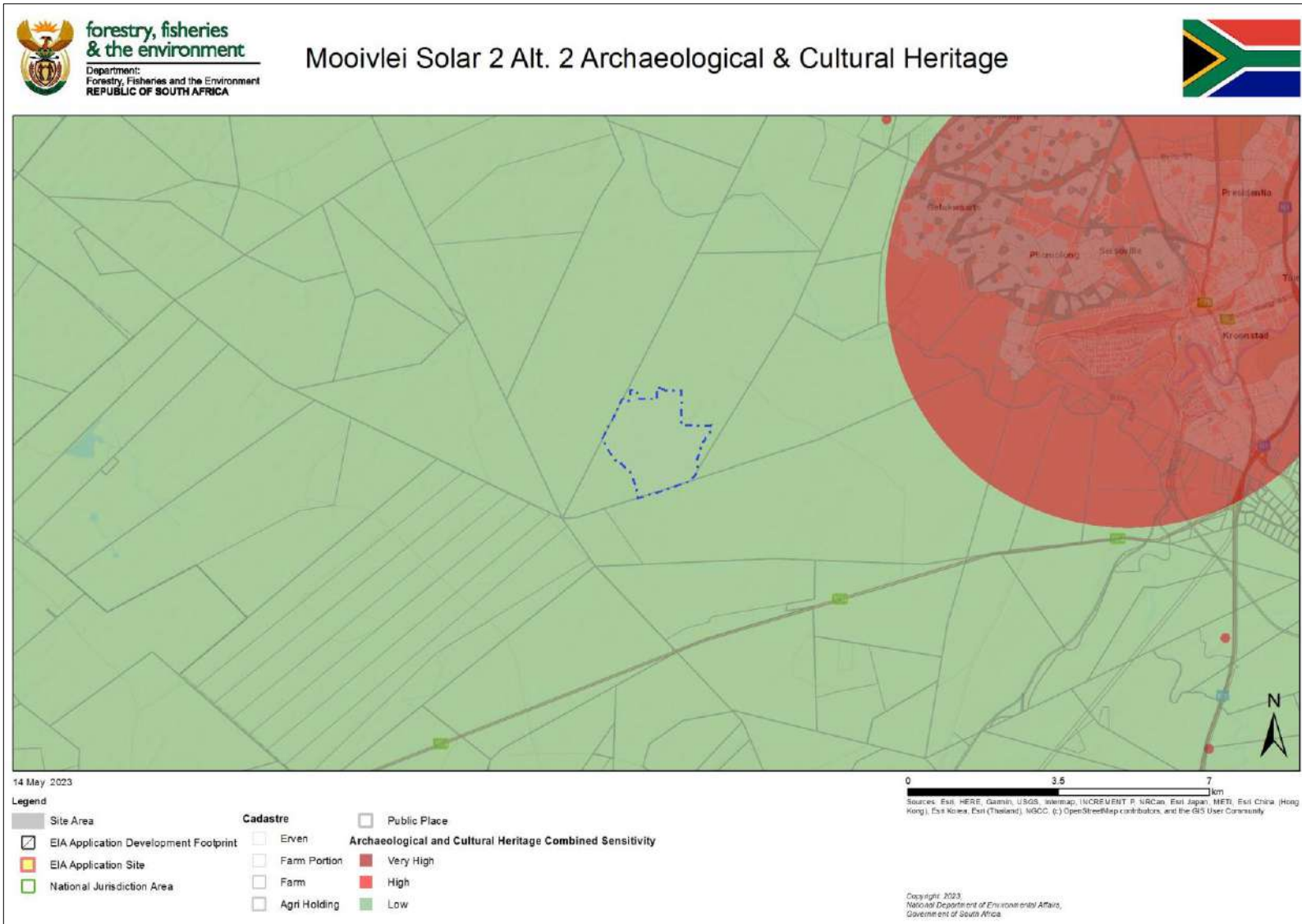
[The-Boer-Rebellion-in-South-Africa-pdf.pdf \(moltenofamily.net\)](https://www.moltenofamily.net/the-boer-rebellion-in-south-africa-pdf.pdf)

