HERITAGE IMPACT ASSESSMENT REPORT FOR THE QUAGGA SOLAR PARK PROJECT, LEJWELEPUTSWA DISTRICT MUNICIPALITY, FREE STATE PROVINCE

CES

ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

Heritage Impact Assessment Report for the Quagga Solar Park Project, Lejweleputswa District Municipality, Free State Province

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REVISIONS TRACKING TABLE

CES Report Revision and Tracking Schedule

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DECLARATION

I, Nelius Le Roux Kruger, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Quagga Solar Park Project in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, including the relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980), the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment (SAHRA, AMAFA and the CRM section of ASAPA), regulations and any guidelines that have relevance to the proposed activity;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this declaration are true and correct.

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 Regulations.

_____

Signature of specialist
Company: CES
Date: 5 May 2023

This Archaeological Impact Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the NEMA Table below.

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
1.(1) (a) (i) Details of the specialist who prepared the report	Page 3, Section 2 and Addendum 1 of Report.	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 2 and Addendum 1 of Report.	-
(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 2: Introduction and Terms of Reference, Section 3: Description of the Project Activity	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 7: The Heritage Baseline Environment	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9: Expected Heritage Impacts of the Project	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 6: Methodology	-
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 6: Methodology	-
(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 9: Expected Heritage Impacts of the Project	-
(g) An identification of any areas to be avoided, including buffers	Section 8: Findings and Results	-
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 8: Findings and Results	-
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 6.2: Assumptions and Limitations	-
(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	Section 9: Statement of Significance and Impact Rating	
(k) Any mitigation measures for inclusion in the EMPr	Section 10: Heritage Management Section 11: Conclusion and Recommendations	
(l) Any conditions for inclusion in the environmental authorisation	N/A	None required
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 10: Heritage Management Section 11: Conclusion and Recommendations	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 & Section 9	
(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 10: Heritage Management Section 11: Conclusion and Recommendations	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process will be conducted as part of the EIA and EMPr process.
(p) A summary and copies if any comments that were received during any consultation process	N/A	Not applicable.
(q) Any other information requested by the competent authority.	N/A	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 4: CRM: Legislation, Conservation and Heritage Management	

1 EXECUTIVE SUMMARY

This report details the results of an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Indus Energy (Pty) Ltd Quagga Solar Park Project on Portions of the Farm Delaporte 887 and Farm Quaggafontein 3 in the Lejweleputswa District Municipality of the Free State Province. The proposed project entails the establishment of a solar park on the Farm Delaporte and Quaggafontein over a total surface area of **530ha** with a Power Line connection over approximately **16km**. The report includes background information on the area's archaeology, its representation in Southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency (SAHRA) and recommendations contained in this document will be reviewed.

Project Title	Quagga Solar Park Project
Project Location	S28.257075° E26.998822°
1:50 000 Map Sheet	2826BB, 2826BD, 2827AA & 2827AC
Farm Portion / Parcel	Portions of the Farm Delaporte 887 and Farm Quaggafontein 3 (Solar) as well as other farms (power Line).
Magisterial District / Municipal Area	Lejweleputswa District Municipality
Province	Free State Province

The history of the Free State Province is reflected in a rich archaeological landscape. Sites, documenting Stone Age habitation occur in places, mostly in open air locales or in sediments alongside rivers or pans. Bantu-speaking groups moved into this area during the last millennia and these presumably Basotho groups occupied the landscape during the Late Iron Age times at around AD 1500-1800. Settlement by Iron Age communities occurred on plains near rivers and close to rocky outcrops. European farmers, settling in the area since the middle of the 19th century, divided up the landscape into a number of farms. In recent years the Virginia region has seen intensive agriculture and mining development. The farm Delaporte and Quaggafontein subject to this assessment was portioned towards the end of the 19th century and no particular reference to archaeological sites or features of heritage potential were recorded during an examination of literature thematically or geographically related to the property. An examination of historical aerial imagery and archive maps indicate that the Delaporte and Quaggafontein properties had been utilized for agriculture during the last century and portions of the project areas have been altered and transformed in the last century. This inference was confirmed during an archaeological site assessment which identified a number of heritage receptors and the following observations are made for the proposed Quagga Solar Park Project in terms of heritage resources management.

- A possible Iron Age Farmer site (**QGS-IA01**) is of medium significance in terms of its regional representation in the archaeological landscape and its relation to the vast and prominent later Iron Age representations of the Free State. The site is situated in the Quagga Solar Park project area and impact might occur. It is recommended that a 50m development no-go buffer be implemented prior to commencement of the construction phase. The site and the buffer should be monitored throughout all phases of the project in order to detect impact on the site and / or destruction of previously undetected heritage sites at the earliest opportunity. Should impact on the site be foreseen, a Phase 2 heritage assessment subject to necessary SAHRA permitting should be initiated and application should be made for a destruction permit during the preconstruction phase

- The remains of a large Historical Period settlement (**QGS-HP01**) occur within the proposed powerline corridor area and impact on the site is likely. The site of medium-low significance and its features are generally protected under the National Heritage Resource Act (NHRA 1999). Since human burials occur in the vicinity of the site, it is recommended that a 20m development no-go buffer be implemented prior to commencement of the construction phase. The site and the buffer should be monitored throughout all phases of the project in order to detect impact on the site and / or destruction of previously undetected heritage sites at the earliest opportunity. Should impact on the site be foreseen application should be made for a destruction permit during the preconstruction phase. Another small Historical Period settlement (**QGS-HP02**) occurs within the proposed powerline corridor area and impact on the site is likely but the little remains of the site in terms of features and material culture and it is rated as low significance. The site should be monitored throughout all phases of the project in order to avoid the potential destruction of undetected heritage sites.
- A cemetery (**QGS-BP01)** occurs within the proposed powerline corridor area and impact on the high heritage significance heritage resource is likely**.** It is primarily recommended that infrastructure such as the placement of monopoles, pylons and service roads be designed to avoid the burial site where a 50m no-go buffer should be demarcated prior to the construction phase. The site should be fenced or a permanent construction barricade should be erected to clearly indicate the site and the margins of the no-go buffer. The cemetery must be monitored on a frequent basis during all phases of the project by an informed ECO in order to detect direct or indirect impact on these sites. A Site Management Plan (SMP) should be implemented, detailing these conservation measures and indicating responsible parties in this regard. Should impact on the resources prove inevitable, the graves should be relocated by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions and laws and by-laws pertaining to human remains. A full social consultation process should occur in conjunction with the mitigation of cemeteries and burials.
- As burials have been located on the project property, it is recommended that the EIA public participation and social consultative process address the possibility of further graves occurring in the project area.

It is the opinion of the Specialist that the proposed Quagga Solar Park and its associated power line connection will have a little to negligible negative cumulative impact on the heritage value of the area for the following reasons:

- The absence of significant archaeological resources documented in the project area and in its immediate surroundings implies low-severity short and long-term impacts on the heritage landscape.
- The transformed nature of much of the project landscapes and the presence of agricultural fields, large-scale mining and existing power lines in development areas means that the significance of the landscape in terms of its heritage is bound not to change during the course of construction, operation and decommissioning of the project.
- The heritage context and sensitivity of the proposed development zones points to a landscape of limited heritage significance on a local level.
- It should be noted that archaeological knowledge and the initiation of research projects into significant archaeological sites often result from Heritage Impact Assessments conducted for developments. Provided that significant archaeological sites are conserved and that appropriate heritage mitigation and management procedures are followed, the cumulative impact of development can be positive.

This report details the methodology, limitations and recommendations relevant to these heritage areas, as well as areas of proposed development. It should be noted that recommendations and possible mitigation measures

are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process.

Quagga Solar Park Project Heritage Sites

Site Code	Coordinate S E	Short Description	Field Rating	Mitigation Action	Project Phase
QGS-IA-01	S28.251358° E27.012257°	Later Iron Age Site	3. Medium Significance	**IF SITE IS RETAINED:** **Avoidance:** Implement a development no-go buffer of 50m. **Site Monitoring:** Strict frequent monitoring by the heritage consultant or an ECO familiar with the heritage occurrences of the site.	**Pre-Construction** **Construction** **Operations** **Decommissioning**
				IF IMPACT IS TO OCCUR: **Site Impact Mitigation:** Phase 2 Assessment, permitting (if impact is to occur)	**Pre-Construction**
				Close-Out Reporting: ECO review management procedures and ensure that effective measures were implemented.	**Decommissioning**
QGS-BP-01	S28.232145° E26.983951°	Burial Site	4a. High Significance	**IF SITE IS RETAINED:** **Avoidance:** Redesign project infrastructure to avoid impact, implement a development no-go buffer of 50m (if site is retained) **Site monitoring:** Weekly monitoring during initial site clearing and earth moving activities by an ECO familiar with the sensitivity of receptors, or the Heritage Consultant. Monthly monitoring of the burial sites is recommended during subsequent stages of development. A Site Management Plan (SMP) and a 50m conservation buffer should be implemented.	**Pre-Construction** **Construction** **Operations** **Decommissioning**
				IF IMPACT IS TO OCCUR: **Site Impact Mitigation:** Grave Relocation, permitting, social consultation (if impact is to occur).	**Pre-Construction**
				Close-Out Reporting: ECO review management procedures and ensure that effective measures were implemented.	**Decommissioning**
QGS-HP-01	S28.23525° E26.98127°	Historical Period Site	2a. Low Significance	**IF SITE IS RETAINED:** **Site Monitoring:** If the site is retained, monitor the 20m conservation buffer in order to detect potential impact on the site at the earliest opportunity. **General Site Monitoring** in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.	**Pre-Construction** **Construction** **Operations** **Decommissioning**
				IF IMPACT IS TO OCCUR: **Destruction Permitting:** Apply for destruction permit (if impact is to occur).	**Pre-Construction**
QGS-HP-02	S28.185712° E26.912904°	Historical Period Site	2a. Medium Low Significance	General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.	**Pre-Construction** **Construction** **Operations** **Decommissioning**

NOTATIONS AND TERMS/TERMINOLOGY

Archaeological record: The archaeological record minimally includes all the material remains documented by archaeologists. More comprehensive definitions also include the record of culture history and everything written about the past by archaeologists.

Artefact: Entities whose characteristics result or partially result from human activity. The shape and other characteristics of the artefact are not altered by removal of the surroundings in which they are discovered. In the Southern African context examples of artefacts include potsherds, iron objects, stone tools, beads and hut remains.

Assemblage: A group of artefacts recurring together at a particular time and place, and representing the sum of human activities.

Collective Memory: The shared pool of information (stories, artefacts, symbols, traditions, images) held in the memories of two or more members of a group. As for individual memory, it is construed over time through the interpretation of past events (in the present case, interpreted by the group members). By the virtue of being shared among the group members, it creates a social group identity in the sense that it forms the ties that bind group members together.

Context: An artefact's context usually consists of its immediate *matrix*, its *provenience* and its *association* with other artefacts. When found in *primary context*, the original artefact or structure was undisturbed by natural or human factors until excavation and if in *secondary context,* disturbance or displacement by later ecological action or human activities occurred.

Cultural Heritage Resource: The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.
Cultural landscape: A cultural landscape refers to a distinctive geographic area with cultural significance.

Cultural Resource Management (CRM): A system of measures for safeguarding the archaeological heritage of a given area, generally applied within the framework of legislation designed to safeguard the past.

Feature: Non-portable artefacts, in other words artefacts that cannot be removed from their surroundings without destroying or altering their original form. Hearths, roads, and storage pits are examples of archaeological features

Impact: A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Intangible cultural heritage: UNESCO defines "intangible cultural heritage" as the practices, representations, expressions, knowledge and skills recognized by communities, groups and individuals as part of their cultural heritage. It is transmitted from generation to generation inconstant recreation, providing the communities with a sense of identity (Article 2).

Lithic: Stone tools or waste from stone tool manufacturing found on archaeological sites.

Matrix: The material in which an artefact is situated (sediments such as sand, ashy soil, mud, water, etcetera). The matrix may be of natural origin or human-made.

Midden: Refuse that accumulates in a concentrated heap.
Microlith: A small stone tool, typically knapped of flint or chert, usually about three centimetres long or less.
Monolith: A geological feature such as a large rock, consisting of a single massive stone or rock, or a single piece of rock placed as, or within, a monument or site.
Provenience: Provenience is the three-dimensional (horizontal and vertical) position in which artefacts are found. Fundamental to ascertaining the provenience of an artefact is *association,* the co-occurrence of an artefact with other archaeological remains; and *superposition,* the principle whereby artefacts in lower levels of a matrix were deposited before the artefacts found in the layers above them, and are therefore older.

Random Sampling: A probabilistic sampling strategy whereby randomly selected sample blocks in an area are surveyed. These are fixed by drawing coordinates of the sample blocks from a table of random numbers.

Scoping Assessment: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialist involvement.

Site (Archaeological): A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity. These include surface sites, caves and rock shelters, larger open-air sites, sealed sites (deposits) and river deposits. Common functions of archaeological sites include living or habitation sites, kill sites, ceremonial sites, burial sites, trading, quarry, and art sites,

Stratigraphy: This principle examines and describes the observable layers of sediments and the arrangement of strata in deposits

Systematic Sampling: A probabilistic sampling strategy whereby a grid of sample blocks is set up over the survey area and each of these blocks is equally spaced and searched.

Trigger: A particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an *issue* and/or potentially significant *impact* associated with that proposed development that may require specialist input. Legal requirements of existing and future legislation may also trigger the need for specialist involvement.

Abbreviation	Description
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
BCE	Before Common Era
BGG	Burial Grounds and Graves
CRM	Culture Resources Management
EIA	Early Iron Age (also Early Farmer Period)
EIA	Environmental Impact Assessment
EFP	Early Farmer Period (also Early Iron Age)
ESA	Earlier Stone Age
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
K2/Map	K2/Mapungubwe Period
LFP	Later Farmer Period (also Later Iron Age)
LIA	Later Iron Age (also Later Farmer Period)
LSA	Later Stone Age
MIA	Middle Iron Age (also Early later Farmer Period)
MRA	Mining Right Area
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
PFS	Pre-Feasibility Study
PHRA	Provincial Heritage Resources Authorities
SAFA	Society for Africanist Archaeologists
SAHRA	South African Heritage Resources Association
YCE	Years before Common Era (Present)

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2 INTRODUCTION AND TERMS OF REFERENCE

CES was commissioned by AGES Limpopo on behalf of Indus Energy (Pty) Ltd, to conduct an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Quagga Solar Park Project in the Free State Province. The rationale of this AIA is to determine the presence of heritage resources such as archaeological and historical sites and features, graves and places of religious and cultural significance in previously unstudied areas; to consider the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features.

Heritage specialist input into the Environmental Impact Assessment (EIA) process is essential to ensure that, through the management of change, developments still conserve our heritage resources. It is also a legal requirement for certain development categories which may have an impact on heritage resources. Thus, EIAs should always include an assessment of heritage resources. The heritage component of the EIA is provided for in the **National Environmental Management Act, (Act 107 of 1998)** and endorsed by section 38 of the **National Heritage Resources Act (NHRA - Act 25 of 1999)**. In addition, the NHRA protects all structures and features older than 60 years, archaeological sites and material and graves as well as burial sites. The objective of this legislation is to ensure that developers implement measures to limit the potentially negative effects that the development could have on heritage resources. Based hereon, this project functioned according to the following **terms of reference for** heritage specialist input**:**

- Provide a detailed description of all archaeological artefacts, structures (including graves) and settlements which may be affected, if any.
- Assess the nature and degree of significance of such resources within the area.
- Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- Assess and rate any possible impact on the archaeological and historical remains within the area emanating from the proposed development activities.
- Propose possible heritage management measures provided that such action is necessitated by the development.
- Liaise and consult with the South African Heritage Resources Agency (SAHRA). A Notification of Intent to Develop (NID) will be submitted to SAHRA at the soonest opportunity.

As archaeologist for CES, Mr Neels Kruger acted as field director and specialist for this project. He was responsible for the assimilation of all information, the compilation of the final consolidated AIA report and recommendations in terms of heritage resources on the demarcated project areas. Mr Kruger is an accredited archaeologist and Culture Resources Management (CRM) practitioner with the Association of South African Professional Archaeologists (ASAPA), a member of the Society for Africanist Archaeologists (SAFA) and the Pan African Archaeological Association (PAA). Please refer to Addendum 1 for a Specialist CV.

3 DESCRIPTION OF THE ACTIVITY

3.1 PROJECT DESCRIPTION

South Africa currently relies principally on fossil fuels (coal and oil) for the generation of electricity. At the present date, Eskom generates approximately 90% of the electricity used in South Africa. On the other hand, South Africa has a largely unexploited potential in renewable energy resources such as solar, wind, biomass and hydro to produce electricity as opposed to other energy types (liquid fuel or coal). South Africa's electricity supply still heavily relies upon coal power plants, whereas the current number of renewable energy power plants is still limited. In the last few years, the demand for electricity in South Africa has been growing at a rate approximately 3% per annum. These factors, if coupled with the rapid advancement in community development, have determined the growing consciousness of the significance of environmental impacts, climate change and the need for sustainable development. The use of renewable energy technologies is a sustainable way in which to meet future energy requirements. The development of clean, green and renewable energy has been qualified as a priority by the Government of South Africa with a target for 2013 of 10 000 GWh, as planned in the Integrated Resource Plan 1 (IRP1) and with the Kyoto Protocol. Subsequently the Department of Energy of South Africa (DoE) decided to undertake a detailed process to determine South Africa's 20-year electricity plan, called Integrated Resources Plan 2010-2030 (IRP 2010). The IRP1 (2009) and the IRP 2010 (2011, updated in March 2014 and in October 2019) outline the Government's vision, policy and strategy in matter of the use of energy resources and the current status of energy policies in South Africa. To achieve this goal, the DoE announced a Renewable Energy IPP (Independent Power Producers) Procurement Programme. The Renewable Energy IPP Procurement Programme (REIPPPP**)**, issued on 3rd of August 2011, envisaged the commissioning of 3725 MW of renewable projects (1450 MW with solar photovoltaic technology) capable of beginning commercial operation before the end of 2017. This goal has not been fully fulfilled. On 2014, the Department of Energy announced the intention to procure an additional 3 600 MW of renewable energy projects by 2020 (DOE Media Statement of 12 December 2014). In the IRP 2019, issued by the Department of Energy (now Department of Mineral Resources and Energy (DMRE)) under Notice No. 1360 dated 18 October 2019 in Government Gazette 42784, pursuant to the Electricity Regulation Act, provision has been made to procure an additional 6000 MW of solar PV and 14400 MW of wind between 2022 and 2030.

In view of this and in an effort to use renewable energy resources, Indus Energy (Pty) Ltd is assessing the feasibility of an energy generation facilities, consisting of the construction, operation and maintenance of a Photovoltaic (PV) Power Plant on the Farm Delaporte 887 and Farm Quaggafontein 3, Ventersburg. The purpose of the proposed Solar Photovoltaic Plant is to add new capacity for the generation of renewable electric energy to the national electricity supply in compliance with the REIPP Procurement Programme in order to meet the "sustainable growth" of the Free State Province. The use of solar radiation for power generation is considered as a non-consumptive use and a renewable natural resource which does not produce greenhouse gas emissions. The generation of renewable energy will contribute to the growth of South Africa's electricity market, which has been primarily dominated up to this date by coal-based power generation. With specific reference to photovoltaic energy, and the proposed project, it is important to consider that South Africa, and in particular the Free State Province, has one of the highest levels of solar radiation in the world. The proposed solar park will assist the Eskom grid to meet the high energy demand related to the mining and industrial activities conducted in the Virginia and Welkom areas. Furthermore, being a renewable energy project which don't generate greenhouse gases, it will assist to compensate the greenhouse gas emissions arising from these mining and industrial activities.

The proposed Quagga renewable energy generation facility, located within the Matjhabeng and Masilonyana Municipalities, Lejweleputswa District Municipality, Free State Province, is located between 8 and 22 km South-East of Virginia and ±20km South-West of Ventersburg. The developed area (footprint) required for the proposed project will be up to **530hectares**. The final size and location of the project footprint will be assessed following the outcomes of the Public Participation Process and of the recommendations and conclusions of the Specialist Studies to be conducted during the Environmental Impact Assessment (EIA) process.