[Kroonstad | South African History Online \(sahistory.org.za\)](https://www.sahistory.org.za/kroonstad)

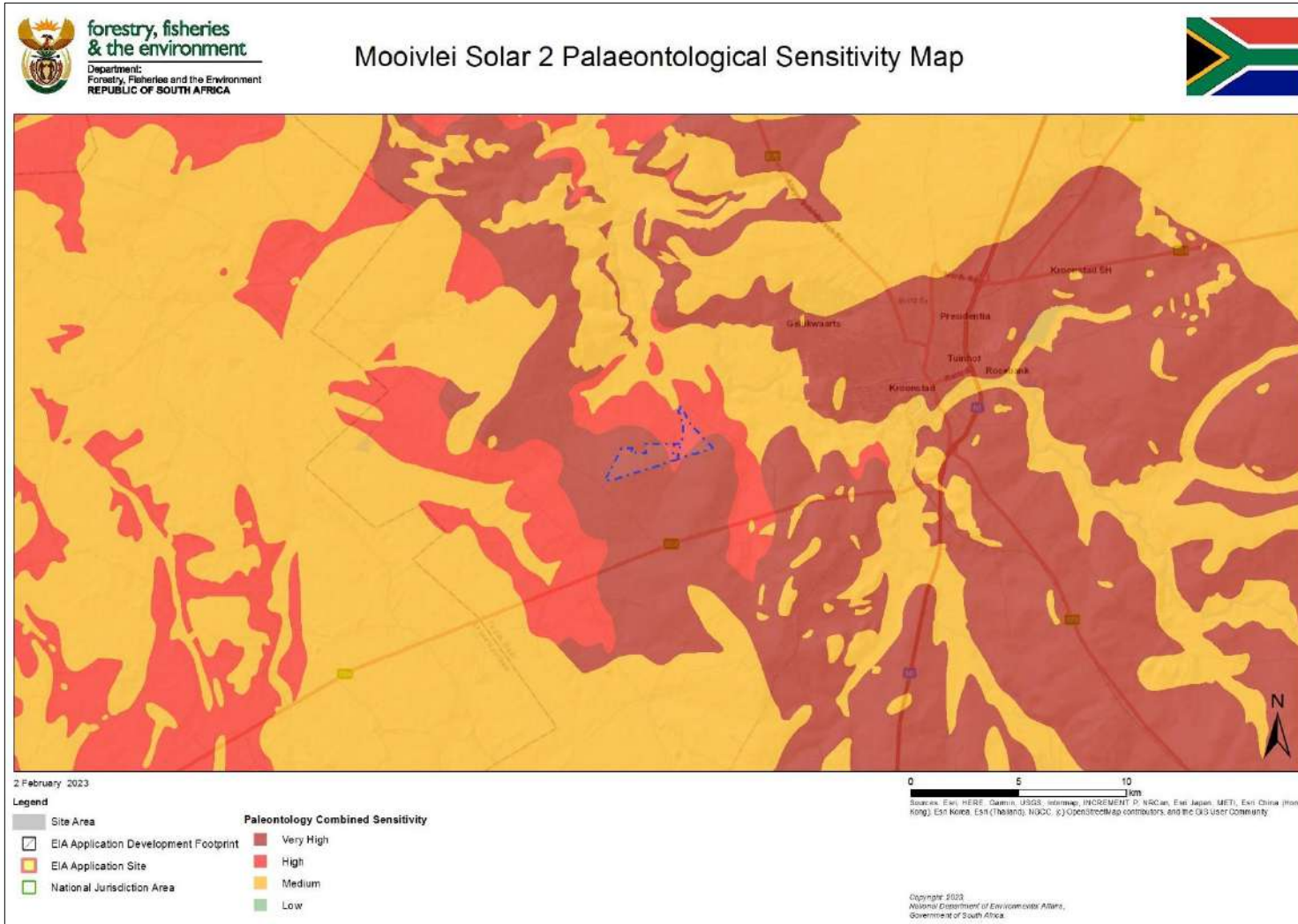
APPENDIX 1: HERITAGE SENSITIVITY MAP/S

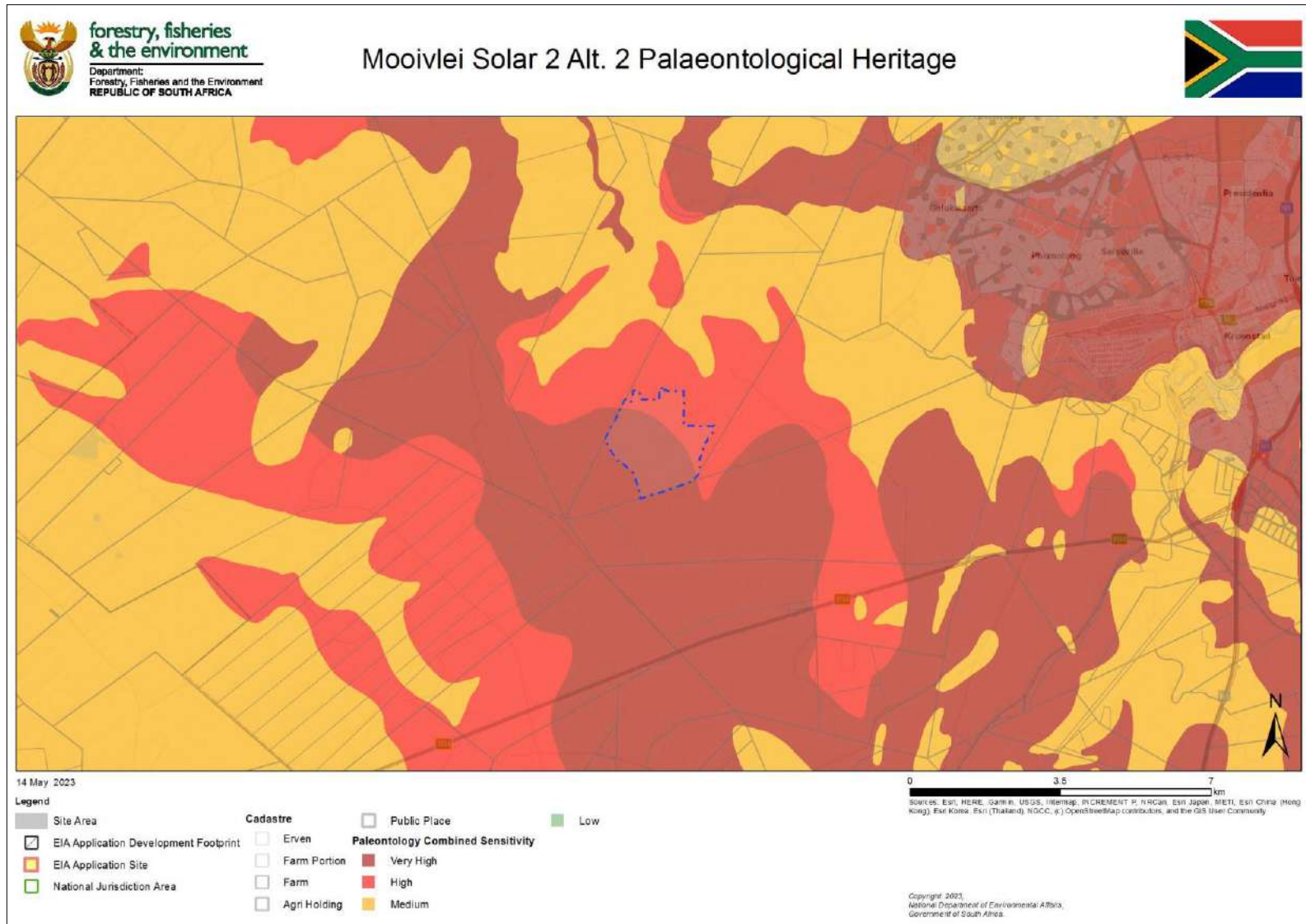
1. Cultural Heritage Sensitivity map from DFFE screening tool – Alternative 1 and Alternative 2