Access to the project sites would be from the regional road R70 running from the N1, North-East of Aldam, in the direction of Meloding and Virginia. This road crosses the Farm Blomskraal 216 passing along the north-eastern corner of the development area of Quagga . One alternative is a new internal road from the regional road R73 that runs from the N1, North-East of Winburg, in the direction of Virginia, crossing the farms Palmiet Fontein, 229, Blomskraal 216, Quaggafontein 3 and Delaporte 887, located north and west of the development area of Quagga. The other alternative is from the regional road R70 through Blomskraal 216, Quaggafontein 3 and Delaporte 887.

The proposed development (the Photovoltaic (PV) Power Plants and connection infrastructure) consists of the installation of the following equipment:

- Photovoltaic modules (mono-crystalline, poly-crystalline or bi-facial modules)
- Mounting systems for the PV arrays (single-axis horizontal trackers or fixed structures) and related foundations
- Internal cabling and string boxes
- DC/AC inverters
- Medium voltage stations, hosting LV/MV power transformers & medium voltage receiving station(s)
- Workshops & warehouses
- Five on-site high-voltage substations (one per project) with 22kV/132kV step-up transformers, and with four 132 kV busbars (switching stations) with metering and protection devices
- Four 132 kV power lines (double circuits), connecting each solar park to the Eskom Theseus Main Transmission Substation (MTS)
- One high-voltage substation (if required by Eskom) with 132kV/400kV step-up transformers, and with 132 kV and 400 kV busbars (switching stations) with metering and protection devices, to be located next to the Eskom Theseus MTS
- Five Battery Energy Storage Systems (5 BESS, one per project), with a Maximum Export Capacity from 100 MW up to 240 MW each (depending on the Maximum Export Capacity of the solar park) and up to 6-hour storage capacity (from 600 MWh up to 1440 MWh each), with a footprint from 10 ha up to 20 ha each, next to the on-site high-voltage substations, within the PV plant footprint / fenced area
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system, grounding system
- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities
- Sewage system
- Interventions on the Eskom Theseus Main Transmission Substation (MTS).

During the construction phase, the site may be provided with additional:

- Water access point, water supply pipelines, water treatment facilities
- Prefabricated buildings
- Workshops & warehouses which will be removed at the end of construction.

The connection may also entail interventions on the Eskom grid, according to Eskom's connection requirements/solution. The solar park will be connected to the Eskom Theseus Main Transmission Substation (MTS) located on Portion 6 of the Farm Doorn rivier 330, Theunissen RD, **+/- 18 km** North-West of the north-western corner of the Quagga project site. The following properties fall within the Powerline Study Corridor and may be crossed by up to four proposed 132 kV powerlines, depending on the final alignments:

- Farm Blomskraal 216, Registration Division Ventersburg RD;
- Farm De Dam 27, Registration Division Ventersburg RD;
- Farm Tevrede 361, Registration Division Ventersburg RD;
- Farm Biddulph 329, Registration Division Ventersburg RD;
- Remaining Extent of the Farm Le Roux 766, Registration Division Ventersburg RD;
- Portion 1 (Remaining Extent) of the Farm Le Roux 766, Registration Division Ventersburg RD;
- Portion 2 of the farm Le Roux 766, Registration Division Ventersburg RD;
- Portion 1 of the farm Le Roux 717, Registration Division Ventersburg RD;
- Portion 1 of the Farm Florida 633, Registration Division Ventersburg RD;
- Portion 4 of the Farm Florida 633, Registration Division Ventersburg RD;
- Portion 2 of the Farm Welgelegen 382, Registration Division Ventersburg RD;
- Portion 22 of the Farm Welgelegen 382, Registration Division Ventersburg RD;
- Portion 24 of the Farm Welgelegen 382, Registration Division Ventersburg RD
- Portion 27 of the Farm Welgelegen 382, Registration Division Ventersburg RD;
- Remaining Extent of the Farm Bloemhoek 509, Registration Division Ventersburg RD;
- Portion 2 (Remaining Extent) of the Farm Bloemhoek 509, Registration Division Ventersburg RD;
- Portion 3 of the Farm Bloemhoek 509, Registration Division Ventersburg RD;
- Remaining Extent of the Farm Doorn River 330 (Portion 11 & Portion 21 unregistered), Registration Division Theunissen RD;
- Portion 3 of Farm Hakkies 695, Registration Division Theunissen RD;
- Portion 18 of Farm Hakkies 695, Registration Division Theunissen RD (unregistered);
- Portion 6 of the Farm Doorn River 330, Registration Division Theunissen RD;

3.2 TECHNICAL ASPECTS

Solar energy facilities such as those using PV technology use the energy from the sun to generate electricity through a process known as Photovoltaic Effect, which consists in the generation of electrons by photons of sunlight to create electrical energy.

The PV plant will mainly consist of the following components and equipment:

- **Photovoltaic cells and photovoltaic modules**: PV cells are made in silicone and act as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic module. The facility will use **mono/polycrystalline photovoltaic (PV) modules** or **bi-facial modules** with high efficiency .
- **Support structures:** PV modules will be assembled on steel or aluminium frames. The preferred technical solutions for the proposed solar parks entail PV modules mounted on **single-axis horizontal trackers** (alternative option 1) or on **fixed mounting systems** (alternative option 2), or a combination of both. As depicted in Figures 1 and 2, each tracker is composed by several PV arrays North-South oriented and linked by a horizontal axis, driven by a motor. The horizontal axis allows the rotation of the PV arrays toward the West and East direction, to follow the daily sun path. In the case of fixed mounting systems, as depicted in Figures 3 and 4: each mounting frame hosts PV modules along parallel rows of PV modules placed side by side, with the position of the panels northwards and an optimized tilt angle (between 20° and 30°). The rows of PV modules are mounted horizontally one on top of the other, with an overall mounting structure height up to 4.5 meters above ground level.

- **Strings and string boxes:** the PV modules are connected in series to form PV strings, so that the string voltage fits into the voltage range of the DC/AC inverters. PV strings are devised to be connected to DC-connection boxes (string boxes) with a parallel connection solution (PV sub-field). String Boxes monitor the currents in photovoltaic modules and can promptly diagnose faults. String boxes are also designed with a general circuit breaker to disconnect the photovoltaic sub-fields from the DC/AC inverters.
- **Medium-voltage stations:** each medium-voltage station is designed to host one or more DC/AC inverters, and one or more medium-voltage power transformers. The DC/AC inverters are deemed to convert the direct current (DC) to alternating current (AC) at low voltage; subsequently the AC will pass through a medium-voltage power transformer to step-up the voltage up to 22 kV or 33 kV.
- **Medium voltage receiving station:** the energy from the medium voltage stations will be collected into one medium voltage receiving stations, linking in parallel all the PV fields of the PV generator.
- **On-site high-voltage substation and switching station:** from the medium-voltage receiving station, the electrical energy will be delivered to one small on-site high-voltage substation with two or more high-voltage power transformers (one as spare), stepping up the voltage to the voltage of the Eskom grid (132 kV). Furthermore, the on-site high-voltage substation will be equipped with a control building and one busbar with metering and protection devices (also called “switching station”).
- **Up to 4 (four) 132 kV power lines,** approximately from 9 up to 21 long (depending on the selected location of the project footprints), for the connection of the on-site substation to the Eskom Theseus Main Transmission Substation (MTS) located on Portion 6 of the Farm Doorn rivier.
- **One high-voltage substation** (if required by Eskom) with 132kV/400kV step-up transformers, and with 132 kV and 400 kV busbars (switching stations) with metering and protection devices, to be located next to the Eskom Theseus MTS.
- **A Battery Energy Storage Systems** (**BESS)**, with a Maximum Export Capacity from 100 MW up to 240 MW (depending on the Maximum Export Capacity of the solar park) and up to 6-hour storage capacity (from 600 MWh up to 1440 MWh each), with a footprint from 10 ha up to 20 ha, next to the on-site high-voltage substation, within the PV plant footprint / fenced area.

Other key features of the project are to ensure a high level of reliability, operational and maintenance safety, low water consumption. The expected operational life of a plant is deemed to be between 30 up to 40 years. The construction and the commissioning of each PV plant are expected to last approximately **24 months.**

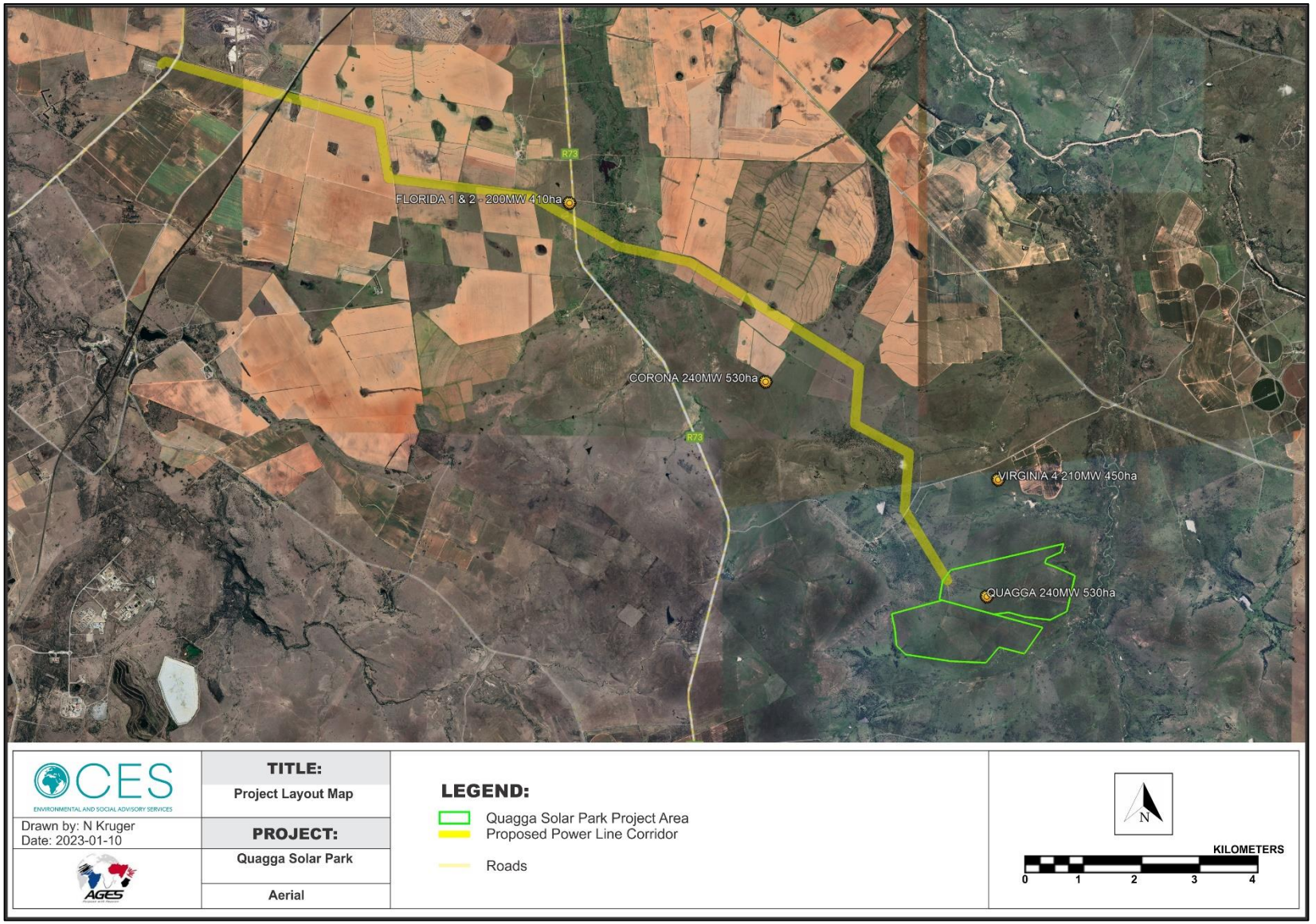

Figure 3-1: Aerial map indicating the proposed development areas subject to the Quagga Solar Park Project.

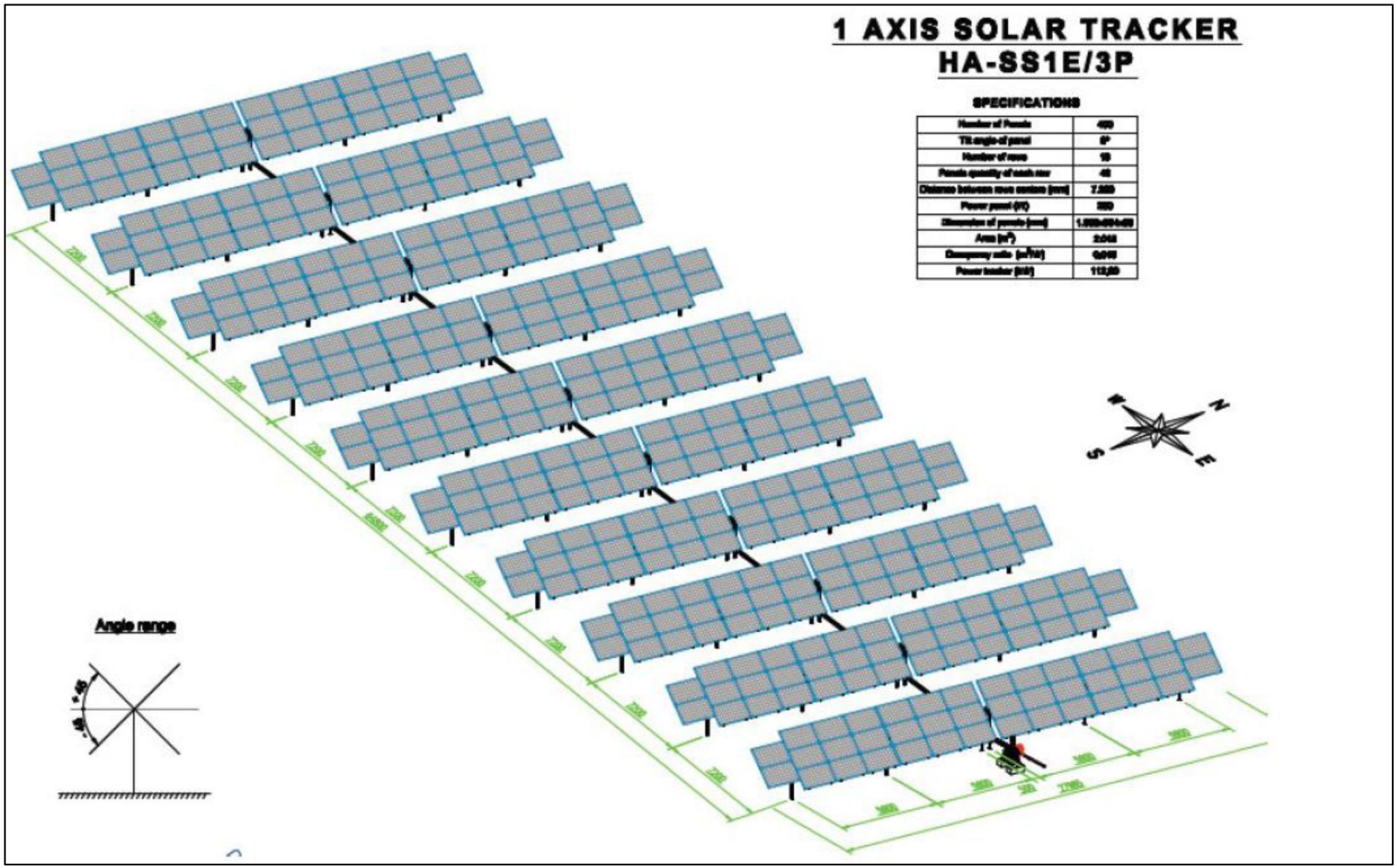

Figure 3-2: Frontal views of the PV arrays mounted on horizontal 1-axis tracker.

4 LEGAL BASIS OF THE ACTIVITY

4.1 OVERVIEW

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

4.2 LEGISLATION FOR THE PROTECTION OF HERITAGE SITES

The South African Heritage Resources Agency (SAHRA) and its provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act No 25 of 1999 (section 35) the following features are protected as cultural heritage resources:

a. Archaeological artefacts, structures and sites older than 100 years

b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography

c. Objects of decorative and visual arts

d. Military objects, structures and sites older than 75 years

e. Historical objects, structures and sites older than 60 years

f. Proclaimed heritage sites

g. Grave yards and graves older than 60 years

h. Meteorites and fossils

i. Objects, structures and sites of scientific or technological value.

In addition, the national estate includes the following:

a. Places, buildings, structures and equipment of cultural significance

b. Places to which oral traditions are attached or which are associated with living heritage

c. Historical settlements and townscapes

d. Landscapes and features of cultural significance

e. Geological sites of scientific or cultural importance

f. Archaeological and paleontological sites

g. Graves and burial grounds

h. Sites of significance relating to the history of slavery

i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

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

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves and burial grounds are commonly divided into the following subsets:

a. ancestral graves

b. royal graves and graves of traditional leaders

c. graves of victims of conflict

d. graves designated by the Minister

e. historical graves and cemeteries

f. human remains

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and Ordinance on Excavations (Ordinance no. 12 of 1980) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments.

c. National Heritage Resources Act No 25 of 1999, section 35

This act (Act 107 of 1998) states that a survey and evaluation of cultural resources must be done in areas where development projects, that will change the face of the environment, will be undertaken. The impact of the development on these resources should be determined and proposals for the mitigation thereof are made. Environmental management should also take the cultural and social needs of people into account. Any disturbance of landscapes and sites that constitute the nation's cultural heritage should be avoided as far as possible and where this is not possible the disturbance should be minimized and remedied

4.3 BACKGROUND TO HERITAGE IMPACT ASSESSMENTS

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

A detailed guideline of statutory terms and requirements is supplied in Addendum 1

.

5 REGIONAL CONTEXT

5.1 LOCATION

The proposed Quagga Solar Park Project occurs on portions of the Farm Delaporte 887 and Farm Quaggafontein 3 in the Lejweleputswa District Municipality, Free State Province. The area is situated approximately 15km south-east of Virginia and 50km north-west of Winburg. The study area appears on 1:50000 map sheets 2826BB, 2826BD, 2827AA & 2827AC (see Figure 5-1) and coordinates for the project area are as follows:

- **Solar Park:** S28.257075° E26.998822°
- **Power Line Eastern Offset:** S28.252533° E26.990752°
- **Power Line Central Point:** S28.19186° E26.92537°
- **Power Line Western Offset**: S28.16295° E26.83869°

5.2 RECEIVING ENVIRONMENT

The development site lies within the Savanna biome which is the largest biome in Southern Africa. The original vegetation of the landscape around the subject farms is made up of Dry Sandy Highveld Grassland, but in many places has been replaced due to farming activities (ploughing). The geology of the area is made up of mudstone. The topography is described as moderately undulating plains and pans. The Maselspruit bisects the landscape to flow into the Sand River to the north. Portions of the project property have been converted to agricultural fields in past decades and other farms are being used for livestock grazing, farming and tourism.

5.3 SITE DESCRIPTION

The landscape on the farms Delaporte and Quaggafontein is generally open land with undulating rolling hills in places. The area is densely to sparsely grassed and can be described as typical Free State grasslands with regular outcrops of dolerite on the ridges. Trees and shrubs occur in isolated spots in the landscape and around farmsteads. Vegetation remains relatively in the project area and along pristine along drainage lines and rivers. The current land-use of Delaporte and Quaggafontein is intensive livestock and game farming and a number of livestock and game enclosures, wind mills and water storage dams occur on the property and in the project area. Neighbouring farms are used for livestock grazing and cattle farming. Existing infrastructure on the property comprise farmhouses, sheds, warehouses as well as workers housing.

Figure 5-1: View of occasional trees, grasslands and termite activity along surfaces in the project area.

Figure 5-2: View of dams and a livestock drinking as well as denser thicket in the project area.

Figure 5-3: View of general surroundings in the project area along vast grasslands.

Figure 5-4: View of vegetation along the eastern border of the project area.

Figure 5-5: View of denser thicket in a portion of the project area.

Figure 5-6: View of general surroundings and grasslands in the project area along the exiting ESKOM Powerline servitude.

Figure 5-7: View of the western offset of the project at the Eskom substation (left) and the project corridor through cultivated land (right).

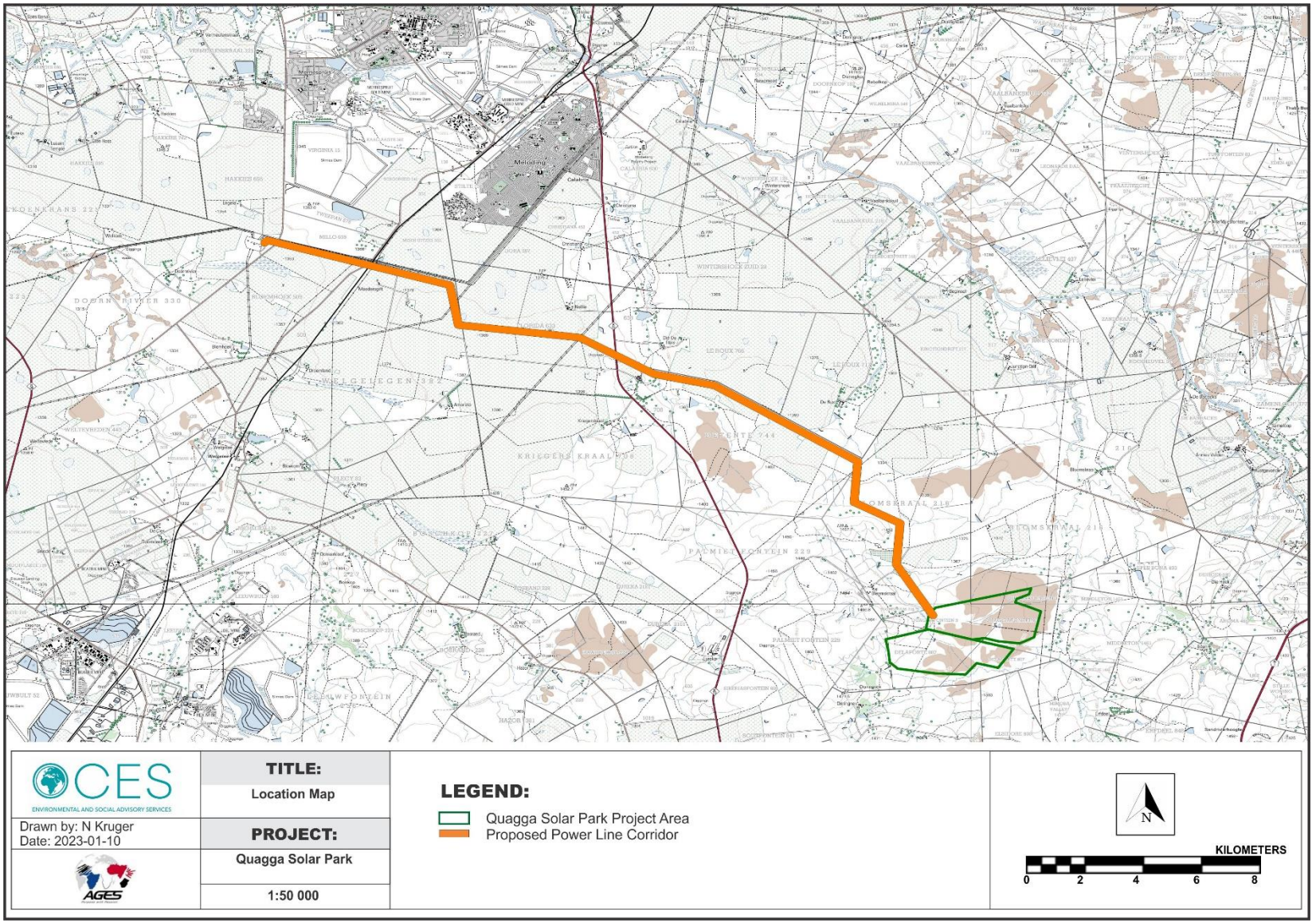

Figure 5-9: 1:50 00 Map representation of the location of the proposed Virginia Solar Park Power Lines BA Project (sheet 2826BB).

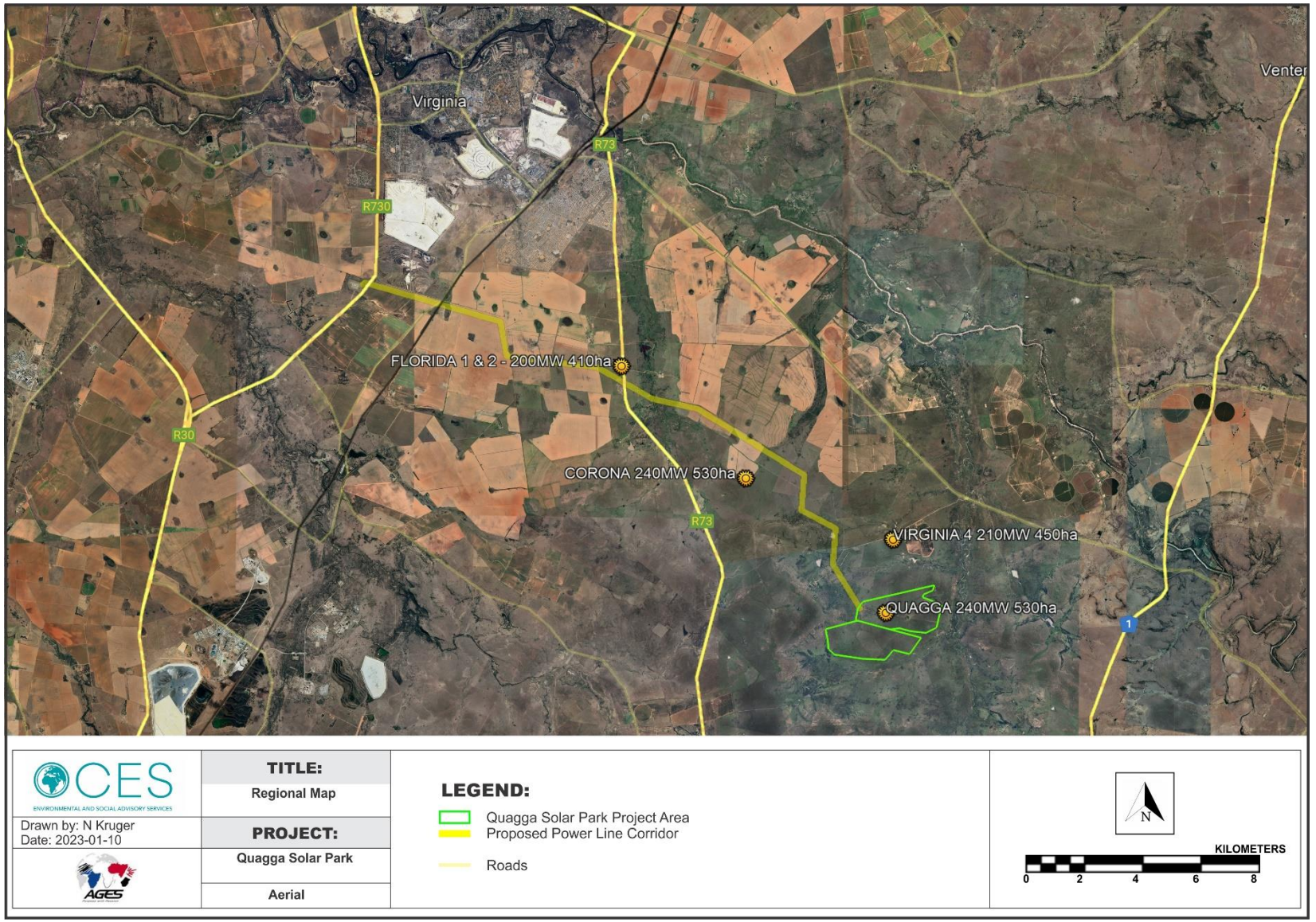

Figure 5-10: Aerial map providing a regional context for the proposed Virginia Solar Park Power Lines BA Project.

6 METHODOLOGY

6.1 SOURCES OF INFORMATION

6.1.1 Desktop Work (Literature Review, Remote Sensing)

The larger landscape of the western Free State has been relatively well documented in terms of its archaeology and history. A desktop study was prepared in order to contextualize the proposed project within a larger historical milieu. Numerous academic papers and research articles supplied a historical context for the proposed project and archival sources, aerial photographs, historical maps and local histories were used to create a baseline of the landscape's heritage. In addition, the study drew on available unpublished Heritage Assessment reports to give a comprehensive representation of known sites in the study area. These included:

- Coetzee, F.P. (Unisa). 2008. Cultural Heritage Survey of the Proposed Phakisa Housing Development, Welkom, Free State.
- Dreyer, C. (Private). 2004a. Archaeological and Historical Investigation of the Proposed Developments at Ventersburg, Free State.
- Dreyer, C. (Private). 2004b. Archaeological and Historical Investigation of the Graves at the Proposed Housing Developments near Thabong, Welkom, Free State.
- Dreyer, C. (Private). 2005a. Historical Investigation of the Existing Outbuildings at the Farm Smaldeel 202, Kroonstad, Free State.
- Dreyer, C. (Private). 2005b. Archaeological and Historical Investigation of the Proposed New Filling Station at Virginia, Free State.
- Dreyer, C. (Private). 2006a. First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at the Farm Middenspruit 151, Kroonstad, Free State.
- Dreyer, C. (Private). 2006b. First Phase Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at Katdoringfontein 379, Senekal, Free State.
- Dreyer, C. (Private). 2007a. Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at Mmamahahabane (Ventersburg), Free State.
- Dreyer, C. (Private). 2007b. First Phase Archaeological and Cultural Heritage Assessment of the Proposed Borrow Pit Sites along the R30 Main Road between Brandfort and Vet River, Free State.
- Dreyer, C. (Private). 2007c. First Phase Archaeological and Cultural Heritage Investigation of the Proposed Filling Station Developments at Harmonia 867,Winburg, Free State.
- Dreyer, C. (Private). 2008a. First Phase Archaeological and Cultural Heritage Investigation of the Proposed Oppenheimer Park Golf Estate, Welkom, Free State.
- Dreyer, C. (Private). 2008b. Archaeological and Cultural Heritage Assessment of the Proposed Residential Developments at Matlwantlwang (Steynsrust), Free State.
- Kusel, U. (African Heritage Consultants). 2007. Cultural Heritage Resources Impact Assessment of Portion 22 (A Portion of Portion 8) of the Farm Klipplaatsdrift 82 HP.
- Roodt, F. (R&R Cultural Resource Consultants). 2007. Heritage Resource Scoping Report: Aldam Estate, Setsoto Municipality, Free State Province.
- Van Schalkwyk, J.A. (National Cultural History Museum). 2003. Mercury Perseus 400 KV Transmission Line, Cultural Heritage Resources.

Of particular interest to this assessment and findings are the following AIAs conducted for renewable energy projects on Delaporte and Quaggafontein and the surrounding region:

- Kruger, N. 2021. Archaeological Impact Assessment for the proposed Virginia 1, 2 & 3 Solar Parks EIA Project on Portions of the Farms Bloemhoek 509, Welgelegen 382, Mooi Uitzig 352, Florida 633, Le Roux 717 and Detente 744 Lejweleputswa District Municipality, Free State Province
- Kruger, N. 2021. Archaeological Impact Assessment for the proposed Virginia Solar Park Power Lines BA Project on Portions of the Farms Bloemhoek 509, Welgelegen 382, Mooi Uitzig 352, Florida 633, Le Roux 717 and Detente 744 Lejweleputswa District Municipality, Free State Province

6.1.2 Remote Sensing

Aerial photography is often employed to locate and study archaeological sites, particularly where larger scale area surveys are performed. The site assessment of the Delaporte and Quaggafontein property relied heavily on this method to assist the challenging foot and automotive site survey. Here, depressions, variation in vegetation, soil marks and landmarks were examined and specific attention was given to shadow sites (shadows of walls or earthworks which are visible early or late in the day), crop mark sites (crop mark sites are visible because disturbances beneath crops cause variations in their height, vigour and type) and soil marks (e.g. differently coloured or textured soil (soil marks) might indicate ploughed-out burial mounds). Attention was also given to moisture differences, as prolonged dampening of soil as a result of precipitation frequently occurs over walls or embankments. In addition, historical aerial photos obtained during the archival search were scrutinized and features that were regarded as important in terms of heritage value were identified and if they were located within the boundaries of the project area, they were physically visited in an effort to determine whether they still exist and in order to assess their current condition and significance. By superimposing high frequency aerial photographs with images generated with Google Earth as well as historical aerial imagery, potential sensitive areas were subsequently identified, geo-referenced and transferred to a handheld GPS device. These areas served as reference points from where further vehicular and pedestrian surveys were carried out. Similar to the aerial survey, the site assessment of the Delaporte and Quaggafontein farm relied heavily on archive and more recent map renderings of the property to assist the challenging foot and automotive site survey where historical and current maps of the project area were examined. By merging data obtained from the desktop study and the aerial survey, sites and areas of possible heritage potential were plotted on these maps of the larger area using GIS software. These maps were then superimposed on high-definition aerial representations in order to graphically demonstrate the geographical locations and distribution of potentially sensitive landscapes.

6.1.3 Site Surveys

Archaeological survey implies the systematic procedure of the identification of archaeological sites. An archaeological survey of the Quagga Solar Park Project area was conducted over a three-day period in January 2023. The process encompassed a random field survey in accordance with standard archaeological practice by which heritage resources are observed and documented. As the project area large and in some instances is densely vegetated, particular focus was placed on GPS reference points identified during the aerial and mapping survey. Where possible, random spot checks were made and potentially sensitive heritage areas were investigated. Using a Garmin GPS, the survey was tracked and general surroundings were photographed with a Samsung Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible disturbed areas during the survey.

6.2 Assumptions and Limitations

The site survey for the Quagga Solar Park Project AIA proved to be constrained and the investigation primarily focused around areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the mapping and aerial survey) as well as areas of potential high human settlement catchment. In summary, the following constraints were encountered during the site survey:

- The surrounding vegetation in the project area mostly comprised out of mixed grassland, disused farmlands and occasional trees. For the largest part, visibility prove to be a minor constraint during the site assessment but observations were obstructed in denser thicket in wester portions of the project area.
- Cognisant of the constraints noted above, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

7 THE HERITAGE BASELINE ENVIRONMENT

7.1 ARCHAEOLOGY AND THE CULTURAL LANDSCAPE

Archaeology in Southern and Central Africa is typically divided into two main fields of study, the **Stone Age** and the **Iron Age** or **Farmer Period**. The following table provides a concise outline of the chronological sequence of periods, events, cultural groups and material expressions in Southern African pre-history and history.

Period	Epoch	Associated cultural groups	Typical Material Expressions
Early Stone Age 2.5m – 250 000 YCE	Pleistocene	Early Hominins: *Australopithecines* *Homo habilis* *Homo erectus*	Typically large stone tools such as hand axes, choppers and cleavers.
Middle Stone Age 250 000 – 25 000 YCE	Pleistocene	First *Homo sapiens* species	Typically smaller stone tools such as scrapers, blades and points.
Late Stone Age 20 000 BC – present	Pleistocene / Holocene	*Homo sapiens sapiens* including San people	Typically small to minute stone tools such as arrow heads, points and bladelets.
Early Iron Age / Early Farmer Period 300 – 900 AD **(commonly restricted to the interior and north-east coastal areas of Central and Southern Africa)**	Holocene	First Bantu-speaking groups	Typically distinct ceramics, bead ware, iron objects, grinding stones.
Middle Iron Age (Mapungubwe / K2) / early Later Farmer Period 900 – 1350 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	Bantu-speaking groups, ancestors of present-day groups	Typically distinct ceramics, bead ware and iron / gold / copper objects, trade goods and grinding stones.
Late Iron Age / Later Farmer Period 1400 AD -1850 AD	Holocene	Various Bantu-speaking groups including Venda, Thonga, Sotho-Tswana and Zulu	Distinct ceramics, grinding stones, iron objects, trade objects, remains of iron smelting activities including iron smelting furnace, iron slag and residue as well as iron ore.
Historical / Colonial Period ±1850 AD – present	Holocene	Various Bantu-speaking groups as well as European farmers, traders, settlers and explorers	Remains of historical structures e.g. homesteads, missionary schools etc. as well as, glass, porcelain, metal and ceramics.

The history of the Northern Free State is reflected in a rich archaeological landscape. Sites, documenting Stone Age habitation occur in places, mostly in open air locales or in sediments alongside rivers or pans. Bantu-speaking groups moved into this area during the last millennia and these presumably Sotho groups occupied the

landscape during the Late Iron Age times at around AD 1500-1800. Settlement by Iron Age communities occurred near rivers and close to rocky outcrops. European farmers, settling in the area since the middle of the 19th century, divided up the landscape into a number of farms. In recent years an urban element developed, expanding at a rapid rate, largely as a result of mining development in the region.

7.1.1 Early History and the Stone Ages

According to archaeological research, the earliest ancestors of modern humans emerged some two to three million years ago. The remains of Australopithecine and *Homo habilis* have been found in dolomite caves and underground dwellings at Sterkfontein and Swartkrans near Krugersdorp. *Homo habilis*, one of the Early Stone Age hominids, is associated with Oldowan artefacts, which include crude implements manufactured from large pebbles. The Acheulian industrial complex replaced the Oldowan industrial complex during the Early Stone Age. This phase of human existence was widely distributed across South Africa and is associated with *Homo erectus*, who manufactured hand axes and cleavers from as early as one and a half million years ago. Oldowan and Acheulian artefacts were also found four to five decades ago in some of the older gravels (ancient river beds and terraces) of the Vaal River and the Klip River in Vereeniging. The earliest ancestors of modern man may therefore have roamed the Vaal valley at the same time that their contemporaries occupied some of the dolomite caves near Krugersdorp. Middle Stone Age sites dating from as early as two hundred thousand years ago have been found all over South Africa. Middle Stone Age hunter-gatherer bands also lived and hunted in the Orange and Vaal River valleys. These people, who probably looked like modern humans, occupied campsites near water but also used caves as dwellings. They manufactured a wide range of stone tools, including blades and point s that may have had long wooden sticks as hafts and were used as spears. The Late Stone Age commenced twenty thousand years ago or somewhat earlier. The various types of Later Stone Age industries scattered across the country are associated with the historical San and Khoi-Khoi people. The San were renowned as formidable hunter-gatherers, while the Khoi-Khoi herded cattle and small stock during the last two thousand years. Late Stone Age people manufactured tools that were small but highly effective, such as arrow heads and knives.

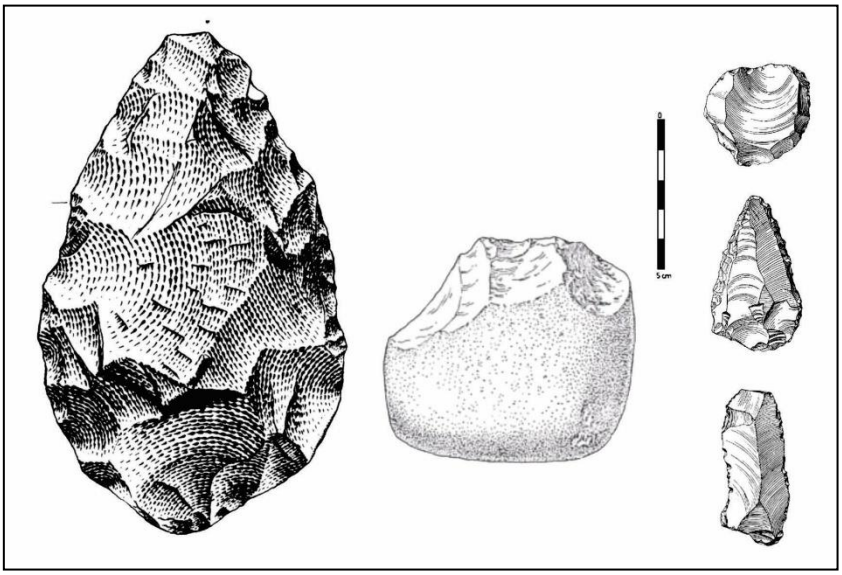

Figure 7-1: Typical ESA handaxe (left) and cleaver (center). To the right is a MSA scraper (right, top), point (right, middle) and blade (right, bottom).