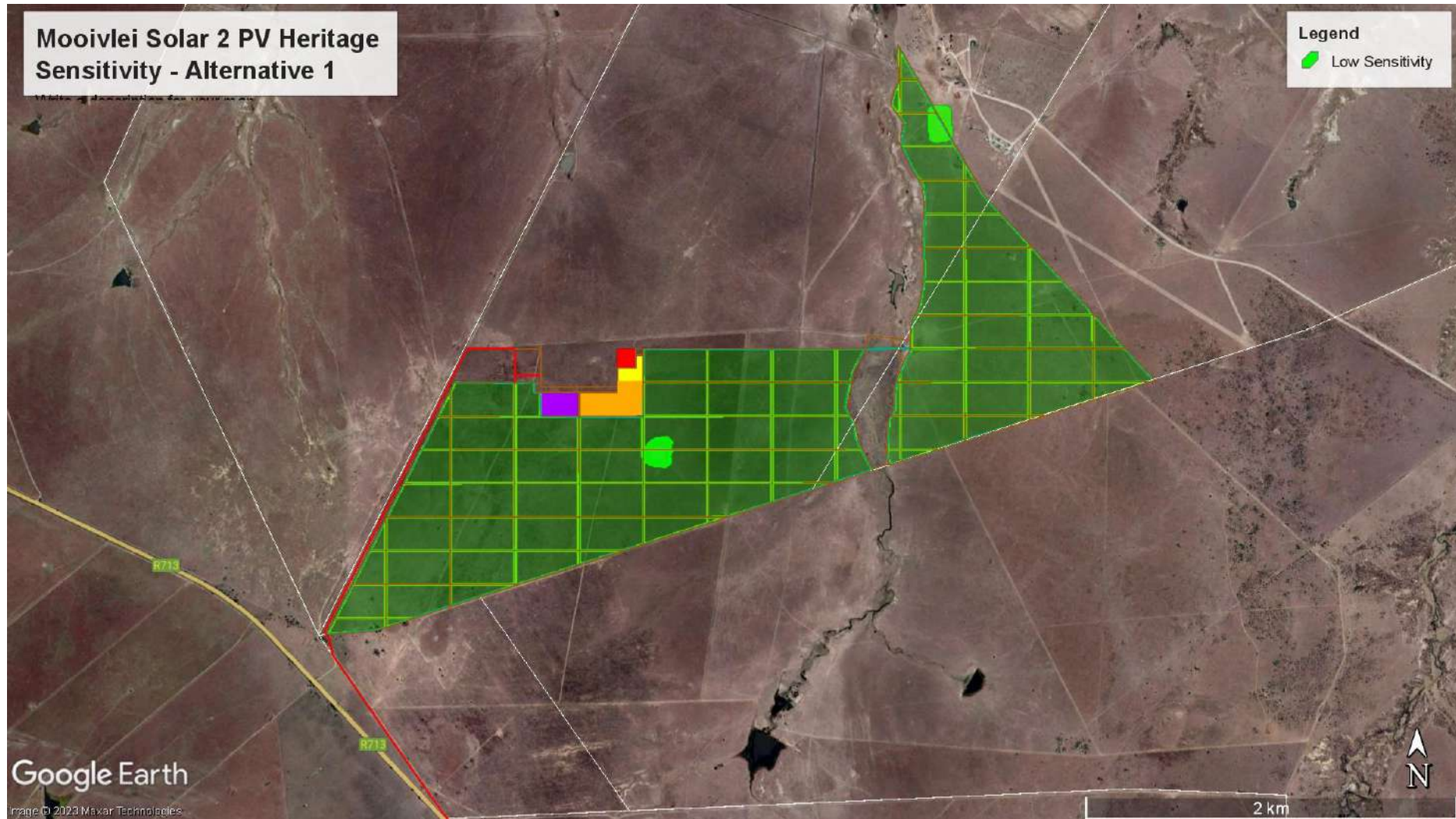


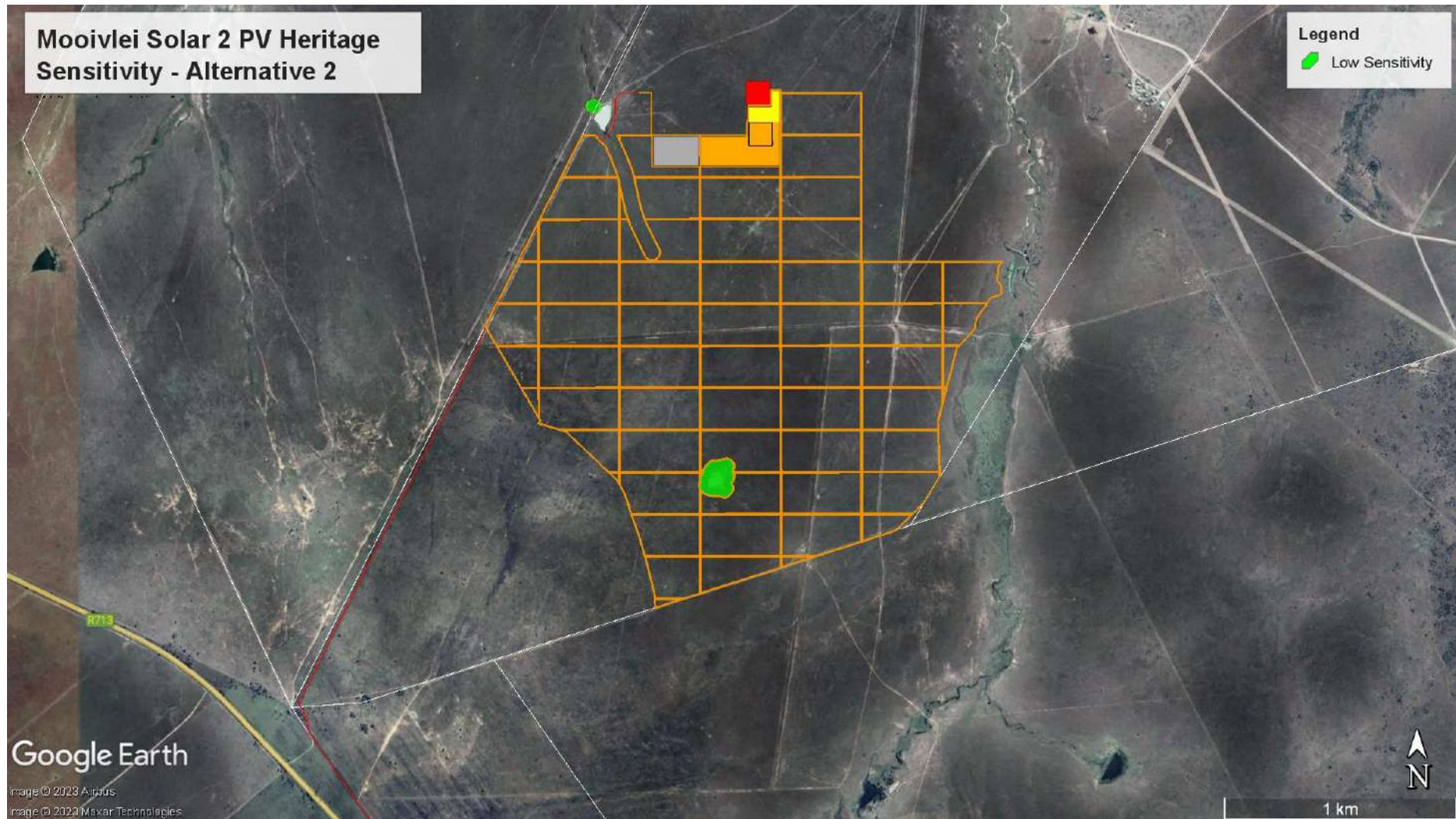
2. Palaeontological Sensitivity map from DFFE screening tool (Alternative 1 and Alternative 2 layouts)