The earliest ancestors of modern man may therefore have roamed the Vaal valley at the same time that their contemporaries occupied some of the dolomite caves near Krugersdorp. Middle Stone Age sites dating from as early as two hundred thousand years ago have been found all over South Africa. Middle Stone Age hunter-gatherer bands also lived and hunted in the Orange and Vaal River valleys. These people, who probably looked

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7.1.2 Iron Age Farmers

The beginnings of the Iron Age (Farmer Period) in Southern Africa are associated with the arrival of a new Bantu speaking population group at around the third century AD. These newcomers introduced a new way of life into areas that were occupied by Later Stone Age hunter-gatherers and Khoekhoe herders. Distinctive features of the Iron Age are a settled village life, food production (agriculture and animal husbandry), metallurgy (the mining, smelting and working of iron, copper and gold) and the manufacture of pottery. Iron Age people moved into Southern Africa by c. AD 200, entering the area either by moving down the coastal plains, or by using a more central route. From the coast they followed the various rivers inland. Being cultivators, they preferred rich alluvial soils. The Iron Age can be divided into three phases. The Early Iron Age includes the majority of the first millennium A.D. and is characterised by traditions such as Happy Rest and Silver Leaves. The Middle Iron Age spans the 10th to the 13th Centuries A.D. and includes such well known cultures as those at K2 and Mapungubwe. The Late Iron Age is taken to stretch from the 14th Century up to the colonial period and includes traditions such as Icon and Letaba.

The Iron Age archaeology of the Free State is characterised by a wide distribution of stone-walled sites along the flat-topped ridges and hills. Studies have revealed detail and consistency in the arrangement and design of the structures. People's expression of culture has left its imprint on the material environment. Thus, recognised settlement patterns display human perceptions with regard to social clustering, economic system and political organisation. Patterns are indicated by the arrangement of huts, byres and ash heaps in a particular order and in relation to one another. Spatial organisation in general is characterised by the central position of stock byres and the placing of the main dwelling area on the perimeter of the settlement. During the Later Iron Age, emphasis was not only on stone building, for additional structures of perishable materials, supplementing living space, have also been revealed. All the characteristics of settlement patterns allow the immediate recognition of specific cultural groups of people populating the landscape. Extensive surveying by Tim Maggs in the Free State during the 1970s culminated in an extensive framework for Late Iron Age stone-walled settlements characterised by connecting walls, surrounding walls and huts with bilobial courtyards.

Maggs established the following classification of sites (Maggs 1976):

- Type N (Ntuanatsatsi): Occurring mostly in the north eastern Free State.
- Type V (Makgwareng): Occurring mostly in the eastern Free State towards the Drakensberg.
- Type Z (OXF1): Occurring mostly in the north western regions of the Free State.
- Type R (OFD 1): Riet River area of the Free State.

The N-type settlements were built by the Fokeng and Kwena while the Taung were responsible for the construction of some of the V-type settlements. The Kubung built the Z-type settlements and Khoi groups, who lived near the Riet River, built R-type sites. The stone walled sites that have been identified in the project area constitutes mainly Z-type settlements. These types of settlement also occurred along the lower

reaches of the Renoster River. Large concentrations of V-type settlements are found along the upper reaches of the Renoster and Vals Rivers, to the east of the Project Area. Stone walled sites closest to the Project Area occur on Doringberg and Beckersberg within the Willem Pretorius Nature Reserve which is located near the Allemanskraal Dam between Winburg and Ventersburg.

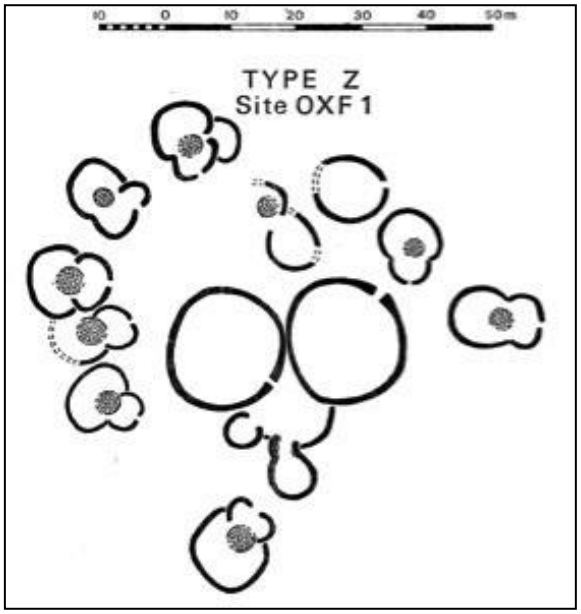

Figure 7-2: Plan of typical Type Z settlement patter as classified by Maggs (1976).

Figure 7-3: View of preserved Iron Age stone walling on the farm Middenspruit south of Kroonstad.

Maggs' research indicated that the division of sites based on layout is confirmed by associated pottery assemblages with different decoration styles. Different settlement patterns also produced huts of different materials in different styles. The classification of sites is based on the assumption that settlement layout is bound and prescribed by cultural perceptions. The identification of different ethnic groups is thus possible from the way in which these traditional peoples have organised their different living places in terms of space and time. The final result was directed by cultural preference (choice) and function. The importance of livestock, personal status, kinship, social organisation and the diverse roles of men, women and offspring have always been important in the understanding of settlement patterns. Pottery decorations associated with this settlement type are characterised by shallow line incisions in bands and triangles below the rim and on the shoulder, combined with straight or curved lines and areas of red ochre burnish on the body of clay vessels (Maggs 1976).

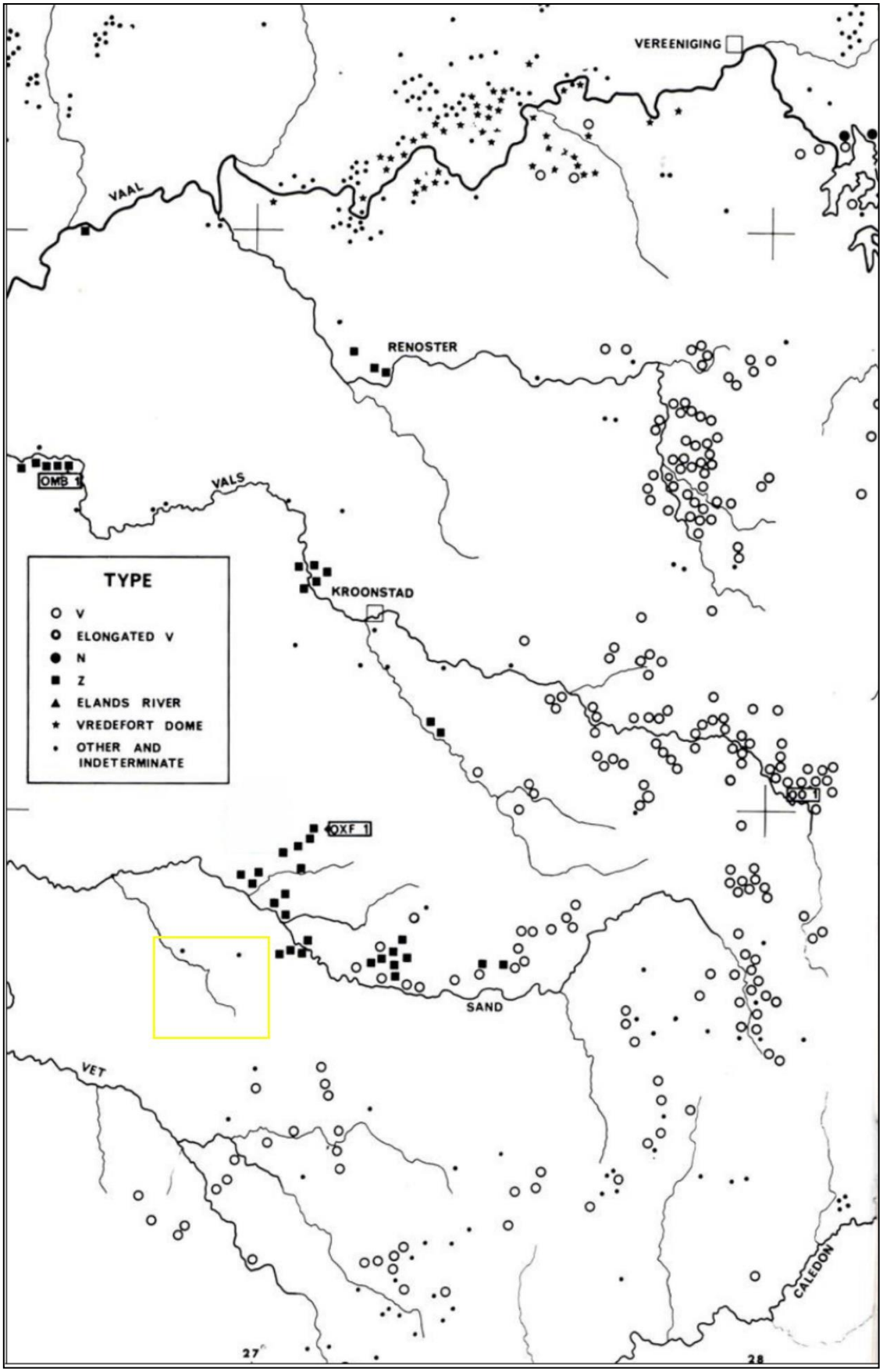

Figure 7-4: Distribution of Iron Age sites in the north western Free State (project area indicated by yellow outline) (Maggs 1976).

7.1.3 The Cultural Landscape

The town of Winburg, a small mixed farming town, is the oldest proclaimed town (1837) in the Orange Free State, South Africa and thus along with Griquatown, one of the oldest settlements in South Africa located north of the Orange River. When the Voortrekkers reached the area of Winburg, there were no other tribes or inhabitants. The nearest community was that of a Tswana tribe under Chief Makwana at Thaba Nchu, 60 km south east of the town and the Basotho tribes in the mountains of the current Lesotho, 100 km east of the town. The trade of cattle for land between the Vaal and Vet Rivers, undertaken by Andries Pretorius and the Bataung Chief Makwana in 1836, led to the settlement of a dispute between the African tribes. The Voortrekkers offered protection for Chief Makwana from the Tswana tribes, against the Basotho tribes habouring in the mountains of the current Lesotho and stealing the cattle of the Bataung tribe. In exchange for continued protection, the Voortrekkers were offered the land between the Vet and Vaal Rivers. The Voortrekker leaders had a small disagreement as to where to establish a town. A vote was held under the Burgers and Andries Pretorius's group won and elected to establish the town in its current position and to call it Winburg, after the Dutch word winnen (to win). Winburg acted as a settlement and religious centre for Voortrekkers. Winburg was originally selected as the site for the main Voortrekker Monument, but Pretoria won favour and a five-tiered secondary Voortrekker monument was built on the outskirts of Winburg instead in the 1950s. It carries the names of the Voortrekker leaders: Piet Uys, Andries Hendrik Potgieter, Andries Pretorius, Piet Retief and Gerrit Maritz. The lengths of the five tiers are proportional to the distances travelled by the respective settler groups. The monument is built near the site of the birth-house of Martinus Theunis Steyn, who was president of the Boer Republic of the Orange Free State. The town was the site of a concentration camp for women and children captured by the British Army during their scorched earth campaign during the Second Boer War. 355 children and 132 adults died in this camp due to malnutrition and contagious diseases, while kept in tents without any infrastructure or protection during the bitter cold winters of 1899 – 1901. The famous Boer General Koos de la Rey was born in the district of Winburg on the farm Doornfontein. General De La Rey was the leading Boer General of the Western Transvaal in 1899 – 1901. Winburg had a black armed commando supporting the British soldiers during the war of 1899 – 1901. The town of Virginia is located 50km north of Windburg and was laid out on the banks of the Sand River in 1954. The name of the town is derived from two American engineers who in 1890 surveyed the railway line north across Merriespruit. Whilst completing this task they chiselled the name ‘Virginia’ on a boulder on a hill nearby. When the railway line via Kroonstad to Gauteng was built two years later a siding with the same name was established on the spot. The name was retained when the town mushroomed in the 1950’s following the discovery of gold. The name Merriespruit was given to a suburb of Virginia. Within three years Virginia became the second largest town on the goldfields and the fourth largest in the Free State. On 22 Feb 1994 the wall of a Harmony mine slimes dam broke and engulfed part of the Merriespruit suburb.

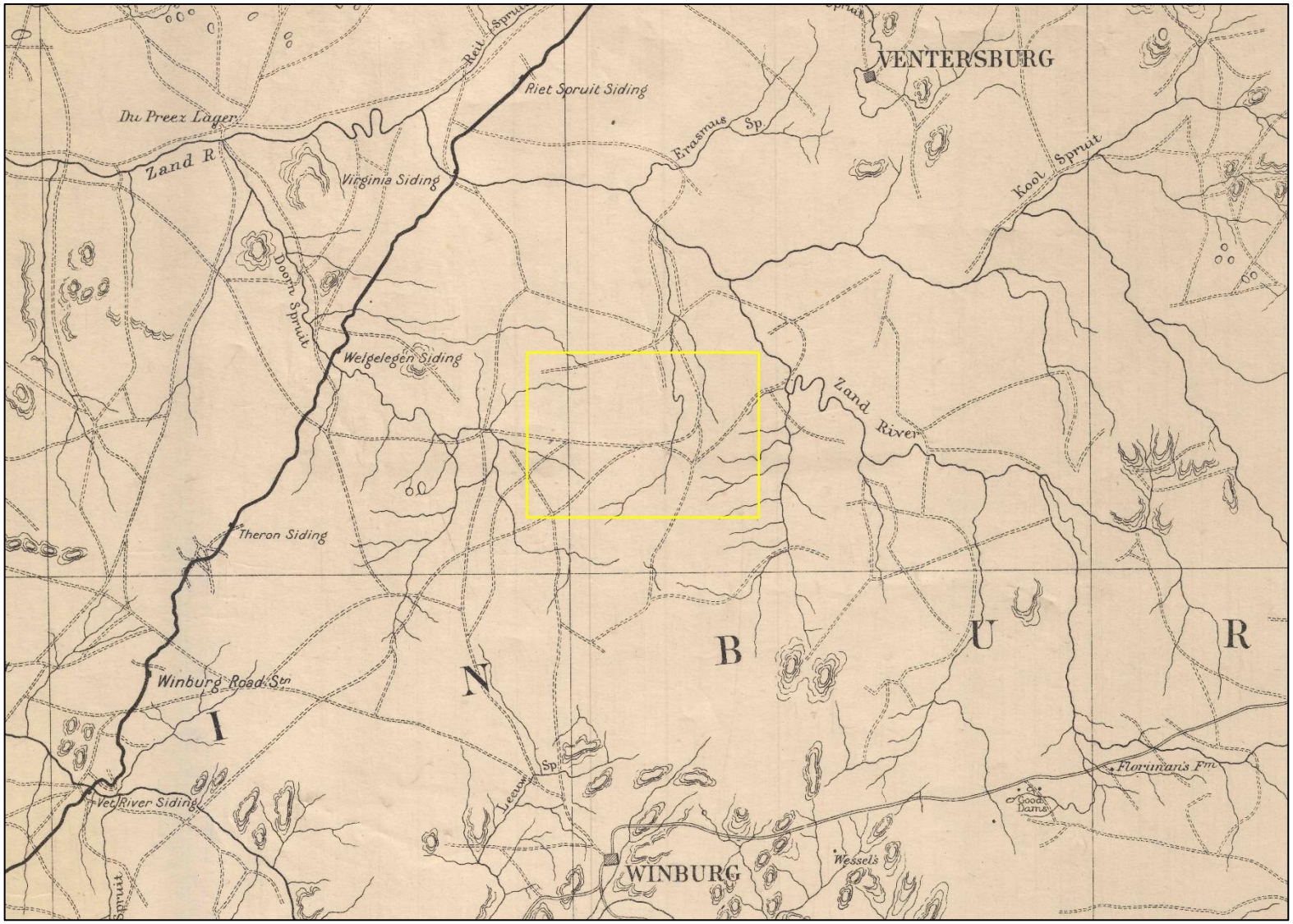

Figure 7-5: Transvaal and Orange Free State Series: Winburg map dating to 1899. The general location of Delaporte and Quaggafontein is indicated by the yellow outline.

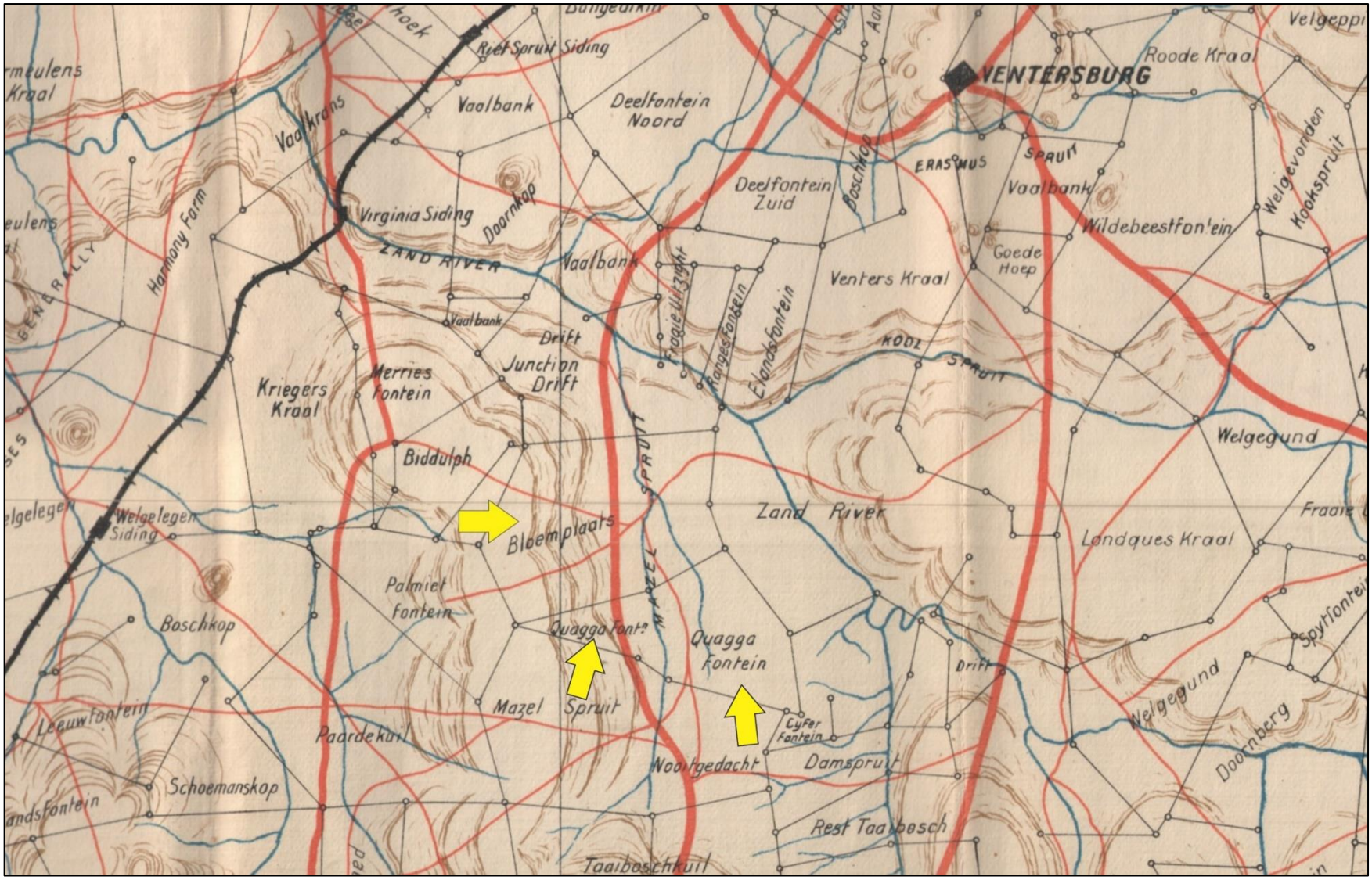

Figure 7-6: The South African War Map (1899-1902) of the Winburg area dating to 1900. The farms Bloemplaats and Quaggafontein are indicated by the yellow arrows.

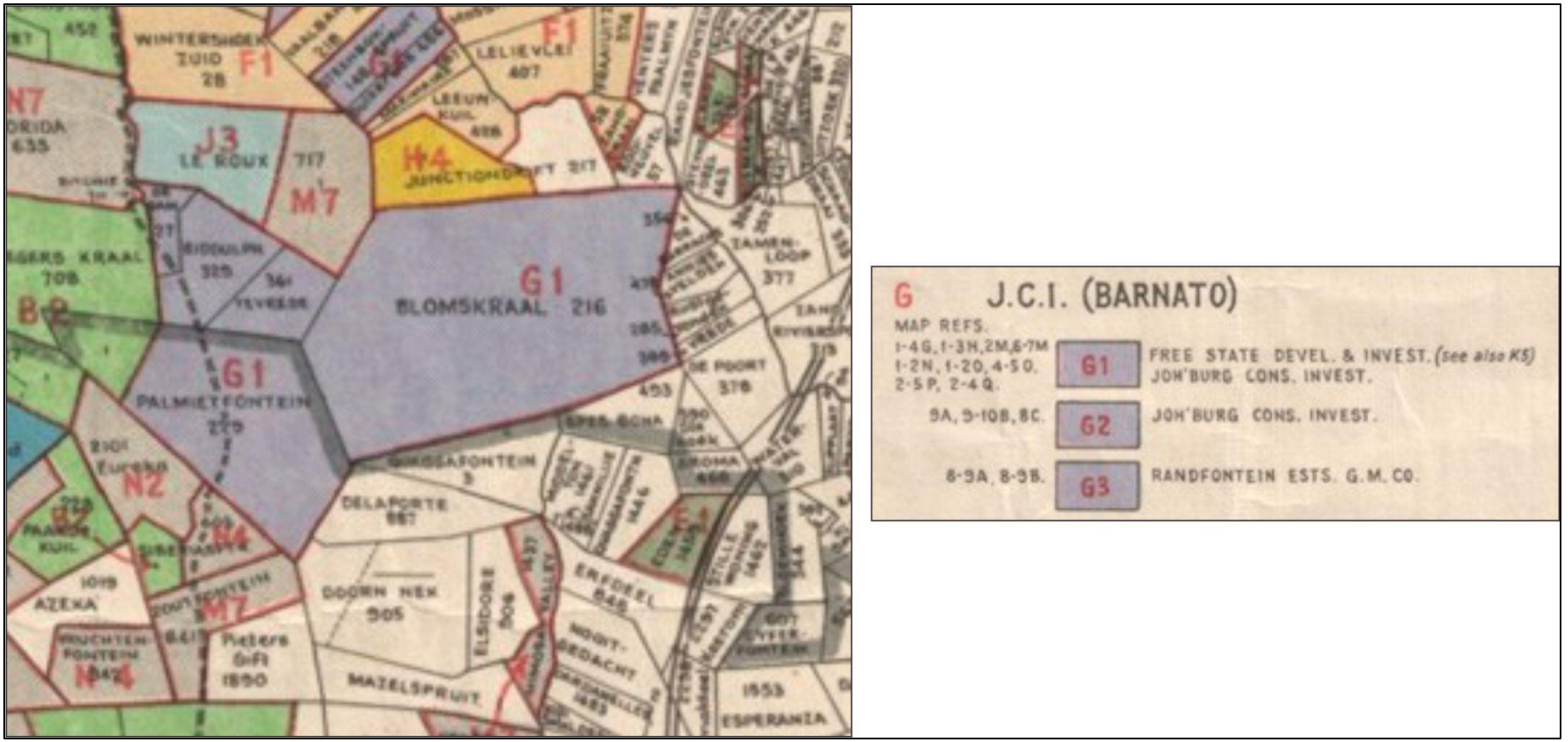

Figure 7-7: The map of the "Gold mines & mineral rights of the Greater Witwatersrand and Orange Free State - 1949. Note the mineral rights on the farm Delaporte and Quaggafontein .

8 FINDINGS AND RESULTS

8.1 ARCHAEOLOGY AND THE CULTURAL LANDSCAPE

8.1.1 Desktop Appraisal

In terms of heritage resources, the general landscape around the project area is primarily well known for its Iron Age Farmer and Colonial / Historical Period archaeology related to farming, rural expansion and warfare of the past century. The farms Delaporte and Quaggafontein were surveyed at around 1895 along with other farms in the area. An analysis of historical aerial imagery and archive maps reveals the following (see Figure 5-2 to Figure 5-6):

- The farm Quagga Fontein is indicated on the South African War Map (1899-1902) of the Winburg area dating to 1900.
- A mining right for Gold Mining existed on the property and adjoining farms in the 1940's and the holder of the right was the J.C.I (Bernato) Group.
- Besides for catchment dams and boreholes, no man-made features are indicated on the farms Delaporte and Quaggafontein but so-called "huts" appear on Blomhoek (in the power line corridor) on topographic maps dating to 1947, 1975 and 1997. The maps indicate "erosion / sand" over vast areas across the Delaporte and Quaggafontein properties.
- These maps also indicate vast cultivated fields occurring across properties traversed by the proposed power line corridor, over past decades.
- Aerial imagery dating to 1950 indicate that portions of the Delaporte and Quaggafontein property - and particularly areas subject to this assessment - have been altered by what seems to be erosion and agriculture.
- Buildings and potential man-made structures appear outside and within the project area on the historical aerial imagery (1950).

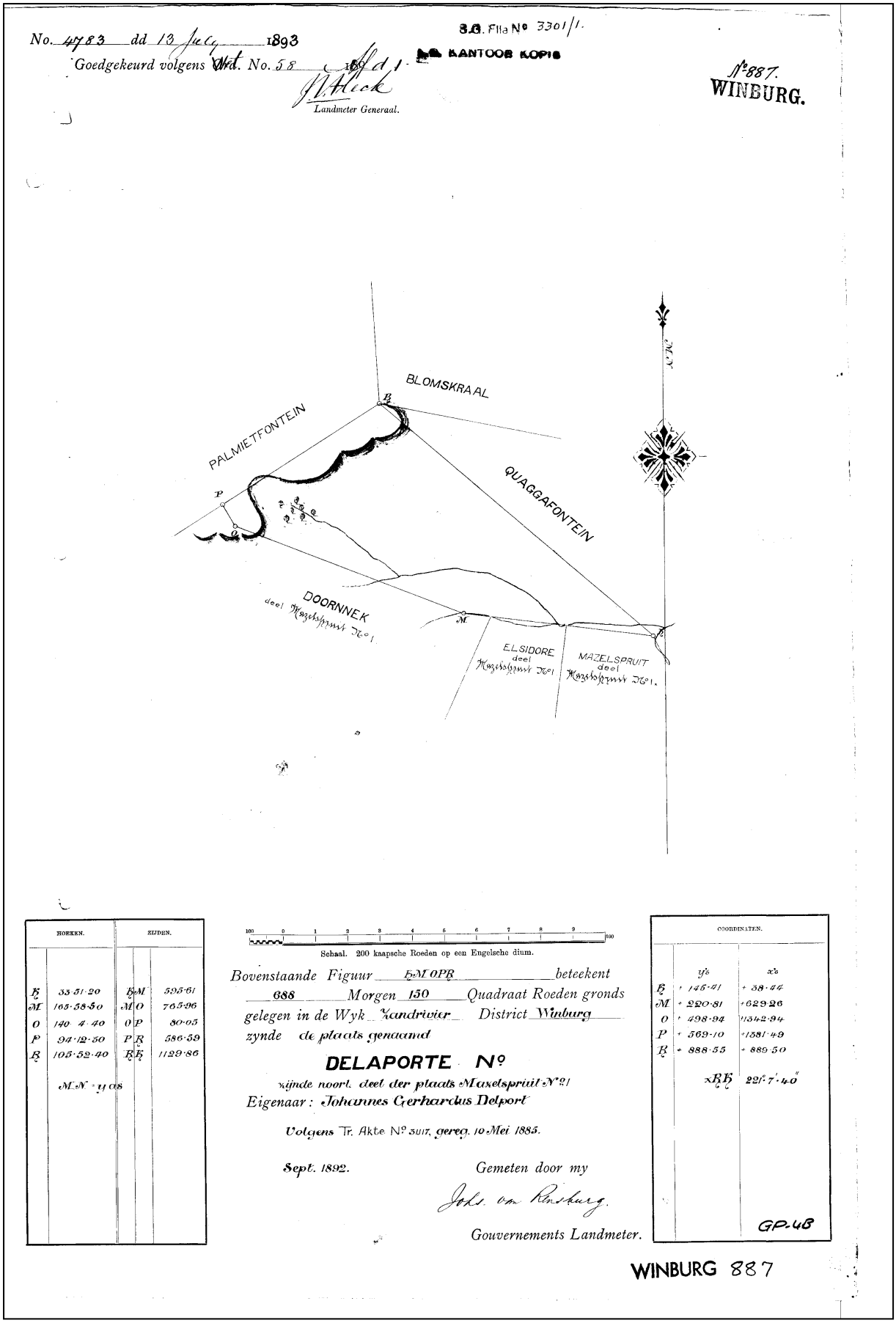

Figure 8-1: Title deed for the farm Junctiodrift adjoining Delaporte, dating to 1892.

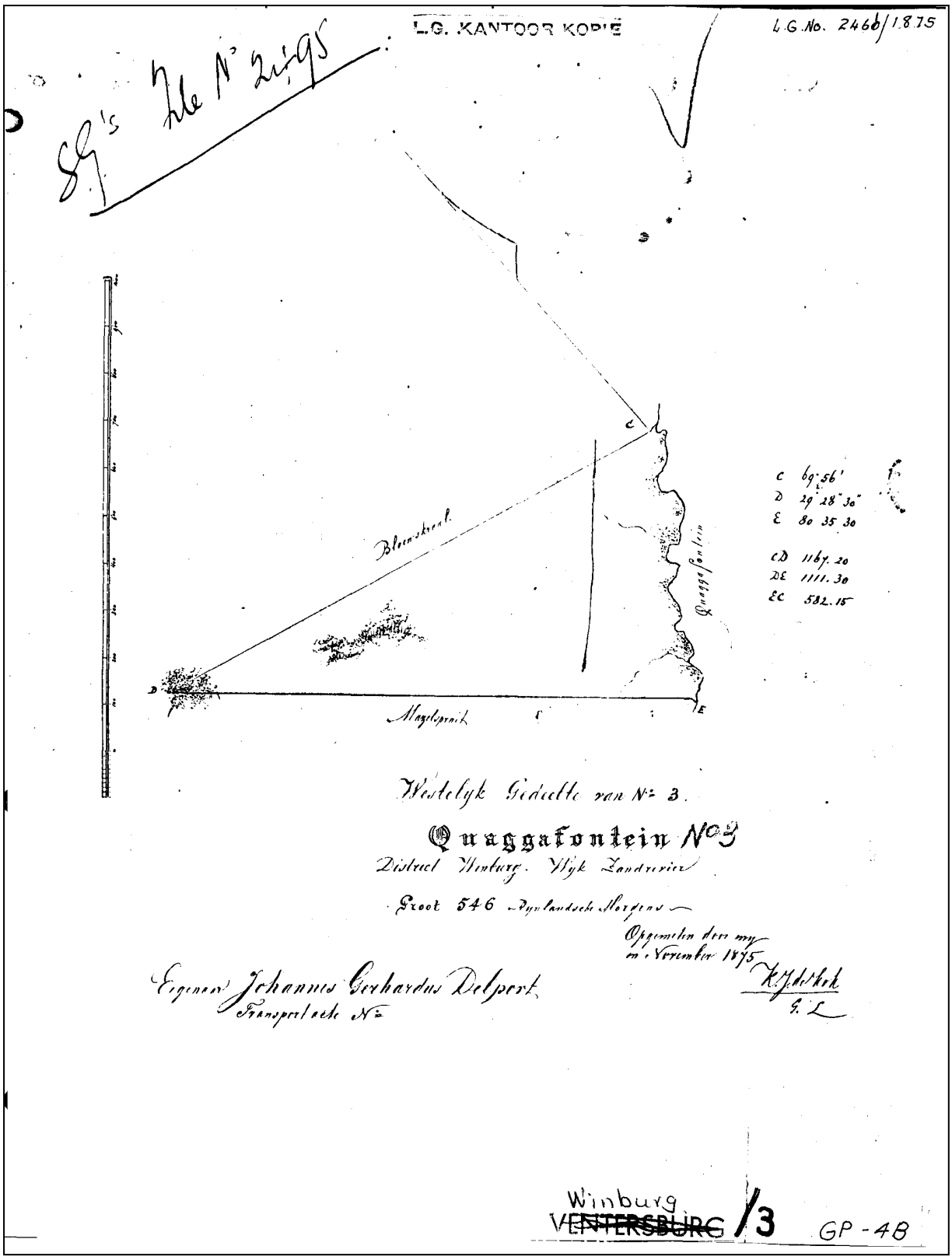

Figure 8-2: Title deed for the farm Quaggafontein , dating to 1895.

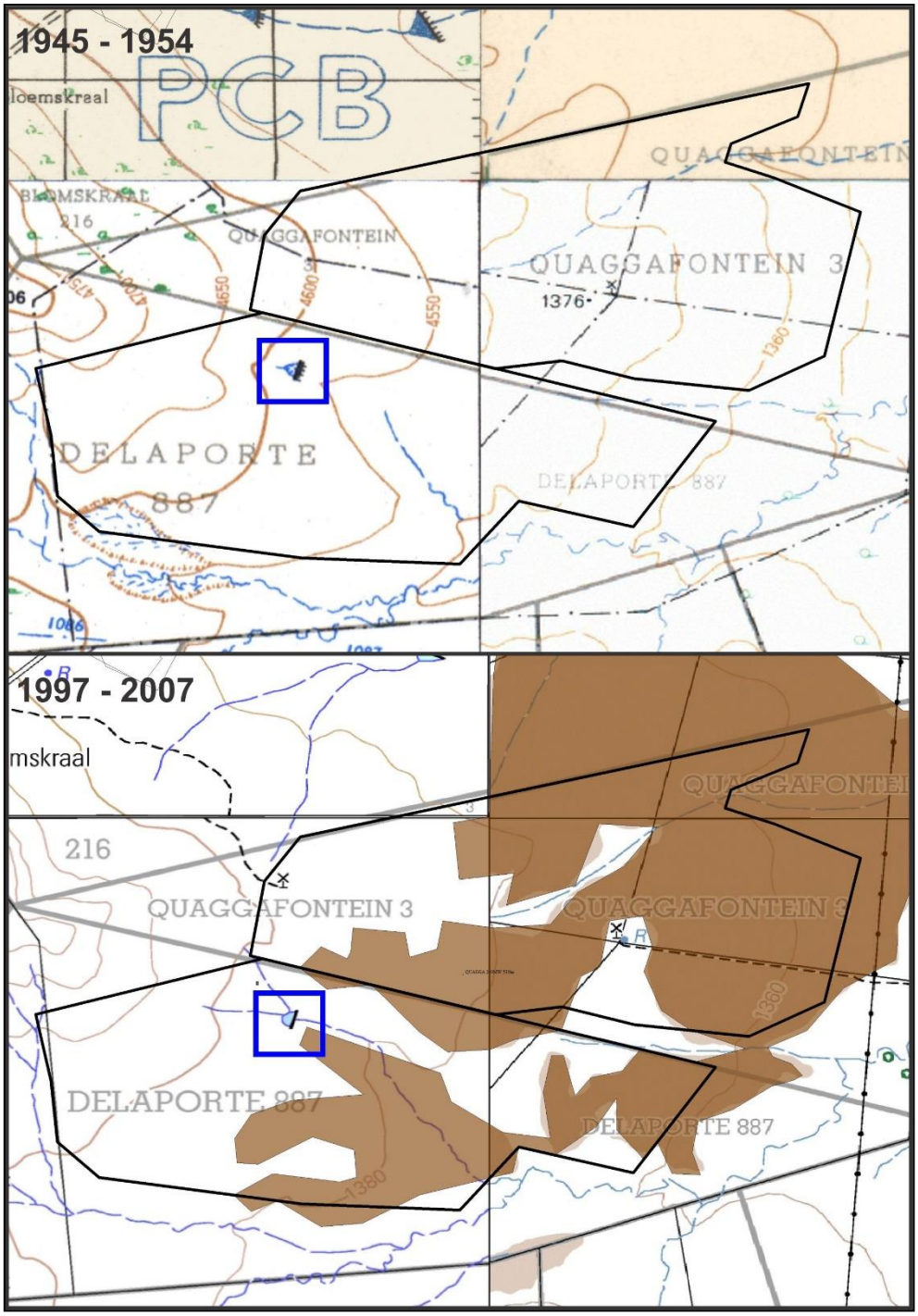

Figure 8-3: Historical topographic maps of Delaporte and Quaggafontein indicating the location of the project area (black outline) in the past decades. A more recent dam is indicated by the blue block and brown shading indicates "erosion/ sand".

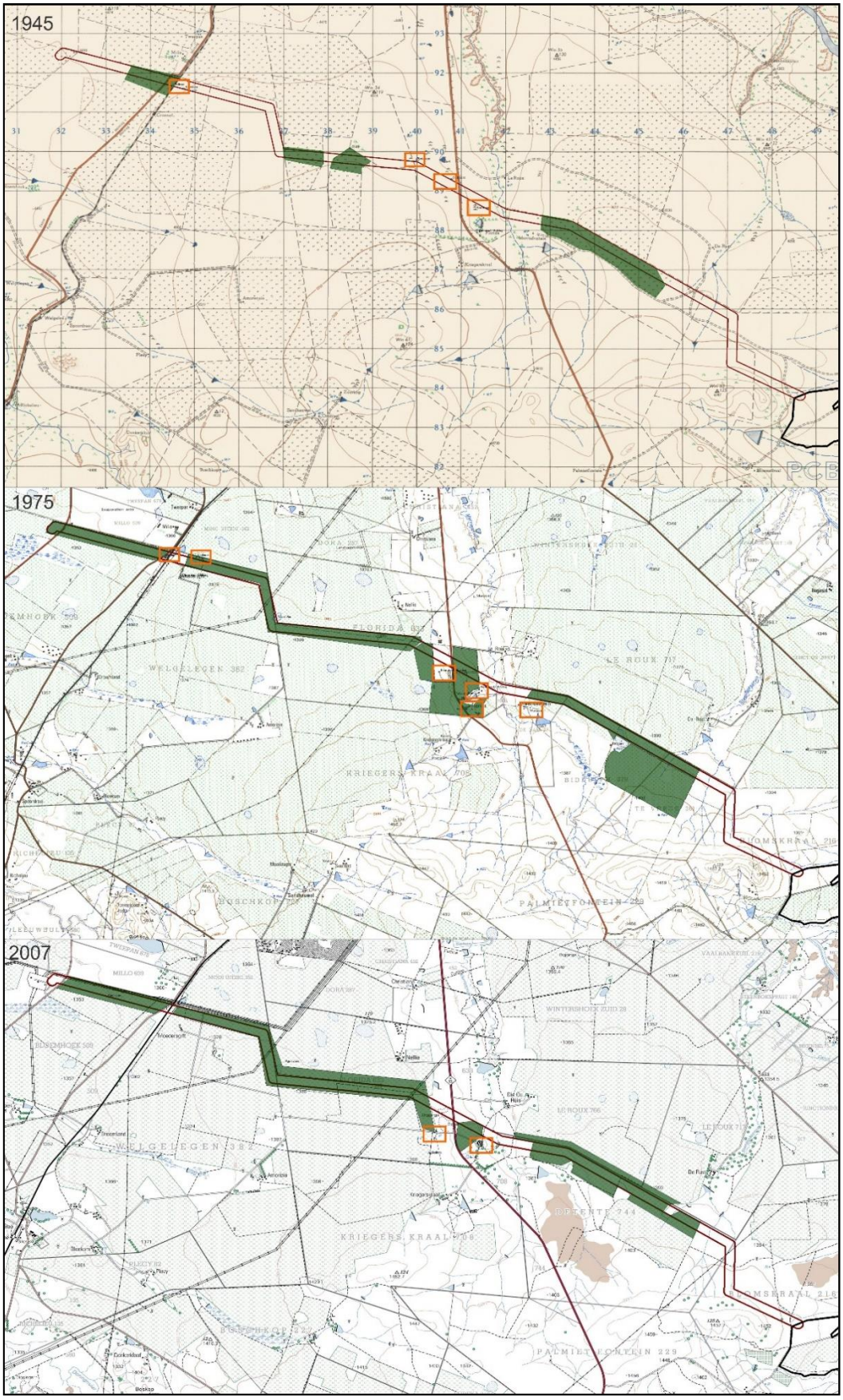

Figure 8-4: Historical topographic maps of farms along the proposed power line corridor (red polygon) indicating the location of the project area (black outline) in the past decades. Man-made structures and settlements are indicated by the yellow block and cultivated land are shaded in green.