3. Heritage Sensitivity Map based on the Site Inspection / Field survey





APPENDIX 2: CURRICULUM VITAE OF HERITAGE SPECIALIST

1 Personal Particulars

Profession:	Heritage Specialist
Date of Birth:	11 September 1966
Name of Firm:	Nitai Consulting
Name of Staff:	Jennifer Kitto
Nationality:	RSA
Membership of Professional Societies	Association of Southern African Professional Archaeologists (444); International Association for Impact Assessment South Africa (7151)

2 Education:

BA Hons Social Anthropology, WITS, South Africa, 1994

BA. Archaeology and Social Anthropology, WITS, South Africa, 1993

Higher National Diploma, Practical Archaeology, Dorset Institute for Higher Education (now Bournemouth University), UK, 1989

3 Employment Record:

2022 – Present Heritage Specialist, Nitai Consulting

Conduct Heritage Impact Assessments;

2012 – 2021 Heritage Specialist, PGS Heritage (Pty) Ltd

Conduct Heritage Impact Assessments

Compile Desktop Historical Research

Compile Heritage Audit and Management Plans

Compile and submit permit applications to National and Provincial Heritage Authorities for Section 34 building alterations and demolitions (under National Heritage Resources Act, 25 of 1999)

Compile and submit permit applications to Provincial and Municipal Health Authorities for Section 36 relocations of graves and burial grounds (under National Heritage Resources Act, 25 of 1999 and National Health Act, No 61 of 2003)

2008 – 2011 *Cultural Heritage Officer (National), Burial Grounds and Graves Unit: South African Heritage Resources Agency (SAHRA)*

Review and assessing permit applications for relocation of historical graves and burial grounds

1998 – 2008 *Cultural Heritage Officer (Provincial), Provincial Office – Gauteng: SAHRA*

Review and comment on heritage and archaeological impact reports

Research for the nomination and grading process for related to the declaration of specific heritage resources as National Heritage Sites

Monitoring of certain archaeological and built environment National Heritage Sites (e.g. The Cradle of Humankind World Heritage Site)

4 Selected Consultancies

4.1 GDID East Corridor, OHS Implementation, Tambo Memorial Regional Hospital (as sub-contractor to PGS Heritage (Pty) Ltd

2022 Independent Heritage Specialist. Compile Historical Archival Report of Tambo Hospital Boksburg, Gauteng for PGS Heritage (Pty) Ltd, Finalise HIA Report and submit HIA report to Gauteng Provincial Heritage Resources Authority

4.2 GDID East Corridor, OHS Implementation, Tembisa Regional Hospital (as sub-contractor to PGS Heritage (Pty) Ltd

2022 Independent Heritage Specialist. Compile Historical Archival Report of Tembisa Hospital, Ekurhuleni, Gauteng for PGS Heritage (Pty) Ltd, Finalise HIA Report and submit HIA report to Gauteng Provincial Heritage Resources Authority.

4.4 Kroonstad South Solar PV Facilities

2022/2023 Heritage Specialist, Development of five Solar PV facilities near Kroonstad, Free State Province, South Africa, Undertake Heritage Impact Assessment of all heritage resources associated with the five solar PV facilities

4.5 Rustenburg Solar PV Facilities

2022/2023 Heritage Specialist, Development of three Solar PV facilities near Rustenburg, North West Province, South Africa, Undertake Heritage Impact Assessment all heritage resources associated with the three solar PV facilities.

4.6 Seelo Solar PV Cluster

2022/2023 Heritage Specialist, Development of three Solar PV facilities near Carletonville, North West Province, South Africa, Undertake Heritage Impact Assessment all heritage resources associated with the three solar PV facilities

4.7 Decommissioning of Komati Power Station

2023, Heritage Specialist, Proposed Decommissioning of the Komati Power Station, Middelburg, Mpumalanga, Undertake Heritage Impact Assessment of all heritage structures within the power station

5 Languages:

English - excellent speaking, reading, and writing

Afrikaans –fair speaking, reading and writing