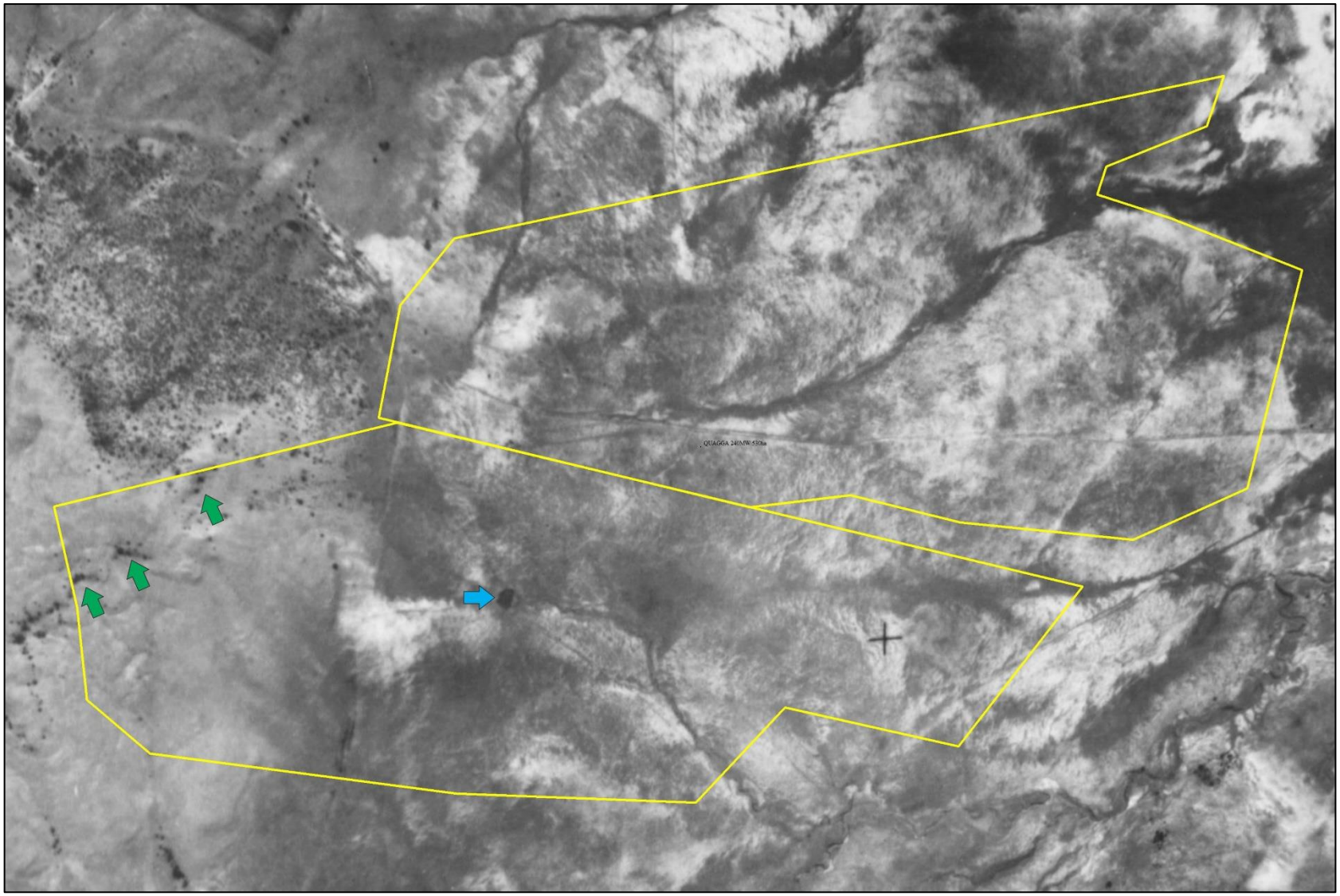

Figure 8-5: An aerial image of the project site on Delaporte and Quaggafontein dating to 1950 (yellow outline) indicating the presence of a dam (blue arrow) and tree cover (green arrows).

Figure 8-6: An aerial image of the power line corridor (yellow outline) captured during a previous assessment (Kruger 2021) indicating the presence of extensive agriculture activities (green arrows) as well as potential man-made structures or features of heritage potential (yellow arrows).

8.1.2 Site Survey Findings

An analysis of historical aerial imagery and archive maps of areas subject to this assessment suggests a landscape which has been subjected to historical farming activities possibly sterilising the area of heritage remains. This inference was confirmed during an archaeological site assessment but *in situ* heritage remains were encountered. The following observations were made during the site survey.

- **Proposed Quagga Solar Park Project Area**

QGS-IA01 (Possible Iron Age activity area)

Farm Quaggafontein 3: S28.251358° E27.012257°

Field Rating: 3. Medium significance

A possible Iron Age activity area were noted along the north-eastern periphery of the project area. Here, single stone wall foundations and rudimentary stone cairns were noted. In addition, a stone displaying linear striations were noted and the site was probably used to sharpen spears / knives. Considering the proximity of this site to known Late Iron Age stone walled sites on the neighbouring Blomskraal, this site probably forms part of a complex later Iron Age landscape and it is of scientific value in terms of its regional representation and association in the Iron Age farmer period landscape of this area. The site occurs within the proposed project development area and impact on the site is likely where potential direct impacts to the site should be mitigated and monitored.

Figure 8-7: View of the possible Iron Age activity area at Site QGS-IA01. Note stone feature in the veld and under a tree.

Figure 8-8: View of a rock noting striations on the surface (left) and collapsed walling under a tree (right).

- **Proposed Quagga Solar Park Power Lines Project Area**

QGS-HP01 (Historical Period Remains)

Farm Blomskraal 216: S28.23525° E26.98127°

Field Rating: 2a. Low significance

The ruined remains of a Historical Period settlement area consisting out of a number of concrete and brick foundation structures, ash middens and material culture such as glass, metal, plastic and a lower grind stone were noted in the project area. The site was probably a compound of worker's houses for the Blomskraal farm. An absolute temporal context for the settlement could not be ascertained but it appears on archive aerial photographs (1950) and historical topographical maps (1947 and 1975). As such, the site is older than 60 years - and generally protected under the National Heritage Resource Act (NHRA 1999) but structures and features are poorly preserved and no notable heritage or historical association could be established. The site occurs within the proposed powerline corridor area and impact on the site is likely where potential direct impacts to the site should be mitigated and monitored.

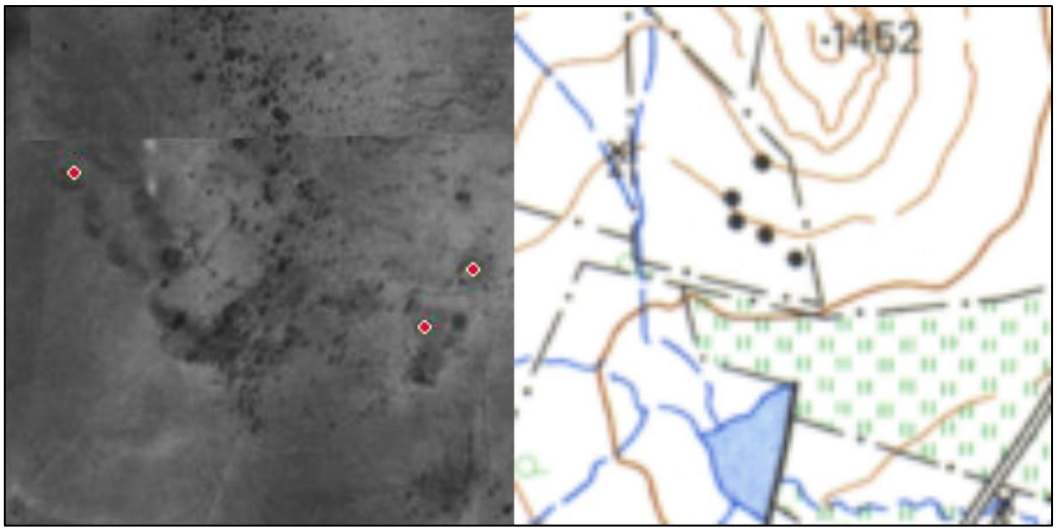

Figure 8-9: View of the historical settlement area at Site QGS-HP01 on an aerial image dating to 1947 (left) and indicated on a topographical map dating to 1950 (right).

Figure 8-10: View of the settlement remains at Site QGS-HP01.

Figure 8-11: View of foundations (left) and a lower grindstone (right) at Site QGS-HP01.

QGS-HP02 (Historical Period Remains)

Farm Florida 633: S28.185712° E26.912904°

Field Rating: 2a. Low significance

The ruined remains of another Historical Period settlement area consisting out of a number of concrete and brick foundation structures, ash middens and material culture such as glass, metal and plastic were noted on the farm Florida in the project area. The site was probably a compound of worker's houses for the Florida farm. An absolute temporal context for the settlement could not be ascertained but it appears on archive aerial photographs (1950) and historical topographical maps (1947 and 1975). As such, the site is older than 60 years - and generally protected under the National Heritage Resource Act (NHRA 1999) but structures and features are poorly preserved and no notable heritage or historical association could be established. The site occurs within the proposed powerline corridor area and impact on the site is likely where potential direct impacts to the site should be monitored.

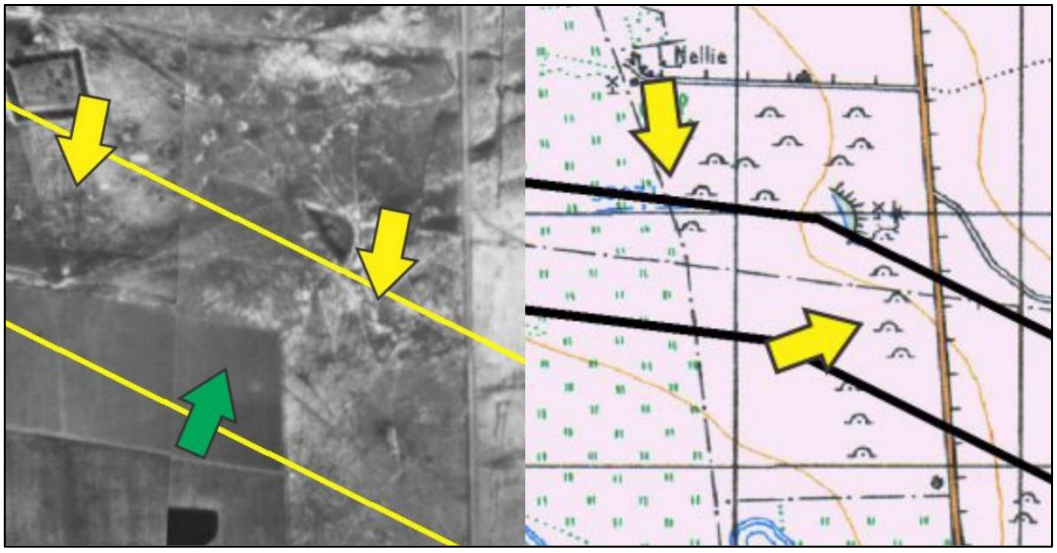

Figure 8-12: View of the historical settlement area at Site QGS-HP02 on an aerial image dating to 1947 (left) and indicated on a topographical map dating to 1950 (right).

Figure 8-13: View of the settlement remains at Site QGS-HP02.

Figure 8-14: View of ash deposits (left) and a site clearing (right) at Site QGS-HP02.

QGS-BP01 (Burial Site)

Farm Blomskraal 216: S28.232145° E26.983951°

Field Rating: 4b. High significance

An informal burial site holding a large number of graves was noted in a densely vegetated part of the project area in association with Historical Period remains at site QGS-HP-01. Some of the graves are dressed with marked marble and concrete headstones and other burials are indicated by elongated stone cairn and circle features filled in with earth. Dates of passing of deceased indicated on some of the tombstones range from 1076 to 1991. The burials area positioned in a relative east-west orientation, the site is not fenced off and its condition of preservation is poor. Material culture such as enamel and glass containers were noted on the surface in association with the graves. The burial site, which is of high heritage significance, occurs within the proposed powerline corridor area and impact on the site is likely where potential direct impacts to the site should be mitigated and monitored (see Section 6).

Figure 8-15: View the burial site at Site QGS-BP01.

Figure 8-16: View of headstones on graves at Site QGS-BP01.

Figure 8-17: View a graves and grave goods on burials at Site QGS-BP01.

QGS-CP01 Contemporary Period Feature

Farm Bloemhoek 509: S28.165590° E26.855740°

Field Rating: None

Concrete building foundations, wall remains, concrete stormwater pipes and material culture such as glass, metal, and plastic were noted in the project on the farm Bloemhoek, area next to a railway line. An absolute age for the structures could not be ascertained but the buildings do not appear on historical topographical maps and aerial photographs and the site is probably of more recent age. The structure remains are therefore not of heritage significance.

Figure 8-18: View of concrete building fragments and a stone cairn at Site QGS-CP01.

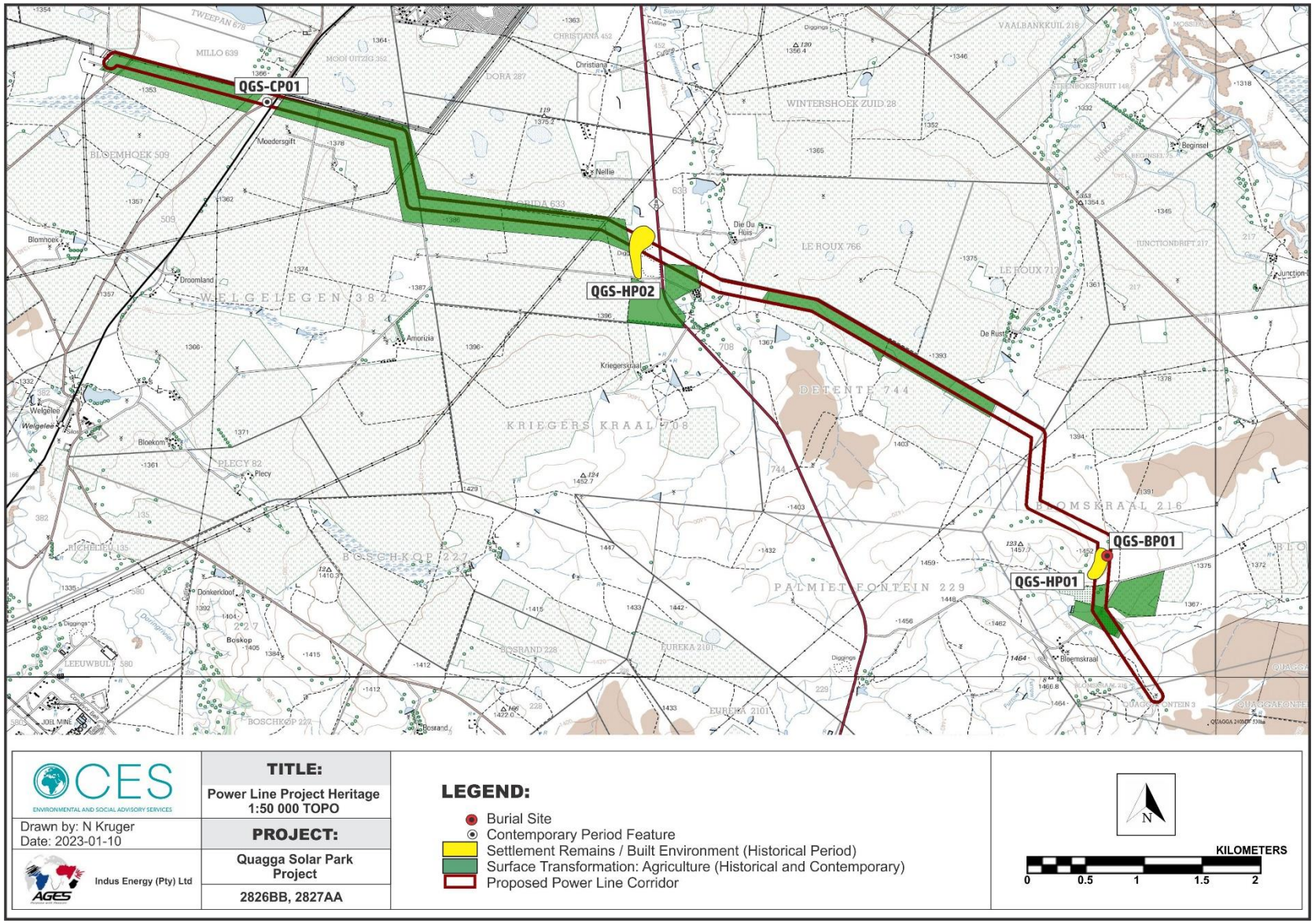

Figure 8-19: Topographical map indicating the location of heritage occurrences and landscape features discussed in the text.

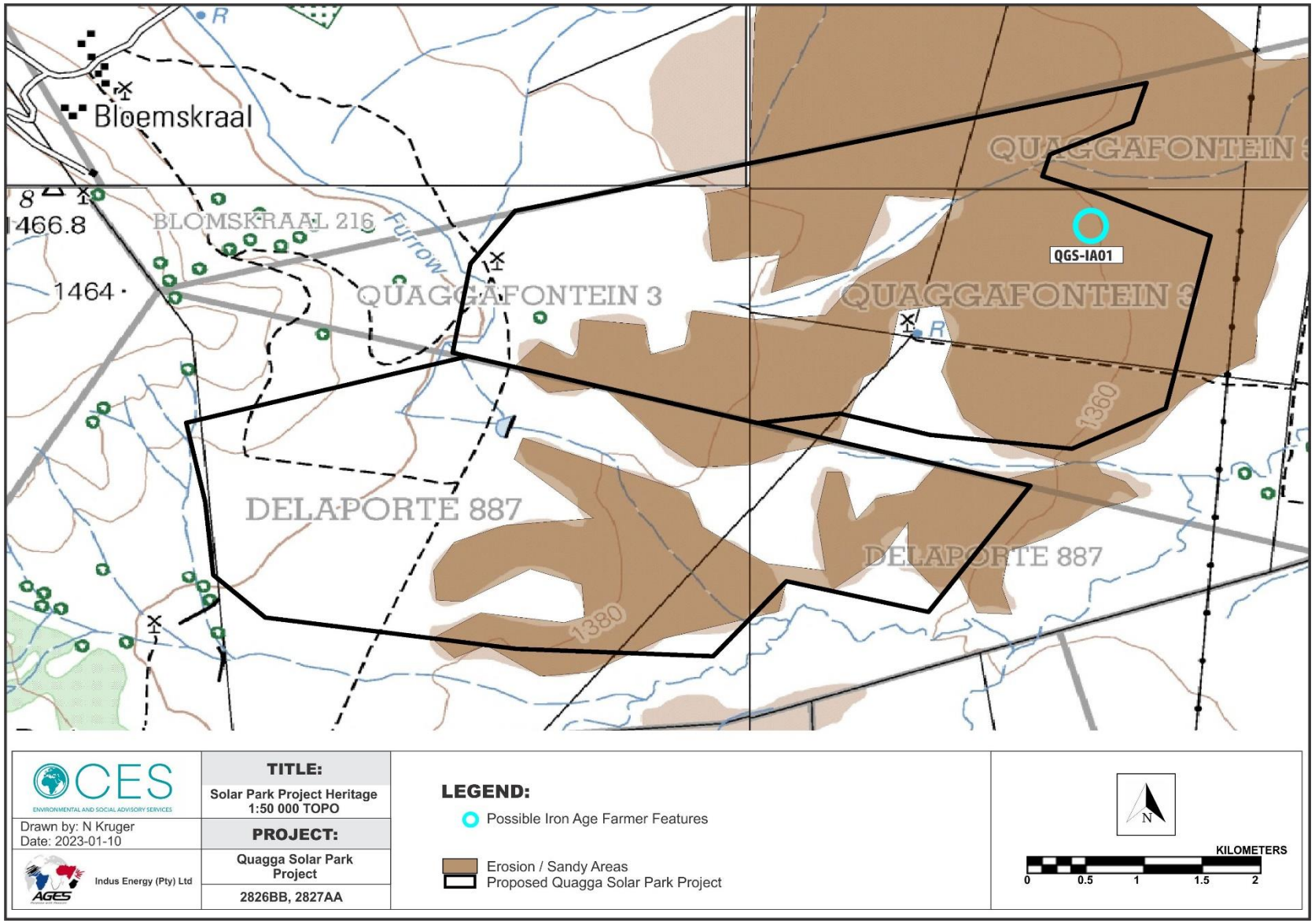

Figure 8-20: Topographical map indicating the location of heritage occurrences and landscape features discussed in the text.

9 EXPECTED HERITAGE IMPACTS OF THE PROJECT

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. Direct or primary effects on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work. Indirect effects or secondary effects on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access (refer to Section 10.3 in the Addendum for an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected).

The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts. The following section provides a background to the identification and assessment of possible direct and indirect impacts and alternatives, as well as a range of risk situations and scenarios commonly associated with heritage resources management. A guideline for the rating of impacts and recommendation of management actions for areas of heritage potential within the study area is supplied in Addendum 3.

9.1 PRECONSTRUCTION PHASE

Heritage risks and impacts are commonly associated with construction activities and no impact on archaeological sites, built environment features, human burials and the cultural landscape is foreseen during the preconstruction phase. However, some mitigation and management measures will require actioning during this phase, particularly the demarcation of development no-go heritage buffers for the Iron Age Farmer site (QGS-IA01), the Historical settlements (QGS-HP01, QGS-HP02) and the burial site (QGS-BP01) prior to the commencement of construction. Should impact on any of these sites be foreseen, Phase 2 heritage assessment, destruction permitting and / or full grave relocation procedures should be initiation during the preconstruction phase.

9.2 CONSTRUCTION PHASE

Construction activities pose the greatest threat to tangible heritage resources within the cultural landscape and it is often during this Phase that heritage sites are lost. However, portions of the project area and the baseline environment have been affected by historical, recent and ongoing farming activities which possibly sterilized the landscape from prehistorical archaeological and other remnants. The possible Iron Age Farmer site (QGS-IA01) is situated in the project area and impact on the archaeological landscape during the construction phase should be mitigated and monitored. In addition, previously undetected cultural (archaeological) layers are usually superficial, subsoil layers and that makes them easily vulnerable to destruction and the likelihood for encountering additional cultural heritage sites as the land clearing process commences, or during construction of infrastructure should be considered. Two Historical Period settlements (QGS-HP01, QGS-HP02) noted in the proposed power line corridor might be impacted and the site will require mitigation during the preconstruction phase, either by means of development no-go heritage buffering or the application for a destruction permit. Similarly, a cemetery (QGS-BP01) occurs in close proximity of project development areas and a potential high

impact should be mitigated to low during the construction phase by means of a no-go development buffer. It should be noted that graves and cemeteries do not only occur around farmsteads in family burial grounds but they are also randomly scattered around archaeological and historical settlements in the rural areas of the Northern Cape Province. The probability of informal human burials encountered during the construction phase should thus not be excluded. Generally, the construction of transmission lines are typically low impact activities but excavation holes may expose artefacts, sites or human remains and ECO monitoring activities will be required throughout the construction phase of the project. Monitoring activities will be required throughout the construction phase of the Project in order to avoid the destruction of previously undetected heritage sites and human burials.

9.3 Operations Phase

It is understood that no new areas will be disturbed and/or impacted during the operations phase of the project and the risk and severity of heritage impacts should decrease once the projects activate. Furthermore, the majority of sites of archaeological and heritage significance would have been recorded and/or assessed in preceding phases. However, impact on previously undetected arkeological sites, human burials and the cultural landscape might occur as a result of operational activities (site access, movement, maintenance, trespassing, natural elements, hazards etc). During the Operations Phase, the implementation of mitigation and management measures for sites QGS-IA01, QGS-HP01, QGS-HP02 and the burial site at site QGS-BP01 should be tracked and continuous ECO site monitoring will be required (should these site/s be retained).

9.4 Decommissioning and Post-closure Phase

The decommissioning phase will see the progressive downscaling and termination of operations. Similar to the Operations Phase, no new areas are expected to be disturbed and/or impacted and no additional sites of archaeological and heritage significance are expected to be impacted on during decommissioning. During the decommissioning and closure phase, it may be recommended that the ECO review management procedures (and particularly those recommended for sites QGS-IA01, QGS-HP01, QGS-HP02 and the burial site at site QGS-BP01) and ensure that effective measures were implemented.

9.5 Cumulative Impacts

It is the opinion of the Specialist that the proposed Quagga Solar Park and its associated power line connection will have a little to negligible negative cumulative impact on the heritage value of the area for the following reasons:

- The absence of significant archaeological resources documented in the project area and in its immediate surroundings implies low-severity short and long-term impacts on the heritage landscape.
- The transformed nature of much of the project landscapes and the presence of agricultural fields and existing power lines in development areas means that the significance of the landscape in terms of its heritage is bound not to change during the course of construction, operation and decommissioning of the project.
- The heritage context and sensitivity of the proposed development zones points to a landscape of limited heritage significance on a local level.
- It should be noted that archaeological knowledge and the initiation of research projects into significant archaeological sites often result from Heritage Impact Assessments conducted for developments. Provided that significant archaeological sites are conserved and that appropriate heritage mitigation and management procedures are followed, the cumulative impact of development can be positive.

9.6 Heritage Impact Assessment Matrix

The following table (Table 1) summarizes impacts to the heritage landscape of the study area:

Table 1 Impact Assessment Matrix

Pre-Construction Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
QGS-BP01, QGS-IA01	Negative	Short term	Study area	Moderate / Moderately Beneficial	Unlikely	LOW NEGATIVE	Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
QGS-HP01, QGS-HP02	Negative	Short term	Study area	Slight/ Slightly Beneficial	Unlikely	LOW	Reversible	Resource will not be lost	Easily achievable	LOW

Construction Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
QGS-BP01, QGS-IA01	Negative	Permanent	Study area	Severe/ Beneficial	Probable	HIGH NEGATIVE	Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
QGS-HP01, QGS-HP02	Negative	Permanent	Study area	Moderate / Moderately Beneficial	Probable	LOW	Reversible	Resource will not be lost	Easily achievable	LOW

Operation Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
QGS-BP01, QGS-IA01	Negative	Short term	Study area	Moderate / Moderately Beneficial	Unlikely	LOW NEGATIVE	Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
QGS-HP01, QGS-HP02	Negative	Short term	Study area	Slight/ Slightly Beneficial	Unlikely	LOW	Reversible	Resource will not be lost	Easily achievable	LOW

Closure / Decommissioning Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
QGS-BP01, QGS-IA01	Negative	Short term	Study area	Moderate / Moderately Beneficial	Unlikely	LOW NEGATIVE	Reversible	Resource will not be lost	Easily achievable	LOW NEGATIVE
QGS-HP01, QGS-HP02	Negative	Short term	Study area	Slight/ Slightly Beneficial	Unlikely	LOW	Reversible	Resource will not be lost	Easily achievable	LOW

10 HERITAGE MANAGEMENT

10.1 HERITAGE SITE MANAGEMENT

Recommendations for relevant heritage resource management actions are vital to the conservation of heritage resources. A general guideline for recommended management actions is included in Section 10.4 of Addendum 3.

OBJECTIVE: ensure conservation of heritage resources of significance, prevent unnecessary disturbance and/or destruction of previously undetected heritage receptors.

*For the Burial Site of high significance **(QGS-BP-01)** the following are required in terms of heritage management and mitigation:*

POTENTIAL IMPACT	Damage/destruction of sites.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.		
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**PROJECT COMPONENT/S**
Conservation: Demarcate a 50m no-go development buffer with a fence or permanent construction barricade. Redesign placement of monopoles, pylons, service roads and other infrastructure to avoid the burial site and the no-go buffer.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Pre-Construction**
Site Monitoring: Monitor the 50m no-go development buffer in order to detect potential impact on the site at the earliest opportunity. ***General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.***		ECO	**Construction**
Site Monitoring: Monitor the 50m no-go development buffer in order to detect potential impact on the site at the earliest opportunity. ***General Site Monitoring***		ECO	**Operation**
Site Monitoring: Monitor the 50m no-go development buffer in order to detect potential impact on the site at the earliest opportunity. **Close-Out Reporting:** ECO review management procedures and ensure that effective measures were implemented.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Closure / Decommissioning**
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		

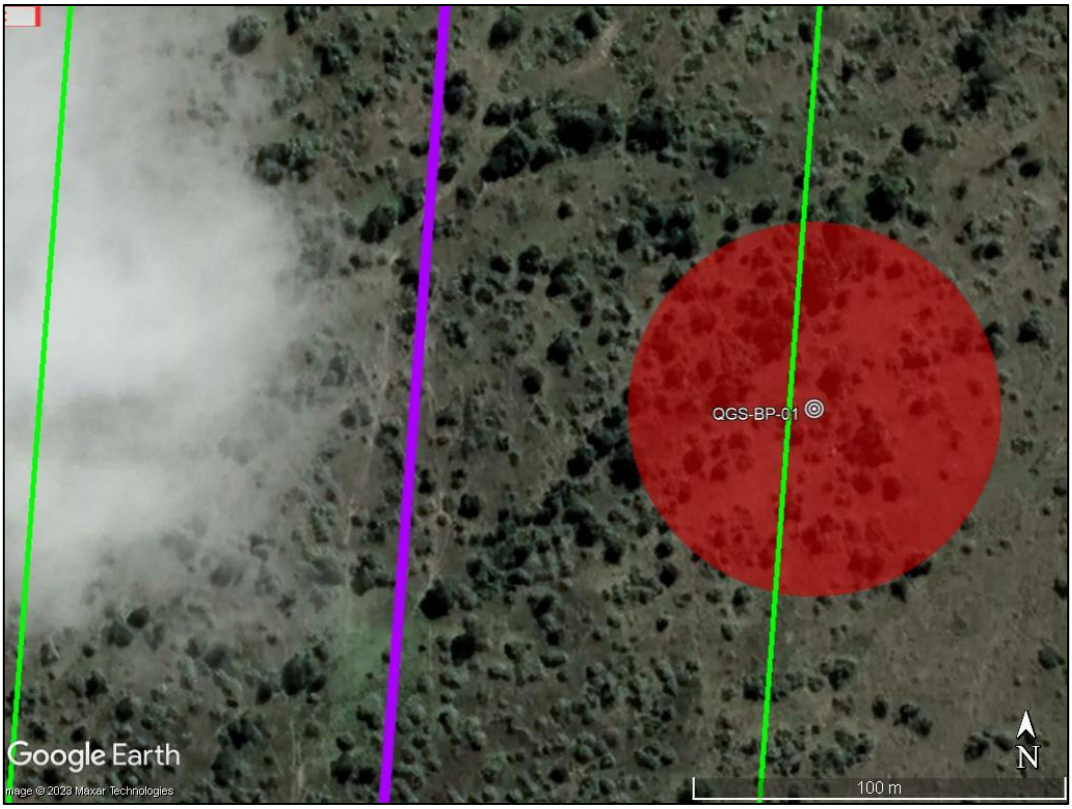

Figure 10-1: Aerial image indicating the 50m no-go development buffer (red shade) recommended for site QGS-BP01 in relation to project infrastructure components: the purple line indicates the proposed power line centre and the green lines indicated a 100m corridor.

*For the potential Iron Age activity area of medium significance **(QGS-IA-01)** within the project area the following are required in terms of heritage management and mitigation:*

POTENTIAL IMPACT	Damage/destruction of sites.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.		
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**PROJECT COMPONENT/S**
Permitting: If the sites are to be destroyed, initiate Phase 2 Assessments (documentation, sampling) and obtain the necessary destruction permits from the relevant Heritage Resources Authorities prior to site impact and destruction. **Conservation:** If the sites are to be retained, demarcate a 50m no-go development buffer with a fence or construction barricade.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Pre-Construction**
Site Monitoring: If the sites are to be retained, monitor the 50m no-go development buffer in order to detect potential impact on the site at the earliest opportunity. ***General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.***		ECO	**Construction**
Site Monitoring: If the sites are to be retained, monitor the 50m no-go development buffer in order to detect potential impact on the site at the earliest opportunity. ***General Site Monitoring***		ECO	**Operation**
Site Monitoring: If the sites are to be retained, monitor the 50m no-go development buffer in order to detect potential impact on the site at the earliest opportunity. **Close-Out Reporting:** ECO review management procedures and ensure that effective measures were implemented.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Closure / Decommissioning**
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		

Figure 10-2: Aerial image indicating the 50m no-go development buffer (red shade) recommended for site QGS-IA01 in relation to project infrastructure components: the green line indicates the Quagga Solar Park project boundary.

*For the Historical Period sites of medium-low significance **(QGS-HP-01, QGS-HP-02)** within the project area the following are required in terms of heritage management and mitigation:*

POTENTIAL IMPACT	Damage/destruction of sites.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.		
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**PROJECT COMPONENT/S**
Permitting: If the site is to be destroyed, obtain the necessary destruction permits from the relevant Heritage Resources Authorities prior to site impact and destruction. **Conservation:** If the site is to be retained, demarcate a 20m conservation buffer with a fence or construction barricade.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Pre-Construction**
Site Monitoring: If the site is retained, monitor the 20m conservation buffer in order to detect potential impact on the site at the earliest opportunity. ***General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.***		ECO	**Construction**
Site Monitoring: If the site is retained, monitor the 20m conservation buffer in order to detect potential impact on the site at the earliest opportunity. ***General Site Monitoring***		ECO	**Operation**
Site Monitoring: If the site is retained, monitor the 20m conservation buffer in order to detect potential impact on the site at the earliest opportunity. **Close-Out Reporting:** ECO review management procedures and ensure that effective measures were implemented.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Closure / Decommissioning**
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		

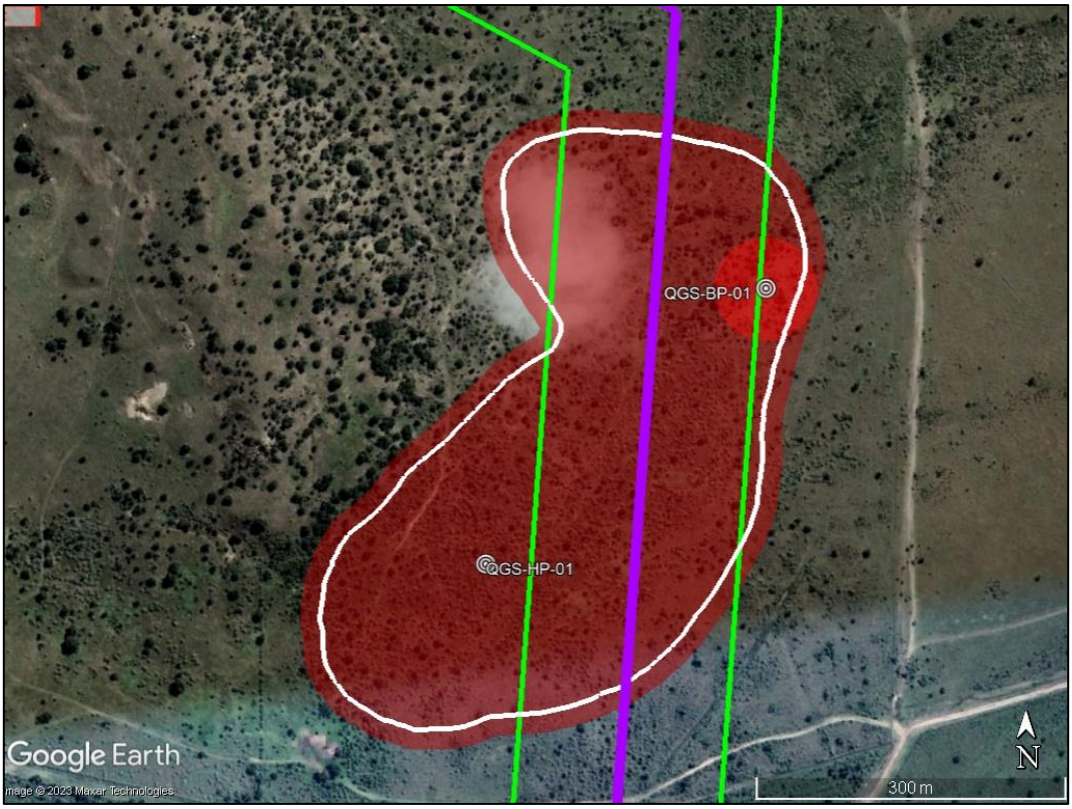

Figure 10-3: Aerial image indicating the 20m no-go development buffer (red shade) recommended for site QGS-HP01 in relation to project infrastructure components: the purple line indicates the proposed power line centre and the green lines indicated a 100m corridor. Also note the proximity of the burial site at QGS-BP01.

*For the Historical Period site of low significance **(QGS-HP-02)** within the project area the following are required in terms of heritage management and mitigation:*

POTENTIAL IMPACT	Damage/destruction of sites.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.		
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**PROJECT COMPONENT/S**
General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.		ECO	**Construction**
General Site Monitoring		ECO	**Operation**
Close-Out Reporting: ECO review management procedures and ensure that effective measures were implemented.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Closure / Decommissioning**
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		

11 CONCLUSION AND RECOMMENDATIONS

The larger landscape around the project area indicates a rich heritage horizon encompassing Iron Age Farmer and Colonial / Historical Period archaeology primarily related to farming, rural expansion and warfare of the past century. Portions of the project area and the baseline environment have been affected by historical, recent and ongoing farming activities which possibly sterilized the landscape of prehistorical archaeological and other remnants. The following observations are made for the proposed Quagga Solar Park Project:

- A possible Iron Age Farmer site (**QGS-IA01**) is of medium significance in terms of its regional representation in the archaeological landscape and its relation to the vast and prominent later Iron Age representations of the Free State. The site is situated in the Quagga Solar Park project area and impact might occur. It is recommended that a 50m development no-go buffer be implemented prior to commencement of the construction phase. The site and the buffer should be monitored throughout all phases of the project in order to detect impact on the site and / or destruction of previously undetected heritage sites at the earliest opportunity. Should impact on the site be foreseen, a Phase 2 heritage assessment subject to necessary SAHRA permitting should be initiated and application should be made for a destruction permit during the preconstruction phase
- The remains of a large Historical Period settlement (**QGS-HP01**) occur within the proposed powerline corridor area and impact on the site is likely. The site of medium-low significance and its features are generally protected under the National Heritage Resource Act (NHRA 1999). Since human burials occur in the vicinity of the site, it is recommended that a 20m development no-go buffer be implemented prior to commencement of the construction phase. The site and the buffer should be monitored throughout all phases of the project in order to detect impact on the site and / or destruction of previously undetected heritage sites at the earliest opportunity. Should impact on the site be foreseen application should be made for a destruction permit during the preconstruction phase. Another small Historical Period settlement (**QGS-HP02**) occurs within the proposed powerline corridor area and impact on the site is likely but the little remains of the site in terms of features and material culture and it is rated as low significance. The site should be monitored throughout all phases of the project in order to avoid the potential destruction of undetected heritage sites.
- A cemetery (**QGS-BP01)** occurs within the proposed powerline corridor area and impact on the high heritage significance heritage resource is likely**.** It is primarily recommended that infrastructure such as the placement of monopoles, pylons and service roads be designed to avoid the burial site where a 50m no-go buffer should be demarcated prior to the construction phase. The site should be fenced or a permanent construction barricade should be erected to clearly indicate the site and the margins of the no-go buffer. The cemetery must be monitored on a frequent basis during all phases of the project by an informed ECO in order to detect direct or indirect impact on these sites. A Site Management Plan (SMP) should be implemented, detailing these conservation measures and indicating responsible parties in this regard. Should impact on the resources prove inevitable, the graves should be relocated by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions and laws and by-laws pertaining to human remains. A full social consultation process should occur in conjunction with the mitigation of cemeteries and burials (see Addendum 1).
- As burials have been located on the project property, it is recommended that the EIA public participation and social consultative process address the possibility of further graves occurring in the project area.

- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.

In addition to these site-specific recommendations, careful cognizance should be taken of the following:

- As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.
- Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material occur in the larger landscape, such resources should be regarded as potentially sensitive in terms of possible subsurface deposits.

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13 ADDENDUM 1: SPECIALIST CV

NELIUS LE ROUX KRUGER

BHCS Hons. (Archaeology)

(Date compiled: 2023/01/10)

PERSONAL DETAILS

Nationality:	South African
Date of Birth:	3 April 1979
Postal Address:	Postnet Suite 74, Private Bag x04, Menlo Park, 0102
Work Address:	70 Regency Dr, Route 21 Business Park, Centurion, 0178
Telephone numbers:	W: +27 12 751 2160 C: +27 82 967 2131
Identity number:	790403 5029 087
Languages:	English, Afrikaans, Sepedi (Basic)

HIGHER EDUCATION

University Attended:	University of the Pretoria
Degree Obtained:	BA Archaeology *(Cum Laude)* 2002
Major Subjects:	Anthropology, Archaeology, English, Afrikaans
University Attended:	University of the Pretoria
Degree Obtained:	BHCS Hons. Archaeology (*Cum Laude)* 2004

PROFESSIONAL AFFILIATIONS

- Member of the Association for South African Professional Archaeologists (ASAPA).
- Member of the Council of the Association for South African Professional Archaeologists (ASAPA): CRM Portfolio
- Member of the CRM Section of the Association for South African Professional Archaeologists (ASAPA).
- Member of the Society of Africanist Archaeologists (SAFA).
- Member of the South African Museums Association (SAMA).
- Accredited Professional Archaeologist & CRM Practitioner by the Association for South African Professional Archaeologists (ASAPA) & Heritage Natal (AMAFA).

HONOURS AND AWARDS

Aage V. Jensen Development Foundation (Denmark) grant for participation in the joint SAFA/PAA Congress, Dakar, Senegal (2010).

Five Hundred Years Initiative (NRF) Research Grant (2008 – 2009).

University of Pretoria post-graduate Merit Grant for MA studies in Archaeology (2004 – 2008).

University of Pretoria (CINDEK) bursary for post-graduate studies awarded by the Centre of Indigenous Knowledge (2003).

South African Archaeological Society's Hanisch Award for best graduate student in the Department of Anthropology and Archaeology at the University of Pretoria (2003).

University of Pretoria Academic Honorary Colours (2002).

University of Pretoria Graduate Merit Grant (2002).

University of Pretoria honorarium for archaeological collections management at the Department of Archaeology and Anthropology (2001).

CURRENT STATUS

Heritage Resources Manager for CES (Coastal and Environmental Services)

SPECIALITY FIELDS

- Integrated Heritage and Archaeological Impact Assessment (Phase 1, 2 & 3), complying to SAHRA, PHRA and industry standards for heritage impact assessments.

- Industry standard Heritage Resources Management Plans, complying to SAHRA & PHRA standards for heritage impact assessments.

- Heritage destruction / alteration / excavation permitting facilitation and associated research.

- General facilitation in consultation and negotiation with heritage resources authorities (SAHRA, PHRA's).

- Heritage-related social consultation and focus group facilitation (for example, with Interested and Affected parties).

- Historical and anthropological studies.

- Heritage and Social Spatial Development Frameworks & Strategic Development Area Frameworks for municipalities.

- Industry standard and compliant Social Impact Assessments (SIA's).

- Mine Social and Labour Plans (SLP's)and social facilitation.

- Socio-cultural baseline studies and research.

- GIS and geo-spatial referencing and data analysis, heritage and social mapping.

PROFESSIONAL SKILLS & EXPERIENCE

Nelius Le Roux Kruger is an accredited ASAPA (Association of Southern African Professional Archaeologists) archaeologist and Culture Resources Management (CRM) Practitioner with over 15 years' experience in the fields of heritage resources assessment, conservation management and social studies. In addition, he is involved in various aspects of social research and social impact assessment. He holds a BHCS (Hons) Archaeology degree from the University of Pretoria specializing in the Iron Age Farmer and Colonial Periods of South Africa. He has worked extensively on archaeological and heritage sites of the time periods and cultural contexts present in Southern Africa, both in the commercial and academics spheres and he holds vast experience in human remains relocation and related social consultation. Nelius has conducted social research projects across Southern Africa involving Social Impact Assessments as well as the compilation and monitoring of mining social and labor plans, public meeting facilitation and socio-cultural studies. His experience is not limited to South Africa and he has worked on archaeological and socio-cultural research projects across Africa and the Middle East. His publication record includes a number of academic publications in peer reviewed journals and books as well as a vast number of Heritage Management Reports. Nelius' expertise includes CRM assessment and management, applications in heritage legislation, Social Impact Assessment, social consulting as well as geospacing and Geographical Information Systems (GIS) applications in archaeology and CRM. Nelius is a conscientious and committed archaeologist and social scientist who is dedicated to the professionalism of the discipline of archaeology and social studies. He approaches all aspects of his specialst fields with enthusiasm, maintaining best practise at all times. When working with people, he strives to manage interpersonal communication and group dynamics with dedication, promoting positive group cohesion.

SELECTED PUBLICATIONS

Kruger, N. In Prep. Living the frontier: Ritual and Conflict in Ha-Tshirundu.
Kruger, N. 2016. Forthcoming. The Crocodile in his Pool: Notes on a significant find in the Ha-Tshirundu area, Limpopo Valley, South Africa. Nyame Akuma Bulletin of the Association of Africanist Archaeologists.
Antonites, A. & Kruger, N. et al. 2014. Report on excavations at Penge, a frst-millennium Doornkop settlement. Southern African Humanties 26:177-92
Antonites, A. & Kruger, N. 2012. **A Preliminary Assessment of Animal Distribution on a 19th Century VhaVenda Settlement. Nyame** Akuma Bulletin of the Association of Africanist Archaeologists. 2012:77
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Mathers, K. & Kruger, N. 2008. The Past is another Country: Archaeology in the Limpopo Province in Smith, A. & Gazin-Schwartz, A (Eds.). 2008. Landscapes of Clearance: Archaeological and Anthropological Perspectives. California: Left Coast Press

SELECTED PROJECTS

NATIONAL

- Phase 1 Heritage Impact Assessment (HIA) and further heritage management for the upgrading of the Warrenton Anglo Boer War blockhouse, Warrenton, Northern Cape Province

- Phase 1 Heritage Impact Assessment (HIA) and Phase 2 Site Investigation for the restoration of the old Johannesburg Fort, Constitution Hill, Johannesburg, Gauteng Province

- Phase 1 Heritage Impact Assessment (HIA) and further heritage management for the upgrading/refurbishment of the Burgershoop MPCC, Mogale City, Gauteng Province

- Phase 1 Heritage Impact Assessment (HIA) of historical period heritage sites on the farm Roodekrans, Dullstroom area, Mpumalanga Province

- Phase 1 Heritage Impact Assessment (HIA) of a historical bridge on the farm Pienaarspoort 339jr at Delfsand, Gauteng Province

- Phase 1 Heritage Impact Basements (HIAs) for 20 PV Solar Parks on location at Upington, Kimberley, Vryburg, Kuruman, Kathu, Hotazel, Douglas, Groblershoop and Prieska, Northern Cape Province, South Africa.

- Phase 1 Heritage Impact Assessments (HIAs) for 18 large scale water supply projects on location at East London, Mthatha, Ngcobo, Barley East, Elliot, Cathcart, King Williams Town and Mdantsane, Eastern Cape Province, South Africa.

- Phase 1 Heritage Impact Assessments (HIAs) for more than 40 residential infrastructure developments across South Africa.

INTERNATIONAL

- Heritage Impact Assessment for the Kitumba Copper-Gold Project (KCGP), Zambia

- Heritage Scoping Study for the BTR Kitumba Project, Mumbwa, Zambia

- Heritage Scoping Study for the Buckreef Gold Project, Geita, Tanzania

- Phase 2 mitigation and heritage assessment of the Koidu Monkey Hill Iron Age metallurgy site, Koidu Diamond Mine, Sierra Leone

- Phase 2 heritage site mitigation of the Sessenge archaeological site, Kibali Gold Mine,Democratic Republic of the Congo.

14 ADDENDUM 2: HERITAGE LEGISLATION

14.1 CRM: LEGISLATION, CONSERVATION AND HERITAGE MANAGEMENT

The broad generic term Cultural Heritage Resources refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

14.1.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and their provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act of 1999 a historical site is any identifiable building or part thereof, marker, milestone, gravestone, landmark or tell older than 60 years. This clause is commonly known as the "60-years clause". Buildings are amongst the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Iron Age settlements. "Tell" refers to the evidence of human existence which is no longer above ground level, such as building foundations and buried remains of settlements (including artefacts).

The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects, meteorites and rare geological specimens
- visual art objects
- military objects
- numismatic objects
- objects of cultural and historical significance
- objects to which oral traditions are attached and which are associated with living heritage
- objects of scientific or technological interest
- any other prescribed category

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

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

(e) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(f) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(g) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(h) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(i) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(j) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and the Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities.

14.1.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

The National Heritage Resources Act (Act No. 25 of 1999, section 38) provides guidelines for Cultural Resources Management and prospective developments:

"38. *(1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:*

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site:

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

And:

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

(k) The identification and mapping of all heritage resources in the area affected;

(l) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;

(m) an assessment of the impact of the development on such heritage resources;

(n) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(o) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(p) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(q) plans for mitigation of any adverse effects during and after the completion of the proposed development (38. [3] 1999:64)."

Consequently, section 35 of the Act requires Heritage Impact Assessments (HIAs) or Archaeological Impact Assessments (AIAs) to be done for such developments in order for all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic or technological value or significance to be protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects. Heritage resources management and conservation.

14.2 ASSESSING THE SIGNIFICANCE OF HERITAGE RESOURCES

Archaeological sites, as previously defined in the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people have lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities. Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and *non-renewable.* Many such sites are unfortunately lost on a daily basis through development for housing, roads and infrastructure and once archaeological sites are damaged, they cannot be re-created as site integrity and authenticity is permanently lost. Archaeological sites have the potential to contribute to our understanding of the history of the region and of our country and continent. By preserving links with our past, we may not be able to revive lost cultural traditions, but it enables us to appreciate the role they have played in the history of our country.

- CATEGORIES OF SIGNIFICANCE

Rating the significance of archaeological sites, and consequently grading the potential impact on the resources is linked to the significance of the site itself. The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences. The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3 are used when determining the cultural significance or other special value of archaeological or historical sites. In addition, ICOMOS (the Australian Committee of the International Council on Monuments and Sites) highlights four cultural attributes, which are valuable to any given culture:

- *Aesthetic value:*

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria include consideration of the form, scale, colour, texture and material of the fabric, the general atmosphere associated with the place and its uses and also the aesthetic values commonly assessed in the analysis of landscapes and townscape.

- *Historic value:*

Historic value encompasses the history of aesthetics, science and society and therefore to a large extent underlies all of the attributes discussed here. Usually a place has historical value because of some kind of influence by an event, person, phase or activity.

- *Scientific value:*

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality and on the degree to which the place may contribute further substantial information.

- *Social value:*

Social value includes the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a certain group.

It is important for heritage specialist input in the EIA process to take into account the heritage management structure set up by the NHR Act. It makes provision for a 3-tier system of management including the South Africa Heritage Resources Agency (SAHRA) at a national level, Provincial Heritage Resources Authorities (PHRAs) at a provincial and the local authority. The Act makes provision for two types or forms of protection of heritage resources; i.e. formally protected and generally protected sites:

Formally protected sites:

- Grade 1 or national heritage sites, which are managed by SAHRA
- Grade 2 or provincial heritage sites, which are managed by the provincial HRA (MP-PHRA).
- Grade 3 or local heritage sites.

Generally protected sites:

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 60 years.
- Structures older than 60 years.

With reference to the evaluation of sites, the certainty of prediction is definite, unless stated otherwise and if the significance of the site is rated high, the significance of the impact will also result in a high rating. The same rule applies if the significance rating of the site is low. The significance of archaeological sites is generally ranked into the following categories.

Significance	Rating Action
No significance: sites that do not require mitigation.	None
Low significance: sites, which may require mitigation.	2a. Recording and documentation (Phase 1) of site; no further action required 2b. Controlled sampling (shovel test pits, auguring), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium significance: sites, which require mitigation.	3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High significance: sites, where disturbance should be avoided.	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism
High significance: Graves and burial places	4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

Furthermore, the significance of archaeological sites was based on six main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

15 ADDENDUM 2: IMPACT ASSESSMENT METHODOLOGY

15.1 ISSUES IDENTIFICATION MATRIX

Impacts were rated and assessed using an Impact and Risk Assessment Methodology provided by CES, for the Scoping Phase of the EIA process in accordance with the requirement of EIA Regulations. Here, two parameters and five factors are considered when assessing the significance of the identified issues, and each is scored. ***Significance*** is achieved by ranking the five criteria presented in Table 1 below, to determine the overall significance of an issue. The ranking for the "effect" (which includes scores for duration; extent; consequence and probability) and reversibility / mitigation are then read off the matrix presented in Table 2 below, to determine the overall significance of the issue. The overall significance is either negative or positive.

- ***Duration*** - The temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

- ***Extent*** - The spatial scale defines the physical extent of the impact.

- ***Consequence*** - The consequence scale is used in order to, as far as possible, objectively evaluate how severe a number of negative impacts associated with the issue
under consideration might be, or how beneficial a number of positive impacts associated with the issue under consideration might be.

- The ***probability*** of the impact occurring - The likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

- ***Reversibility / Mitigation*** – The degree of difficulty of reversing and/or mitigating the various impacts ranges from easily achievable to very difficult. The four categories used are listed and explained in Table 1 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

15.2 ASSESSING IMPACTS

The CES rating scale used in this assessment takes into consideration the following criteria, and includes the new criteria for assessing post mitigation significance (residual impacts), by incorporating the principles of reversibility and irreplaceability:

- **Nature of impact** (Negative or positive impact on the environment).
- **Type of impact** (Direct, indirect and/or cumulative effect of impact on the environment).
- **Duration, Extent, Probability** (see **Table 4** below)

Table 4: Duration, Extent, Probability

Duration (Temporal Scale)		*Score*
Short term	*Less than 5 years*	*1*
Medium term	*Between 5-20 years*	*2*
Long term	*Between 20 and 40 years (a generation) and from a human perspective also permanent*	*3*
Permanent	*Over 40 years and resulting in a permanent and lasting change that will always be there*	*4*
Extent (Spatial Scale)		
Localised	*At localised scale and a few hectares in extent*	*1*
Study Area	*The proposed site and its immediate environs*	*2*
Regional	*District and Provincial level*	*3*
National	*Country*	*3*
International	*Internationally*	*4*
Probability (Likelihood)		
Unlikely	*The likelihood of these impacts occurring is slight*	*1*
May Occur	*The likelihood of these impacts occurring is possible*	*2*
Probable	*The likelihood of these impacts occurring is probable*	*3*
Definite	*The likelihood is that this impact will definitely occur*	*4*

- Severity or benefits

Table 5: Severity of Benefits

Impact Severity *(The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)*		*Score*
Very severe	**Very beneficial**	**4**
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.	
Severe	**Beneficial**	**3**
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.	
Moderately severe	**Moderately beneficial**	**2**
Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.	
Slight	**Slightly beneficial**	**1**
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.	
No effect	**Don't know/Can't know**	
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.	

** In certain cases it may not be possible to determine the severity of an impact thus it may be determined: Don't know/Can't know*

The scores for the three criteria in Table 4 and Table 5 above are added to obtain a composite score. They must then be considered against the severity rating to determine the overall significance of an activity. This is because

the severity of the impact is far more important than the other three criteria. The overall significance is then obtained by reading off the matrix presented in the table below. The overall significance is either negative or positive (Criterion 1) and direct, indirect or cumulative (Criterion 2).

Table 6: Composite Duration, Extent, Probability Scores

SEVERITY	COMPOSITE DURATION, EXTENT & PROBABILITY SCORE									
	3	4	5	6	7	8	9	10	11	12
Slight	3	4	5	6	7	8	9	10	11	12
Mod severe	3	4	5	6	7	8	9	10	11	12
Severe	3	4	5	6	7	8	9	10	11	12
Very severe	3	4	5	6	7	8	9	10	11	12

The **environmental significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

Table 7: Overall Significance

OVERALL SIGNIFICANCE *(The combination of all the above criteria as an overall significance)*	
VERY HIGH NEGATIVE	**VERY BENEFICIAL**
These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects. *Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.* *Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.*	
HIGH NEGATIVE	**BENEFICIAL**
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light. *Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.* *Example: The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.*	
MODERATE NEGATIVE	**SOME BENEFITS**
These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial. *Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.*	
LOW NEGATIVE	**FEW BENEFITS**
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect. *Example: The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.* *Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.*	
NO SIGNIFICANCE	
There are no primary or secondary effects at all that are important to scientists or the public. *Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.*	
DON'T KNOW	
In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information. *Example: The effect of a particular development on people's psychological perspective of the environment.*	

15.3 POST MITIGATION SIGNIFICANCE

Once mitigation measure is proposed, the following criteria are then used to determine the overall post mitigation significance of the impact:

- Reversibility: The degree to which an environment can be returned to its original/partially original state.
- Irreplaceable loss: The degree of loss which an impact may cause.

Mitigation potential: The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 8 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 8: Mitigation Potential

Reversibility	
Reversible	*The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.*
Irreversible	*The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.*
Irreplaceable loss	
Resource will not be lost	*The resource will not be lost/destroyed provided mitigation measures are implemented.*
Resource will be partly lost	*The resource will be partially destroyed even though mitigation measures are implemented.*
Resource will be lost	*The resource will be lost despite the implementation of mitigation measures.*
Mitigation potential	
Easily achievable	*The impact can be easily, effectively and cost effectively mitigated/reversed.*
Achievable	*The impact can be effectively mitigated/reversed without much difficulty or cost.*
Difficult	*The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.*
Very Difficult	*The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.*

15.4 MANAGEMENT AND MITIGATION ACTIONS

The following table provides a guideline of relevant heritage resources management actions is vital to the conservation of heritage resources.

No further action / Monitoring

Where no heritage resources have been documented, heritage resources occur well outside the impact zone of any development or the primary context of the surroundings at a development footprint has been largely destroyed or altered, no further immediate action is required. Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation in order to ensure that no undetected heritage\ remains are destroyed.

Avoidance

This is appropriate where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. Mitigation is not acceptable or not possible. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.

Mitigation

This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated to a degree of medium to low significance, e.g. the high to medium impact of a development on an archaeological site could be mitigated through sampling/excavation of the remains. Not all negative impacts can be mitigated.

Compensation

Compensation is generally not an appropriate heritage management action. The main function of management actions should be to conserve the resource for the benefit of future generations. Once lost it cannot be renewed. The circumstances around the potential public or heritage benefits would need to be exceptional to warrant this type of action, especially in the case of where the impact was high.

Rehabilitation

Rehabilitation is considered in heritage management terms as an intervention typically involving the adding of a new heritage layer to enable a new sustainable use. It is not appropriate when the process necessitates the removal of previous historical layers, i.e. restoration of a building or place to the previous state/period. It is an appropriate heritage management action in the following cases:

- The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.

- Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal

loss of historical fabric.

- Where the rehabilitation process will not result in a negative impact on the intrinsic value of the resource.